



Heywood Old Road, Middleton

Phase 2 Geo-Environmental Investigation, Risk Assessment and Outline Remediation Strategy

Job Number
LKC251564

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Client
Rochdale Borough Council



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EXECUTIVE SUMMARY

Site Details

Location	East of Heywood Old Road, south of Langley Lane, Birch, Middleton. Centred at approximate National Grid Reference 385375E 407505N.
Area	3.5Ha.
Topography	106-115 metres above ordnance datum (AOD). Site is slopes up to the south-east.
Current Site Use	Vacant area of grassed land. A single shed is located in the north-west of the site.
Proposed Development	New school building and associated infrastructure including a nature walk. New access road with retaining structures adjacent to Whittle Brook.

Site Setting

Main Historical Features	Onsite: Sand pit, Field, Whittle Book, unreferenced building, Pond Surrounding Area: Sand pit, Fields, Pond.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Till (Diamicton). Secondary Undifferentiated Aquifer. Bedrock: Pennine Lower Coal Measures (sandstone), Lower Coal Measures. Secondary A Aquifer.
Landfills / Infilled Ground	No recorded landfills. 3no. Potentially infilled ground identified including ponds and sand pit.
Site Reconnaissance	Groundcover comprises rough undulating grassland, 1no. building was observed on site comprising wooden structure probable use to house horses. Site is secured by electrical fence to the north, barbed wire and security fencing to the west and south with residential fence lines located on the eastern boundary. The study site generally slopes to the south-east; a small valley is present to the north-west. A legacy borehole was noted during the site investigation. No visual or olfactory evidence of contamination was identified during the site reconnaissance.
Recommendations	Site Investigation was recommended to further assess geo-environmental risk.

Ground Investigation Work Undertaken

Date of Investigation:	2 nd to 5 th December 2025.
Intrusive Investigation Work Undertaken:	12no. mechanically excavated trial pits. 1no. cable percussion boreholes. 4no. BRE365 soakaway tests. 8no. Cone penetration tests (CPT). Contamination and geotechnical testing.

Ground Conditions

Made Ground / Topsoil	Made ground generally comprised slightly gravelly sandy silt with ceramic and brick fragments to depths of 0.20-0.50mbgl (ref: TP102, TP103, TP106, TP107, TP110, SA101 & CP101). Topsoil was noted within the other trial pits and BRE365 soakaway pits.
Superficial	Firm to stiff light brown gravelly sandy silty clay was encountered within TP101, TP105, TP108 & TP110. Brown gravelly silty Sand was encountered within TP102, TP103, TP104, TP106, TP107, TP111, TP112, SA102, SA103, SA104 & CP101. Brown gravelly sandy silt encountered within TP109 & SA101.
Bedrock	Not encountered.
Groundwater	Groundwater strikes were recorded during the investigation in trial pits and boreholes. This data is provided in the profile logs (Appendix C). Groundwater strikes were recorded between 1.0mbgl to 5.50mbgl in

	TP102, TP107, TP108, TP109, TP112 & CP101. No groundwater strikes were recorded within the remainder of the trial pits.
Permeability	Slow draining in the majority of test locations. For SA104, the permeability at test depth has been calculated within an order of magnitude of 10^{-5} m/sec.

Geotechnical Assessment

Allowable Bearing Pressure	The medium dense SAND at 1.20m returns an average ABC of c.160kN/m ² , for traditional strip foundations. When considering the presence of groundwater this will be reduced to c.80kN/m ² .
Anticipated Foundation Type	It is considered that the building will include large spans and therefore strip foundations may not be appropriate. Pad or pile foundations supporting column loads are considered more suitable. Cladding and curtain walls can be supported by traditional shallow foundations such as strip or trench.
Earthworks Strategy	The predominantly granular soils are likely to be suitable for re-use as a general engineered fill in accordance with Class 2A of the Specification for Highway Works Series 600.
Other Considerations	A high voltage electricity cable is noted running generally east to west across the school site. The location of this should be confirmed on site and an appropriate standoff distance factored into the proposed layout and foundation design. Consideration of effects of trees also needs to be considered should clay strata be used to support foundations. Concrete should be designed in accordance with DS-1 AC-1s at the location of the proposed school building. DS-1 AC-2z may be required in the south and north of the site. Further investigation is advisable. Temporary support of all excavations will be required.

Contamination Risk Assessment

Pollutant Linkage		Risk	Assessment
1	Asbestos PAHs Petroleum hydrocarbons Metals	Low	No remediation required.
2	Naphthalene	Low	No remediation required.
3	Carbon dioxide, Methane	Moderate / Low	No remediation required.
4	PAHs, petroleum hydrocarbons, metals	Low	No remediation required.
5	PAHs, petroleum hydrocarbons	Low	Utility provider risk assessment to be completed. Standard PE pipe likely to be acceptable.

Waste Assessment

The results show that all the samples tested by LKC are classified as non-hazardous for disposal.

Remediation Recommendations

PL	Recommendation
1	No remediation required.
2	No remediation required.
3	No remediation required.
4	No remediation required.
5	Potable water pipe assessment required. Standard PE pipe likely to be acceptable.

Other Considerations
Unexpected Contamination
Re-use of Site Generated Material
Stockpile Management
Disposal
Control of Water
Health and Safety Considerations

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Appendix E – Certificates of Analysis (Soil)

Appendix F – Certificates of Analysis (Geotechnical)

Appendix G – Soakaway Tests

Appendix H – Generic Assessment Criteria Values

Appendix I – HazWasteOnline™ Output Sheets

Appendix J – References

1. Introduction

1.1. Background

LK Consult Ltd (LKC) has been commissioned to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Outline Remediation Strategy for Heywood Old Road. The investigation was undertaken in support of a planning application to develop the site for a SEN school.

The following work has previously been undertaken:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC251564-A1-PRA-Heywood Old Road R0, dated 24th December 2025).

This investigation has been undertaken to confirm the ground conditions below the site and to allow a contamination and geotechnical assessment to be undertaken.

The investigation will aim to confirm the risks of the potential pollutant linkages identified in the PRA and recommend further assessment / remediation, as required.

A summary of the site details is presented in Table 1-1. Figure 1 indicates the site location and boundary plan. Figure 2 indicates the proposed development.

Location	East of Heywood Old Road, south of Langley Lane, Birch, Middleton. Centred at approximate National Grid Reference 385375E 407505N.
Area	3.5Ha.
Topography	106-115 metres above ordnance datum (AOD). Site is slopes up to the south-east.
Current Site Use	Vacant area of grassed land. A single shed is located in the north-west of the site.
Proposed Development	New school building and associated infrastructure including a nature walk. New access road with retaining structures adjacent to Whittle Brook.

Table 1-1: Summary of site details.

2. Summary of Preliminary Risk Assessment (PRA)

2.1. Phase 1 Preliminary Risk Assessment (PRA)

Pertinent information has been summarised from the PRA in Table 2-1.

Main Historical Features	Onsite: Sand pit, Field, Whittle Brook, unreferenced building, Pond Surrounding Area: Sand pit, Fields, Pond.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Till (Diamicton). Secondary Undifferentiated Aquifer. Bedrock: Pennine Lower Coal Measures (sandstone), Lower Coal Measures. Secondary A Aquifer.
Landfills / Infilled Ground	No recorded landfills. 3no. Potentially infilled ground identified.
Site Reconnaissance	Groundcover comprises rough undulating grassland, 1no. building was observed on site comprising wooden structure probable use to house horses. Site is secured by electrical fence to the north, barbed wire and security fencing to the west and south with residential fence lines located on the eastern boundary. The study site generally slopes to the south-east; a small valley is present to the north-west. A legacy borehole was noted during the site investigation. No visual or olfactory evidence of contamination was identified during the site reconnaissance.

Table 2-1: Summary of site details, historical review, environmental settings, and site reconnaissance.

Table 2-2 summarises the geotechnical constraints. This has been updated to consider the previous site investigation work.

Coal Mining	Site is not within a Development High Risk Area. No further assessment required.
Slope Stability	A new access road is proposed along the crest of the Whittle Brook valley in the north of the site. Consideration should be given to the stability of the slope with addition loadings from the road.
Ground Stability Hazards	No to low hazard identified. No further action required.
Made Ground	Unknown depth and constituent of made ground across the site. Initial information indicates relatively shallow made ground. Unlikely to be a suitable founding stratum unless engineering work is undertaken. No made ground was encountered by the previous investigation.
Superficial	Clay from previous investigation was described as soft to very stiff. Sand described as loose to medium dense. Clay and sand encountered below site. Strata may be variable giving differential settlement.
Bedrock	Unknown depth to bedrock.
Groundwater	Shallow groundwater encountered by previous investigation. Shallow / fluctuating groundwater can affect the strength of the soil, particularly in granular ground. Shallow groundwater can also affect construction works.
Plasticity	Plasticity of clay deposits should be confirmed, particularly where trees are present or proposed, to identify the shrink / swell risk. Clay recorded on site.
Sulphate	Unknown sulphate content of the made ground and natural.
Road / Pavement Design	Unknown CBR values for footpath and road design.

Table 2-2: Summary of geotechnical constraints.

2.2. Previous Site Investigations

Wardell Armstrong completed 6no. trial pits (TP11 to TP16) and 2no. boreholes (BH2 & BH3) on the subject site within the Phase 2 Ground investigation for the wider school site (ref: GM11081/FINAL dated July 2020). Plate 2-1 shows the locations of the exploratory holes on the LKC subject site.

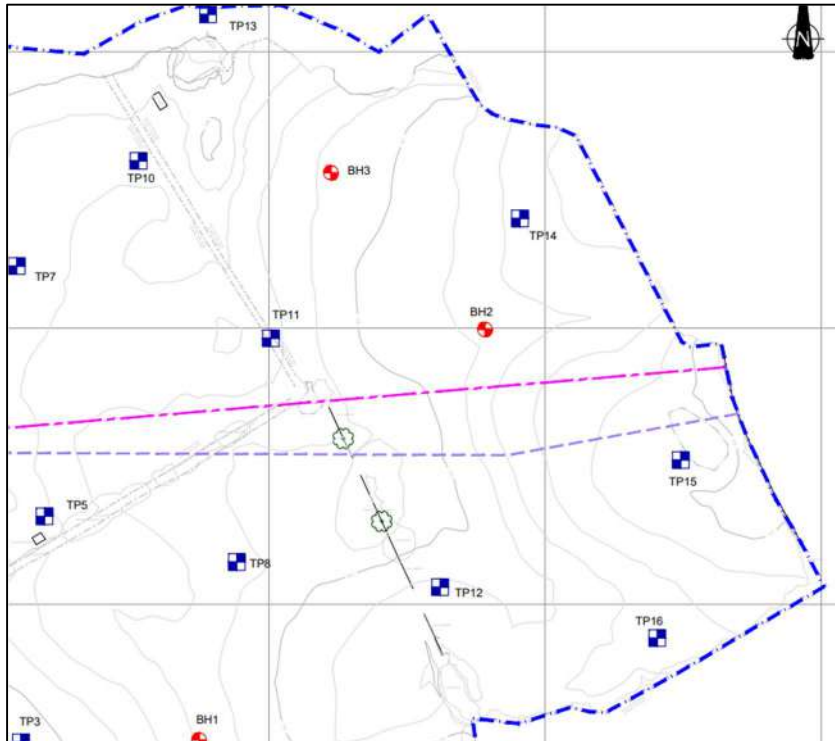


Plate 2-1: Extract of Exploratory Hole Location Plan from GM11081/FINAL.

Profile logs, laboratory test results and gas monitoring results are provided in Appendix A. Ground conditions and contamination assessment, from relevant exploratory holes, are summarised in Table 2-3 below.

Made Ground	No made ground was encountered on the site. The site is surfaced by grass over topsoil.
Superficial	Superficial deposits comprised soft to very stiff occasionally sandy and silty gravelly clay to 3-4mbgl. Very loose to medium dense sand was recorded between 0.70mbgl and 10.00mbgl and generally underlies the clay.
Bedrock	Bedrock was not encountered by the Wardell Armstrong investigation.
Groundwater	Shallow groundwater has been monitored across the site at depths between 0.80-7.56mbgl.
Obstructions	No obstructions were encountered.
Report Assessment and Observations for Contamination	No made ground was encountered on the subject site. All contaminants were below relevant screening values. The risk to human health was considered low. 6no. gas monitoring visits noted gas regime was CS1.

Table 2-3: Summary of Ground Conditions and contamination assessment.

2.3. Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in LCRM¹ has been summarised in Table 2-3.

Each pollutant linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552². The risk matrix is provided in Appendix B.

PL	Contaminants of Concern (source)	Pathway	Receptor	Probability	Consequence	Risk	Assessment and Recommendations
1	Asbestos, heavy metals, PAHs (shallow made ground)	Dermal contact. Inhalation of soil, fibres, and dust. Ingestion of soils, dust, home-grown produce, soil attached to home-grown produce. Windblown dust.	Future site users.	Low Likelihood	Medium	Moderate / Low (localised)	Significant contamination not anticipated given the site history. No made ground encountered in previous investigation. Limited made ground likely around shed on site. The probability is considered low likelihood until ground conditions have been established on site. Recommendations: Site Investigation to confirm ground conditions with confirmatory testing.
2	PAHs such as naphthalene (shallow made ground)	Inhalation of vapours. Migration via permeable strata and preferential pathways.	Future site users.	Unlikely	Medium	Low	No significant source of volatile contamination noted from site history and the anticipated ground conditions below the site. Recommendations: Confirmatory intrusive investigation with testing as part of recommendations for PL1.
3	Hazardous / ground gas: methane, carbon dioxide (shallow made ground)	Migration via permeable strata and preferential pathways. Inhalation of gas. Explosion in confined spaces.	Future site users. Buildings.	Unlikely	Severe	Moderate / Low	Unlikely as no significant source of gas identified within influencing distance of the site. Previous investigation encountered CS1 conditions on site. Recommendations: No gas monitoring required unless evidence of significant thickness of organic and / or putrescible material identified on site.
4	Metals, PAHs (shallow made ground)	Surface run-off. Migration via permeable strata and preferential pathways. Perched waters migration.	Groundwater Surface water	Unlikely	Medium	Low	Unlikely as no significant source of mobile contamination identified. Recommendations: No further assessment required unless evidence of significantly mobile contamination identified on site.
5	PAHs such as naphthalene (shallow made ground)	Ingestion of tainted water supply.	Future site users. Water pipes.	Unlikely	Medium	Low	Unlikely due to limited to no made ground expected. Recommendations: Sampling required if made ground at possible pipeline depth. Water pipeline risk assessment required.

Table 2-3: Preliminary Contamination Conceptual Model.

3. Ground Investigation

3.1. Site Investigation Design and Methodology

The investigation was carried out on 2nd – 5th December 2025 and comprised the following:

- 1no. cable percussion boreholes drilled to 25.05mbgl (ref. CP101).
- 12no. trial pits (using JCB 3CX) excavated to 2.20-2.80mbgl (ref. TP101 to TP112).
- 8no. cone penetration testing (CPT) tests. 4no. tests to a depth of 20.00mbgl within the area of the proposed retaining wall. 4no. tests to a depth of 25.00mbgl within the area of the proposed school building.
- 4no BRE365 Soakaway tests. (Ref: SA101 – SA104).

All site investigation locations are shown in Figure 3.

The locations were chosen to allow adequate assessment of ground conditions across the site . Table 3-1 details the site investigation locations. The sampling locations target depths around the school and the proposed access road were determined in conjunction with the appointed engineer.

Site Investigation Locations	Rationale
CPT101-CPT104	To gain geotechnical information within proposed new access road retaining wall construction.
CPT105-CPT108	To gain geotechnical information within the proposed footprint of the school.
CP101	To confirm ground interpreted by the CPT Rig and confirm deeper ground conditions.
SA101-SA104	BRE365 soakaway tests undertaken to prove permeability of soils.
TP101-TP112	To confirm ground conditions across the whole study area.

Table 3-1: Summary of Sampling Locations.

The number of site investigation points corresponds to approximately one location per 35m square centres. This is considered to be a conservative sampling density and is in line with BS10175³ for a 'detailed investigation'.

All borehole and trial pit profile logs are provided in Appendix C and are in line with BS14688-1⁴ and BS5930⁵. The CPT logs are provided in Appendix D.

3.2. Sampling Protocol

3.2.1. Soil Sampling (Contamination)

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation⁶.

Soil was collected for onsite testing for total volatile organic compounds (TVOCs) using a photoionisation detector (PID) fitted with a 10.6eV lamp and moisture trap. A plastic zip bag was half filled with soil allowing a suitably sized headspace. The bag was sealed and stored for at least 20 minutes before being tested. Results of the PID readings are presented on the profile logs (Appendix C). The onsite monitoring was carried out in line CIRIA C665⁷ to aid in screening samples for volatile analysis.

Soil samples of approximately 500g were recovered in amber jars and plastic tubs. All the samples were sent to DETS laboratory for chemical testing.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix E. Table 3-2 shows the soil testing undertaken.

Testing	No. Samples	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	5	A basic suite with a broad selection of contaminants where no significant evidence of contamination was identified (except for rare brick and ceramic).
LKC Waste Suite	1	Samples of representative material which may be earmarked for disposal.

Table 3-2: Summary of Soil Testing.

Notes:

If asbestos present during screen identification and quantification will be undertaken.

Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc, and boron; PAH=polycyclic aromatic hydrocarbons.

3.2.2. Soil Sampling (Geotechnical)

Soil samples taken during the investigation were collected in tubs, bulk bags and sealed U100 tubes for sent to Murray Rix Laboratories and DETS for geotechnical testing.

Table 3-3 shows the geotechnical testing undertaken. Certificates of analysis are presented in Appendix F.

Testing	No. Samples
Atterberg Limits (plasticity testing)	2
Particle Size Distribution (PSD) fine and coarse grain	6
Particle Size Distribution (PSD) coarse grain	2
Moisture Content	2
Rammer Compaction Test (2.5kg)	2
BRE Suite Short	3

Table 3-3: Summary of Geotechnical Testing Undertaken.

3.3. In-situ Testing

3.3.1. Geotechnical Testing

The CPT report is provided in Appendix D.

In-situ geotechnical tests were performed in the cable percussion borehole to further characterise the sub-soil conditions. The following tests were undertaken:

- Standard Penetration Tests (SPTs) were performed in the cable percussion boreholes at approximately 1m intervals within the first 5.00mbgl then approximately 1.50mbgl intervals alternating U100 where possible.
- Shear vane tests (giving undrained shear strength) were performed in the trial pits within cohesive strata.
- Lightweight Deflectometer Tests were undertaken to provide equivalent CBR values for road and pavement design.

Shear vanes tests were not always possible due to the friable or sandy nature of some of the clay deposits.

The results are provided within Appendix C.

3.3.2. Soakaway Tests

Soakaway tests were undertaken in SA101-SA104 in accordance with BRE Digest 365⁸ in machine excavated trial pits. The locations and depths were determined in conjunction with the appointed engineer. The arisings were logged in accordance with BS14688-1⁹ and BS5930. Test results are provided in Appendix G.

3.4. Gas Monitoring

Gas monitoring was not carried out as part of this investigation and has been carried out previously by Wardell Armstrong (Appendix A).

A Moderate / low risk was identified in the preliminary contamination conceptual model for gas (Pollutant Linkage 3) and further action was only recommended if significant organic / putrescible material was identified on site. Based on the ground conditions encountered, LKC did not consider gas monitoring to be required. This is discussed further in Section 5.3.

4. Ground Conditions

4.1. Geology

The ground conditions beneath the site are summarised below.

4.1.1. Made Ground

Made ground generally comprised slightly gravelly sandy silt with ceramic and brick fragments to depths of 0.20-0.50mbgl (ref: TP102, TP103, TP106, TP107, TP110, SA101 & CP101).

Topsoil was noted within the other trial pits and BRE365 soakaway pits.

4.1.2. Natural Strata

Site comprised various superficial strata which are summarised below:

Firm to stiff light brown gravelly sandy silty clay was encountered within TP101, TP105, TP108 & TP110.

Brown gravelly silty Sand was encountered within TP102, TP103, TP104, TP106, TP107, TP111, TP112, SA102, SA103, SA104 & CP101.

Brown gravelly sandy silt encountered within TP109 & SA101.

The CPT logs within the proposed road area (CPT101-CPT104) encountered refusals from 19.41mbgl to 19.97mbgl. CPTs carried out within the proposed school area (CPT105-CPT108) generally corroborated the profile logs with refusals encountered from c. 21.36mbgl to 24.97mbgl.

4.1.3. Contamination

There was no visual / olfactory evidence of hydrocarbons or volatile contaminants in any locations. The PID recorded a maximum of 0.1ppm TVOC in the samples.

4.2. Groundwater

4.2.1. Groundwater Levels

Groundwater strikes were recorded during the investigation in trial pits and boreholes. This data is provided in the profile logs (Appendix C). Groundwater strikes were recorded between 1.0mbgl to 5.50mbgl in TP102, TP107, TP108, TP109, TP112 & CP101. No groundwater strikes were recorded within the remainder of the trial pits.

A legacy borehole was identified on site from the previous site investigation undertaken by Wardell Armstrong in the year 2020, the results are summarised below:

Groundwater depth	4.08mbgl
Well installation depth	7.97mbgl

Table 4-2: Summary of Geotechnical Testing Undertaken.

4.2.2. Contamination

No evidence of contamination was identified in the groundwater during investigation work or monitoring. No free phase hydrocarbons were detected.

4.3. Permeability Tests

4.3.1. Soakaway Tests

The results of the soakaways are presented in Appendix G.

BRE365¹⁰ indicates that the calculation of the soil infiltration rate is made from the time taken for the water level to fall from 75% to 25% effective storage depth in each pit.

$$\text{Soil infiltration rate, } f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

V_{p75-25} = the effective storage volume of water in the trial pit between 75% and 25% effective depth.

a_{p50} = the internal surface area of the trial pit up to 50% effective depth including the base area.

t_{p75-25} = the time for the water level to fall from 75% to 25% effective depth.

Due to the slow rate at which water drained, three tests were not carried out in SA101-SA103, and tests were terminated before the required effective depth, therefore the permeability rate could not be calculated.

For SA104, the permeability at test depth has been calculated within an order of magnitude of 10^{-5} m/sec.

5. Geotechnical Assessment

5.1. Proposed Development

It is understood that the proposed development will comprise a new school with associated landscaping and infrastructure.

Details of the proposed loadings are not known.

Trial pits and bulk samples for earthwork specification were analysed on the potential for significant earthworks and levelling at the site, including the proposed nature trail in the southern part of the site. Once final levels have been confirmed that further assessment on the potential earthworks required may be provided.

Given the nature of the proposed development the structure is considered to meet the criteria of Geotechnical Category 2 of Eurocode 7¹¹.

5.2. Summary of Ground Conditions

Ground conditions identified at the site are detailed in Section 4.1 and typically comprises made ground up to 0.50mbgl over natural granular and cohesive superficial deposits of sand and clay to the completion depths investigated.

A high voltage electricity cable is noted running generally east to west across the school site. The location of this should be confirmed on site and an appropriate standoff distance factored into the proposed layout and foundation design.

5.3. Site Preparation

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the Specification for Highway Works¹². This should include:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill.
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,

The near surface soils may potentially be disturbed by weathering and site traffic. Precautions should be taken to avoid this, as excessive disturbance may result in more onerous floor slab design, road cap thickness and increased amount of site disposal etc. Based on site observations the near surface soils may require at least some treatment or reinforcing to allow safe movement of construction plant and labour. A working platform will be required for piling plant.

5.4. Foundation Conditions and Bearing Capacity

5.4.1. General

The natural granular material has been assessed using in-situ testing by CPT and SPT to obtain the density of the material. The natural cohesive material has been assessed using in-situ testing by Cone Penetrometer Testing (CPT), SPT and Hand Shear Vane (HV) to obtain the undrained shear strength (s_u) of the material. The results of the in-situ testing are provided in the exploratory hole Profile Logs (Appendix C) and the CPT logs (Appendix D).

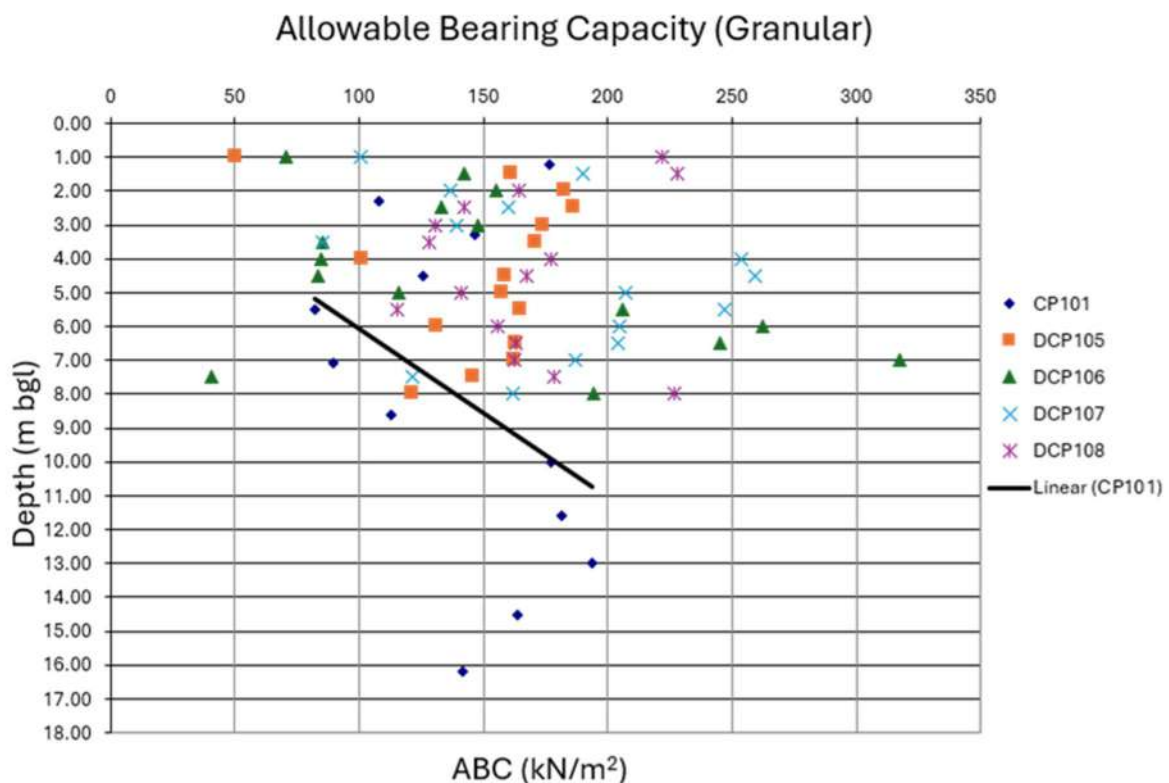
Considering logs within the footprint of the proposed building (CP101 & CPT105-108) the underlying strata is predominantly sand. Using the SPT results to a depth of 8mbgl and plotting them for Allowable Bearing Capacity (ABC) vs depth (shown in Graph 5-1), return an average ABC of c. 160kN/m².

The presence of groundwater (GW) has the potential to reduce the ABC of a granular material by as much as 50%. GW has been recorded at 0.50mbgl in the CPT locations, but at deeper depths in the

cable percussive borehole (5mbgl) and was not recorded in the trial pits undertaken in/near the footprint of the building. The trial pits were advanced to c.2.50mbgl. Previous reporting undertaken by Wardell Armstrong (WA) includes a cable percussive borehole (CP2) located in the area of the proposed building, this recorded a groundwater strike at 4mbgl, rising to 2m bgl and was monitored on 5 subsequent occasions, with the groundwater level ranging between 1.24m and 3.21mbgl, indicating a mobile, fluctuating water table.

Considering the GW recorded in the LKC exploratory hole locations along with the previous investigation by WA, it is considered that the presence of a high, fluctuating water table will have a negative effect upon the bearing capacity of the shallow granular strata.

The plot of the ABC vs depth (corrected for rods and energy) is shown below:



Graph 5-1: Summary of ABC vs Depth from in-situ SPT data.

The SPTs return an average result of 160kN/m²; when taken into consideration the potential for a high groundwater table to be present then this will effectively reduce the bearing capacity of the SAND to 80kN/m² at a depth of 1.20mbgl.

5.4.2. Plasticity

Clay samples from trial pits TP108 and TP109 in the south of the site were subjected to Atterberg Limits (plasticity) and Moisture Content testing. Results are provided in Appendix F.

The clay is classified as medium plasticity.

The modified plasticity index as detailed in Chapter 4.2-D5 of the NHBC standards (modified plasticity index = plasticity index x % less than 425µm sieve / 100%) characterises the clay as having a medium volume change potential.

5.4.3. Foundations Options

The proposed school building (Draft Plan, ED0064-SK1) will likely be constructed using steel construction such as a portal frame technique to facilitate the large open interior spaces (classrooms, dining areas, activity studios etc.).

5.4.4. Strip Foundations

The results of the SPTs plotted against depth as shown in Graph 5-1, and corrected for the presence of groundwater, will return an ABC of 80kN/m² for strip foundations placed at 1.20m depth.

5.4.5. Ground Improvement

The use of ground improvement techniques such as vibro granular columns will allow shallow foundations to be utilised with the loose to medium dense SAND. The vibro granular columns should provide an Allowable Bearing Capacity of around 150kN/m² but will also remove variability within the made ground.

Specialist advice should be sought from a suitably experienced contractor with regard to whether the ground conditions are suitable, the allowable bearing capacity that can be achieved and settlements.

It should be noted that the stone columns provide a pathway for gas and vapour migration, and additional mitigation measures may be required to help prevent the ingress into properties.

5.4.6. Pad Foundations

Based upon the N₆₀ values, obtained from the in-situ testing of granular natural strata by CPT and SPT, an assessment has been made on a pad foundation supporting column loads. For preliminary assessment purposes, a 1m² pad has been considered at a depth of 2.00mbgl.

The Bearing Capacity values were calculated using Brinch-Hansen Ng factor using an internal angle of friction (ϕ') of 40° based on the in-situ CPT data. A unit weight (γ) of 16kN/m³ has been used for the granular soils. Groundwater has been taken at 2mbgl. No additional loads (live or static or horizontal) have been added as surcharge into the analysis.

Pad Size	Pad Depth (mbgl)	Ultimate Bearing Capacity (kN/m ²)	Allowable Bearing Capacity (kN/m ²)
1m ² (1.00m x 1.00m)	1.50	1,128	376
2m ² (1.42m x 1.42m)		1,266	422

Table 5-1: Summary of Pad ABC.

Table 5-1 shows that a 1m² Pad founded at 1.50mbgl will return an Allowable Bearing Capacity (ABC), utilising a Factor of Safety (FoS) of 3, of 946kN/m². Increasing the pad to 2m² will increase the ABC to 1,009kN/m².

The above is for assessment purposes only, foundation design should be undertaken by a specialist contractor.

5.4.7. Piled Foundations

Consideration can also be given to a piled foundation solution should greater loads be required. It is recommended that the present topsoil and any made ground is first removed down to at least 0.30mbgl and replaced with a suitably compacted material to allow safe deployment of the piling rig. It is recommended that the emplaced fill is of a granular type and is tested and rolled in line with Specification For Highways Works Series 600¹³. Plate Load and CBR Tests should be used to ensure the working platform is suitable for rig loadings.

Due to the presence of sand and groundwater, bored piles are recommended over the use of Continuous Flight Auger as casing will be required while drilling the piles due to the presence of sands and groundwater. This will help minimise ground disturbance and prevent collapse into the borehole causing areas of weakness. This should be discussed with a piling contractor who may feel, from

previous experience with similar ground in the local area and the information available, that CFA could be suitable.

For preliminary purposes the following initial pile carrying capacities have been calculated. When undertaking these preliminary calculations, the following parameters have been used:

- Modelling based on assumed strata of natural sand to c.13.00mbgl, natural clay to >25.00mbgl.
- Groundwater at 5.00mbgl, within the sand.
- The natural sand is predominately medium dense and based on results of the CPT exploratory holes is taken as 16.00kN/m³, with an average angle of internal friction based on SPT results of 40°.
- Earth Pressure coefficient, Ks, of 1.
- Global Factor of Safety of 3.
- Settlement of pile has not been considered.

Depth (mbgl)	Pile Carrying Capacity (kN)		
	300mm dia	450mm dia	600mm dia
5	308	657	1,135
10	404	815	1,346
15	493	972	1,607

Table 5-2: Preliminary Pile Carrying Capacity.

The above examples are not intended to constitute any form of recommendation regarding pile size or type, but merely to illustrate the use of above ground coefficients. Pile design should be undertaken by a specialist contractor to allow them to reduce the Factor or Safety based on their extensive pile testing data and for the design of appropriate piling scheme.

Should a piled foundation solution be the preferred option, then warranty providers such as the NHBC or LABC, may require further information on ground conditions to a minimum of 5m below the base of the pile.

5.4.8. Foundation Recommendations

Whilst a piling solution is viable, pad foundations supporting column loads are considered a reliable and cost-effective option for the site.

5.5. Retaining Wall

It is understood that the proposed access road will require retaining above Whittle Brook as shown on Plate 5-1 below:

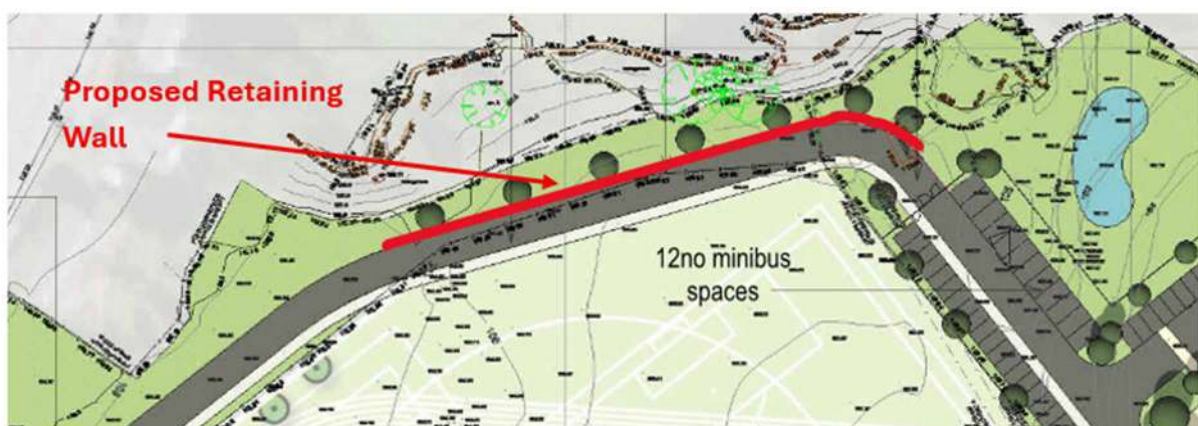


Plate 5-1: Location of Proposed Retaining Wall

The retained material will comprise the shallow deposits that were recorded in CPT101 to CPT104 and are expected to predominantly comprise medium dense sands, with some silt and clay horizons. Table

5-3 below gives indicative parameters for calculating the lateral earth pressure to use in the design of the retaining wall.

Strata	Unit Weight (γ) kN/m ³	Angle of internal Friction (Φ')
SAND	16	40
SILT	18	22
CLAY	21	20

Table 5-3: Soil Parameters.

Consideration must also be given to the depth of the water table below the retaining wall and to structural loads imposed from traffic using the road. Suitable drainage should be incorporated behind the retaining wall with seep holes installed to allow drainage and prevent the build-up of pore water pressure acting against the wall.

5.6. Ground Floor Slabs

Following suitable preparation of the sub-grade, by a combination of excavation and re-compaction, a ground bearing floor slab should be suitable for the proposed structure. Floor slabs should be designed by a suitably experienced structural engineer.

5.7. Pavement Construction

An assessment of the likely California Bearing Ratio (CBR) for the made ground has been assessed from the following sources:

- In Situ CBR tests undertaken using the Lightweight Deflectometer (LWD).
- Description of the materials encountered in the exploratory holes.

Based on this a CBR of less than 2% may be required to account for variability of the topsoil equating to a subgrade surface modulus of 27.42. It is, however, recommended that this be re-assessed using on site plate tests of the formation.

Based on the plasticity index the soils are not considered frost susceptible.

Following excavation, the sub formation should be proof rolled and any soft material inspected and removed.

5.8. Drainage

Four soil infiltration tests were undertaken in accordance with guidance contained within BRE SD365. Of the four locations tested, three did not show any potential for application of soak away drainage whereas SA104 returned a soil infiltration rate of 1.79×10^{-5} m/s.

Based on the results of the soakaway tests, the lateral continuity of the permeability of the ground cannot be assured and it is therefore not recommended that soakaways are used for disposal of surface water runoff.

5.9. Concrete Durability

Based upon the results of the chemical analyses (Appendix E), BRE SD1 suites were undertaken on samples obtained from CP101 which is central to the proposed new school building. Based on the results obtained, subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE Special Digest 1 (2005).

Further tests were undertaken on samples recovered from trial pits further afield in the south and north of the site, due to the lower pH values subsurface concrete in these locations should be designed in accordance with DS-1, AC-2z.

5.10. Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, groundwater seepage was recorded in several of the trial holes, evident of isolated perched water in the silty sand. Generally trial pits were stable.

The natural deposits included granular strata containing perched groundwater. The short- and long-term stability of near vertically sided excavations can therefore not be guaranteed and random and sudden instability within these soils should be anticipated.

It is recommended that all excavations should be supported or battered back in accordance with guidance contained in CIRIA R97¹⁴.

5.11. Cut and Fill Enabling Works

It is considered that the ground will require preparation to facilitate a developable platform for the construction of the school building as well as landscaping in the south of the site for the proposed nature trail.

The enabling works should also cover activities such as undertaking site preparation works including pre commencement surveys of the site and surrounding areas, preparation of access routes and providing suitable piling mats if required, surveying the site and producing topographical plans on completion of the earthworks, as well as installation of safety signs and security fencing.

Consideration has been given to the potential re-use of site won arisings from substructure works as an engineered fill. The soils have been assessed using the following:

- Physical description of the soils encountered (variability and organic content).
- Particle Size Distribution in relation to Specification for Highway Works¹⁵.
- Moisture Content and plasticity data in relation to Specification for Highway Works.
- Compaction Tests.

Based on this, the soils are likely to be suitable for re-use as a general engineered fill in accordance with Class 2A of the Specification for Highway Works.

Results of compaction testing (Appendix F) indicated that granular materials should be placed at an optimum moisture content of 11-12% and compacted to achieve a maximum dry density of 1.81-1.93Mg/m³.

An electric service cable runs east to west across the site to the south of the proposed school building. Consideration must be given to maintaining a suitable easement to the service, along with suitable consideration to its presence if earthworks are proposed near to this service.

5.12. Construction Activity and Inspection

The following activities and inspections should be incorporated into the site works:

- Due to the variability of the soils at the site, it is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction.
- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA R97¹⁶ utilised.
- De-watering may be required, especially following periods of heavy rainfall. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond.

- Where access to confined spaces is required appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results.
- The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

6. Generic Risk Assessment

6.1. Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (LCRM¹⁷). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 6.6.

6.2. Soil Risk Assessment

6.2.1. Methodology

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs) ^{18, 19}.
- LQM Suitable 4 Use Levels (S4ULs) ^{20, 21, 22, 23}.

The proposed development is for a special education school, therefore the assessment criteria for residential without plant uptake has been used due to the proposed development not being a standard receptor and children of ages 5+ will attend.

All criteria have been generated using the CLEA V1.06 model²⁴ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

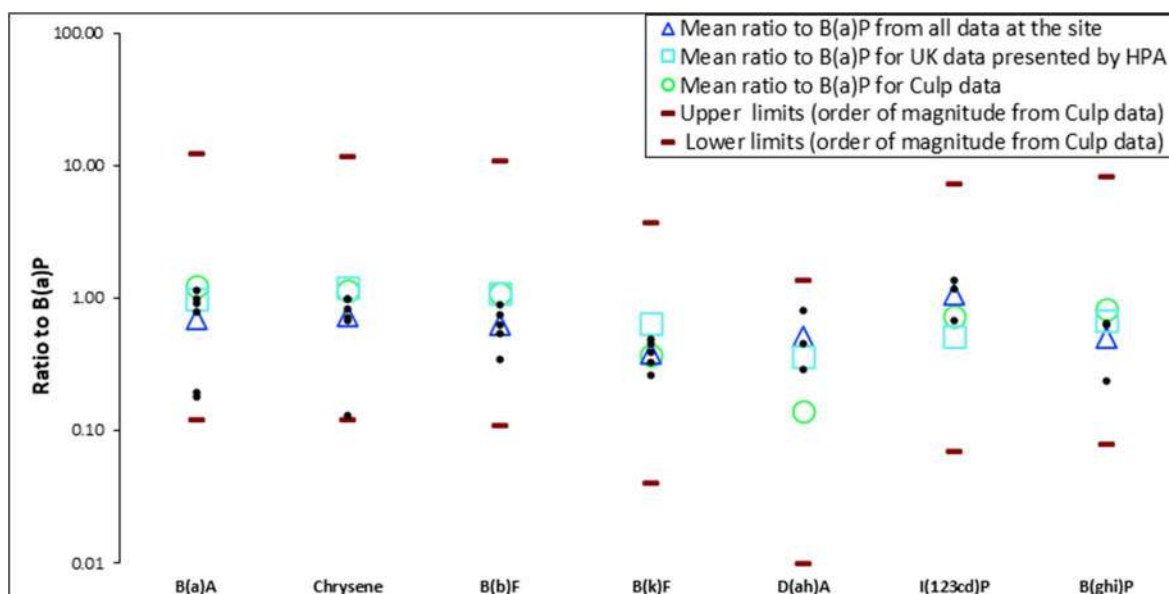
A summary of the generic assessment criteria used in this assessment is provided in Appendix H.

B(a)P as Surrogate Marker

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the PAHs^{25,26} and naphthalene the most volatile and soluble²⁷. The C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible²⁸. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)²⁹ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

LKC undertook an assessment of the PAH data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et al.*³⁰, which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

Graph 6-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.



Graph 6-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 6 samples (where values were >LOD to allow the calculation of a ratio).

Notes:

B(a)P=Benzo(a)pyrene; D(ah)A=Dibenzo(ah)anthracene; B(a)A=Benzo(a)anthracene; B(b)F=Benzo(b)fluoranthene; B(k)F=Benzo(k)fluoranthene; I(123cd)P=Indeno(123cd)pyrene; B(ghi)P=Benzo(ghi)perylene.

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

6.2.2. Soil Results Comparison against Assessment Criteria

All analysis sheets are presented in Appendix E. All the data has been compared to relevant assessment criteria and is presented in Appendix H.

Results have been compared to the relevant assessment criteria and no elevated contaminants were identified.

No asbestos was identified in any soil samples analysed.

6.2.3. Direct Contact Risk – Pollutant Linkage 1

No elevated metals, PAHs or petroleum hydrocarbons have been identified on site.

Limited made ground was encountered at the site.

At the concentrations identified, the contaminants are not considered to pose a potential risk to future site users in soft landscaped areas, where made ground may be exposed / in contact with homegrown produce. The principal pathways are the ingestion pathways (soil, dust, and homegrown produce) and dermal contact.

The probability of PAH, petroleum hydrocarbon and metal contamination affecting site users is unlikely. With a medium consequence, the risk is considered to be low, and no remediation is recommended.

No asbestos was identified in any of the samples; therefore, the probability of asbestos affected site users is considered to be unlikely. With a medium consequence, the risk is moderate / low. At this stage, a low risk is assumed (as no asbestos identified) and remediation is not required. However, as a precaution, construction workers should be and vigilant for any suspected ACM during groundworks (discussed further in Section 9.2).

6.2.4. Risk from Inhalation of Vapours – Pollutant Linkage 2

No visual / olfactory evidence of volatile contaminants was identified during the investigation. The PID did not detect any significant TVOCs. Confirmatory soil analysis did not detect any VOCs / SVOCs above detection limits/ assessment criteria.

LKC therefore consider the probability of volatile contaminants affecting site users as unlikely. The consequence is expected to be medium, giving a low risk and no remediation is required.

6.3. Gas Risk Assessment

Gas monitoring has not been carried out as part of this investigation as a low risk of hazardous or ground gas was identified. Previous monitoring identified CS1 conditions.

Made ground to a depth of 0.20-0.50mbgl with an average depth of 0.30mbgl was encountered across the site.

In line with CL:AIRE Research Bulletin 17³¹ where made ground is 1m or less and no significant organic / putrescible material is present, the site can be classified as Characteristic Situation 1 and no gas protection measures are required.

LKC therefore confirm the probability of gas affecting receptors is unlikely. With a severe consequence, the risk is moderate to low. Given the low concentrations of gas and low flow, LKC consider a low risk would be appropriate.

6.4. Controlled Water Assessment

The PRA identified a low risk with respect to controlled waters as no significant source of mobile contamination was anticipated. Furthermore, although a Principal Aquifer is present below the site, no abstractions have been identified within influencing distance and the site is not located in a Source Protection Zone. The surface water is not considered to be a significant receptor.

No evidence of significant mobile contamination was identified on the site.

The site investigation did not identify any significant sources of likely mobile contamination within the soils. This confirms an unlikely probability of onsite contamination affecting controlled waters. With a medium consequence the risk is anticipated to be low, and no remediation is required.

6.5. Potable Water Supply

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed.

No elevated contaminants were encountered when compared to threshold values for PE pipe. Furthermore, no made ground was encountered at pipeline installation depth.

The probability of organic contaminants affecting potable water pipes is unlikely. Given the consequence is considered to be medium, the risk (Pollutant Linkage 5) is anticipated to be low risk and no remediation is likely to be required.

Once details of the pipeline location and depths are known a UU Water Pipe Risk Assessment in line with the utility provider should be undertaken to confirm the most appropriate pipework for potable water.

6.6. Revised Contamination Conceptual Model

The preliminary contamination conceptual model (Table 2-3) has been revised following the risk assessments undertaken in Sections 6.1-6.4. The revised contamination conceptual model follows the

same methodology and guidance used in the preliminary contamination conceptual model. The risk matrix is provided in Appendix B.

The revised contamination conceptual model is presented in Table 6-1.

Where a very low risk or low risk is identified no specific remediation is required.

Where there is a moderate / low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

PL	Contaminants of Concern	Pathway	Receptor	Probability	Consequence	Risk	Assessment and Recommendations
1	Asbestos, heavy metals, PAHs	Dermal contact. Inhalation of soil, fibres, and dust. Ingestion of soils, dust, home-grown produce, soil attached to home-grown produce. Windblown dust.	Future site users.	Low Likelihood	Medium	Low	Significant contamination not encountered at site. Limited made ground encountered. The probability is considered unlikely. Recommendations: No remediation required.
2	PAHs such as naphthalene	Inhalation of vapours. Migration via permeable strata and preferential pathways.	Future site users.	Unlikely	Medium	Low	No significant source of volatile contamination noted from site history and the anticipated ground conditions below the site. Recommendations: No remediation required.
3	Hazardous / ground gas: methane, carbon dioxide	Migration via permeable strata and preferential pathways. Inhalation of gas. Explosion in confined spaces.	Future site users. Buildings.	Unlikely	Severe	Moderate / Low	Unlikely as no significant source of gas identified on site. Made ground encountered between 0.20-0.5mbgl. Previous investigation encountered CS1 conditions on site. Recommendations: No remediation required.
4	Metals, PAHs	Surface run-off. Migration via permeable strata and preferential pathways. Perched waters migration.	Groundwater Surface water	Unlikely	Medium	Low	Unlikely as no significant source of mobile contamination identified. Recommendations: No remediation required.
5	PAHs such as naphthalene, petroleum hydrocarbons	Ingestion of tainted water supply.	Future site users. Water pipes.	Unlikely	Medium	Low	No elevated contamination when compared to threshold values for PE pipe. No made ground encountered at installation depth. Recommendations: Water pipeline risk assessment required.

Table 6-11: Revised Contamination Conceptual Model.

7. Waste Disposal Assessment

7.1. HazWaste Assessment

The soil contamination results as presented in Appendix E have been used to help determine the waste classification of material for off-site disposal.

As an initial screen the soil results were inputted into HazWasteOnline™. This is a web-based facility that allows an assessment waste as either hazardous or non-hazardous waste based on relevant guidance and legislation.

HazWasteOnline™. has been designed to cover, amongst other waste types, the List of Waste (LoW) code number 17 "Construction and Demolition Waste (Including Excavated Soil from Contaminated Sites)".

Where less than limits of detection (LOD) were recorded, the value of the LOD was inputted.

Where applicable, contaminants were selected based on observations during sampling, site history, ground conditions and likely species present in soils (e.g., metal oxides relating to an ash-based source).

The results show that all the samples tested are classified as non-hazardous for disposal. The HazWasteOnline™ output sheets are provided in Appendix I.

7.2. Waste Acceptance Criteria (WAC) Testing

Waste Acceptance Criteria (WAC) testing was also undertaken on a sample of made ground. WAC test results are included in Appendix E.

The WAC limits cannot be used to assess whether a waste is non-hazardous or hazardous. It is recommended that waste assessment and WAC data is forwarded to a licensed waste disposal operator.

8. Conclusions

8.1. Ground Conditions

Ground conditions are summarised in Table 8-1 below.

Made Ground / Topsoil	Made ground generally comprised slightly gravelly sandy silt with ceramic and brick fragments to depths of 0.20-0.50mbgl (ref: TP102, TP103, TP106, TP107, TP110, SA101 & CP101). Topsoil was noted within the other trial pits and BRE365 soakaway pits.
Superficial	Firm to stiff light brown gravelly sandy silty clay was encountered within TP101, TP105, TP108 & TP110. Brown gravelly silty Sand was encountered within TP102, TP103, TP104, TP106, TP107, TP111, TP112, SA102, SA103, SA104 & CP101. Brown gravelly sandy silt encountered within TP109 & SA101.
Bedrock	Not encountered.
Groundwater	Groundwater strikes were recorded during the investigation in trial pits and boreholes. This data is provided in the profile logs (Appendix C). Groundwater strikes were recorded between 1.0mbgl to 5.50mbgl in TP102, TP107, TP108, TP109, TP112 & CP101. No groundwater strikes were recorded within the remainder of the trial pits.
Permeability	Slow draining in the majority of test locations. For SA104, the permeability at test depth has been calculated within an order of magnitude of 10^{-5} m/sec.

Table 8-1: Summary of Ground Conditions.

8.2. Geotechnical

Geotechnical observations and conclusions are contained in Table 8-2 below; more detailed discussions are contained within Section 5.

Allowable Bearing Pressure	The medium dense SAND at 1.20m returns an average ABC of c.160kN/m ² , for traditional strip foundations. When considering the presence of groundwater this will be reduced to c.80kN/m ² .
Anticipated Foundation Type	It is considered that the building will include large spans and therefore strip foundations may not be appropriate. Pad or pile foundations supporting column loads are considered more suitable. Cladding and curtain walls can be supported by traditional shallow foundations such as strip or trench.
Plasticity	Consideration will need to be given to the shrink / swell of the clay strata if it is to be used as founding strata, particularly where trees/hedges are present. Foundations may need to be deepened. A medium volume change potential has been calculated for the site.
Retaining Walls	It is understood that part of the access road will be retained from Whittle Brook and the strata that will be retained will predominantly comprise medium dense SAND with a γ of 16kN/m ³ and a ϕ of 40°. In areas of soft ground, the depth of the retaining structures below ground may need to be increased. The presence of shallow groundwater is a constraint to the installation of retaining structures and suitable drainage e.g., weepholes, granular fill behind structure should be provided.
Shallow Groundwater	Shallow groundwater identified on the site which will present a constraint to the development.

	Shallow groundwater was recorded in five of the sixteen trial pit locations, at depths of between 1.00m and 2.40m. Within the cable percussive borehole groundwater was recorded at 5.00mbgl.
Concrete Requirements	Based on BRE Digest 2005 ³² – DS-1 AC-1s at the location of the proposed school building. DS-1 AC-2z may be required in the south and north of the site. Further investigation is advisable.
Services	Services – an electrical service pipe runs east west across the site, south to the proposed school building. Consideration to maintaining a suitable easement to the service, along with suitable consideration to its presence if earthworks are proposed near to this service.
Temporary support of excavation	It is recommended that all excavations should be supported or battered back in accordance with guidance contained in CIRIA R9733.
Road / Pavement Design	A CBR of less than 2% may be required to account for variability of the topsoil. It is, however, recommended that this be re-assessed using on site plate tests of the formation. It is possible that a higher design CBR of 3% may then be achievable. Based on the plasticity index the soils are not considered frost susceptible.

Table 8-2: Geotechnical Conclusions Table.

8.3. Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-3 below (more detailed model provided in Section 6).

PL	Contaminant	Risk	Recommendations
1	Asbestos PAHs Petroleum hydrocarbons Metals	Low	No remediation required.
2	Naphthalene	Low	No remediation required.
3	Carbon dioxide, Methane	Moderate / Low	No remediation required.
4	PAHs, petroleum hydrocarbons, metals	Low	No remediation required.
5	PAHs, petroleum hydrocarbons	Low	Utility provider risk assessment to be completed. Standard PE pipe likely to be acceptable.

Table 8-3: Summary Risk Table.

PL=Pollutant Linkage, see Table 6-1 for details.

8.4. Waste Assessment

The results show that all the samples tested by LKC are classified as non-hazardous for disposal.

9. Recommendations and Remediation Strategy

The recommendations/requirements provided below are considered appropriate for the site based on the site investigation work undertaken. LKC should stress that no remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

Based on the findings of the site investigation and risk assessment, no remediation is required. A watching brief for any unexpected contamination should be maintained during groundworks (refer to Section 9.1), and any imported soils brought to site for use in gardens / soft landscaping should be validated to ensure they are suitable for use (refer to Section 9.2).

9.1. Other Considerations

9.1.1. Unexpected Contamination

The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required.

Impacted soils should be placed on an impermeable surface to await further assessment, treatment, or removal from site (this may be subject to chemical testing to confirm suitable waste facility). The work should be done under the supervision and instruction of an environmental consultant.

To determine that significantly impacted soils have been removed, verification samples will be collected from the base and sides of the excavation. If all impacted ground cannot be removed and contamination remains on the ground, further remediation may need to be considered.

Validation requirements should include a log of work undertaken, including photographs and details of any sampling undertaken and validation of any potential additional remedial work.

9.1.2. Re-use of Site Generated Material

To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used³⁴):

- 5,000 tonnes (c. 2,500m³) treatment of crushed concrete / stone.
- 1,000 tonnes (c. 500m³) use of non-hazardous soil.
- 5,000 tonnes (c. 2,500m³) use of clays, sand, gravel, brick, concrete, stone etc.
- 50,000 tonnes (c. 25,000m³) use of bituminous material to be used in roadways.

A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice³⁵ may be required if volumes exceed exemption limits. This must be registered before material movement starts onsite.

If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'.

For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2.

9.1.3. Stockpile Management

Stockpiled material should be suitably managed. Material should be segregated by type and source. For example, construction / demolition arisings, site won subsoil. Stockpiles may also require covering to minimise the generation of vapours, fibres, dust, and possible nuisance to adjacent receptors, and to prevent rainwater ingress. The source of each stockpile should be recorded and appropriate validation testing for re-use or potential offsite disposal should be undertaken as required.

9.1.4. Disposal

Material required to be removed from site should be undertaken under an appropriate duty of care and the results of chemical analysis should be provided to a licensed landfill for confirmation of waste classification.

Waste records such as disposal tickets and waste carrier licences should be provided in the Site Completion Report. Photographic evidence of removal and waste removal tickets should be retained and included in the validation report.

9.1.5. Control of Water

If significant organic contamination is present or to chase out deeper obstructions some localised excavation below the groundwater table may be required. Contingency arrangements to remove groundwater (including contaminated groundwater if encountered) from excavations/ relict structures should be allowed.

Small volumes of pumped fluids/ groundwater may be stored in appropriate, sealed tanks/containers and analysed for a range of determinants prior to disposal to suitable facility. Alternatively, a temporary discharge licence, including their requirements for treatment/ testing should be agreed with local utility providers (United Utilities) prior to start on site.

Where relict structures are found to retain fluid contaminants, they should be drained prior to removal.

9.1.6. Health and Safety Considerations

In working with, removing, or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance³⁶) should be adopted by all workers involved with site enabling and construction works.

9.2. Validation of Imported / Site Won Soils

Chemical validation of all imported and site-won soils to be used on site in soft landscaping areas should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

A summary of the required imported material sampling requirements is presented in Table 9-1 and is based on the slightly modified YALPAG guidance (2021)³⁷ based on a general worst case scenario. Ideally, the material should be sampled at source to prevent double handling if soil fails, with confirmatory sampling undertaken on importation to site. Where this is not possible then material imported should be segregated based on source and soil type. Validation samples should be taken prior to placement in gardens to ensure suitability for use.

Site won topsoil is expected to be suitable for reuse on site, subject to appropriate validation testing.

Material Type	Source	Suite of Analysis	Sampling Rate
Virgin Quarried Material	First generation quarried material (stone / subsoil)	Suite A	1 or 2 depending upon the type of stone / subsoil utilised to confirm the inert nature of the material.
Crushed Hardcore Stone and Brick (excluding asphalt)	Recycled (no volatile staining)	Suite A*	1 sample per 500m ³
General Fill	Imported fill – Greenfield / manufactured	Suite A*	1 sample per 500m ³
	Imported fill - Brownfield	Suite B*	
Topsoil / Subsoil	Greenfield / manufactured / natural site-won soil	Suite A*	^A 1 sample per 50m ³
	Brownfield / Screened Soils / site won made ground	Suite B*	^B 1 sample per 50m ³

Table 9-1: Sampling Requirements for Imported and Site Won Soils.

Notes:

Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.

Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.

*Minimum sampling rate of 3 samples per source.

Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

It should be ensured that the matrix of imported topsoil is suitable as a growing medium in line with BS3882³⁸. Topsoil soil shall be free of weeds, roots or perennial weeds, pests, diseases, debris, tree roots, sticks, subsoil and foreign matter and shall be capable of being broken down to a fine tilth. LKC advise this information is provided by the supplier before material is imported onto site.

Imported material to be used in gardens will be compared against residential with plant uptake criteria (as used in the contamination risk assessment in Section 6).

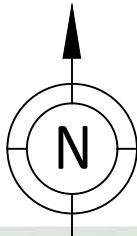
9.3. Site Completion Report

All remediation and validation work should be documented in a Site Completion Report. The Site Completion Report will allow discharge of relevant planning conditions.

Figures



Client: Rochdale Borough Council				Title: Site Location & Boundary Plan		 LK CONSULT	
Site: Heywood Old Road, Middleton				Scale (see scale bar): 1:25,000 & 1:3,000 @ A4			
Drawing No.: LKC251564		Drawn By: CK	Checked By: CC	Drawn: Dec 2025	Figure: 1		



KEY

Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



LK CONSULT

Client: Rochdale Borough Council

Site: Heywood Old Road, Middleton

Title: Proposed Development Plan

Job No.: LKC251564	Scale (See Scale Bar): See Scale Bar	Figure: 2	Revision: C
Drawn By: CC	Checked By: CW	Drawn: Mar 2026	





KEY

- Site Boundary
- Legacy Borehole (BH)
- Trial Pit (TP)
- Cable Percussive Borehole (CP)
- Cone Penetrometer Test (CPT)
- Soakaway Test (SA)

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



LK CONSULT

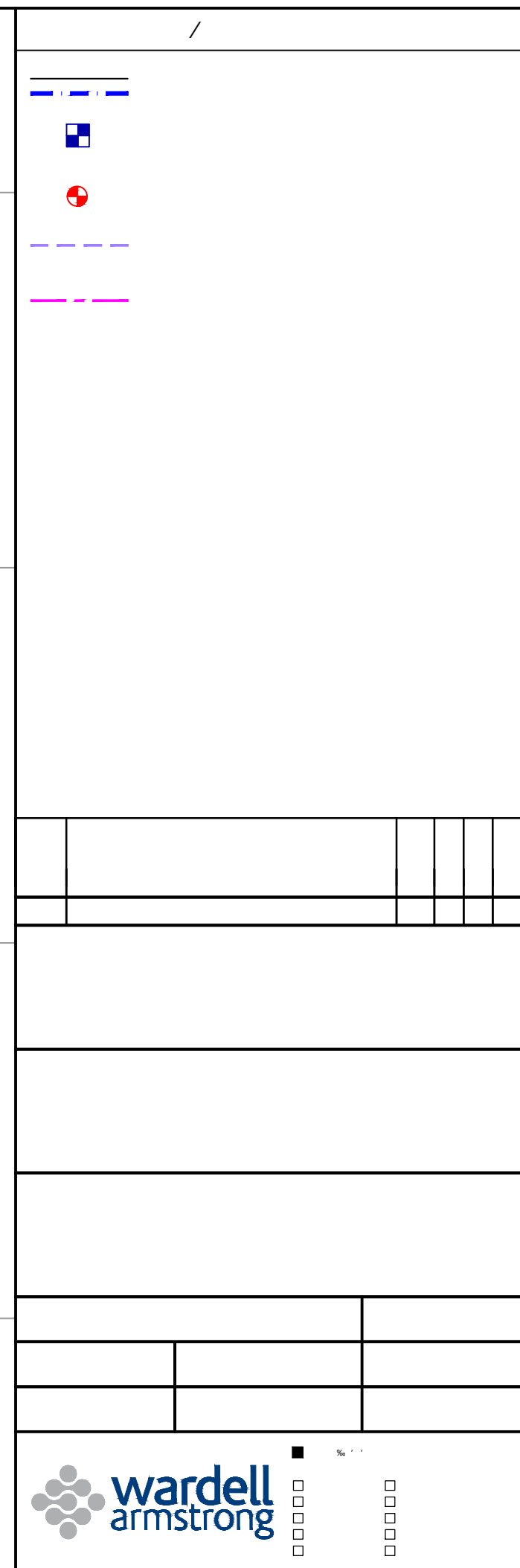
Client: Rochdale Borough Council

Site: Heywood Old Road, Middleton

Title: Site Investigation Location Plan

Job No.: LKC251564	Scale (See Scale Bar): See Scale Bar	Figure: 3	Revision: B
Drawn By: CC	Checked By: CW	Drawn: Mar 2026	

Appendix A – Previous Investigation Factual Information



Trial Pit Log

Project Name: Edgar Wood Academy		Client: Turner and Townsend		Date: 12/03/2020	
Location: As shown on WA Drawing Number GM11081-003.		Contractor: Geo-Ventures (UK) Ltd			
Project No. : GM11081		Crew Name:		Equipment: JCB 3CX	
Location Number TP11	Location Type TP	Level	Logged By LH	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D		0.60			Short grass over (soft) dark brown clay LOAM with frequent rootlets. (TOPSOIL)	
		1.00	D		2.00			(Soft) dark brown clay LOAM (subsoil).	1
					3.50			Greyish orange slightly silty slightly clayey fine to coarse SAND.	2
								End of Trial Pit at 3.500m	3
									4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
3.50	0.90	Severe spalling from 0.3mbgl to 3.9mbgl.					

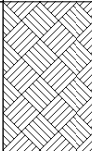
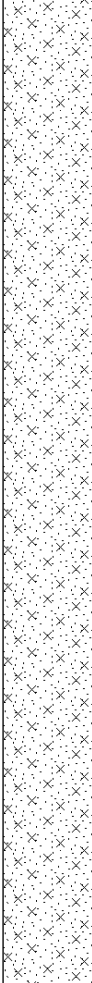
Remarks

SERVICES: Area was checked using a C.A.T and Genny prior to excavation. GROUNDWATER: Not encountered during excavation. TESTING: Hand vane testing was not undertaken due to granular nature of material. STABILITY: Severe spalling from 0.3mbgl to 3.9mbgl. BACKFILL: Trial pit backfilled with arisings.



Trial Pit Log

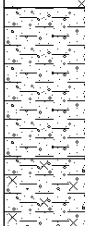
Project Name: Edgar Wood Academy		Client: Turner and Townsend		Date: 11/03/2020	
Location: As shown on WA Drawing Number GM11081-003.		Contractor: Geo-Ventures (UK) Ltd			
Project No. : GM11081		Crew Name:		Equipment: JCB 3CX	
Location Number TP12	Location Type TP	Level	Logged By LH	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	D		0.50			Short grass over (soft) dark brown clay LOAM with frequent rootlets. (TOPSOIL)	
					0.70			(Soft) dark brown clay LOAM (subsoil).	
		0.80	D					Orange silty fine to coarse SAND.	1
									2
									3
					4.00			End of Trial Pit at 4.000m	4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
4.00	0.90	Stable throughout.					

Remarks
 SERVICES: Area was checked using a C.A.T and Genny prior to excavation. GROUNDWATER: Encountered at 0.6mbgl. TESTING: Hand vane testing was not possible due to the presence of sand. STABILITY: Trial pit stable throughout excavation. BACKFILL: Trial pit backfilled with arisings.



Project Name: Edgar Wood Academy					Client: Turner and Townsend					Date: 11/03/2020				
Location: As shown on WA Drawing Number GM11081-003.					Contractor: Geo-Ventures (UK) Ltd									
Project No. : GM11081					Crew Name:					Equipment: JCB 3CX				
Location Number TP13			Location Type TP		Level			Logged By LH		Scale 1:25		Page Number Sheet 1 of 1		
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description						
		Depth (m)	Type	Results										
		0.90	D		0.30			Short grass over (soft) dark brown clay LOAM with frequent rootlets. (TOPSOIL)				1 -		
								(Soft) dark brown clay LOAM (subsoil).						
								(Soft) grey mottled orangish brown slightly sandy slightly gravelly silty CLAY with low cobble content. Gravel and cobbles are sub-rounded and sub-angular of mixed lithologies.						
								Greyish red slightly gravelly slightly sandy CLAY with low cobble content. Gravel and cobbles are subrounded of mixed lithologies.						
		1.20	D		1.20			Clay becoming firmer with depth.				2 -		
												3 -		
					3.80			End of Trial Pit at 3.800m				4 -		
												5 -		
Dimensions				Trench Support and Comment						Pumping Data				
Pit Length		Pit Width		Pit Stability	Shoring Used	Remarks				Date	Rate	Remarks		
3.80		0.90		Stable throughout.										
Remarks														
SERVICES: Area was checked using a C.A.T and Genny prior to excavation. GROUNDWATER: Not encountered during excavation. TESTING: Hand vane testing was not undertaken due to granular nature of material. STABILITY: Trial pit unstable throughout excavation. BACKFILL: Trial pit backfilled with arisings.														
														

Trial Pit Log

Project Name: Edgar Wood Academy		Client: Turner and Townsend		Date: 11/02/2020	
Location: As shown on WA Drawing Number GM11081-003.		Contractor: Geo-Ventures (UK) Ltd			
Project No. : GM11081		Crew Name:		Equipment: JCB 3CX	
Location Number TP14	Location Type TP	Level	Logged By LH	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.20			Short grass over (soft) dark brown clay LOAM with frequent rootlets. (TOPSOIL)	1
								(Soft) dark brown clay LOAM (subsoil).	
		0.60	D		0.80			(Soft) grey mottled orangish brown slightly sandy slightly gravelly silty CLAY with low cobble content. Gravel and cobbles are sub-rounded and sub-angular of mixed lithologies.	
					1.00			Greyish red slightly gravelly CLAY with low cobble content. Gravel and cobbles are subrounded of mixed lithologies.	
					4.10			End of Trial Pit at 4.100m	4
									5

Dimensions		Trench Support and Comment				Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks		Date	Rate	Remarks
4.10	0.90	Stable throughout.						

Remarks

SERVICES: Area was checked using a C.A.T and Genny prior to excavation. GROUNDWATER: Not encountered during excavation. TESTING: Hand vane testing was not undertaken due to granular nature of material. STABILITY: Trial pit stable throughout excavation. BACKFILL: Trial pit backfilled with arisings.



Trial Pit Log

Project Name: Edgar Wood Academy		Client: Turner and Townsend		Date: 11/03/2020	
Location: As shown on WA Drawing Number GM11081-003.		Contractor: Geo-Ventures (UK) Ltd			
Project No. : GM11081		Crew Name:		Equipment: JCB 3CX	
Location Number TP15	Location Type TP	Level	Logged By LH	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D	HVP=66	0.30			Short grass over (soft) dark brown clay LOAM with frequent rootlets. (TOPSOIL)	1
		0.70	D		0.80			(Soft) dark brown clay LOAM (subsoil).	
					1.20			(Soft) grey mottled orangish brown slightly sandy slightly gravelly silty CLAY with low cobble content. Gravel and cobbles are sub-rounded and sub-angular of mixed lithologies.	
					1.50			(Firm) greyish red slightly gravelly CLAY with low cobble content. Gravel and cobbles are subrounded of mixed lithologies.	
								<u>Clay becoming firmer with depth.</u>	
					3.90		End of Trial Pit at 3.900m	4	
									5

Trial Pit Log

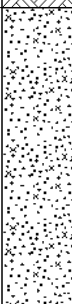
Project Name: Edgar Wood Academy		Client: Turner and Townsend		Date: 11/03/2020	
Location: As shown on WA Drawing Number GM11081-003.		Contractor: Geo-Ventures (UK) Ltd			
Project No. : GM11081		Crew Name:		Equipment: JCB 3CX	
Location Number TP16	Location Type TP	Level	Logged By LH	Scale 1:25	Page Number Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	D	HVP=189	0.20			Short grass over (soft) dark brown clay LOAM with frequent rootlets. (TOPSOIL)	1
		0.50	D				(Very stiff) dark brown clay LOAM (subsoil).		
		0.60							
		1.00		HVP=195	0.80			(Very stiff) greyish brown silty gravelly CLAY. Gravel is sub-rounded fine to coarse of mixed lithologies.	
					4.00			End of Trial Pit at 4.000m	4
									5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
4.00	0.90	Stable throughout.					

Remarks
 SERVICES: Area was checked using a C.A.T and Genny prior to excavation. GROUNDWATER: Not encountered during excavation. TESTING: Hand vane testing was undertaken in samples recovered from excavator bucket at 0.6m and 1.0m. STABILITY: Trial pit stable throughout excavation. BACKFILL: Trial pit backfilled with arisings.



Geo-Ventures (UK) Limited Geotechnical and Environmental Services							Site Edgar Site, Land adjacent to Heywood Old Road, Middleton		Borehole Number BH 2		
Boring Method Cable Percussion		Casing Diameter 150mm cased to 9.00m			Ground Level (mOD)		Client			Job Number 20-1910	
		Location			Dates 13/03/2020		Engineer Wardell Armstrong LLP			Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr	
0.20	D					(1.00)	Black TOPSOIL				
1.00-1.45 1.00-1.45	SPT N=6 DB			1,1/1,1,2,2		1.00	Loose brown slightly clayey silty fine SAND		▼1		
2.00-2.45 2.00-2.45	SPT N=4 DB			1,0/1,1,1,1		(2.00)					
3.00-3.45	U			46 blows		3.00	Firm brown sandy CLAY				
3.50	D					(1.00)					
4.00-4.45	DB			Moderate(1) at 4.00m, rose to 2.00m in 20 mins, sealed at 8.80m.		4.00	Very loose brown fine / medium SAND		▽1		
4.00-4.45	SPT N=3			1,0/1,1,0,1							
5.00-5.45 5.00-5.45	SPT N=1 DB			1,0/0,1,0,0							
6.00	D										
6.50-6.95 6.50-6.95	SPT N=4 DB			1,0/1,1,1,1		(4.80)					
8.00-8.45 8.00-8.45	SPT N=8 DB			1,1/2,2,2,2							
8.80	D					8.80	Firm / stiff brown sandy CLAY				
9.50-9.95	U			58 blows		(1.20)					
10.00	D					10.00					
Remarks Services pit excavated by hand Water added to borehole to assist with drilling								Scale (approx)	Logged By		
								1:50	Dr J Crook		
								Figure No. 20-1910.BH 2			

Geo-Ventures (UK) Limited <i>Geotechnical and Environmental Services</i>						Site Edgar Site, Land adjacent to Heywood Old Road, Middleton		Borehole Number BH 3		
Boring Method Cable Percussion		Casing Diameter 150mm cased to 9.00m			Ground Level (mOD)		Client		Job Number 20-1910	
		Location			Dates 16/03/2020		Engineer Wardell Armstrong LLP		Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	D					(1.00)	Black TOPSOIL			
1.00-1.45 1.00-1.45	SPT N=8 DB			1,2/2,2,2,2		1.00	Loose brown slightly clayey silty fine SAND			
2.00-2.45 2.00-2.45	SPT N=8 DB			1,2/2,2,2,2		(3.00)			▼1	
3.00-3.45 3.00-3.45	SPT N=8 DB			2,2/2,2,2,2						
4.00-4.45 4.00-4.45	DB SPT N=7			Moderate(1) at 4.00m, rose to 2.00m in 20 mins. 1,0/1,2,2,2		4.00	Medium dense brown fine / medium and medium SAND		▽1	
5.00-5.45 5.00-5.45	SPT N=22 DB			2,3/4,4,6,8						
6.50-6.95 6.50-6.95	SPT N=21 DB			2,3/3,4,6,8		(6.00)				
8.00-8.45 8.00-8.45	SPT N=20 DB			2,3/4,4,5,7						
9.50-9.95 9.50-9.95	SPT N=23 DB			2,3/4,5,6,8		10.00				
Remarks Water added to borehole to assist with drilling Services pit excavated by hand								Scale (approx)	Logged By	
								1:50	Dr J Crook	
								Figure No. 20-1910.BH 3		

Geo-Ventures (UK) Limited Geotechnical and Environmental Services			Site Edgar Site, Land adjcent to Heywood Old Road, Middleton	Borehole Number BH 2
Installation Type Single Installation	Dimensions Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm		Client	Job Number 20-1910
	Location	Ground Level (mOD)	Engineer Wardell Armstrong LLP	Sheet 1/1

[illegible]

Remarks

Geo-Ventures (UK) Limited Geotechnical and Environmental Services			Site Edgar Site, Land adjcent to Heywood Old Road, Middleton	Borehole Number BH 3
Installation Type Single Installation	Dimensions Internal Diameter of Tube [A] = 50 mm Diameter of Filter Zone = 150 mm		Client	Job Number 20-1910
	Location	Ground Level (mOD)	Engineer Wardell Armstrong LLP	Sheet 1/1

[illegible]

[illegible]

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/8	20/02677/9	20/02677/10	20/02677/11	20/02677/12	20/02677/13	20/02677/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP7	TP6	TP6	TP10	TP10	TP10	TP11			
Depth to Top	0.40	0.20	0.80	0.30	0.60	0.80	0.30			
Depth To Bottom										
Date Sampled	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5AE	6AE	6AE	6AE	6AE	4A	6AE			
% Stones >10mm _A	0.8	<0.1	<0.1	4.9	25.0	<0.1	3.9	% w/w	0.1	A-T-044
pH _D ^{M#}	6.35	5.23	-	5.57	5.52	6.36	5.46	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphide _A	7	<5	-	<5	<5	<5	<5	mg/kg	5	A-T-S2-s
Fraction of organic carbon _D [#]	0.0090	0.0411	-	0.0365	0.0207	0.0009	0.0250	N/A	0.0003	A-T-032 FOC
Arsenic _D ^{M#}	2	17	-	15	11	<1	5	mg/kg	1	A-T-024s
Cadmium _D ^{M#}	0.7	0.8	-	0.8	0.5	<0.5	<0.5	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	19	40	-	32	26	2	17	mg/kg	1	A-T-024s
Chromium _D ^{M#}	30	27	-	19	15	4	18	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	-	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	12	81	-	74	56	2	32	mg/kg	1	A-T-024s
Mercury _D	<0.17	0.24	-	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	35	22	-	18	14	4	13	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	2	-	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	57	70	-	64	50	13	40	mg/kg	5	A-T-024s
Leachate Prep BS EN 12457-2 (10:1) _A	-	-	*	-	-	-	-			A-T-001
pH (leachable) _A [#]	-	-	5.92	-	-	-	-	pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	-	-	27.67	-	-	-	-	mg/l	1	A-T-026w
Sulphide (leachable) _A	-	-	<0.1	-	-	-	-	mg/l	0.1	A-T-S2-w
Arsenic (leachable) _A [#]	-	-	<1	-	-	-	-	µg/l	1	A-T-025w
Cadmium (leachable) _A [#]	-	-	<1	-	-	-	-	µg/l	1	A-T-025w
Copper (leachable) _A [#]	-	-	22	-	-	-	-	µg/l	1	A-T-025w
Chromium (leachable) _A [#]	-	-	<1	-	-	-	-	µg/l	1	A-T-025w
Lead (leachable) _A [#]	-	-	38	-	-	-	-	µg/l	1	A-T-025w
Mercury (leachable) _A [#]	-	-	<0.1	-	-	-	-	µg/l	0.1	A-T-025w
Nickel (leachable) _A [#]	-	-	4	-	-	-	-	µg/l	1	A-T-025w
Selenium (leachable) _A [#]	-	-	<1	-	-	-	-	µg/l	1	A-T-025w
Zinc (leachable) _A [#]	-	-	109	-	-	-	-	µg/l	1	A-T-025w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/8	20/02677/9	20/02677/10	20/02677/11	20/02677/12	20/02677/13	20/02677/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP7	TP6	TP6	TP10	TP10	TP10	TP11			
Depth to Top	0.40	0.20	0.80	0.30	0.60	0.80	0.30			
Depth To Bottom										
Date Sampled	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5AE	6AE	6AE	6AE	6AE	4A	6AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	-	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	-	N/A	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/8	20/02677/9	20/02677/10	20/02677/11	20/02677/12	20/02677/13	20/02677/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP7	TP6	TP6	TP10	TP10	TP10	TP11			
Depth to Top	0.40	0.20	0.80	0.30	0.60	0.80	0.30			
Depth To Bottom										
Date Sampled	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5AE	6AE	6AE	6AE	6AE	4A	6AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.11	-	0.11	0.23	<0.01	0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	0.08	-	0.02	0.05	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.40	-	0.25	0.45	<0.02	0.05	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	1.09	-	0.67	1.29	<0.04	0.14	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.97	-	0.58	1.11	<0.04	0.14	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	1.01	-	0.64	1.21	<0.05	0.14	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.43	-	0.23	0.54	<0.05	0.08	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	0.36	-	0.23	0.42	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	1.16	-	0.74	1.32	<0.06	0.17	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	0.11	-	0.07	0.14	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	2.15	-	1.53	2.83	<0.08	0.29	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	0.15	-	0.07	0.17	<0.01	0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.47	-	0.28	0.61	<0.03	0.08	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	0.04	-	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	1.85	-	1.06	2.03	<0.03	0.20	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	2.28	-	1.43	2.60	<0.07	0.27	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	12.7	-	7.91	15	<0.08	1.58	mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/8	20/02677/9	20/02677/10	20/02677/11	20/02677/12	20/02677/13	20/02677/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP7	TP6	TP6	TP10	TP10	TP10	TP11			
Depth to Top	0.40	0.20	0.80	0.30	0.60	0.80	0.30			
Depth To Bottom										
Date Sampled	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5AE	6AE	6AE	6AE	6AE	4A	6AE			
PAH 16MS (leachable)										
Acenaphthene (leachable) _A	-	-	0.11	-	-	-	-	µg/l	0.02	A-T-019w
Acenaphthylene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Anthracene (leachable) _A	-	-	0.05	-	-	-	-	µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Chrysene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Fluoranthene (leachable) _A	-	-	0.12	-	-	-	-	µg/l	0.02	A-T-019w
Fluorene (leachable) _A	-	-	0.15	-	-	-	-	µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	-	-	<0.02	-	-	-	-	µg/l	0.02	A-T-019w
Naphthalene (leachable) _A	-	-	0.08	-	-	-	-	µg/l	0.02	A-T-019w
Phenanthrene (leachable) _A	-	-	0.49	-	-	-	-	µg/l	0.02	A-T-019w
Pyrene (leachable) _A	-	-	0.11	-	-	-	-	µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) _A	-	-	1.11	-	-	-	-	µg/l	0.02	A-T-019w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/8	20/02677/9	20/02677/10	20/02677/11	20/02677/12	20/02677/13	20/02677/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP7	TP6	TP6	TP10	TP10	TP10	TP11			
Depth to Top	0.40	0.20	0.80	0.30	0.60	0.80	0.30			
Depth To Bottom										
Date Sampled	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5AE	6AE	6AE	6AE	6AE	4A	6AE			
TPH CWG (leachable)										
Ali >C5-C6 (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
Ali >C6-C8 (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
Ali >C8-C10 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Ali >C10-C12 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Ali >C12-C16 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Ali >C16-C21 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Ali >C21-C35 (leachable) _A	-	-	<20	-	-	-	-	µg/l	20	A-T-055w
Total Aliphatics (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Aro >C5-C7 (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
Aro >C7-C8 (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
Aro >C8-C10 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Aro >C10-C12 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Aro >C12-C16 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Aro >C16-C21 (leachable) _A	-	-	<10	-	-	-	-	µg/l	10	A-T-055w
Total Aromatics (leachable) _A	-	-	<20	-	-	-	-	µg/l	20	A-T-055w
TPH (Ali & Aro >C5-C35) (leachable) _A	-	-	<20	-	-	-	-	µg/l	20	A-T-055w
BTEX - Benzene (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
BTEX - Toluene (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
BTEX - Ethyl Benzene (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
BTEX - o Xylene (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
BTEX - m & p Xylene (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
MTBE (leachable) _A	-	-	<1	-	-	-	-	µg/l	1	A-T-022w
Aro >C21-C35 (leachable) _A	-	-	<20	-	-	-	-	µg/l	20	A-T-055w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/8	20/02677/9	20/02677/10	20/02677/11	20/02677/12	20/02677/13	20/02677/14	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP7	TP6	TP6	TP10	TP10	TP10	TP11			
Depth to Top	0.40	0.20	0.80	0.30	0.60	0.80	0.30			
Depth To Bottom										
Date Sampled	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20	12-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	5AE	6AE	6AE	6AE	6AE	4A	6AE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	-	-	-	<1	-	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	-	-	-	<1	-	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	-	-	-	-	<1	-	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	-	-	-	-	<1	-	mg/kg	1	A-T-055s
Ali >C21-C35 _A	<1	-	-	-	-	6	-	mg/kg	1	A-T-055s
Total Aliphatics _A	<1	-	-	-	-	6	-	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	-	-	-	-	1	-	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	-	-	-	-	1	-	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	-	-	-	-	4	-	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	-	-	-	-	14	-	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	<1	-	-	-	-	63	-	mg/kg	1	A-T-055s
Total Aromatics _A	<1	-	-	-	-	83	-	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	<1	-	-	-	-	89	-	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	-	-	-	-	<0.01	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/15	20/02677/16	20/02677/17	20/02677/18	20/02677/19	20/02677/20	20/02677/21	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP14	TP14	TP15	TP15	TP16	TP16			
Depth to Top	1.00	0.20	0.60	0.20	0.70	0.30	0.50			
Depth To Bottom										
Date Sampled	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4A	6AE	4AE	6AE	5AE	6AE	5AE			
% Stones >10mm _A	<0.1	17.1	3.7	<0.1	<0.1	2.0	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	5.77	5.47	-	5.82	6.97	5.61	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	<0.01	-	<0.01	0.03	<0.01	-	g/l	0.01	A-T-026s
Sulphide _A	<5	<5	-	<5	<5	<5	-	mg/kg	5	A-T-S2-s
Fraction of organic carbon _D [#]	0.0036	0.0191	-	0.0271	0.0046	0.0668	-	N/A	0.0003	A-T-032 FOC
Arsenic _D ^{M#}	<1	9	-	11	3	25	-	mg/kg	1	A-T-024s
Cadmium _D ^{M#}	<0.5	0.6	-	0.8	0.8	0.9	-	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	6	32	-	27	19	51	-	mg/kg	1	A-T-024s
Chromium _D ^{M#}	10	21	-	27	48	26	-	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	-	<1	<1	<1	-	mg/kg	1	A-T-040s
Lead _D ^{M#}	5	59	-	59	11	95	-	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	-	<0.17	<0.17	<0.17	-	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	8	16	-	21	50	25	-	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	-	1	1	2	-	mg/kg	1	A-T-024s
Zinc _D ^{M#}	17	62	-	64	61	78	-	mg/kg	5	A-T-024s
Leachate Prep BS EN 12457-2 (10:1) _A	-	-	*	-	-	-	*			A-T-001
pH (leachable) _A [#]	-	-	5.92	-	-	-	7.48	pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	-	-	80.57	-	-	-	1.47	mg/l	1	A-T-026w
Sulphide (leachable) _A	-	-	<0.1	-	-	-	<0.1	mg/l	0.1	A-T-S2-w
Arsenic (leachable) _A [#]	-	-	<1	-	-	-	<1	µg/l	1	A-T-025w
Cadmium (leachable) _A [#]	-	-	<1	-	-	-	<1	µg/l	1	A-T-025w
Copper (leachable) _A [#]	-	-	12	-	-	-	<1	µg/l	1	A-T-025w
Chromium (leachable) _A [#]	-	-	<1	-	-	-	<1	µg/l	1	A-T-025w
Lead (leachable) _A [#]	-	-	9	-	-	-	<1	µg/l	1	A-T-025w
Mercury (leachable) _A [#]	-	-	0.1	-	-	-	<0.1	µg/l	0.1	A-T-025w
Nickel (leachable) _A [#]	-	-	2	-	-	-	<1	µg/l	1	A-T-025w
Selenium (leachable) _A [#]	-	-	<1	-	-	-	<1	µg/l	1	A-T-025w
Zinc (leachable) _A [#]	-	-	36	-	-	-	13	µg/l	1	A-T-025w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/15	20/02677/16	20/02677/17	20/02677/18	20/02677/19	20/02677/20	20/02677/21	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP14	TP14	TP15	TP15	TP16	TP16			
Depth to Top	1.00	0.20	0.60	0.20	0.70	0.30	0.50			
Depth To Bottom										
Date Sampled	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4A	6AE	4AE	6AE	5AE	6AE	5AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	-	NAD	NAD	NAD	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	-	N/A	N/A	N/A	-			A-T-045

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/15	20/02677/16	20/02677/17	20/02677/18	20/02677/19	20/02677/20	20/02677/21	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP14	TP14	TP15	TP15	TP16	TP16			
Depth to Top	1.00	0.20	0.60	0.20	0.70	0.30	0.50			
Depth To Bottom										
Date Sampled	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4A	6AE	4AE	6AE	5AE	6AE	5AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.03	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.08	-	<0.02	<0.02	<0.02	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	0.34	-	0.12	<0.04	0.07	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.37	-	0.13	<0.04	0.08	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	0.43	-	0.16	<0.05	0.08	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.21	-	0.08	<0.05	<0.05	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	0.14	-	<0.07	<0.07	<0.07	-	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.40	-	0.14	<0.06	0.10	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	0.05	-	<0.04	<0.04	<0.04	-	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	0.69	-	0.21	<0.08	0.16	-	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	0.02	-	<0.01	<0.01	<0.01	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.22	-	0.08	<0.03	<0.03	-	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	-	<0.03	<0.03	<0.03	-	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	0.27	-	0.09	<0.03	0.07	-	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.65	-	0.21	<0.07	0.16	-	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	3.90	-	1.22	<0.08	0.72	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/15	20/02677/16	20/02677/17	20/02677/18	20/02677/19	20/02677/20	20/02677/21	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP14	TP14	TP15	TP15	TP16	TP16			
Depth to Top	1.00	0.20	0.60	0.20	0.70	0.30	0.50			
Depth To Bottom										
Date Sampled	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4A	6AE	4AE	6AE	5AE	6AE	5AE			
PAH 16MS (leachable)										
Acenaphthene (leachable) _A	-	-	0.66	-	-	-	<0.02	µg/l	0.02	A-T-019w
Acenaphthylene (leachable) _A	-	-	0.08	-	-	-	<0.02	µg/l	0.02	A-T-019w
Anthracene (leachable) _A	-	-	0.19	-	-	-	<0.02	µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Chrysene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Fluoranthene (leachable) _A	-	-	0.20	-	-	-	<0.02	µg/l	0.02	A-T-019w
Fluorene (leachable) _A	-	-	0.84	-	-	-	<0.02	µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	-	-	<0.02	-	-	-	<0.02	µg/l	0.02	A-T-019w
Naphthalene (leachable) _A	-	-	0.77	-	-	-	<0.02	µg/l	0.02	A-T-019w
Phenanthrene (leachable) _A	-	-	1.17	-	-	-	<0.02	µg/l	0.02	A-T-019w
Pyrene (leachable) _A	-	-	0.13	-	-	-	<0.02	µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) _A	-	-	4.04	-	-	-	<0.02	µg/l	0.02	A-T-019w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/15	20/02677/16	20/02677/17	20/02677/18	20/02677/19	20/02677/20	20/02677/21	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP14	TP14	TP15	TP15	TP16	TP16			
Depth to Top	1.00	0.20	0.60	0.20	0.70	0.30	0.50			
Depth To Bottom										
Date Sampled	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4A	6AE	4AE	6AE	5AE	6AE	5AE			
TPH CWG (leachable)										
Ali >C5-C6 (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
Ali >C6-C8 (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
Ali >C8-C10 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Ali >C10-C12 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Ali >C12-C16 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Ali >C16-C21 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Ali >C21-C35 (leachable) _A	-	-	<20	-	-	-	<20	µg/l	20	A-T-055w
Total Aliphatics (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Aro >C5-C7 (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
Aro >C7-C8 (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
Aro >C8-C10 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Aro >C10-C12 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Aro >C12-C16 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Aro >C16-C21 (leachable) _A	-	-	<10	-	-	-	<10	µg/l	10	A-T-055w
Total Aromatics (leachable) _A	-	-	<20	-	-	-	<20	µg/l	20	A-T-055w
TPH (Ali & Aro >C5-C35) (leachable) _A	-	-	<20	-	-	-	<20	µg/l	20	A-T-055w
BTEX - Benzene (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
BTEX - Toluene (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
BTEX - Ethyl Benzene (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
BTEX - o Xylene (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
BTEX - m & p Xylene (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
MTBE (leachable) _A	-	-	<1	-	-	-	<1	µg/l	1	A-T-022w
Aro >C21-C35 (leachable) _A	-	-	<20	-	-	-	<20	µg/l	20	A-T-055w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/15	20/02677/16	20/02677/17	20/02677/18	20/02677/19	20/02677/20	20/02677/21	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP14	TP14	TP15	TP15	TP16	TP16			
Depth to Top	1.00	0.20	0.60	0.20	0.70	0.30	0.50			
Depth To Bottom										
Date Sampled	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4A	6AE	4AE	6AE	5AE	6AE	5AE			
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Ali >C21-C35 _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Total Aliphatics _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
Total Aromatics _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	<1	-	-	-	<1	-	-	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	-	-	-	<0.01	-	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/22	20/02677/23	20/02677/24	20/02677/25	20/02677/26	20/02677/27	20/02677/28	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP8	TP8	TP8	TP1	TP1			
Depth to Top	0.40	0.80	0.20	0.60	1.20	0.20	0.30			
Depth To Bottom										
Date Sampled	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	6AE	4A	6AE	5AE	4A	6AE	5AE			
% Stones >10mm _A	<0.1	<0.1	<0.1	1.8	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH _D ^{M#}	5.75	-	5.35	5.68	6.05	5.48	5.81	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	-	<0.01	<0.01	0.02	<0.01	0.04	g/l	0.01	A-T-026s
Sulphide _A	<5	-	<5	10	<5	<5	<5	mg/kg	5	A-T-S2-s
Fraction of organic carbon _D [#]	0.0262	-	0.0620	0.0090	0.0029	0.0390	0.0050	N/A	0.0003	A-T-032 FOC
Arsenic _D ^{M#}	12	-	20	2	2	19	3	mg/kg	1	A-T-024s
Cadmium _D ^{M#}	0.6	-	0.7	<0.5	<0.5	0.8	1.0	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	26	-	46	14	8	39	17	mg/kg	1	A-T-024s
Chromium _D ^{M#}	21	-	20	19	10	24	26	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	-	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	56	-	100	11	6	86	10	mg/kg	1	A-T-024s
Mercury _D	<0.17	-	0.20	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	18	-	18	15	14	23	31	mg/kg	1	A-T-024s
Selenium _D ^{M#}	2	-	1	<1	<1	2	<1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	54	-	72	27	25	73	54	mg/kg	5	A-T-024s
Leachate Prep BS EN 12457-2 (10:1) _A	-	*	-	*	-	-	-			A-T-001
pH (leachable) _A [#]	-	6.94	-	6.48	-	-	-	pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	-	1.09	-	52.19	-	-	-	mg/l	1	A-T-026w
Sulphide (leachable) _A	-	<0.1	-	<0.1	-	-	-	mg/l	0.1	A-T-S2-w
Arsenic (leachable) _A [#]	-	<1	-	<1	-	-	-	µg/l	1	A-T-025w
Cadmium (leachable) _A [#]	-	<1	-	<1	-	-	-	µg/l	1	A-T-025w
Copper (leachable) _A [#]	-	6	-	12	-	-	-	µg/l	1	A-T-025w
Chromium (leachable) _A [#]	-	<1	-	1	-	-	-	µg/l	1	A-T-025w
Lead (leachable) _A [#]	-	<1	-	22	-	-	-	µg/l	1	A-T-025w
Mercury (leachable) _A [#]	-	<0.1	-	<0.1	-	-	-	µg/l	0.1	A-T-025w
Nickel (leachable) _A [#]	-	<1	-	5	-	-	-	µg/l	1	A-T-025w
Selenium (leachable) _A [#]	-	<1	-	<1	-	-	-	µg/l	1	A-T-025w
Zinc (leachable) _A [#]	-	8	-	180	-	-	-	µg/l	1	A-T-025w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/22	20/02677/23	20/02677/24	20/02677/25	20/02677/26	20/02677/27	20/02677/28	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP8	TP8	TP8	TP1	TP1			
Depth to Top	0.40	0.80	0.20	0.60	1.20	0.20	0.30			
Depth To Bottom										
Date Sampled	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	6AE	4A	6AE	5AE	4A	6AE	5AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	-	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	-	N/A	N/A	N/A	N/A	N/A			A-T-045

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/22	20/02677/23	20/02677/24	20/02677/25	20/02677/26	20/02677/27	20/02677/28	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP8	TP8	TP8	TP1	TP1			
Depth to Top	0.40	0.80	0.20	0.60	1.20	0.20	0.30			
Depth To Bottom										
Date Sampled	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	6AE	4A	6AE	5AE	4A	6AE	5AE			
PAH-16MS										
Acenaphthene _A ^{M#}	<0.09	-	1.62	<0.01	<0.01	0.03	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.01	-	0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.18	-	1.84	<0.02	<0.02	0.04	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.54	-	2.03	<0.04	<0.04	0.14	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.54	-	1.33	<0.04	<0.04	0.14	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.58	-	1.49	<0.05	<0.05	0.16	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.29	-	0.51	<0.05	<0.05	0.08	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.21	-	0.59	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.61	-	1.97	<0.06	<0.06	0.17	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	0.08	-	0.15	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	1.18	-	5.83	<0.08	<0.08	0.32	<0.08	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.06	-	0.80	<0.01	<0.01	0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.30	-	0.62	<0.03	<0.03	0.08	<0.03	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	-	0.28	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.78	-	6.91	<0.03	<0.03	0.21	<0.03	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.10	-	4.71	<0.07	<0.07	0.30	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	6.46	-	30.7	<0.08	<0.08	1.68	<0.08	mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/22	20/02677/23	20/02677/24	20/02677/25	20/02677/26	20/02677/27	20/02677/28	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP8	TP8	TP8	TP1	TP1			
Depth to Top	0.40	0.80	0.20	0.60	1.20	0.20	0.30			
Depth To Bottom										
Date Sampled	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	6AE	4A	6AE	5AE	4A	6AE	5AE			
PAH 16MS (leachable)										
Acenaphthene (leachable) _A	-	0.05	-	0.02	-	-	-	µg/l	0.02	A-T-019w
Acenaphthylene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Anthracene (leachable) _A	-	<0.02	-	0.03	-	-	-	µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Chrysene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Fluoranthene (leachable) _A	-	0.03	-	0.09	-	-	-	µg/l	0.02	A-T-019w
Fluorene (leachable) _A	-	0.02	-	0.03	-	-	-	µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	-	<0.02	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Naphthalene (leachable) _A	-	0.11	-	<0.02	-	-	-	µg/l	0.02	A-T-019w
Phenanthrene (leachable) _A	-	0.06	-	0.14	-	-	-	µg/l	0.02	A-T-019w
Pyrene (leachable) _A	-	0.02	-	0.07	-	-	-	µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) _A	-	0.29	-	0.38	-	-	-	µg/l	0.02	A-T-019w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/22	20/02677/23	20/02677/24	20/02677/25	20/02677/26	20/02677/27	20/02677/28	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP8	TP8	TP8	TP1	TP1			
Depth to Top	0.40	0.80	0.20	0.60	1.20	0.20	0.30			
Depth To Bottom										
Date Sampled	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	6AE	4A	6AE	5AE	4A	6AE	5AE			
TPH CWG (leachable)										
Ali >C5-C6 (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
Ali >C6-C8 (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
Ali >C8-C10 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Ali >C10-C12 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Ali >C12-C16 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Ali >C16-C21 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Ali >C21-C35 (leachable) _A	-	<20	-	<20	-	-	-	µg/l	20	A-T-055w
Total Aliphatics (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Aro >C5-C7 (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
Aro >C7-C8 (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
Aro >C8-C10 (leachable) _A	-	<10	-	16	-	-	-	µg/l	10	A-T-055w
Aro >C10-C12 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Aro >C12-C16 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Aro >C16-C21 (leachable) _A	-	<10	-	<10	-	-	-	µg/l	10	A-T-055w
Total Aromatics (leachable) _A	-	<20	-	<20	-	-	-	µg/l	20	A-T-055w
TPH (Ali & Aro >C5-C35) (leachable) _A	-	<20	-	<20	-	-	-	µg/l	20	A-T-055w
BTEX - Benzene (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
BTEX - Toluene (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
BTEX - Ethyl Benzene (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
BTEX - o Xylene (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
BTEX - m & p Xylene (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
MTBE (leachable) _A	-	<1	-	<1	-	-	-	µg/l	1	A-T-022w
Aro >C21-C35 (leachable) _A	-	<20	-	<20	-	-	-	µg/l	20	A-T-055w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/22	20/02677/23	20/02677/24	20/02677/25	20/02677/26	20/02677/27	20/02677/28	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP12	TP12	TP8	TP8	TP8	TP1	TP1			
Depth to Top	0.40	0.80	0.20	0.60	1.20	0.20	0.30			
Depth To Bottom										
Date Sampled	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	6AE	4A	6AE	5AE	4A	6AE	5AE			
TPH CWG										
Ali >C5-C6 _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Ali >C21-C35 _A	-	-	-	6	-	-	<1	mg/kg	1	A-T-055s
Total Aliphatics _A	-	-	-	6	-	-	<1	mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Aro >C12-C16 _A	-	-	-	1	-	-	<1	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	-	-	-	<1	-	-	<1	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	-	-	-	15	-	-	<1	mg/kg	1	A-T-055s
Total Aromatics _A	-	-	-	16	-	-	<1	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	-	-	-	23	-	-	<1	mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	-	-	-	<0.01	-	-	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/29	20/02677/30	20/02677/31	20/02677/32	20/02677/33	20/02677/34		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	HDP1	HDP2	TP13	TP13	TP13				
Depth to Top	0.50	0.20	0.20	0.40	0.90	1.20				
Depth To Bottom										
Date Sampled	11-Mar-20	12-Mar-20	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	5A	6AE	6AE	6AE	4A	4A				
% Stones >10mm _A	1.8	3.0	3.5	10.5	<0.1	<0.1		% w/w	0.1	A-T-044
pH _D ^{M#}	6.08	5.38	5.32	5.50	6.38	6.41		pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.04	<0.01	<0.01	<0.01	<0.01	<0.01		g/l	0.01	A-T-026s
Sulphide _A	<5	<5	<5	<5	<5	<5		mg/kg	5	A-T-S2-s
Fraction of organic carbon _D [#]	0.0056	0.0251	0.0362	0.0205	0.0011	0.0016		N/A	0.0003	A-T-032 FOC
Arsenic _D ^{M#}	4	12	11	9	1	2		mg/kg	1	A-T-024s
Cadmium _D ^{M#}	0.6	0.7	0.7	0.5	<0.5	<0.5		mg/kg	0.5	A-T-024s
Copper _D ^{M#}	14	24	27	21	5	5		mg/kg	1	A-T-024s
Chromium _D ^{M#}	18	18	20	15	8	7		mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1		mg/kg	1	A-T-040s
Lead _D ^{M#}	10	61	67	48	4	4		mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17		mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	23	18	17	14	7	6		mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	2	<1	<1	<1		mg/kg	1	A-T-024s
Zinc _D ^{M#}	43	64	60	47	14	11		mg/kg	5	A-T-024s
Leachate Prep BS EN 12457-2 (10:1) _A	*	-	-	-	-	-				A-T-001
pH (leachable) _A [#]	6.37	-	-	-	-	-		pH	0.01	A-T-031w
Sulphate (leachable) _A [#]	45.33	-	-	-	-	-		mg/l	1	A-T-026w
Sulphide (leachable) _A	<0.1	-	-	-	-	-		mg/l	0.1	A-T-S2-w
Arsenic (leachable) _A [#]	<1	-	-	-	-	-		µg/l	1	A-T-025w
Cadmium (leachable) _A [#]	<1	-	-	-	-	-		µg/l	1	A-T-025w
Copper (leachable) _A [#]	5	-	-	-	-	-		µg/l	1	A-T-025w
Chromium (leachable) _A [#]	<1	-	-	-	-	-		µg/l	1	A-T-025w
Lead (leachable) _A [#]	6	-	-	-	-	-		µg/l	1	A-T-025w
Mercury (leachable) _A [#]	<0.1	-	-	-	-	-		µg/l	0.1	A-T-025w
Nickel (leachable) _A [#]	7	-	-	-	-	-		µg/l	1	A-T-025w
Selenium (leachable) _A [#]	<1	-	-	-	-	-		µg/l	1	A-T-025w
Zinc (leachable) _A [#]	84	-	-	-	-	-		µg/l	1	A-T-025w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/29	20/02677/30	20/02677/31	20/02677/32	20/02677/33	20/02677/34		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	HDP1	HDP2	TP13	TP13	TP13				
Depth to Top	0.50	0.20	0.20	0.40	0.90	1.20				
Depth To Bottom										
Date Sampled	11-Mar-20	12-Mar-20	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	5A	6AE	6AE	6AE	4A	4A				
Asbestos in Soil (inc. matrix)										
Asbestos in soil [#]	NAD	NAD	NAD	NAD	NAD	NAD				A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A				A-T-045

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/29	20/02677/30	20/02677/31	20/02677/32	20/02677/33	20/02677/34		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	HDP1	HDP2	TP13	TP13	TP13				
Depth to Top	0.50	0.20	0.20	0.40	0.90	1.20				
Depth To Bottom										
Date Sampled	11-Mar-20	12-Mar-20	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	5A	6AE	6AE	6AE	4A	4A				
PAH-16MS										
Acenaphthene _A ^{M#}	<0.01	0.01	0.02	0.02	<0.01	<0.01		mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	0.01	0.02	<0.01	<0.01	<0.01		mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	0.05	0.10	0.06	<0.02	<0.02		mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	<0.04	0.18	0.30	0.19	<0.04	<0.04		mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	<0.04	0.19	0.30	0.20	<0.04	<0.04		mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	<0.05	0.21	0.31	0.22	<0.05	<0.05		mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	<0.05	0.12	0.17	0.11	<0.05	<0.05		mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	0.12	<0.07	<0.07	<0.07		mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	<0.06	0.21	0.35	0.22	<0.06	<0.06		mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A ^{M#}	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04		mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	<0.08	0.32	0.58	0.40	<0.08	<0.08		mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	0.01	0.04	0.02	<0.01	<0.01		mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	<0.03	0.13	0.18	0.12	<0.03	<0.03		mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03		mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	<0.03	0.20	0.43	0.29	<0.03	<0.03		mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	<0.07	0.33	0.60	0.38	<0.07	<0.07		mg/kg	0.07	A-T-019s
Total PAH-16MS _A ^{M#}	<0.08	1.97	3.52	2.23	<0.08	<0.08		mg/kg	0.01	A-T-019s

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/29	20/02677/30	20/02677/31	20/02677/32	20/02677/33	20/02677/34		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	HDP1	HDP2	TP13	TP13	TP13				
Depth to Top	0.50	0.20	0.20	0.40	0.90	1.20				
Depth To Bottom										
Date Sampled	11-Mar-20	12-Mar-20	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	5A	6AE	6AE	6AE	4A	4A				
PAH 16MS (leachable)										
Acenaphthene (leachable) _A	0.03	-	-	-	-	-		µg/l	0.02	A-T-019w
Acenaphthylene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Anthracene (leachable) _A	0.03	-	-	-	-	-		µg/l	0.02	A-T-019w
Benzo(a)anthracene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Benzo(a)pyrene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Benzo(b)fluoranthene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Benzo(ghi)perylene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Benzo(k)fluoranthene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Chrysene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Dibenzo(ah)anthracene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Fluoranthene (leachable) _A	0.09	-	-	-	-	-		µg/l	0.02	A-T-019w
Fluorene (leachable) _A	0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Indeno(123-cd)pyrene (leachable) _A	<0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Naphthalene (leachable) _A	0.02	-	-	-	-	-		µg/l	0.02	A-T-019w
Phenanthrene (leachable) _A	0.12	-	-	-	-	-		µg/l	0.02	A-T-019w
Pyrene (leachable) _A	0.07	-	-	-	-	-		µg/l	0.02	A-T-019w
Total PAH 16MS (leachable) _A	0.38	-	-	-	-	-		µg/l	0.02	A-T-019w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/29	20/02677/30	20/02677/31	20/02677/32	20/02677/33	20/02677/34		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	HDP1	HDP2	TP13	TP13	TP13				
Depth to Top	0.50	0.20	0.20	0.40	0.90	1.20				
Depth To Bottom										
Date Sampled	11-Mar-20	12-Mar-20	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	5A	6AE	6AE	6AE	4A	4A				
TPH CWG (leachable)										
Ali >C5-C6 (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
Ali >C6-C8 (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
Ali >C8-C10 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Ali >C10-C12 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Ali >C12-C16 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Ali >C16-C21 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Ali >C21-C35 (leachable) _A	<20	-	-	-	-	-		µg/l	20	A-T-055w
Total Aliphatics (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Aro >C5-C7 (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
Aro >C7-C8 (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
Aro >C8-C10 (leachable) _A	13	-	-	-	-	-		µg/l	10	A-T-055w
Aro >C10-C12 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Aro >C12-C16 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Aro >C16-C21 (leachable) _A	<10	-	-	-	-	-		µg/l	10	A-T-055w
Total Aromatics (leachable) _A	<20	-	-	-	-	-		µg/l	20	A-T-055w
TPH (Ali & Aro >C5-C35) (leachable) _A	<20	-	-	-	-	-		µg/l	20	A-T-055w
BTEX - Benzene (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
BTEX - Toluene (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
BTEX - Ethyl Benzene (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
BTEX - o Xylene (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
BTEX - m & p Xylene (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
MTBE (leachable) _A	<1	-	-	-	-	-		µg/l	1	A-T-022w
Aro >C21-C35 (leachable) _A	<20	-	-	-	-	-		µg/l	20	A-T-055w

Envirolab Job Number: 20/02677

Client Project Name: Edgar Wood

Client Project Ref: N/A

Lab Sample ID	20/02677/29	20/02677/30	20/02677/31	20/02677/32	20/02677/33	20/02677/34		Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	HDP1	HDP2	TP13	TP13	TP13				
Depth to Top	0.50	0.20	0.20	0.40	0.90	1.20				
Depth To Bottom										
Date Sampled	11-Mar-20	12-Mar-20	12-Mar-20	11-Mar-20	11-Mar-20	11-Mar-20				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil				
Sample Matrix Code	5A	6AE	6AE	6AE	4A	4A				
TPH CWG										
Ali >C5-C6 _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
Ali >C6-C8 _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	-	-	<1		mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	-	-	<1		mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	<1	-	-	<1		mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	<1	-	-	<1		mg/kg	1	A-T-055s
Ali >C21-C35 _A	<1	7	10	-	-	<1		mg/kg	1	A-T-055s
Total Aliphatics _A	<1	7	10	-	-	<1		mg/kg	1	A-T-055s
Aro >C5-C7 _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	<1	<1	<1	-	-	<1		mg/kg	1	A-T-055s
Aro >C10-C12 _A ^{M#}	<1	<1	<1	-	-	<1		mg/kg	1	A-T-055s
Aro >C12-C16 _A	<1	1	4	-	-	<1		mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	<1	6	17	-	-	<1		mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	<1	30	55	-	-	<1		mg/kg	1	A-T-055s
Total Aromatics _A	<1	37	76	-	-	<1		mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35) _A	<1	44	85	-	-	<1		mg/kg	1	A-T-055s
BTEX - Benzene _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	-	-	<0.01		mg/kg	0.01	A-T-022s

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH1		U100	2.00	2.45	Firm brown slightly gravelly very sandy CLAY.
BH1		B	4.00	4.45	Brown slightly gravelly very sandy CLAY.
BH2		B	2.00	2.45	Brown slightly gravelly very sandy CLAY.
BH2		U100	3.00	3.45	Soft brown slightly gravelly very sandy CLAY.
BH2		B	6.50	6.95	Brown slightly gravelly very sandy CLAY.
BH2		U100	9.50	9.95	Firm brown slightly gravelly very sandy CLAY.
BH3		B	2.00	2.45	Brown slightly gravelly very sandy CLAY.
BH3		B	5.00	5.45	Brown slightly gravelly silty SAND.
BH4		U100	2.00	2.45	Soft brown slightly gravelly very sandy CLAY.
BH4		B	3.00	3.45	Brown slightly gravelly very clayey silty SAND.
BH4		B	6.50	6.95	Brown silty SAND.



4043

PSL

Professional Soils Laboratory

Edgar Wood Site

Contract No:

PSL20/2151

Client Ref:

201910

PARTICLE SIZE DISTRIBUTION TEST

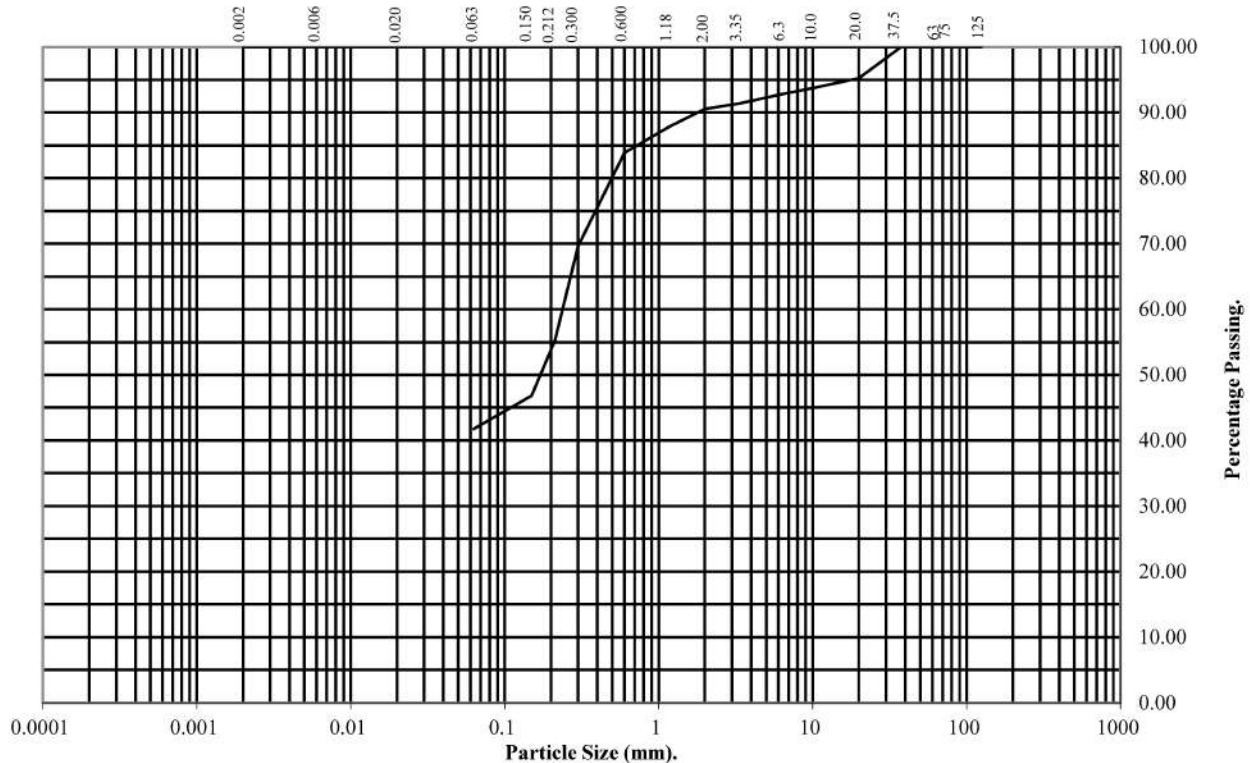
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH2 Top Depth (m): 2.00

Sample Number: Base Depth(m): 2.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	95
10	94
6.3	93
3.35	91
2	91
1.18	88
0.6	84
0.3	70
0.212	55
0.15	47
0.063	42

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	49
Silt/Clay	42

Remarks:

See Summary of Soil Descriptions



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Edgar Wood Site

Contract No:
PSL20/2151
Client Ref:
201910

PARTICLE SIZE DISTRIBUTION TEST

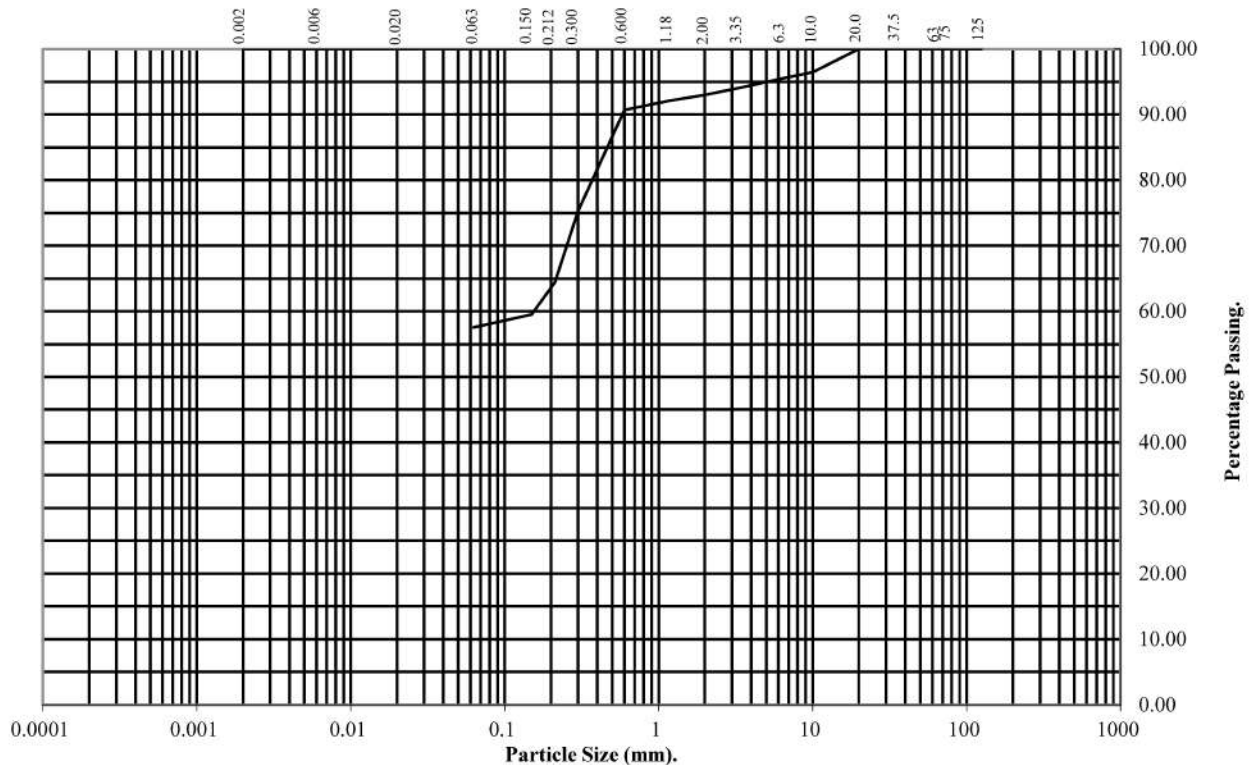
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH2 Top Depth (m): 6.50

Sample Number: Base Depth(m): 6.95

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	96
6.3	95
3.35	94
2	93
1.18	92
0.6	91
0.3	75
0.212	64
0.15	60
0.063	58

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	35
Silt/Clay	58

Remarks:

See Summary of Soil Descriptions



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Contract No:
PSL20/2151
Client Ref:
201910

PARTICLE SIZE DISTRIBUTION TEST

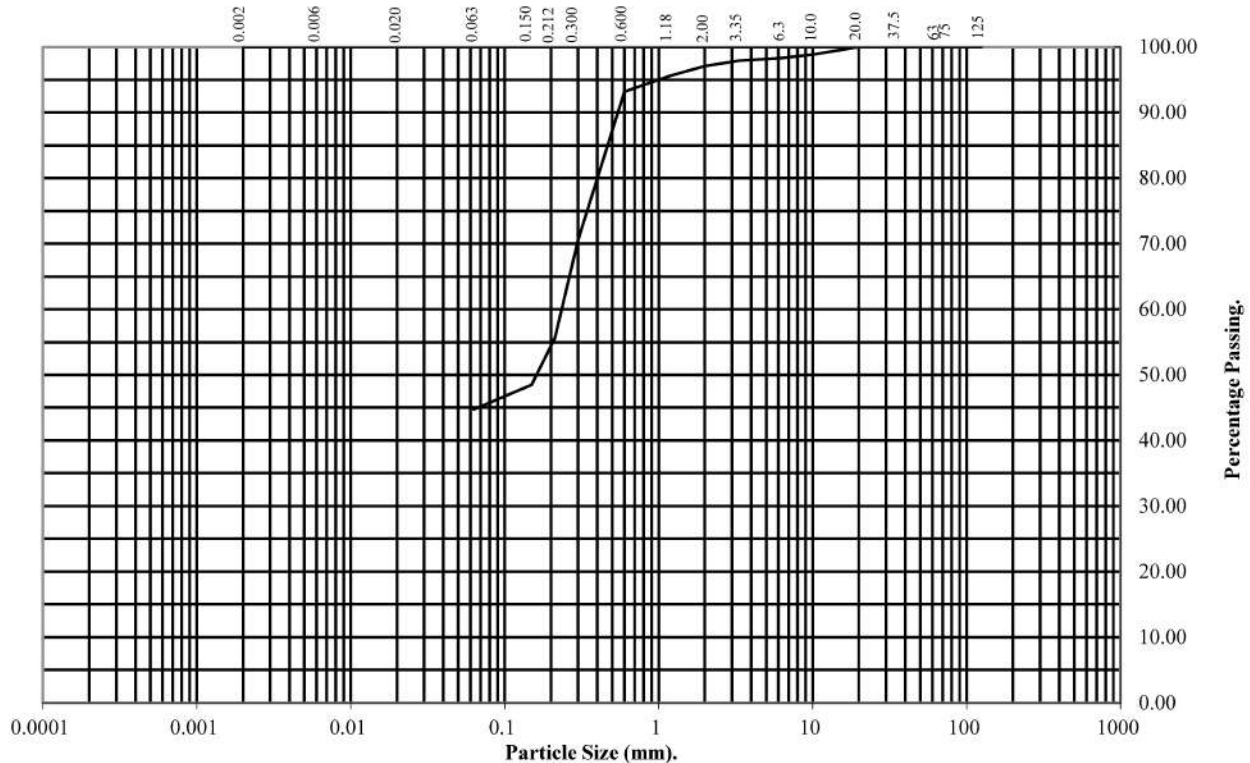
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH3 Top Depth (m): 2.00

Sample Number: Base Depth(m): 2.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	98
3.35	98
2	97
1.18	96
0.6	93
0.3	71
0.212	56
0.15	49
0.063	45

Soil Fraction	Total Percentage
Cobbles	0
Gravel	3
Sand	52
Silt/Clay	45

Remarks:

See Summary of Soil Descriptions



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Contract No:
PSL20/2151
Client Ref:
201910

PARTICLE SIZE DISTRIBUTION TEST

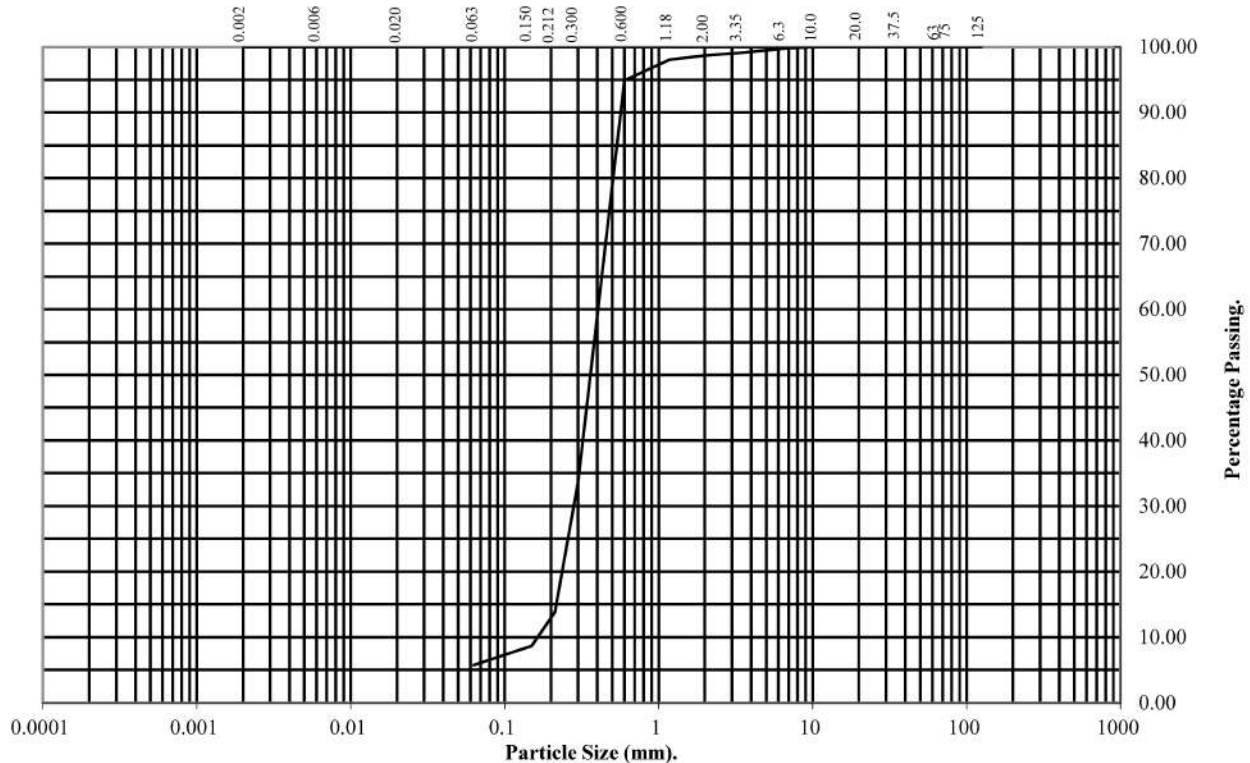
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH3 Top Depth (m): 5.00

Sample Number: Base Depth(m): 5.45

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	99
1.18	98
0.6	95
0.3	34
0.212	14
0.15	9
0.063	6

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	93
Silt/Clay	6

Remarks:

See Summary of Soil Descriptions



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Professional Soils Laboratory

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Contract No:
PSL20/2151
Client Ref:
201910

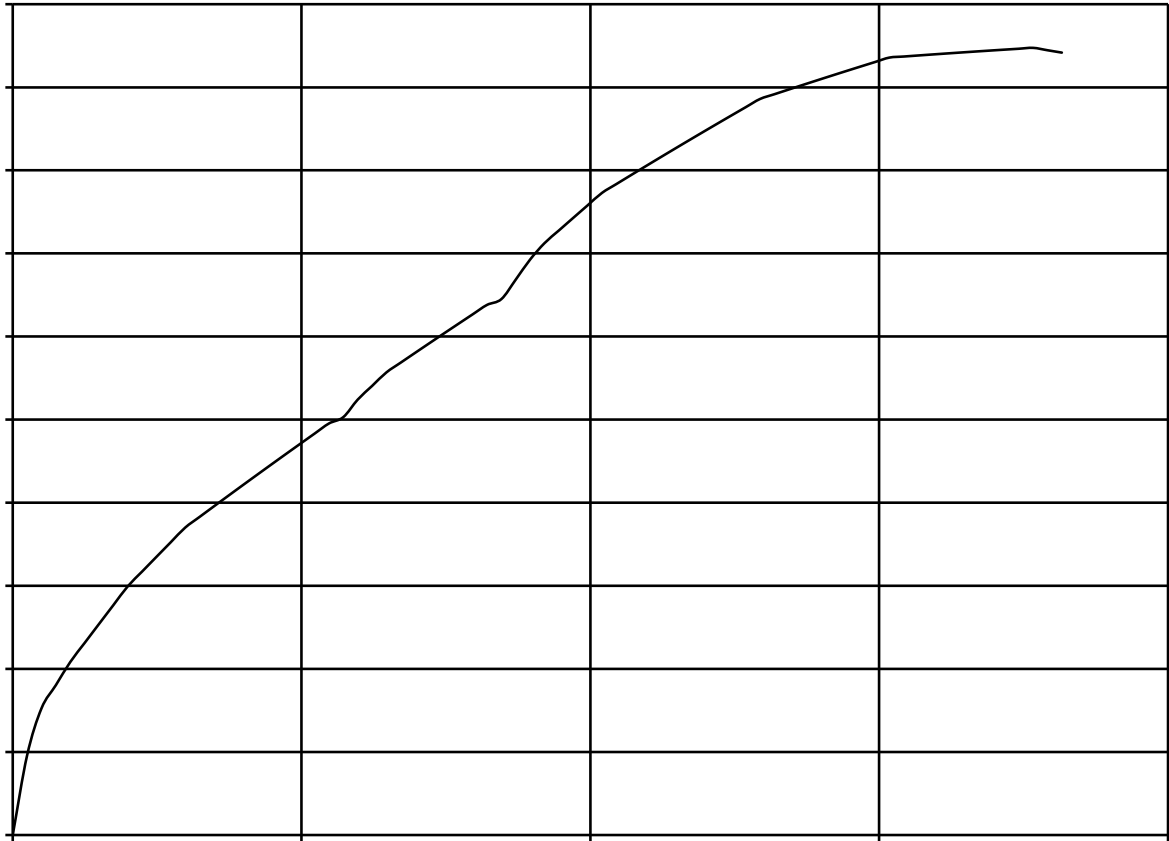
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									444 † ' † †
				θ_3	$(\theta_1 - \theta_3)$	$\frac{1}{2}(\theta_1 - \theta_3)$			

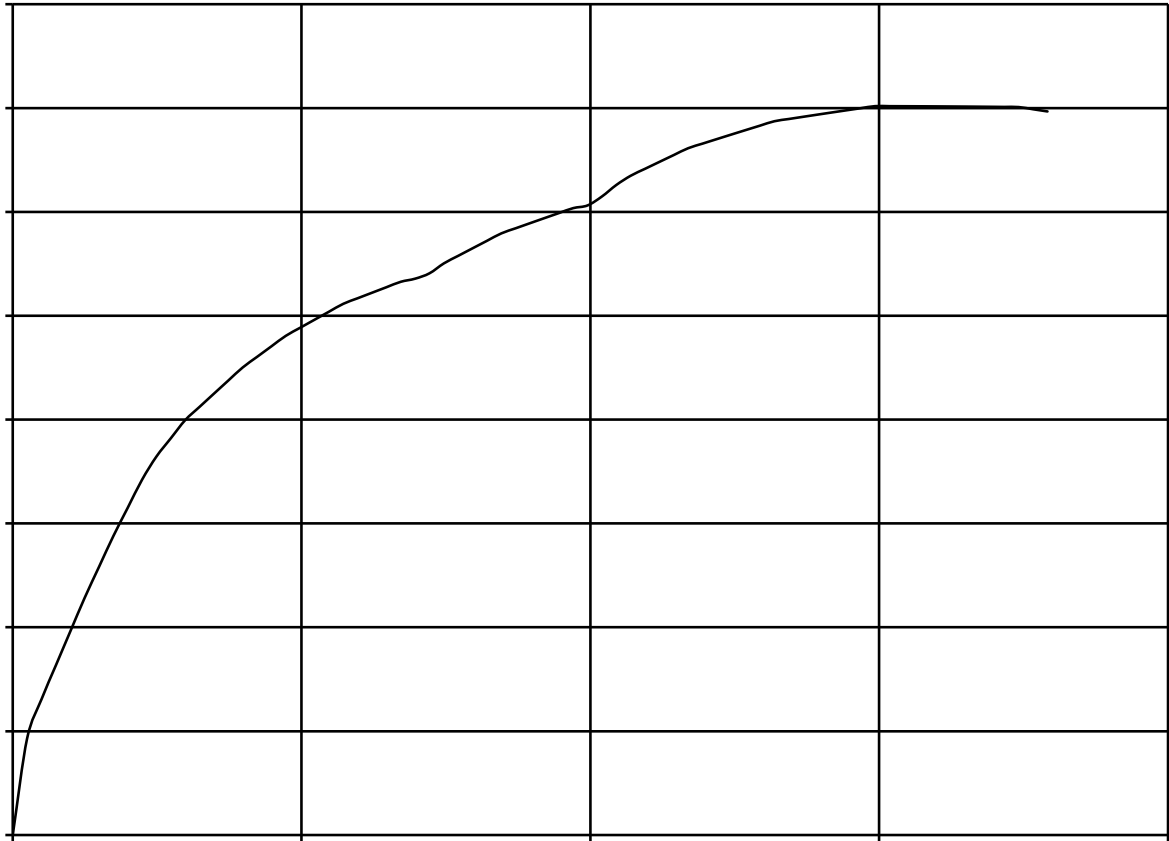
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				θ_3	$(\theta_1 - \theta_3)$	$\frac{1}{2}(\theta_1 - \theta_3)$				



Appendix B – Risk Matrix

RISK EVALUATION

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552³⁹. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude of the probability (likelihood) of the risk occurring (Table B).

Consequence (Severity)		
Classification	Definition	Example
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 (note: water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Catastrophic damage to buildings/properties. A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	High Concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled waters. Explosion, causing building collapse (can also equate to short term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). Pollution of sensitive water resources (note Water Resources Act contains no scope for considering significance of pollution). A significant change in a particular ecosystem, or organism forming part of such ecosystem.	Concentrations of a contaminant from site exceed generic, or site-specific assessment criteria. Leaching of contaminants from a site to a major or minor aquifer (Principal and Secondary). Death of a species within a designated nature reserve.
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures, and services ('significant harm' as defined in DETR, 2000). Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater. 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 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.

Table A. Classification of Consequence

Probability (Likelihood)	
Classification	Definition
High Likelihood	There is a pollutant 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 pollutant 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 pollutant 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 pollutant linkage, but circumstances are such that it is improbable that an event would occur in the very long term.

Table B. Classification of Probability.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

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

Table C. Comparison of Consequence against Probability

Once the risk has been determined the corresponding action can be assessed (Table D).

Risk	Action Required
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not already undertaken) and remediation are likely to be required.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate Risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table D. Description of the Classification and Likely Action Required.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Appendix C – Profile Logs

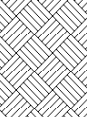
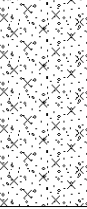
Remarks:
Borehole Stable.
Groundwater strike at 5.50mbgl rising to 5.00mbgl after 20 minutes.
No recovery from SPT at 5.50mbgl.
No recovery from U100 at 19.40mbgl due to high groundwater.

No recovery from U100 at 19.40mbgl due to high groundwater.

No recovery from U100 at 19.40mbgl due to high groundwater.

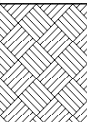
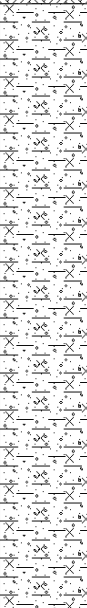
		Cable Percussion Drilling Log					Location Number: CP101				
Project Name: Heywood Old Road, Middleton				Client: Rochdale Borough Council			Date: 03/12/2025 - 05/12/2025				
Project ID:LKC251564				Contractor: D & I Drilling Ltd			Co-ords: 385374.08E, 407525.16N +/- 0.1m				
Equipment: Cable Percussive Drilling Rig / Shell and Auger Rig				Level 111.43m AOD		Logged By LGD		Scale 1:40		Page Number Sheet 4 of 4	
Depth (m)		Samples / Tests		Depth (m)	Legend	Stratum Description				Level (m)	Water Strikes
23.00-23.45 23.00		SPT N=29 (4,5/6,7,8,8)				Stiff consistency dark brown slightly gravelly slightly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising mudstone			23		
24.60-25.05 24.60		SPT N=29 (6,6/7,7,7,8)							24		
				25.05		End of Borehole at 25.05m			25	86.38	
									26		
									27		
									28		
									29		
									30		
Hole Diameter		Casing Diameter		Water Strike Details			Chiselling				
Depth Base (m)	Diameter (mm)	Depth Base (m)	Diameter (mm)	Initial Strike (m)	Time Elapsed (min)	Depth Water Value (m)	Depth Top (m)	Depth Base (m)	Duration (hh:mm)		
10.50 25.00	200 150	6.00 25.00	200 150								
Remarks: Borehole Stable. Groundwater strike at 5.50mbgl rising to 5.00mbgl after 20 minutes. No recovery from SPT at 5.50mbgl. No recovery from U100 at 19.40mbgl due to high groundwater.											

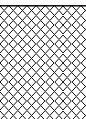
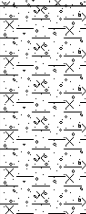
 LK CONSULT		Trial Pit Log					Location Ref: SA101							
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 25/11/2025								
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385273.19E, 407552.14N +/- 0.1m								
Equipment: Excavator: JCB 3CX			Level 106.21m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1					
Depth (m)		Samples / Tests		Depth (m)		Legend		Stratum Description					Level (m)	
0.00-0.30		ES PID=0.0ppm		0.00-0.30				MADE GROUND: Dark brown gravelly sandy SILT with frequent rootlets and rare ceramic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.					105.91	
0.30-1.00		D		0.30				Dark brown gravelly sandy SILT. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.			0.5			
1.10		SV=75.00kPa		1.00				Firm consistency medium to high strength brown slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.			1.0		105.21	
				1.20				End of Trial Pit at 1.20m					105.01	
											1.5			
											2.0			
											2.5			
											3.0			
											3.5			
											4.0			
											4.5			
		Pit Dimensions						Pit Stability						
		Length (m)		Width (m)		Depth (m)		Stable						
		1.20		0.60		1.20								
		Remarks:												
Trial pit dry.														
BRE365 Soakaway test undertaken within trial pit.														

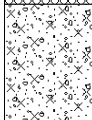
 LK CONSULT		Trial Pit Log					Location Ref: SA102										
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 25/11/2025											
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385322.88E, 407574.12N +/- 0.1m											
Equipment: Excavator: JCB 3CX			Level 108.91m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1								
Depth (m)		Samples / Tests		Depth (m)		Legend		Stratum Description					Level (m)				
0.00-0.40		ES PID=0.0ppm						TOPSOIL: Dark brown gravelly silty SAND with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.									
0.40-1.10		D		0.40				Light brown gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.			0.5		108.51				
				1.10				End of Trial Pit at 1.10m			1.0		107.81				
											1.5						
											2.0						
											2.5						
											3.0						
											3.5						
											4.0						
											4.5						
		Pit Dimensions						Pit Stability									
		Length (m)		Width (m)		Depth (m)		Stable									
		1.40		0.70		1.10											
		Remarks:															
						Trial pit dry.											
						BRE365 Soakaway test undertaken within trial pit.											

 LK CONSULT		Trial Pit Log					Location Ref: SA103			
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 25/11/2025				
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385311.37E, 407509.20N +/- 0.1m				
Equipment: Excavator: JCB 3CX			Level 108.56m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description						Level (m)
0.00-0.50 0.00-0.50	ES PID=0.0ppm			TOPSOIL: Dark brown gravelly silty SAND with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.						
0.50-1.00	B	0.50		Light brown gravelly silty SAND with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone. Cobbles are subangular to subrounded comprising sandstone.					0.5	108.06
		1.10							1.0	
				End of Trial Pit at 1.10m					1.5	
									2.0	
									2.5	
									3.0	
									3.5	
									4.0	
									4.5	
			Pit Dimensions						Pit Stability	
			Length (m)		Width (m)		Depth (m)		Stable	
			1.20		0.60		1.10			
			Remarks:							
Trial pit dry.										
BRE365 Soakaway test undertaken within trial pit.										

LK CONSULT		Trial Pit Log					Location Ref: SA104									
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 25/11/2025										
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385317.14E, 407536.04N +/- 0.1m										
Equipment: Excavator: JCB 3CX			Level 109.09m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1							
Depth (m)		Samples / Tests		Depth (m)		Legend		Stratum Description					Level (m)			
0.00-0.40 0.00-0.40		ES PID=0.0ppm						TOPSOIL: Dark brown gravelly silty SAND with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.								
0.40-1.00		B		0.40				Light brown gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.			0.5		108.69			
				1.00				End of Trial Pit at 1.00m			1.0		108.09			
											1.5					
											2.0					
											2.5					
											3.0					
											3.5					
											4.0					
											4.5					
								Pit Dimensions			Pit Stability					
								Length (m)		Width (m)		Depth (m)		Stable		
								1.20		0.70		1.00				
														Remarks: Trial pit dry. BRE 365 Soakaway test undertaken within trial pit.		

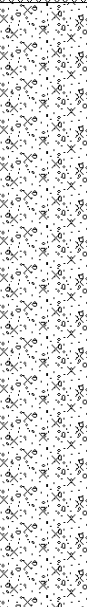
LK CONSULT		Trial Pit Log					Location Ref: TP101	
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025		
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385140.53E, 407546.00N +/- 0.1m		
Equipment: Excavator: JCB 3CX			Level 105.42m AOD		Logged By CK	Scale 1:25		Page Number Sheet 1 of 1
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description				Level (m)
0.00-0.40 0.00-0.40 0.10	ES PID=0.1ppm CBR=3%	0.40		TOPSOIL: Dark brown slightly gravelly sandy SILT with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.				105.02
0.40-1.00 0.50	D CBR=3%			Firm to stiff consistency medium to high strength reddish brown with grey mottling slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				
1.00-1.50 1.00	B SV=86.00kPa							
1.40	SV=96.00kPa			1.50 to 1.80mbgl - Sand lense present.				
1.80-2.40	B			1.80 to 2.40mbgl - Clay becomes very silty Clay becomes firm consistency and medium strength.				
2.10	SV=42.00kPa	2.40		End of Trial Pit at 2.40m				103.02
				Pit Dimensions			Pit Stability	
				Length (m)	Width (m)	Depth (m)	Stable	
				2.50	0.60	2.40		
				Remarks: Trial pit dry.				

 LK CONSULT		Trial Pit Log					Location Ref: TP102			
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025				
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385254.35E, 407583.46N +/- 0.1m				
Equipment: Excavator: JCB 3CX			Level 106.01m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description					Level (m)	Water Strikes
0.00-0.40 0.00-0.40 0.10	ES PID=0.0ppm CBR=2%			MADE GROUND: Dark brown gravelly sandy SILT with rare brick fragments and ceramic fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.						
0.40-0.80 0.50-1.50 0.60	D B CBR=2%	0.40		Light brown gravelly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				0.5	105.61	
								1.0		
								1.5		
1.70-2.40	B	1.70		Firm to stiff consistency greyish brown slightly gravelly very sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				2.0	104.31	
2.40-2.50	B	2.40 2.50		Light greyish brown SAND and GRAVEL. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded comprising sandstone, quartzite and mudstone.				2.5	103.61 103.51	
				End of Trial Pit at 2.50m						
								3.0		
								3.5		
								4.0		
								4.5		
				Pit Dimensions				Pit Stability		
				Length (m)	Width (m)	Depth (m)	Unstable at			
				2.50	0.60	2.50	1.00-1.70mbgl			

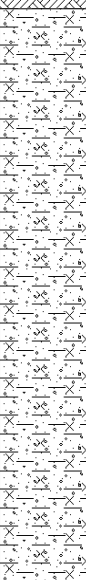
 LK CONSULT		Trial Pit Log					Location Ref: TP103			
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025				
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385308.82E, 407548.18N +/- 0.1m				
Equipment: Excavator: JCB 3CX			Level 108.75m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description						Level (m)
0.00-0.20 0.00-0.20 0.10 0.20-0.50	ES PID=0.0ppm CBR=2% D	0.20		MADE GROUND: Dark brown gravelly sandy SILT with frequent rootlets and rare brick fragments. Sand is fine to coarse. Gravel is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone. Brown gravelly silty SAND with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone. Cobbles are subangular to rounded comprising sandstone. 0.90 to 1.00mbgl - Clay pockets. 1.40 to 2.50mbgl - Sand becomes slightly silty.						108.55
0.70	CBR=9%								0.5	
1.00-2.00	B								1.0	
									1.5	

 LK CONSULT		Trial Pit Log					Location Ref: TP104			
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025				
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385377.31E, 407501.67N +/- 0.1m				
Equipment: Excavator: JCB 3CX			Level 111.39m AOD		Logged By LGD		Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description						Level (m)
0.00-0.50 0.10	D CBR=1%	0.50		TOPSOIL: Dark brown slightly gravelly sandy SILT with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.					0.5	110.89
0.50-1.00	D			Light brown slightly gravelly very silty SAND with low cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to rounded, cobbles subangular to rounded comprising sandstone.						
0.80	CBR=6%			1.40 to 2.80mbgl - Sand becomes slightly silty.						
1.50-2.50	B	2.80		End of Trial Pit at 2.80m						108.59
			Pit Dimensions						Pit Stability	
			Length (m)		Width (m)		Depth (m)		Stable	
			3.00		0.90		2.80			
			Remarks: Trial pit dry.							

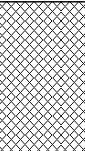
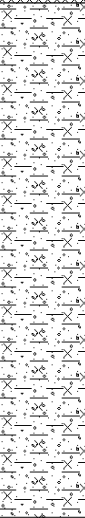
		Trial Pit Log					Location Ref: TP105	
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 25/11/2025		
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385339.88E, 407484.10N +/- 0.1m		
Equipment: Excavator: JCB 3CX			Level 109.97m AOD		Logged By CK		Scale 1:25	Page Number Sheet 1 of 1
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description				Level (m)
0.00-0.40 0.00-0.40 0.10	ES PID=0.1ppm CBR=3%	0.20		TOPSOIL: Dark brown gravelly sandy SILT with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				109.77
				Dark brown gravelly sandy SILT. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				0.5
0.60-1.00 0.60	D CBR=9%	0.60		Stiff to very stiff consistency reddish brown with grey mottling slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				109.37
1.00-1.50	B							1.0
		1.50		Light brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.				1.5
1.90-2.50	B							2.0
		2.50		End of Trial Pit at 2.50m				2.5
								3.0
								3.5
								4.0
								4.5
			Pit Dimensions					Pit Stability
			Length (m)		Width (m)		Depth (m)	Stable
			2.50		0.70		2.50	
			Remarks:					
Trial pit dry.								
Hand Shear Vanes not undertaken due to friable clay.								

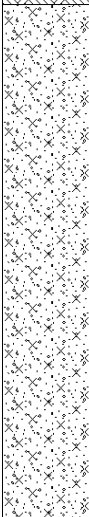
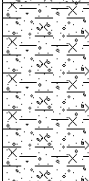
 LK CONSULT		Trial Pit Log					Location Ref: TP106			
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 25/11/2025				
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385325.03E, 407499.20N +/- 0.1m				
Equipment: Excavator: JCB 3CX			Level 109.46m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description						Level (m)
0.00-0.30 0.10	D CBR=2%	0.30		MADE GROUND: Dark brown gravelly sandy SILT with frequent rootlets and rare brick fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.					0.5	109.16
0.30-1.00	B			Light brown gravelly slightly silty SAND with medium cobble content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone. Cobbles are subangular to rounded comprising sandstone. 0.30 to 1.00mbgl - Clay pockets noted within sand.						
0.50	CBR=4%									
1.00-2.00	B									
		2.30		End of Trial Pit at 2.30m						107.16
			Pit Dimensions						Pit Stability	
			Length (m)		Width (m)		Depth (m)		Stable	
			2.40		0.70		2.30			
			Remarks:							
			Trial pit dry.							

 LK CONSULT		Trial Pit Log					Location Ref: TP107	
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025		
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385445.72E, 407475.53N +/- 0.1m		
Equipment: Excavator: JCB 3CX			Level 114.44m AOD	Logged By CK	Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description			Level (m)	Water Strikes
0.00-0.30 0.00-0.30	ES PID=0.0ppm	0.30		MADE GROUND: Dark brown gravelly sandy SILT with frequent rootlets and rare brick fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.			114.14	
0.50-1.00	D			Brown gravelly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.		0.5		
1.50-2.00	B	2.30		End of Trial Pit at 2.30m	1.0	112.14		
					1.5			
					2.0			
					2.5			
					3.0			
					3.5			
					4.0			
					4.5			
			Pit Dimensions			Pit Stability		
			Length (m)	Width (m)	Depth (m)	Stable		
			2.60	0.60	2.30			
			Remarks: Groundwater strike at 1.60mbgl.					

		Trial Pit Log					Location Ref: TP108	
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025		
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385457.44E, 407443.74N +/- 0.1m		
Equipment: Excavator: JCB 3CX			Level 114.96m AOD	Logged By CK	Scale 1:25	Page Number Sheet 1 of 1		
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description			Level (m)	Water Strikes
0.00-0.40 0.00-0.40 0.00-0.40	D ES PID=0.1ppm	0.40		TOPSOIL: Dark brown gravelly sandy SILT with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.			114.56	
0.50-1.00	B			Firm to stiff consistency medium to high strength brown and grey mottled slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.		0.5		
				1.10 to 1.20mbgl - Sand lense noted within clay.		1.0		
1.50	SV=70.00kPa					1.5		
1.80-2.10	B			1.80 to 2.10mbgl - Sand lense noted within clay.		2.0		
2.20	SV=92.00kPa	2.30		2.20 to 2.30mbgl - Clay becomes high strength.			112.66	
				End of Trial Pit at 2.30m		2.5		
						3.0		
						3.5		
						4.0		
						4.5		
			Pit Dimensions			Pit Stability		
			Length (m)	Width (m)	Depth (m)	Unstable		
			2.60	0.60	2.30			
			Remarks:					
			Groundwater strike at 1.80mbgl.					

LK CONSULT		Trial Pit Log					Location Ref: TP109		
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025			
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385433.07E, 407412.38N +/- 0.1m			
Equipment: Excavator: JCB 3CX			Level 112.77m AOD		Logged By CK	Scale 1:25	Page Number Sheet 1 of 1		
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description				Level (m)	Water Strikes
0.00-0.30	ES PID=0.0ppm	0.30		TOPSOIL: Dark brown gravelly sandy SILT with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.			0.5	112.47	
0.30-1.00			D		Brown gravelly sandy SILT with low cobble content and occasional firm to stiff clay inclusions. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.				
1.00-2.00	B	2.10 2.20		1.20 to 2.10mbgl - Silt becomes reddish brownish grey.			1.0	110.67 110.57	
				Light brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.					
				End of Trial Pit at 2.20m			1.5		
							2.0		
							2.5		
							3.0		
							3.5		
							4.0		
							4.5		
				Pit Dimensions			Pit Stability		
				Length (m)	Width (m)	Depth (m)	Stable		
				2.50	0.60	2.20			
				Remarks:					
Groundwater strike at 1.00mbgl.									

 LK CONSULT		Trial Pit Log					Location Ref: TP110					
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 24/11/2025						
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385415.19E, 407373.83N +/- 0.1m						
Equipment: Excavator: JCB 3CX			Level 112.07m AOD		Logged By LGD		Scale 1:25		Page Number Sheet 1 of 1			
Depth (m)		Samples / Tests		Depth (m)	Legend	Stratum Description					Level (m)	
0.00-0.50 0.00-0.50		D ES		0.50		MADE GROUD: Dark brown slightly gravelly sandy SILT with frequent rootlets and rare brick fragments. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.				0.5	111.57	
0.50-1.00 0.60		D SV=113.00kPa				Stiff to very stiff high strength light brown slightly gravelly slightly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone.						
1.00-2.00		B										
1.80		SV=127.00kPa		2.20		End of Trial Pit at 2.20m					109.87	
										2.5		
										3.0		
										3.5		
										4.0		
										4.5		
					Pit Dimensions			Pit Stability				
					Length (m)		Width (m)	Depth (m)		Stable		
					2.80		1.10	2.20				
Remarks: Trial pit dry.												

		Trial Pit Log					Location Ref: TP111			
Project: Heywood Old Road, Middleton			Client: Rochdale Borough Council			Date: 26/11/2025				
Project No. : LKC251564			Contractor: H & C Plant Hire			Co-ords: 385392.96E, 407419.54N +/- 0.1m				
Equipment: Excavator: JCB 3CX			Level 111.22m AOD		Logged By CK		Scale 1:25		Page Number Sheet 1 of 1	
Depth (m)	Samples / Tests	Depth (m)	Legend	Stratum Description						Level (m)
0.00-0.30	D	0.30		TOPSOIL: Dark brown gravelly sandy SILT with frequent rootlets. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.					110.92	
0.50-1.50	B			Brownish grey slightly gravelly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.						
2.00-2.50	B	2.00		Firm to stiff consistency medium strength greyish brown slightly gravelly sandy silty CLAY. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded comprising sandstone and mudstone.					109.22	
2.30	SV=40.00kPa	2.60		End of Trial Pit at 2.60m					108.62	
			Pit Dimensions					Pit Stability		
			Length (m)		Width (m)		Depth (m)		Stable	
			2.70		0.60		2.60			
			Remarks:							
			Trial pit dry.							

Appendix D – CPT Logs

IN SITU

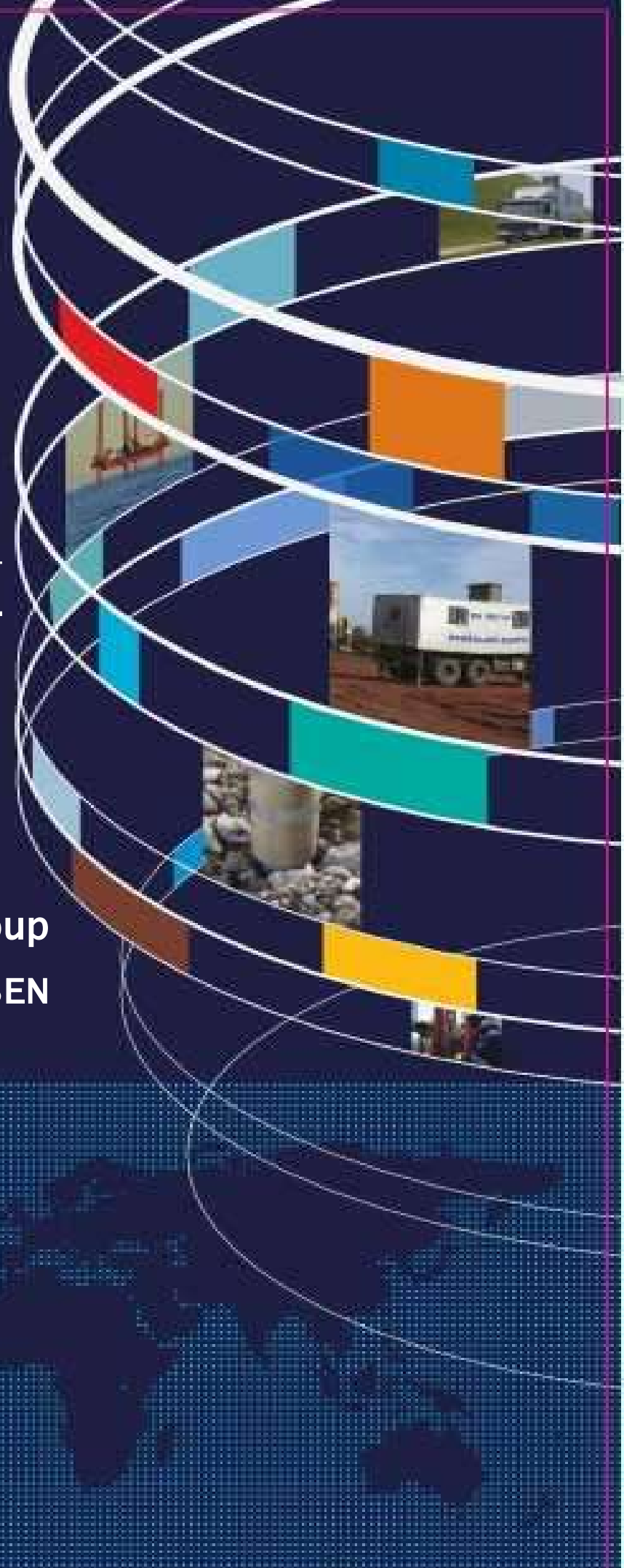
SITE INVESTIGATION

STATIC CONE PENETRATION TEST

FACTUAL REPORT

CLIENT: The LK Group

PROJECT: Redwood SEN



Project	Redwood SEN
Project No.	1250505
Client	The LK Group
Address	Eton Business Park, Eton Hill Road, Radcliffe, Manchester, M26 2ZS

Attention: Colin Crompton

Dear Colin,

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	03/12/2025	Chloe Donovan		Darren Ward		Darren Ward	

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1.0 INTRODUCTION

In Situ Site Investigation Limited (In Situ) was engaged in a geotechnical site investigation at Redwood SEN at the request of The LK Group. The site investigation consisted of completing 8 Static Piezocone Penetration Tests (CPTU), to provide information on the soil conditions and derived geotechnical parameters at:

Heywood Old Road,
Middleton, Birch,
Middleton,
Rochdale,
Greater Manchester,
OL10 2QN

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 25th November 2025 to 26th November 2025 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 *ISO 22476-1:2022(E)*.

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	Levi Inman & Tom Rademaker
Date Started	25 th November 2025
Date Finished	26 th November 2025
In Situ S.I. Project Manager	Darren Ward
Main Contractor's Site Manager	Liam Greenwood-Dean & Chris Kay

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
CPT017	20 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 22476-1:2022*, are shown in Table 2.3.

Table 2.3 Cone Summary		
Number	Cross-section area	Filter position
S15-CFIP.1817	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
8 CPTU to a maximum depth of 24.97m. 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.
<i>Provision of factual report with estimated soil type, derived geotechnical parameters & AGS data file.</i>

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 22476-1:2022(E)* 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 22476-1:2022(E)*.

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 $\pm$ 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 0.5m 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 $\pm$ 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 *ISO 22476-1:2022(E)*, *Lunne et al. (1997)* and *Robertson (2015)*. 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*).

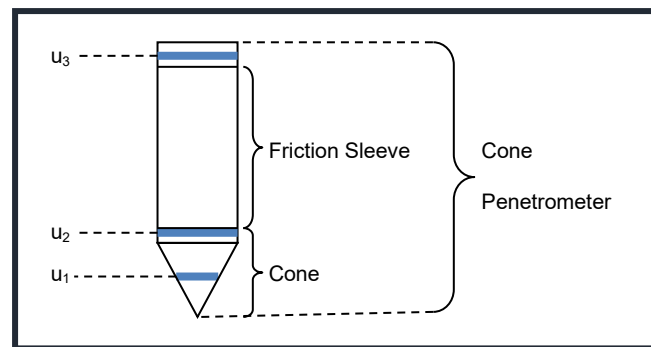


Figure 3.1: Diagram showing pore pressure filter locations (after Lunne et al., 1997)

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).

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

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*.

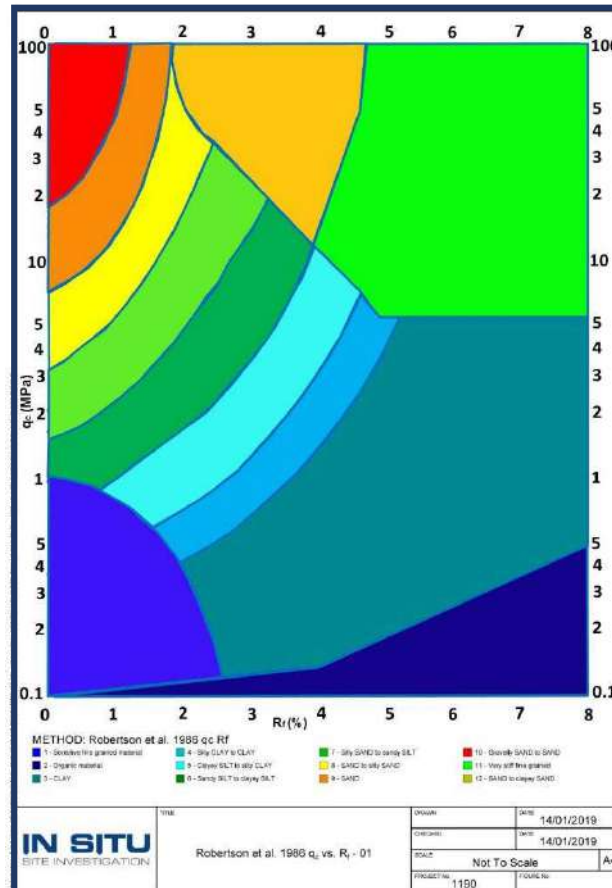


Figure 3.2: *Robertson et al., 1986 soil behaviour type chart.*

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:

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

where

α is the cone area ratio

The cone area ratio used for this project is stated on both the cone calibration certificate and the data footer. 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 22476-1:2022*.

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*).

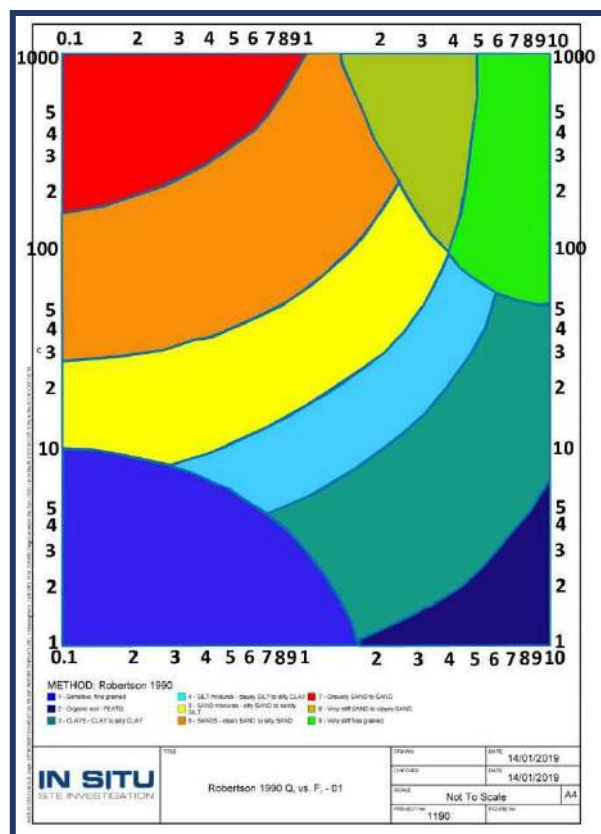


Figure 4.1: Robertson 1990 soil behaviour type chart.

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

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

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)*, *Jefferies and Davies (1998)* and *Robertson (2012)*:

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)*

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

3) *Robertson (2012)*

$$N_{60} = \frac{\frac{q_c}{p_a}}{10^{1.1268 - 0.2817 I_c}}$$

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 these methods provide a better estimation of the N_{60} value than the actual measured N , due to the poor repeatability of SPT test. However, in fine grained soil with high sensitivity these methods may overestimate N_{60} (*Jefferies and Davies, 1991*). The third method suggested by *Robertson (2012)* provides improved estimates of N_{60} for insensitive clays.

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 than less compressible sands.

In this report relative density is calculated using the methods suggested by *Baldi et al., (1986)*, *Jamolkowski 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)

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

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)

$$\phi' = 29.5^0 \cdot B_q^{0.121} \cdot [0.256 + 0.336 \cdot B_q + \log Q_t]$$

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)

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

where

q_c is the cone resistance in *kPa*

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

- 3) Kulhawy and Mayne, (1990)

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

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_{v0} = 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:

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 $V_s = 118.8 \cdot \log(f_s) + 18.5$
 G_s is the specific gravity of solids, typically between 2.40 and 2.90

4.9 STATE PARAMETER (ψ)

The state parameter, ψ is defined as the difference between the current void ratio, e and the void ratio at critical state e_{cs} , at the same mean effective stress for granular soils.

The problem of evaluating the state parameter from CPTU response is complex and depends on several soil parameters, including shear stiffness, shear strength, compressibility and plastic hardening. (*Jefferies and Been, 2006*)

In this report, the state parameter is calculated based on five methods as follows:

1) Been et al. (1987)

$$\psi = -\frac{\ln\left(\frac{Q_p}{k}\right)}{m}$$

$$Q_p = \left(\frac{3Q_t}{1 + 2K_0}\right)$$

where

Q_t is the normalized cone resistance
 K_0 is the coefficient of lateral earth pressure

2) Shuttle and Jefferies (1998)

$$\psi = -\frac{\ln\left(\frac{Q_p}{k}\right)}{m}$$

where

$$k = \left((3.79 + 1.12\ln(I_r))(1 + 1.06(M - 1.25))(1 - 0.30(N - 0.2))(H/1000)^{0.326}(-1.55(\lambda - 0.01))\right)^{1.45}$$

$$m = 1.45(1.04 + 0.46\ln(I_r))(1 - 0.4(M - 1.25))(1 - 0.30(N - 0.2))(H/100)^{0.15}(1 - 2.21(\lambda - 0.01))$$

where

Q_t is the normalised cone resistance
 I_r is rigidity index
 K_0 is the coefficient of lateral earth pressure
 M is critical state ratio
 N is dilation parameter
 H is plastic hardening modulus;
 λ is slope CSL line

3) Shuttle and Jefferies (1998)

The state parameter calculated according this third method is similar to state parameter calculated as presented in the second method, except for the rigidity index that is calculated as follows:

$$I_r = I_{r100} \left(\frac{P_a}{\sigma'_{v0}} \right)^{0.5}$$

where

I_{r100} is rigidity index in reference pressure
 P_a is the reference pressure equal to 100 kPa
 σ'_{v0} is effective vertical overburden stress

4) Plewes (1992)

$$\psi = - \frac{\ln \left(\frac{Q_p / (1 - B_q)}{k'} \right)}{m'}$$

where

$$k' = M \left(3 + \frac{0.85}{\lambda} \right)$$

$$m' = 11.9 - 13.3\lambda$$

$$\lambda = \frac{F_r}{10}$$

where

Q_t is the normalised cone resistance
 B_q is pore pressure ratio
 K_0 is the coefficient of lateral earth pressure
 F_R is normalised friction ratio
 M is critical state ration

5) Been and Jefferies (1992)

$$\psi = - \frac{\ln \left(\frac{Q_p / (1 - B_q)}{k'} \right)}{m'}$$

where

$$k' = M \left(3 + \frac{0.85}{\lambda} \right)$$

$$m' = 11.9 - 13.3\lambda$$

$$\lambda = \frac{1}{34 - 10I_c}$$

For high-risk projects a detailed interpretation of CPTU results using laboratory results and numerical modelling can be appropriate (e.g. *Shuttle and Cunning, 2007*), although soil

variability can complicate the interpretation procedure. For low risk projects and in the initial screening for high-risk projects there is a need for a simple estimate of soil state.

Plewes et al (1991) provided a mean to estimate soil state using the normalised soil behaviour type, *SBT_n* chart suggested by *Jefferies and Davies (1991)*. *Jefferies and Been (2006)* suggested that soils with a state parameter less than -0.05 are dilative at large strains.

4.10 IN SITU STRESS RATIO (K_0)

There are various estimations to determine in situ stress ratio, K_0 , from CPTU in fine grained soils. In this report the methods suggested by *Mayne (2007)* and *Kulhawy and Mayne (1990)* are used, as given below:

- 1) Mayne (2007)

$$K_0 = (1 - \sin\phi')OCR^{\sin\phi'}$$

$$Max K_0 = K_p = \frac{(1 + \sin\phi')}{(1 - \sin\phi')}$$

$$K_0 = 0.192\left(\frac{q_t}{\sigma_{atm}}\right)^{0.22}\left(\frac{\sigma_{atm}}{\sigma_{v0}}\right)^{0.22}OCR^{0.27}$$

where

OCR is the overconsolidation ratio, calculated as presented in session 4.11

- 2) Kulhawy and Mayne (1990)

$$K_0 = 0.1\left(\frac{q_t - \sigma_{v0}}{\sigma_{v0}'}\right)$$

These approaches are generally limited to mechanically overconsolidated, fine grained soils. As considerable scatter exists in the database used for these correlations, in moderate to high risk projects further tests should be performed and these correlations must be considered only as a guide.

4.11 OVERCONSOLIDATION RATIO (OCR)

Overconsolidation ratio, OCR is defined as the ratio of the maximum past effective consolidation stress and the present effective overburden stress:

$$OCR = \frac{\sigma'_p}{\sigma'_{v0}}$$

This definition is appropriate for mechanically overconsolidated soils, where the only change has been the removal of overburden stress. For cemented and aged soils, the *OCR* may represent the ratio of the yield stress and the present effective overburden stress.

In this report σ'_p is calculated based on six methods as presented below:

- 1) Mayne (1995)

$$\sigma'_p = 0.33(q_t - \sigma_{v0})$$

- 2) Chen and Mayne (1996)

$$\sigma'_p = 0.53\Delta u$$

- 3) Mayne (2005)

$$\sigma'_p = 0.6(q_t - u_2)$$

- 4) Robertson (2009)

$$\sigma'_p = 0.25(Q_t^{1.25} - \sigma'_{v0})$$

- 5) Mayne (2005)

$$\sigma'_p = \left[\frac{0.192 \left(\frac{q_t}{\sigma_{atm}} \right)^{0.125}}{(1 - \sin\phi') \left(\frac{\sigma'_{v0}}{\sigma_{atm}} \right)^{0.31}} \right]^{\left(\frac{1}{\sin\phi' - 0.27} \right)} \sigma'_{v0}$$

- 6) Mayne (2007)

$$\sigma'_p = 0.101 \sigma_{atm}^{0.102} (G_0)^{0.478} \sigma'_{v0}{}^{0.420}$$

For larger, moderate to high risk projects, where additional high-quality field and laboratory data may be available, site specific correlations should be developed based in consistent and relevant values of *OCR*.

4.12 SMALL STRAIN YOUNG'S MODULUS (E_0)

Deriving small strain undrained Young's modulus, E_0 , from CPTU is difficult. There is insufficient data available to make a direct correlation and it is recommended that c_u should be derived, then E_u estimated as a rough order of value from one of the available correlations between E_u and c_u (Meigh, 1987).

In this report the small strain Young's modulus is derived as follows:

- 1) Defined from elastic theory:

$$E_0 = 2(1 + \nu)G_0$$

where

ν is the Poisson ratio, equal to 0.2

G_0 is the small strain shear modulus calculated by the formula given below:

$$G_0 = 1634 \left(\frac{q_c}{\sqrt{\sigma'_{v0}}} \right)^{-0.75} q_c$$

- 2) Calculated based on the degree of loading, q_c , effective stress and reduction factor

$$E_0 = \alpha q_c$$

where

α is calculated from degree of loading, q_c , effective stress and reduction factor, given in *Figure 4.2*

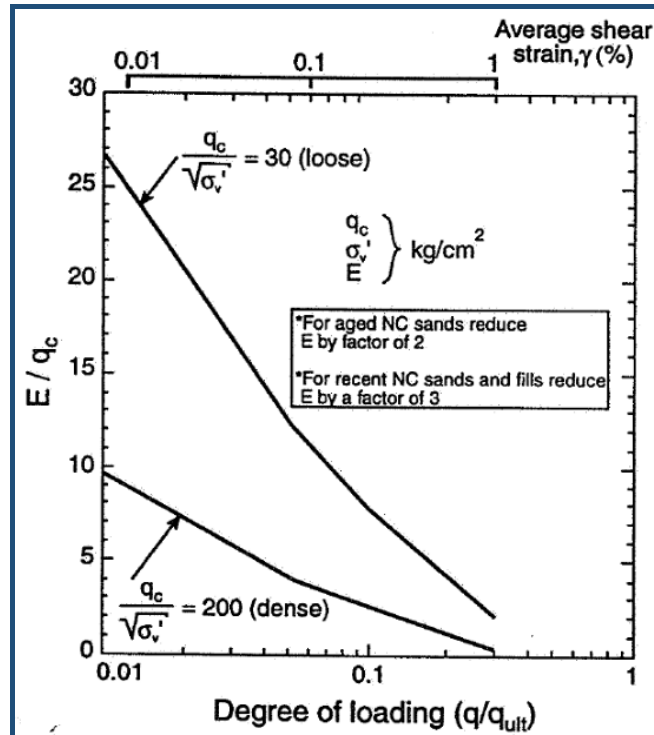


Figure 4.2: Estimation of equivalent Young's modulus for sand based on degree of loading
 (Robertson, 1990)

4.13 CONSTRAINED MODULUS (M)

Constrained Modulus, M , can be estimated by CPTU using the following empirical relationship:

$$M = \alpha_M (q_t - \sigma_{v0})$$

where

α_M varies with soil plasticity and natural water content for a wide range of fine-grained soils and organic soils. *Meigh (1987)* suggested that α_M lies in the range of 2 to 8, whereas *Mayne (2001)* suggested the value of 5.

Robertson (2001) suggested that α_M varies with Q_t , such that:

When $I_c > 2.2$ (fine grained soils) use: $\alpha_M = Q_t$ when $Q_t < 14$

$\alpha_M = 14$ when $Q_t > 14$

When $I_c < 2.2$ (coarse grained soils) use: $\alpha_M = 0.0188[10^{(0.55I_c+1.68)}]$

In this report the Constrained Modulus, M , is calculated after *Kulhawy and Mayne (1990)* using the equation below:

$$M = 8.25(q_t - \sigma_{v0})$$

Also, an alternative method is included in the results, developed by *Burns and Mayne (2002)* using the following relationship:

$$M = 0.02G_0$$

4.13.1 Equivalent Oedometer Coefficient of Compressibility (m_v)

Equivalent oedometer coefficient of compressibility, m_v can be calculated directly by the Constrained Modulus, M , as follows:

$$m_v = \frac{1}{M}$$

4.14 SMALL STRAIN SHEAR MODULUS (G_0)

In this report the small strain shear modulus, G_0 , is calculated from the measured V_s on site as explained in *Section 2.4* (or Elastic Theory) and also derived using the correlation developed by *Rix and Stoke (1992)*.

1) Rix and Stoke (1992)

$$G_0 = 1634 \left(\frac{q_c}{\sqrt{\sigma'_{v0}}} \right)^{-0.75} q_c$$

where

q_c is the net cone tip resistance in kPa
 σ'_{v0} is the effective initial vertical stress in kPa
 γ_{bulk} is the bulk density of the soil
 V_s is the shear wave velocity

This correlation of G_0 is applicable to all soil types.

4.15 RIGIDITY INDEX (I_R)

The rigidity index, I_R , for fine grained soils is defined using the following formula, developed by *Mayne (2001)*:

$$I_R = \exp \left[\left(\frac{1.5}{M} + 2.925 \right) \left(\frac{q_t - \sigma_{v0}}{q_t - u_2} \right) - 2.925 \right]$$

where

M is the Cam-Clay constant, slope of the critical state line defined as:

$$M = \frac{6 \sin \phi'}{3 - \sin \phi'}$$

where

ϕ' is the internal friction angle.

The second method used to define the rigidity index, I_R , for fine grained soils is based on plasticity index and overconsolidation ratio, OCR and calculated after the relationship developed by *Keaveny and Mitchell (1986)* as follows:

$$I_R = \frac{\exp (0.0435(137 - PI))}{[1 + \ln\{1 + 0.385(OCR - 1)^{3.2}\}]^{0.8}}$$

where

PI is the plasticity index of the soil, equal to 20.

OCR is the overconsolidation ratio of the soil

A third method to estimate the Rigidity Index is by using the Small Shear Strain Modulus, G_0 from seismic tests and the Undrained Shear Strength, s_u derived from *Lunne et al. (1997)* as explained in *Section 4.6* for cone factor $N_k = 15$, using the correlation below:

$$I_R = \frac{G_0}{s_u}$$

4.16 CONSOLIDATION CHARACTERISTICS (ch and cv)

All results for consolidation characteristics calculated from dissipation tests measurements using the formulas below are presented in *Dissipation Graphs in Appendix B*.

The coefficient of consolidation is interlinked with the hydraulic conductivity through the formula below:

$$c = \frac{kM}{\gamma_w}$$

where

- M is the 1-D constrained modulus relevant to the problem (i.e. unloading, reloading, virgin loading, etc)
 γ_w is the unit weight of water
 k is the hydraulic conductivity

In geotechnical practice it is very difficult to measure *coefficient of consolidation* and *permeability of soils*. Due to soil anisotropy c and k have different values in the horizontal, c_h and k_h and vertical c_v and k_v directions. The relevant design values depend on drainage and loading direction.

The coefficient of consolidation can be estimated from dissipation data and should be interpreted at 50% degree of dissipation, using the following formula below:

$$c = \left(\frac{T_{50}}{t_{50}} \right) r_0^2$$

where

- T_{50} is theoretical time factor
 t_{50} is measured time for 50% degree of dissipation
 r_0 is penetrometer radius

In soils of very low permeability the time for dissipation can be decreased by using smaller diameter probes. A theoretical solution for these cases is given by *Teh and Houlsby (1991)* and it is compared with data from around the world by *Robertson et al. (1992)*, as shown in *Figure 4.3*.

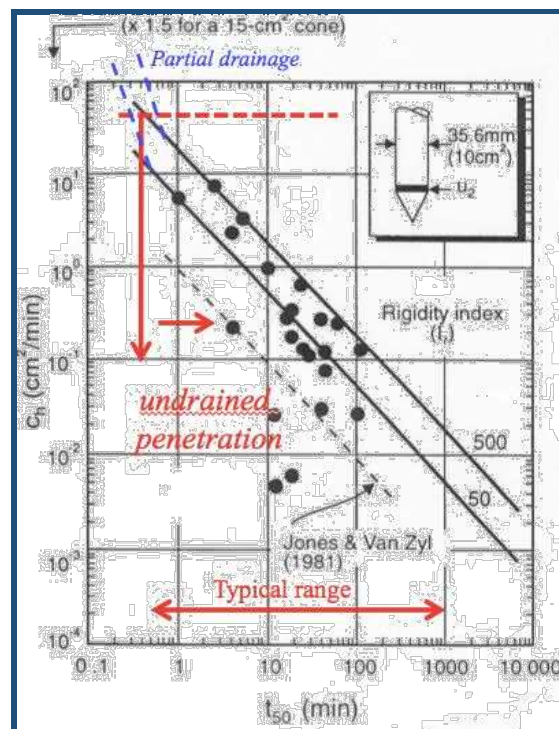


Figure 4.3: Average laboratory c_h values and CPTU results

(after Robertson et al. 1992, Teh and Houlsby theory shown as solid lines for $I_R = 50$ and $I_R = 500$).

c_h estimation is controlled by soil stress history, sensitivity, anisotropy, rigidity index (relative stiffness), fabric and history. In overconsolidated soils, the pore pressure behind the cone tip can be low or negative, results in dissipation data that can initially rise before decreasing to the equilibrium values. Care is required to ensure the dissipation test to end at the right moment of time, not stopped prematurely after the initial rise.

An approximate estimate of the coefficient of consolidation in the vertical direction can be obtained using the ratios of permeability in the horizontal and vertical directions as follows:

$$c_v = c_h \left(\frac{k_v}{k_h} \right)$$

Jamiolkowski et al. (1985) presented the range of field values (Table 4.4), which can be used to estimate k_v from k_h .

Based on the table below, the nature of clay for this site is considered no macrofabric, or only slightly developed macrofabric, essentially homogenous deposits, so the ratio use is k_h/k_v equal to 1.25 and the ratio c_h/c_v used for calculation purposes in this report is equal to 1.25.

Nature of clay	k_h/k_v
No macrofabric, or only slightly developed macrofabric, essentially homogeneous deposits	1 to 1.5
From fairly well to well-developed macrofabric, e.g. sedimentary clays with discontinuous lenses and layers of more permeable material	2 to 4
Varved clays and other deposits containing embedded and more or less continuous permeable layers	3 to 15

Table 4.4: Range of field values of k_h/k_v for soft clays (from Jamiolkowski et al., 1985).

Estimation of soil permeability from CPTU and dissipation data is subject to much uncertainty and should be used as a guide only.

4.17 HYDRAULIC CONDUCTIVITY (k)

Hydraulic conductivity or coefficient of permeability, k , based on Soil Behaviour Type Index, I_c , can be estimated from the following relationships:

$$\begin{aligned} \text{When } 1.0 < I_c \leq 3.27 & \quad k = 10^{(0.952 - 3.04I_c)} \\ \text{When } 3.27 < I_c \leq 4.0 & \quad k = 10^{(-4.52 - 1.37I_c)} \end{aligned}$$

However, in this report the hydraulic conductivity is estimated from 2 soil behaviour classification charts, *Robertson et al. (1986)* and *Robertson et al. (1990)* presented in Table 4.3 and 4.4, respectively.

SBT Zone	Soil Behaviour Type (SBT)	Range of hydraulic conductivity, k (m/s)
1	Sensitive fine grained	3×10^{-9} to 3×10^{-8}
2	Organic soils	1×10^{-8} to 1×10^{-6}
3	Clay	1×10^{-10} to 1×10^{-9}
4	Silty CLAY to CLAY	3×10^{-9} to 1×10^{-8}
5	Clayey SILT to silty CLAY	1×10^{-8} to 1×10^{-7}
6	Sandy SILT to clayey SILT	1×10^{-7} to 1×10^{-6}
7	Silty SAND to sandy SILT	1×10^{-5} to 1×10^{-6}
8	SAND to silty SAND	1×10^{-5} to 1×10^{-4}
9	SAND	1×10^{-4} to 1×10^{-3}
10	Gravelly SAND to SAND	1×10^{-3} to 1
11	Very stiff fine grained	1×10^{-8} to 1×10^{-6}
12	SAND to clayey SAND	3×10^{-7} to 3×10^{-4}

Table 4.3: Estimated soil permeability (k) based on SBT chart by Robertson et al. (1986)

SBT Zone	Soil Behaviour Type (SBT)	Range of hydraulic conductivity, k (m/s)
1	Sensitive fine grained	3×10^{-9} to 3×10^{-8}
2	Organic soils	1×10^{-8} to 1×10^{-6}
3	Clay	1×10^{-10} to 1×10^{-9}
4	Silt Mixture	3×10^{-9} to 1×10^{-7}
5	Sand Mixture	1×10^{-7} to 1×10^{-5}
6	Sand	1×10^{-5} to 1×10^{-3}
7	Gravelly sands to dense sands	1×10^{-3} to 1
8	Very stiff sand to clayey sand	1×10^{-8} to 1×10^{-6}
9	Very stiff fine grained	1×10^{-8} to 1×10^{-6}

Table 4.4: Estimated soils' permeability (k) based on SBT chart by Robertson et al. (1990).

4.18 DERIVED SHEAR WAVE VELOCITY (V_s)

For the purpose of this project the Shear Wave Velocity is measured as explained in Section 2.4. However, by using various correlations from the literature it is possible to also derive the Shear Wave Velocity, V_s . In this report the derived V_s results generated using Mayne (2006), Hegazy and Mayne (1995), Mayne and Rix (1995) and Baldi et al. (1989) correlations.

- 1) Mayne (2006)

$$V_s = 118.8 \log f_s + 18.5$$

where

f_s is the measured sleeve friction *in kPa*

- 2) Hegazy and Mayne (1995)

$$V_s = (10.1 \log q_t - 11.4)^{1.67} \left(\frac{f_s}{q_t} \cdot 100 \right)^{0.3}$$

where

q_t, f_s are corrected cone resistance and measured sleeve friction, respectively *in kPa*

- 3) Mayne and Rix (1995)

$$V_s = 1.75 (q_t)^{0.627}$$

where

q_t is the corrected cone resistance *in kPa*

- 4) Baldi et al. (1989)

$$V_s = 277 (q_t)^{0.13} (\sigma'_{v0})^{0.13}$$

where

q_t, σ'_{v0} are corrected cone resistance and effective vertical stress, respectively *in kPa*

5.0 CPTU RESULTS APPLICATIONS

5.1 SOIL PROFILING AND APPLICATIONS IN GEOTECHNICAL DESIGN

5.1.1 Soil Behaviour Type

The major applications of CPTU are on *soil behaviour type and soil profiling*. Typically, the cone resistance, q_c is high in sands and low in clays, and the friction ratio, $R_f = f_s/q_t$ is low in sands and high in clays. The CPTU cannot be expected to provide accurate predictions of soil type based on *physical characteristics*, e.g. *grain size distribution*, but provides a guide to the *mechanical characteristics*, including: *strength, stiffness, and compressibility* of the soils, or the *soil behaviour type, SBT*.

The most commonly used CPTU soil behaviour type chart, suggested by *Robertson et al. (1986)* uses the basic CPTU measured parameters of cone resistance, q_c and friction ratio, R_f . The chart is global in nature and can provide reasonable predictions of soil behaviour type for CPTU testing. The expected overlap in some zones is modified in the interpretations of this report somewhat based on previous experience or local knowledge of the site.

Since both the penetration resistance and sleeve resistance increase with depth due to the increase in effective overburden stress, the CPTU data requires normalization for overburden stress for very shallow and/or very deep tests. A popular CPTU soil behaviour chart based on normalized CPTU data is firstly proposed by *Robertson (1990)*. The chart identifies general trends in ground response, such as: *increasing soil density, OCR, age and cementation* for granular soils, and *increasing stress history, OCR and soil sensitivity* for cohesive soils.

A more general normalized CPTU SBT chart, using large strain *soil behaviour* descriptions, proposed by *Robertson (2012)* is shown in *Figure 5.1*.

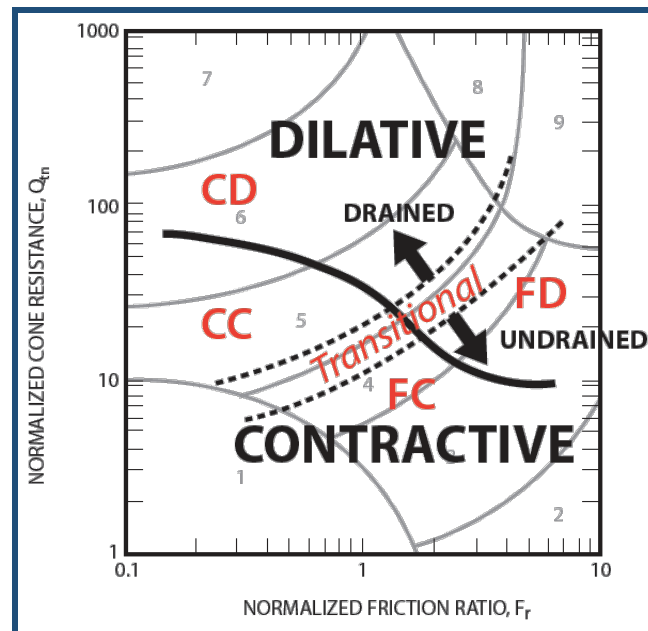


Figure 5.1: Normalized CPTU Soil Behaviour Type (SBT_n) chart, Q_{tn} - F_R using general large strain soil behaviour description (Robertson, 2012).

*

- CD is coarse grained dilative soil-predominately drained CPTU
- CC is coarse grained contractive soil-predominately drained CPTU
- FD is fine grained dilative soil-predominately undrained CPTU
- FC is fine grained contractive soil-predominately undrained CPTU

5.1.2 Soil Profiling

CPTU is an excellent test for soil profiling. The continuous monitoring of pore pressure during the cone penetration improves the soil stratigraphy descriptions. The pore pressure develops in response to the soil type being penetrated in the area where the pore pressure element is located. Soft, firm or stiff clays and contractive silts can show very high pore pressure. Very stiff overconsolidated clays and dilative silts can give very low or negative pore pressures same as very dense silty sands.

The thin layers of sand, or silt in a thick layer of clay, or thin layers of clay or silt in a thick layer of sand are easily distinguished during a CPTU test, which will give a response time sufficiently fast to observe pore pressure changes even in the very thin layers of soils (< 5mm), depending on the response of soil to the advancing of cone.

The sandy soils tend to produce high cone resistance and low friction ratio, whereas soft clayey soils tend to produce low cone resistance and high friction ratio. Organic soils such as peat tend to have very low cone resistance and very high friction ratio. Soils with high horizontal stresses (*high OCR*) tend to have higher cone resistance and friction ratio.

CPTU is an excellent tool to classify the soils based on their behaviour type, and not based on grain size distribution.

The measurement of sleeve friction, f_s is often less reliable than the measurement of cone resistance, q_c (Lunne *et al.*, 1986), but to overpass these problems pore pressure parameter ratio, B_q , and the classification charts based on it.

For more reliability in soil profiling, the soil interpretations in this report are carried out based on three parameters measured on site, cone resistance, sleeve friction and pore pressure and three derived geotechnical parameters soil behaviour type index for all soils, undrained shear strength for cohesive soils and relative density for granular soils.

Generally, soils that fall in zones 8, 9 and 10 of *Robertson et al. (1986)* chart (6 and 7 of *Robertson (1990)* chart) represent approximately drained penetration, whereas, soils in zones 1, 2, 3, 4, 5 and 6 of *Robertson et al. (1986)* chart (1, 2, 3 and 4 of *Robertson (1990)* chart) represent approximately undrained penetration. Soils in zones 7, 11 and 12 of *Robertson et al. (1986)* (5, 8 and 9 of *Robertson (1990)* chart) may represent partially drained penetration. The classification is often influenced by changes in *stress history, in situ stresses, sensitivity, stiffness, mineralogy*, etc. An advantage of pore pressure measurements during cone penetration is the ability to evaluate drainage conditions more directly. (Lunne *et al.*, 1997)

The information about the rate and manner of excess pore pressures during the dissipations significantly helps the accurate classification in the corresponding depths of dissipation tests. In very stiff, overconsolidated clayey soils, the pore pressure behind the cone is very low and sometimes negative of the equilibrium pore pressure, u_0 , whereas the pore pressure on the face of the cone is very large due to the large increase in normal stresses created by the cone penetration. When penetration is stopped in overconsolidated clays, pore pressure recorded behind the cone may initially increase before decreasing to the equilibrium pore pressure. The rise is caused by local equalization of the high pore pressure gradient around the cone.

Cone penetration in fine grained soils, such as clays and silts, is generally undrained. Cone penetration tests under undrained conditions generate high pore pressure and this reading is extremely useful, because it affects both cone resistance and sleeve friction measurements. These parameters should be corrected using the measured pore pressure.

CPTU in coarse grained soils, such as sandy or gravelly soils is generally drained. In these conditions there is no excess pore pressure generated as a result of cone penetration. Relative density has been used as the main parameter for description of sandy deposits.

5.1.3 Applications in geotechnical design

CPTU measured parameters are used to derive geotechnical parameters, which are the input in several geotechnical analyses. An alternate approach is to directly apply CPTU results to the geotechnical calculations.

As a guide, *Table 5.1* shows a summary of the applicability of CPTU results for direct design applications. The ratings shown in the table have been assigned based on current experience and represent a qualitative evaluation of the confidence level assessed to each design problem and general soil type. Details of ground conditions and project requirements can influence these ratings.

Type of soil	Pile Design	Bearing Capacity	Settlement	Compaction Control	Liquefaction
Sand	A-B	A-B	B-C	A-B	A-B
Clay	A-B	A-B	B-C	C-D	A-B
Intermediate Soils	A-B	B-C	B-C	B-C	A-B

Table 5.1: Perceived applicability of CPTU for various direct design problems.

- A is high
- B is high to moderate
- C is moderate
- D is moderate to low

6.0 REFERENCES

- ASTM D7400-14 (2015)*, "Standard and ISSMGE TC10 guideline", by *Butcher, A. P. et al.*
- Baldi et al. (1986) / Al-Hamoud and Wehr (2006)*, "Interpretation of CPTs and CPTUs; 2nd part: drained penetration of sands / Experience of vibrocompaction in calcareous sand of UAE"
- Been et al. (1987)*, "Cone Penetration Test Calibration for Erksak (Beaufort Sea) Sand", Canadian Geotechnical Journal, 24, 4, pp. 601-610
- Been and Jefferies (1992)*, "Towards Systematic CPT Interpretation", Proceedings Wroth Memorial Symposium, Thomas Telford, London, pp. 121–134
- Boulanger and Idriss (2014)*, "CPT and SPT Based Liquefaction Triggering Procedures", Report No. UCD/CGM-14/01, Centre of Geotechnical Modelling, Department of Civil and Environmental Engineering, College of Engineering, University of California at Davis
- British Standard BS5930:1999*, "Code of practice for site investigations". BSI, 1999
- Burns and Mayne (2002)*, "Analytical Cavity Expansion Critical State Model for Piezocone Dissipation in Fine Grained Soils, Soils and Foundations", Vol. 42, No. 2, 2002
- Houlsby and Teh (1998)*, "Analysis of the piezocone in clay". Proceedings of the International Symposium on Penetration Testing, ISOPT-1, Orlando, 2, 777-83, Balkema Pub., Rotterdam
- Idriss and Boulanger (2008)*, "Soil liquefaction during earthquakes", Earthquake Engineering Research Institute, MNO-12
- International Standard*, "Geotechnical Investigation and testing- field testing – part 1: electrical cone and piezocone penetration test", BSI ISO 22476-1:2022(E), April 2022.
- Jamiolkowski et al. (2001)*, Evaluation of relative density in shear strength of sands from cone penetration tests (CPT) and flat dilatometer (DMT), Soil Behaviour and Soft Ground Construction (GSP 119), American Society of Civil Engineers, Reston, Va., 2001, pp. 201-238
- Jefferies and Davies (1991)*, "Soil classification by the cone penetration test": Discussion. Canadian Geotechnical Journal, 28(1), 173-6
- Jefferies and Been (2006)*, "Soil liquefaction: a critical state approach", Taylor and Francis.

- Jones and Rust (1995)*, "Piezocone settlement prediction parameters for embankments on alluvium". Proceedings of the International Symposium on Cone Penetration Testing, CPT '95, Linköping, Sweden, 2, 501-8, Swedish Geotechnical Society
- Kulhawy and Mayne (1990)* "Manual on estimating soil properties for foundation design". Electric Power Research Institute, EPRI, August, 1990.
- Keaveny and Mitchell (1986)*, "Strength of Fine-Grained Soils Using the Piezocone," Use of In Situ Tests in Geotechnical Engineering (GSP 6), American Society of Civil Engineers, Reston, Va., 1986, pp. 668–699
- Lord, Clayton and Mortimore (2002)*, "Engineering in chalk". Ciria Guide C574.
- Lunne and Kleven (1981)*, "Role of CPT in North Sea foundation engineering". Session at the ASCE National Convention: Cone Penetration Testing and Materials, St. Louis, 76-107, American Society of Engineers (ASCE).
- Lunne and Christophersen (1983)*, "Interpretation of cone penetrometer data for offshore sands". Proceedings of the Offshore Technology conference, Richardson, Texas, Paper No. 4464.
- Lunne, Robertson and Powell (1997)*, "Cone Penetration testing in Geotechnical Practice". Blackie.
- Marchetti and Crapps (1981)*, "Flat Dilatometer Manual". Internal Report of G.P.E.Inc.
- Marchetti, et al. (2001)*, The Flat Dilatometer Test (DMT) in soil investigations. A report by the ISSMGE Committee TC16. 41pp. Reprinted in proc. DMT 2006, Washington D.C.
- Mayne and Rix (1995) / Lune et al. (1997)*, "Gmax-qc relationships for clays", Geotechnical Testing Journal, ASTM, 16 (1), pp. 54-60/ CPT in Geotechnical Practice (1997)
- Mayne (2001)*, "Stress-Strain-Strength-Flow Parameters from Enhanced In-Situ Tests", International Conference on In-Situ Measurement of Soil Properties and Case Histories, Indonesia, 2001, pp. 27–48
- Mayne and Campanella (2005)*, "National Cooperative Highway Research Program", Synthesis 368 (2007)
- Mayne (2007)*, "National Cooperative Highway Research Program", Synthesis 368 (2007)
- Mitchell and Gardner (1975)*, "In situ measurement of volume change characteristics". Proceedings of the ASCE Specialty Conference on In Situ Measurements of Soil Properties, Raleigh, North Carolina, 2, 279-345, American Society of Engineers (ASCE)

- Rix and Stoke (1992)*, "Correlation of Initial Tangent Modulus and Cone Resistance", Proceedings of the International Symposium on Calibration Chamber Testing, Potsdam, New York, 1991, pp. 351-362, Elsevier
- Robertson and Campanella (1983)* "Interpretation of cone penetrometer test: Part 1: Sand". Canadian Geotechnical Journal, 20(4), 718-33
- Robertson, Campanella, Gillespie and Greig (1986)*, "Use of piezometer cone data". Proceedings of the ASCE Specialty Conference In Situ '86: Use of In Situ Tests in Geotechnical Engineering, Blacksburg, 1263-80, American Society of Engineers (ACE)
- Robertson (1990)*, "Soil classification using the cone penetration test". Canadian Geotechnical Journal, 27(1), 151
- Robertson and Fear (1995)*, "Liquefaction of sands and its evaluation. IS TOKYO '95". First International Conference on Earthquake Geotechnical Engineering, Keynote Lecture, November, 1995
- Robertson and Wride (1998)*, "Evaluating cyclic liquefaction potential using the cone penetration test". Can. Geotech. J. Vol. 35
- Robertson (2010)*, "Soil behaviour type from the CPT: an update", Gregg Drilling and Testing Inc. Signal Hill, California, USA, CPT 10, paper 2-56
- Robertson (2015)*, "Guide to Cone Penetration Testing", 6th Edition (2015)
- Senneset and Janbu (1985)*, "Shear strength parameters obtained from static cone penetration tests. Strength Testing of Marine Sediments; Laboratory and In Situ Measurements". Symposium, San Diego, 1984, ASTM Special technical publication, STP 883, 41-54
- Senneset, Sandven and Janbu (1989)*, "The evaluation of soil parameters from piezocone tests". Transportation Research Record, No. 1235, 24-37
- Schmertmann (1978)*, "Guidelines for cone penetration test, performance and design", US Federal Highway Administration, Washington, DC, Report, FHWA-TS-78-209, 145
- Shuttle and Jefferies (1998)*, "Dimensionless and unbiased CPT interpretation in sand", International Journal for Numerical and Analytical Methods in Geomechanics, 22, pp. 351-391.
- Suzuki, Tokimatsu, Taya, and Kubota (1995)*, "Correlation between CPT data and dynamic properties of in situ frozen samples". Proceedings of the Third International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, St. Louis, 1, 249-52, University of Missouri Rolla.

APPENDIX A

APPENDIX A1 – Project Summary Sheet

Piezocene Tests Summary Sheet

HOLE ID	Final Depth (m)	Date of Test	Cone Used	Test Remarks
CPT101	19.49	25/11/2025	S15-CFIP.1817	Test refused on total pressure.
CPT102	19.91	25/11/2025	S15-CFIP.1817	Test completed at target depth.
CPT103	19.95	25/11/2025	S15-CFIP.1817	Test completed at target depth.
CPT104	19.97	25/11/2025	S15-CFIP.1817	Test completed at target depth.
CPT105	24.11	26/11/2025	S15-CFIP.1817	Test refused on total pressure.
CPT106	21.36	26/11/2025	S15-CFIP.1817	Test refused on total pressure.
CPT107	24.94	26/11/2025	S15-CFIP.1817	Test completed at target depth.
CPT108	24.97	26/11/2025	S15-CFIP.1817	Test completed at target depth.

APPENDIX A2 – CPT Rig Datasheet

RIGS

20 TONNE CPT TRACK MOUNTED RIG (CPT017)

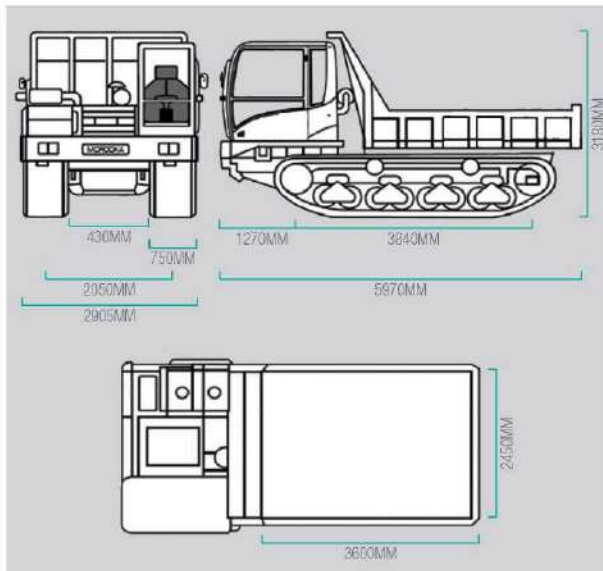
We have a variety of rigs giving us the capacity to meet our clients' needs and specifications for each individual project.

This rubber tracked rig weighs 20 tonnes and is able to push up to a depth of 40 metres, depending on the ground conditions. It has low ground bearing pressure and is ideal for soft, boggy sites which are inaccessible for our wheeled rigs.

CPT RIG DETAILS

DRIVE SYSTEM	RUBBER TRACKED
TOTAL WEIGHT	20 TONNES
GROUND BEARING PRESSURE	35kPa
CPT RAM THRUST CAPACITY	20 TONNES
MAXIMUM PENETRATION	30-40M DEPENDING ON THE GROUND CONDITIONS.
PERFORMANCE RATES	100-150M OF TESTING A DAY, DEPENDING ON ACCESS TO POSITIONS.
TYPICAL SITES FOR THIS RIG	SOFT, BOGGY SITES. THE RIG HAS LOW GROUND BEARING PRESSURE.

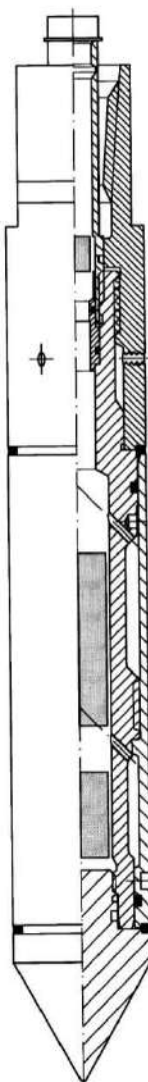
CPT RIG DIMENSIONS



APPENDIX A3 – Cone Datasheet



Rijksstraatweg 22F
 2171 AL Sassenheim
 Tel. : +31 71 301 92 51
 Fax : +31 71 301 92 52
 E-mail : info@geopoint.nl
 ING bank : 68.23.01.396
 Postbank : 5226758
 BTW nr. : NL806331677801



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 mm ²
Friction Sleeve Surface	22,500 mm ²
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. Loadcells may be calibrated for lower ranges.*

APPENDIX A4 – Cone Calibration Certificate

Eijkelkamp GeoPoint
 SoilSolutions

Rijksstraatweg 22F
 2171 AL Sassenheim
 The Netherlands

T +31 71 301 9251
 E info@eijkelkamp-geopoint.com
 I eijkelkamp-geopoint.com

Cone Calibration Certificate

Certificate: **GS-1817-009** Class 2
 Instrument Type: Electric Subtraction Cone
 Model: S15-CFIIP
 Serial number: 1817
 Calibration date: 17-11-2025
 Client: In Situ
 Calibrated by: A. Verhart
 Calibration instruments
 Manufacturer: Hottinger Baldwin Messtechnik GmbH
 NMI certificate: 3975345 00501
 Calibration conditions
 Ambient temperature: 20.5 °C
 Atmospheric pressure: 1018 mBar
 Cone specifications
 Cone base area: 1500 mm²
 Load tip resistance (nom.): 100 kN
 Friction sleeve area: 22500 mm²
 Load tip + local friction (nom.): 100 kN
 Load friction sleeve (nom.): 22.5 kN
 Load pore pressure (nom.): 2 MPa
 Inclination (nom.): +/- 20 °
 Temperature compensation (all channels): 0...+40 °C
 Maximum overload capacity (all channels): 100 %
 Cone area ratio (a): 0.79
 Max. Inaccuracy, relative to measurement value: 1.0 %

Zero points:	Tip:		Sleeve:		Pore Pressure:		Inclinometer:		
	qc in kN	mV	fs in kN	mV	MPa	mV	Degrees	X (mV)	Y (mV)
	0239		0248		0245				
	0	0	0	0	0	0	0	2489	2417
	5	0308	5	0302	0.4	1621	-20	0485	0456
	10	0615	10	0605	0.8	3256	20	4531	4371
	15	0923	15	0908	1.2	4879			
	20	1233	20	1212	1.6	6492			
	25	1543	25	1517	2	8105			
	30	1853	30	1820					
	35	2161	35	2123					
	40	2471	40	2426					
	45	2780	45	2730					
	50	3089	50	3032					
	75	4629	75	4545					
	100	6166	100	6055					

Max. error, abs. qc: 35 kPa
 Max. error, abs. fs: 5 kPa
 Max. error, abs. u2: 10 kPa
 Max. error, abs. i: 1 °

This calibration is compliant with Eijkelkamp GeoPoint SoilSolutions internal quality system, internal calibration procedures and meets the requirements of NEN2549, NEN-EN-ISO 22476-1, NORSOK G-001, ISSMFE and ASTM using calibration equipment traceable to (Inter-)National Standards.

Calibrated by: A. Verhart
 Calibration date: 17-11-2025

Approved by: R. Mosterd
 Date:

Eijkelkamp GeoPoint SoilSolutions
 V.A.T. NO. NL 8584.21.422.801
 Trade Reg. Arnhem no. 70686149

IBAN NL43 RABO 0326 7904 38
 BIC: RABONL2U

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 ($= \frac{e_{max}-e}{e_{max}-e_{min}} \times 100\%$)
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 _{Δu}	is cone factor
p _a	is reference stress ($= 100 \text{ kPa}$)
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 ($= (f_t/q_t) \times 100\%$ or alternatively $= (f_t/q_t) \times 100\%$)
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)
$\sigma_{v0}, \sigma'_{v0}$	is overburden stress (total, effective)
T_{av}	is average cyclic shear stress
T_{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
SCPT	Seismic Cone Penetration
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

PointID

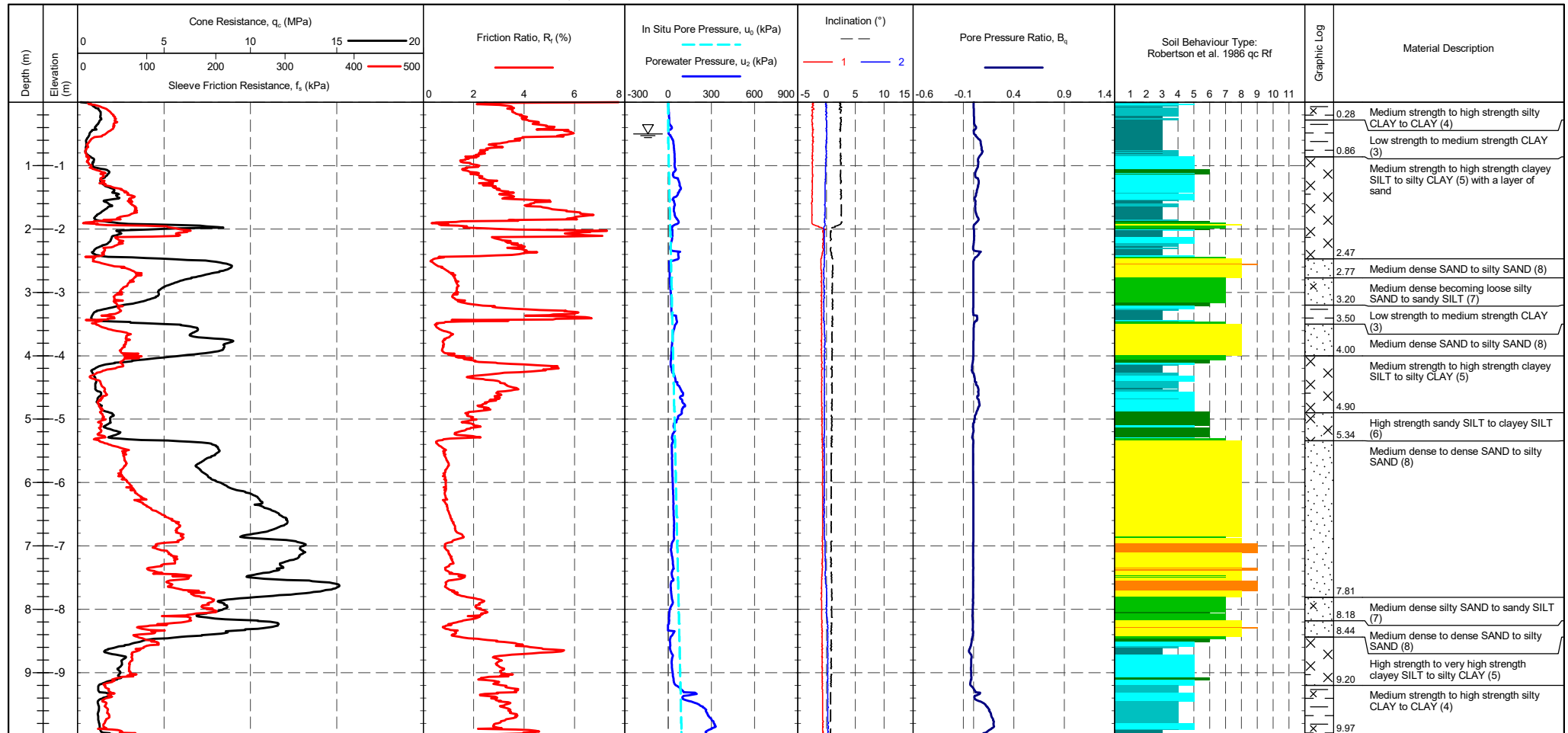
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	254 mV	250 mV	-0.003 kPa
Pore Pressure 2	275 mV	311 mV	0.009 kPa
X-Y Inclinator	2272 mV	2268 mV	

METHOD: Robertson et al. 1986 $q_c R_f$

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level
Dissipation Test

PointID

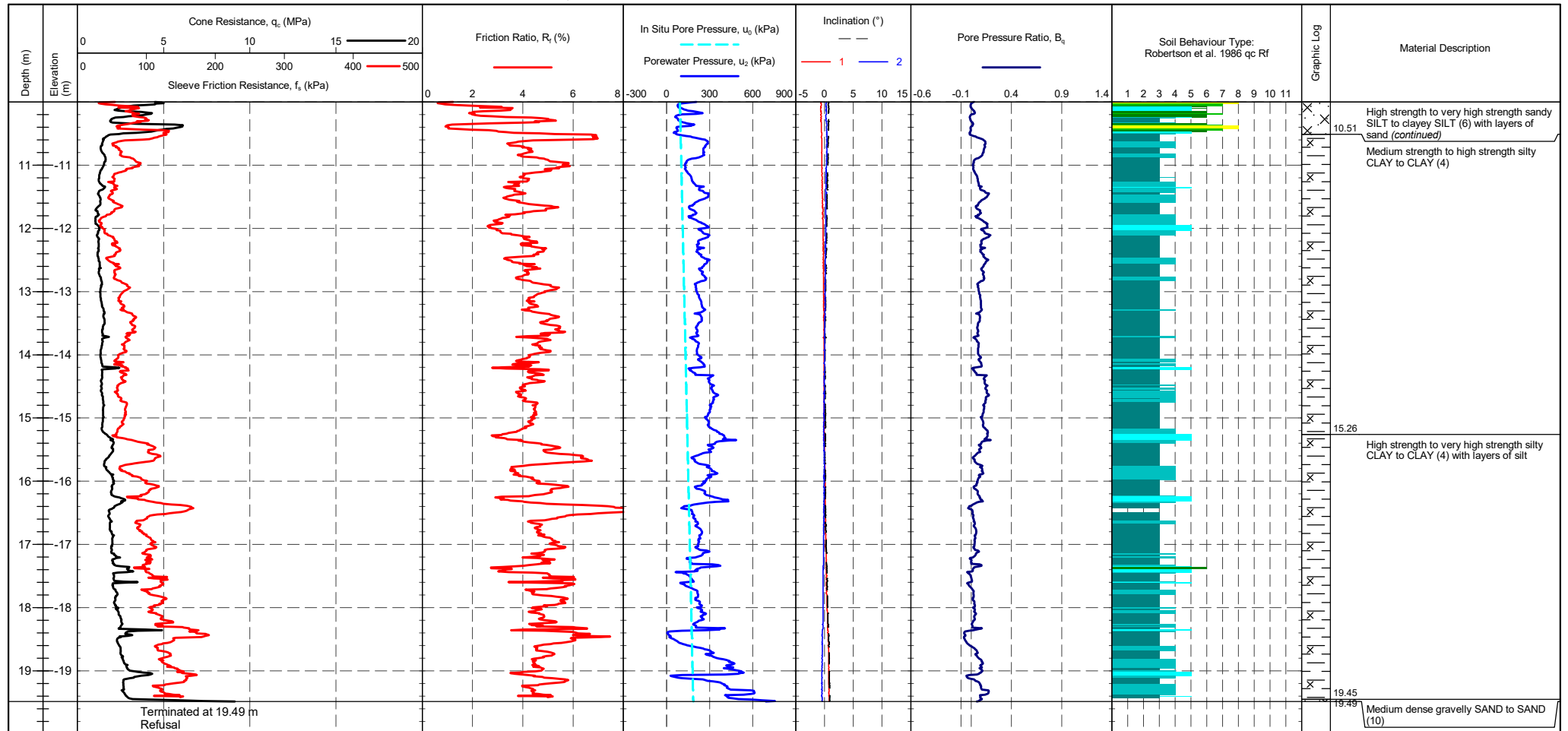
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	254 mV	250 mV	-0.003 kPa
Pore Pressure 2	275 mV	311 mV	0.009 kPa
X-Y Inclinator	2272 mV	2268 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

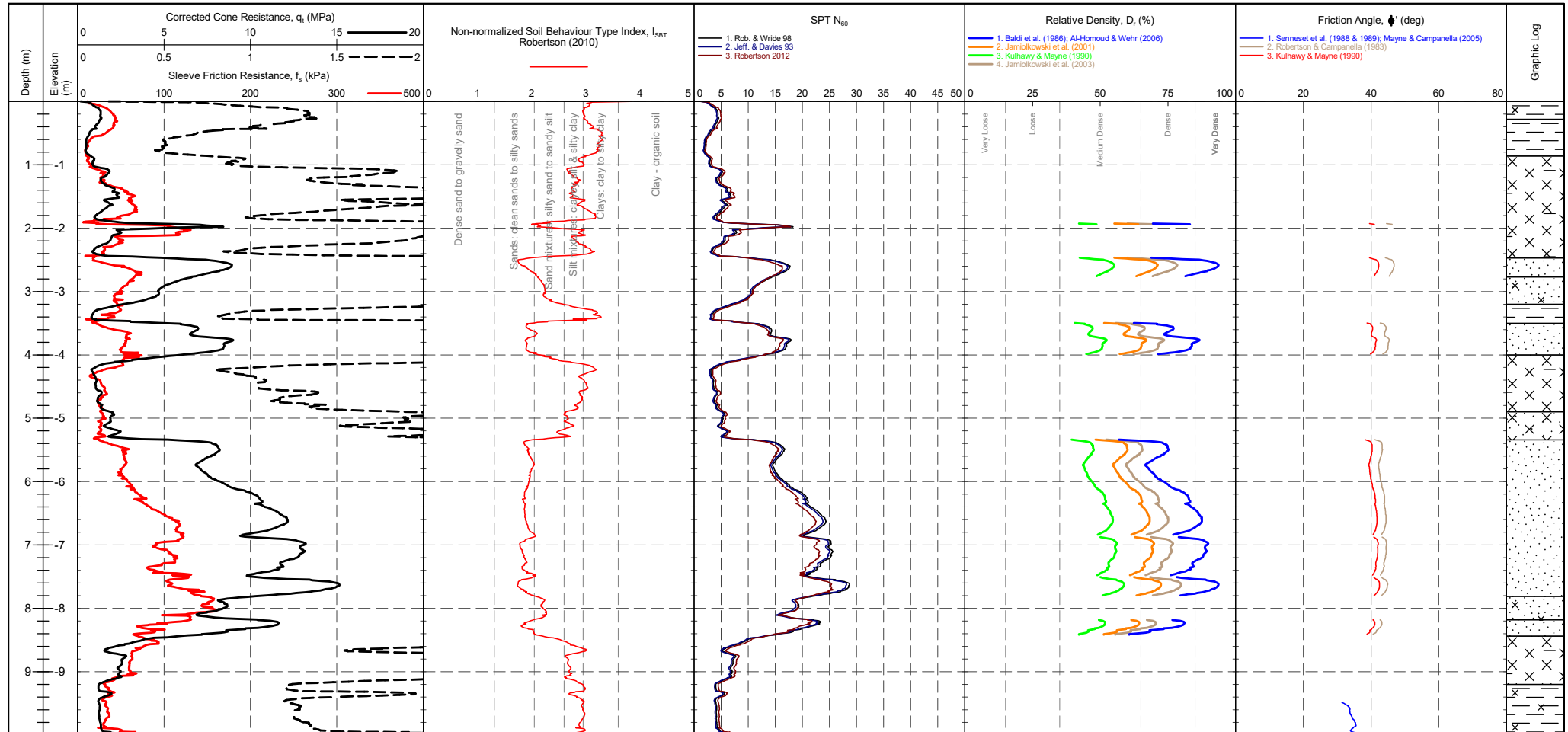
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer : Pre Post Difference
Tip : 248 mV 244 mV -0.043 MPa
Sleeve : 254 mV 250 mV -0.003 kPa
Pore Pressure 2 : 275 mV 311 mV 0.009 kPa
X-Y Inclinator : 2272 mV 2268 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

CPT101

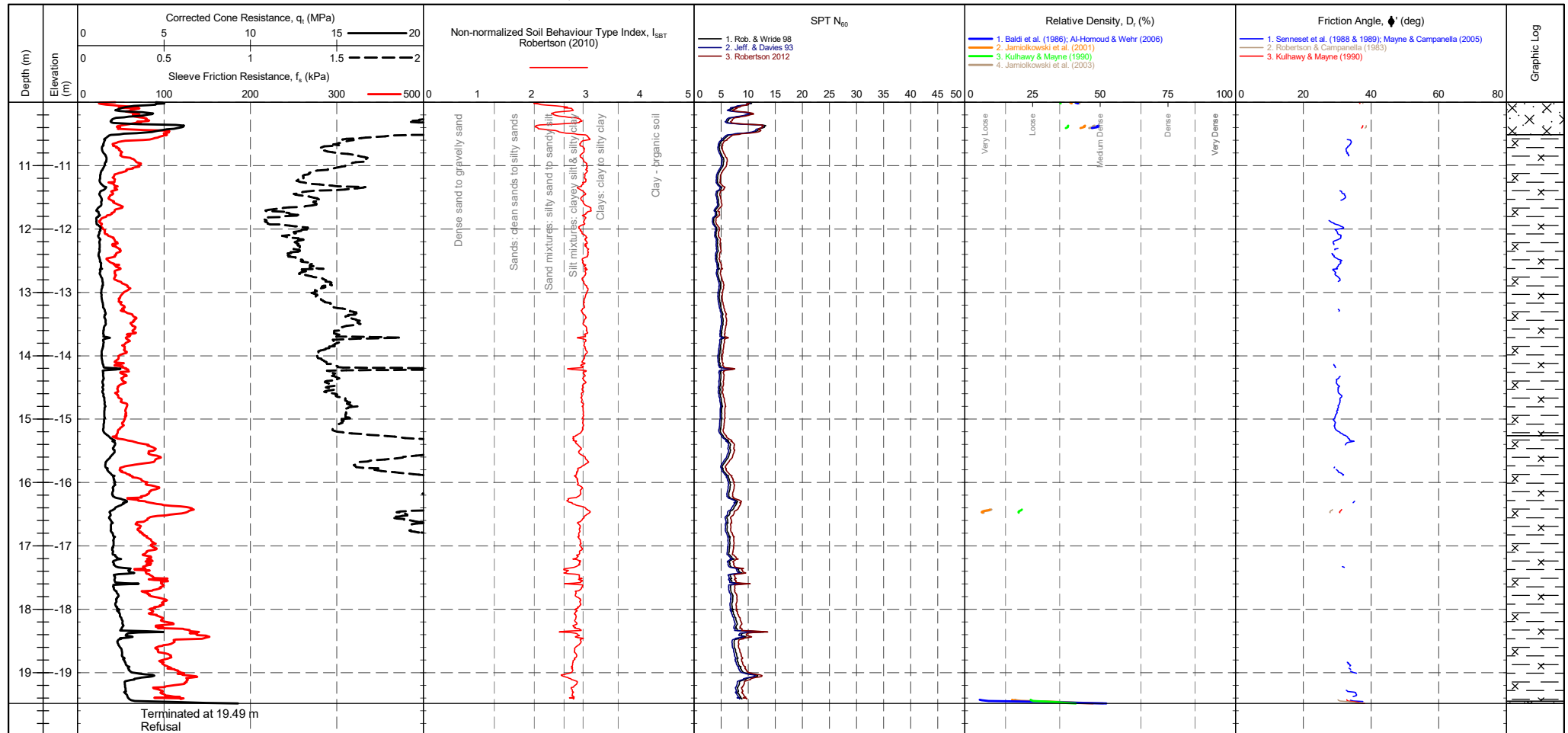
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
248 mV
254 mV
275 mV
2272 mV

Post
244 mV
250 mV
311 mV
2268 mV

Difference
-0.043 MPa
-0.003 kPa
0.009 kPa

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

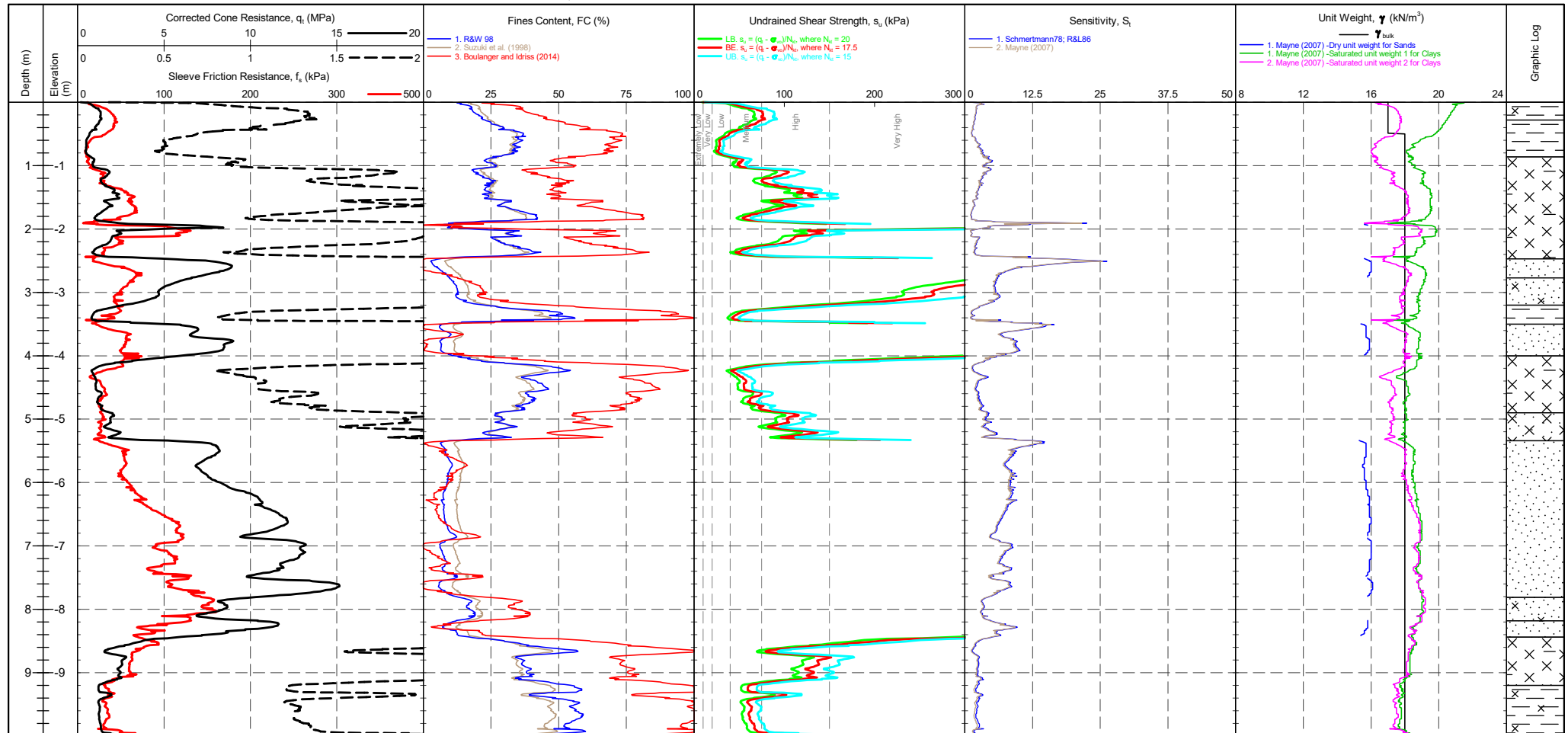
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
248 mV
254 mV
275 mV
2272 mV

Post
244 mV
250 mV
311 mV
2268 mV

Difference
-0.043 MPa
-0.003 kPa
0.009 kPa

CPTU ZERO VALUES

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

PointID

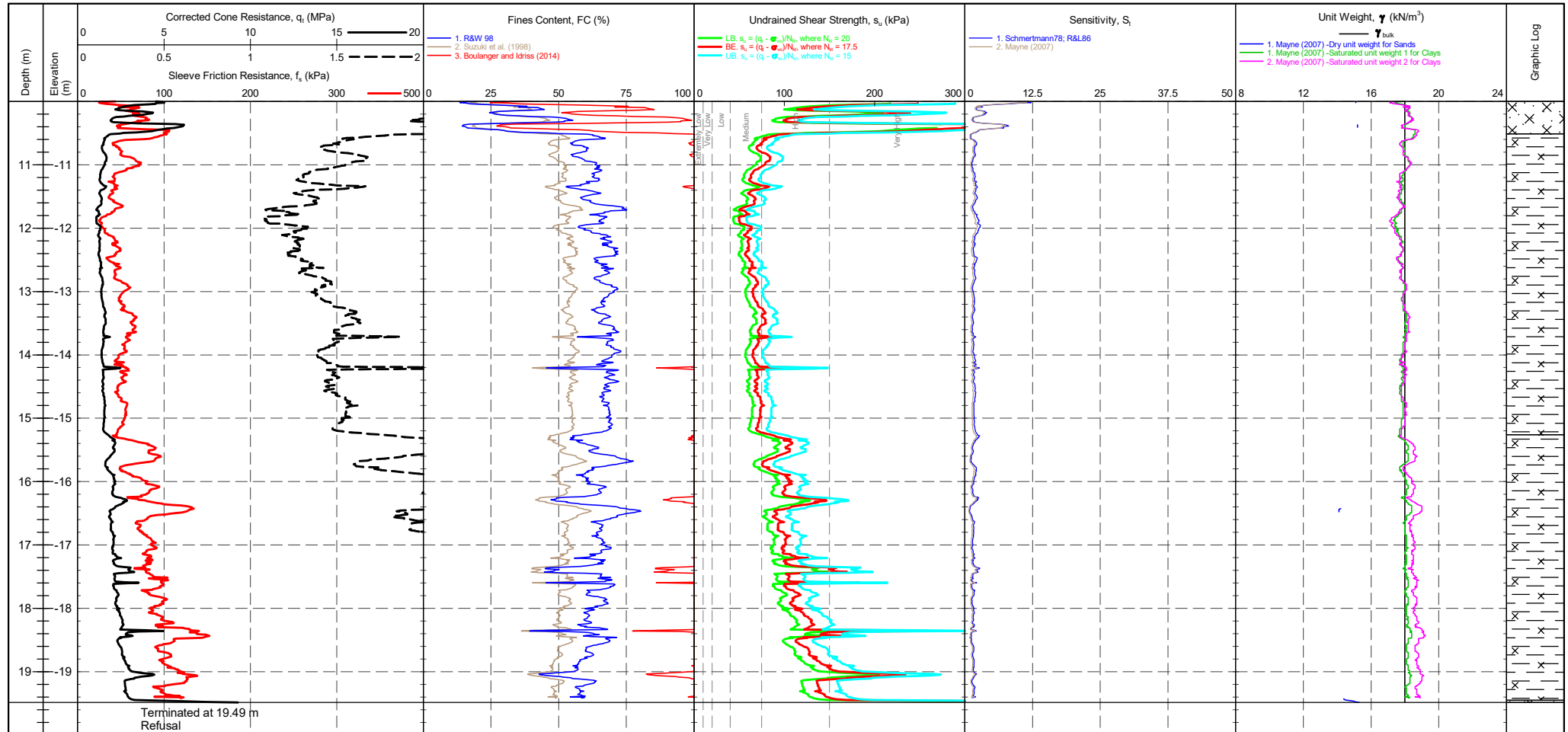
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip: 248 mV
Sleeve: 254 mV
Pore Pressure 2: 275 mV
X-Y Inclinator: 2272 mV

CPTU ZERO VALUES
Pre: 244 mV
Post: 250 mV
Difference: -0.043 MPa
-0.003 kPa
0.009 kPa
2268 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

PointID

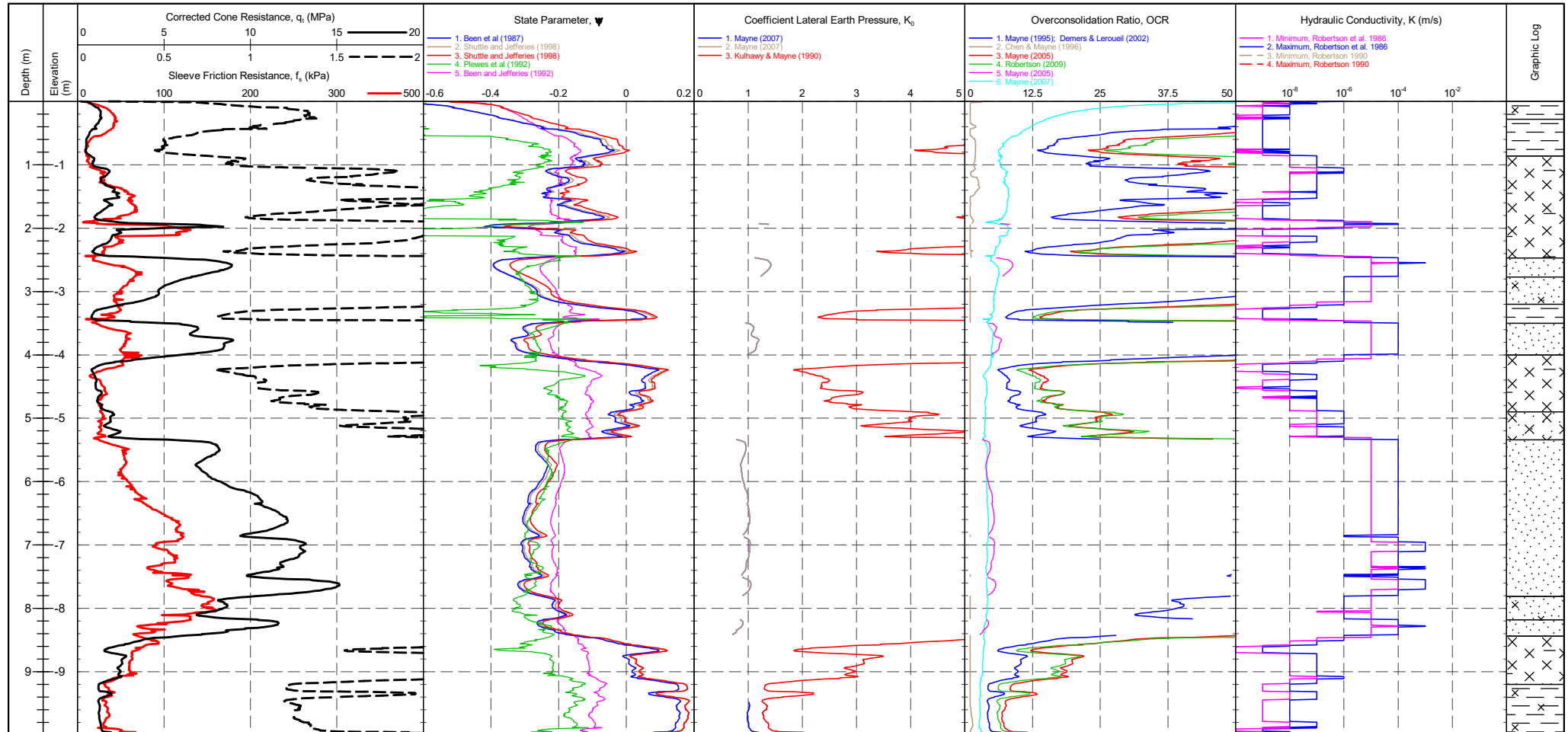
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	254 mV	250 mV	-0.003 kPa
Pore Pressure 2	275 mV	311 mV	0.009 kPa
X-Y Inclinator	2272 mV	2268 mV	

Groundwater Level
Dissipation Test

PointID

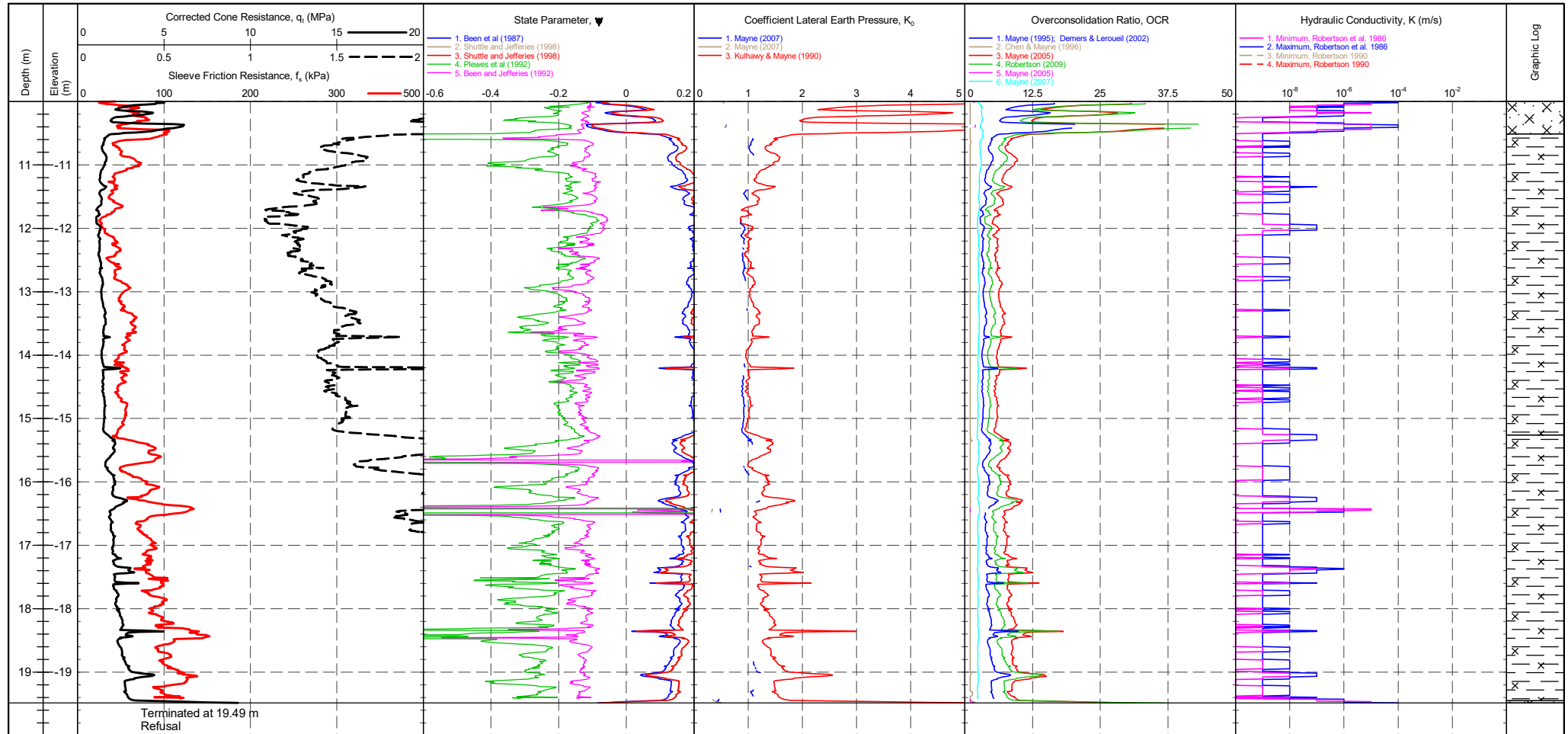
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	254 mV	250 mV	-0.003 kPa
Pore Pressure 2	275 mV	311 mV	0.009 kPa
X-Y Inclinator	2272 mV	2268 mV	

Groundwater Level
Dissipation Test

PointID

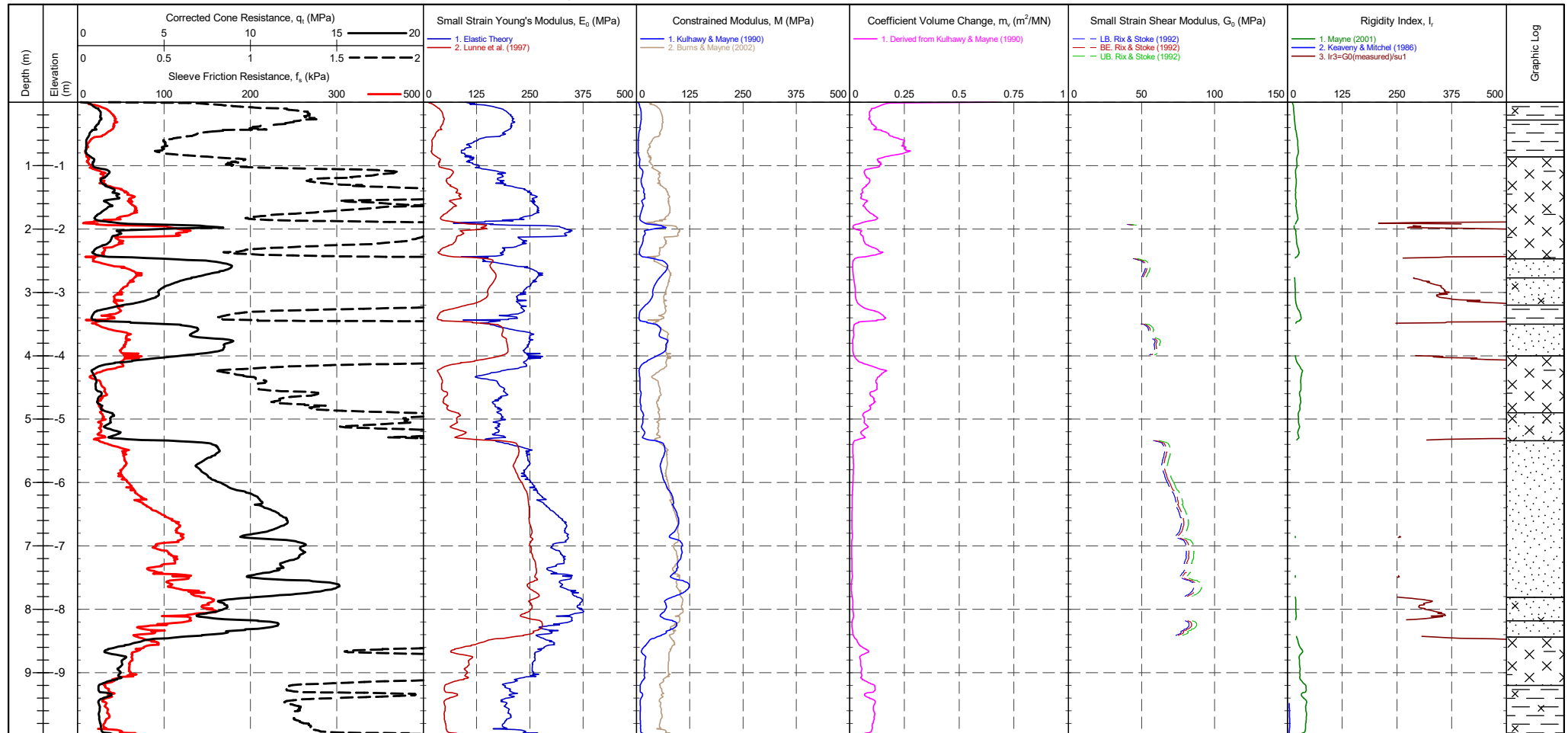
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	254 mV	250 mV	-0.003 kPa
Pore Pressure 2	275 mV	311 mV	0.009 kPa
X-Y Inclinator	2272 mV	2268 mV	

Groundwater Level
Dissipation Test

PointID

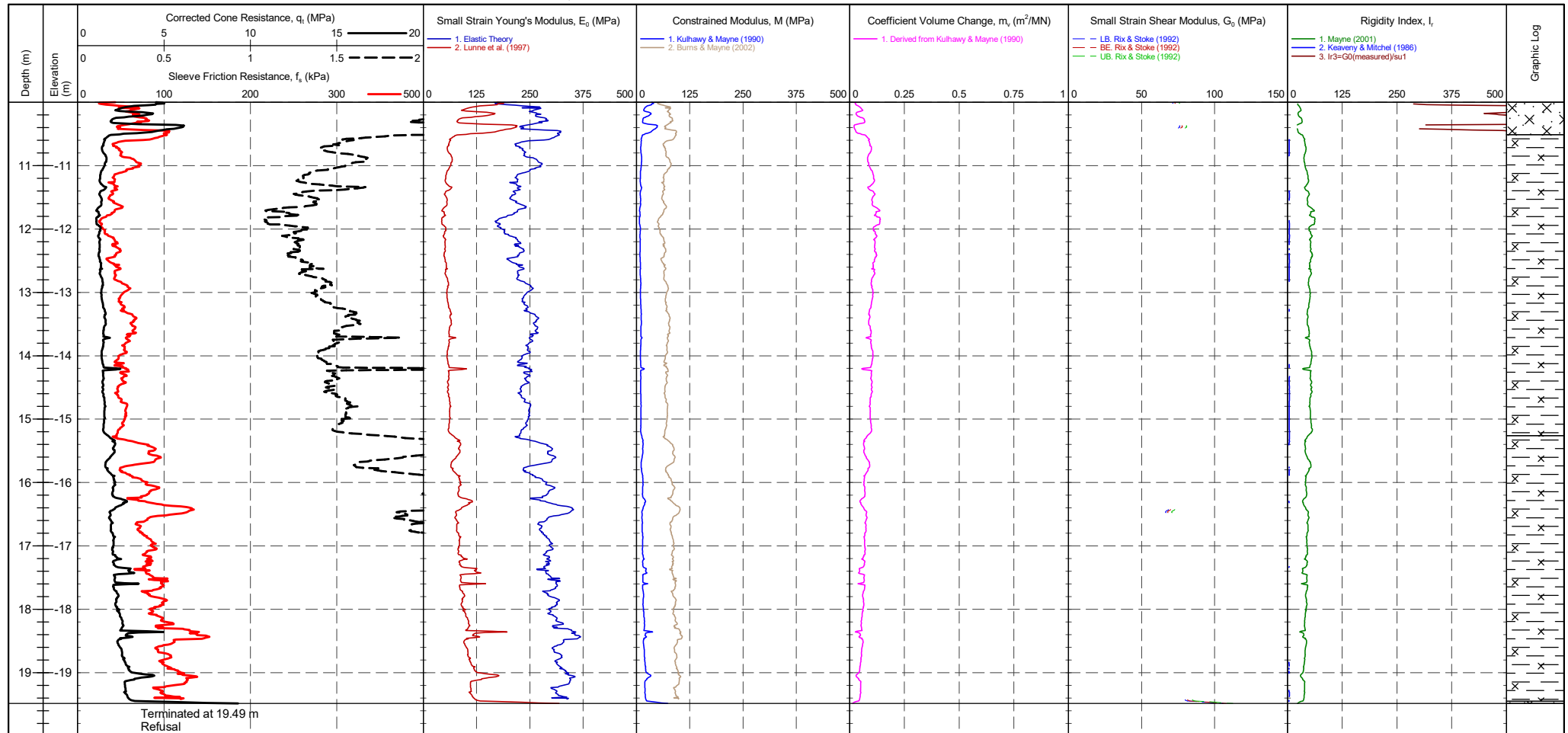
CPT101

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 2
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CONE MODEL : Subtraction
CONE AREA : 15cm^2
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

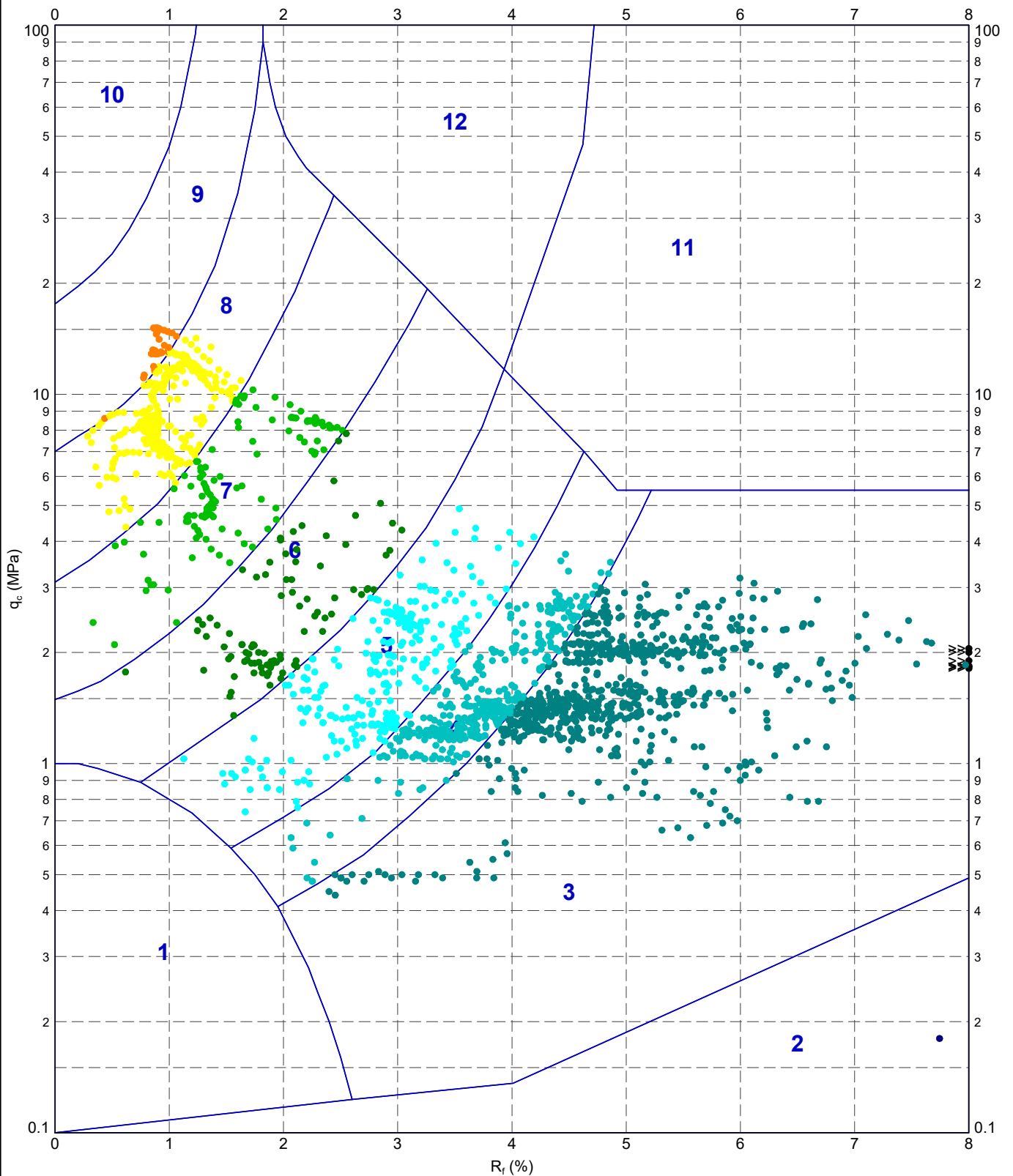
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	254 mV	250 mV	-0.003 kPa
Pore Pressure 2	275 mV	311 mV	0.009 kPa
X-Y Inclinator	2272 mV	2268 mV	

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. Rf AP 1250505-REDWOOD SEN GPJ <<DrawingFile>> 03/12/2025 14:21 10.03.00.08 Dargel Lab and In Situ SI 202.0 2017-07-10 Pjt In Situ SI 202.0 2017-07-10



METHOD: Robertson et al. 1986 q_c R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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

LK Group
Rochdale
Redwood SEN
Robertson et al. 1986 q_c vs. R_f - CPT101

DRAWN

DATE

03/12/2025

CHECKED

DATE

03/12/2025

SCALE

Not To Scale

A4

PROJECT No

1250505

FIGURE No

PointID

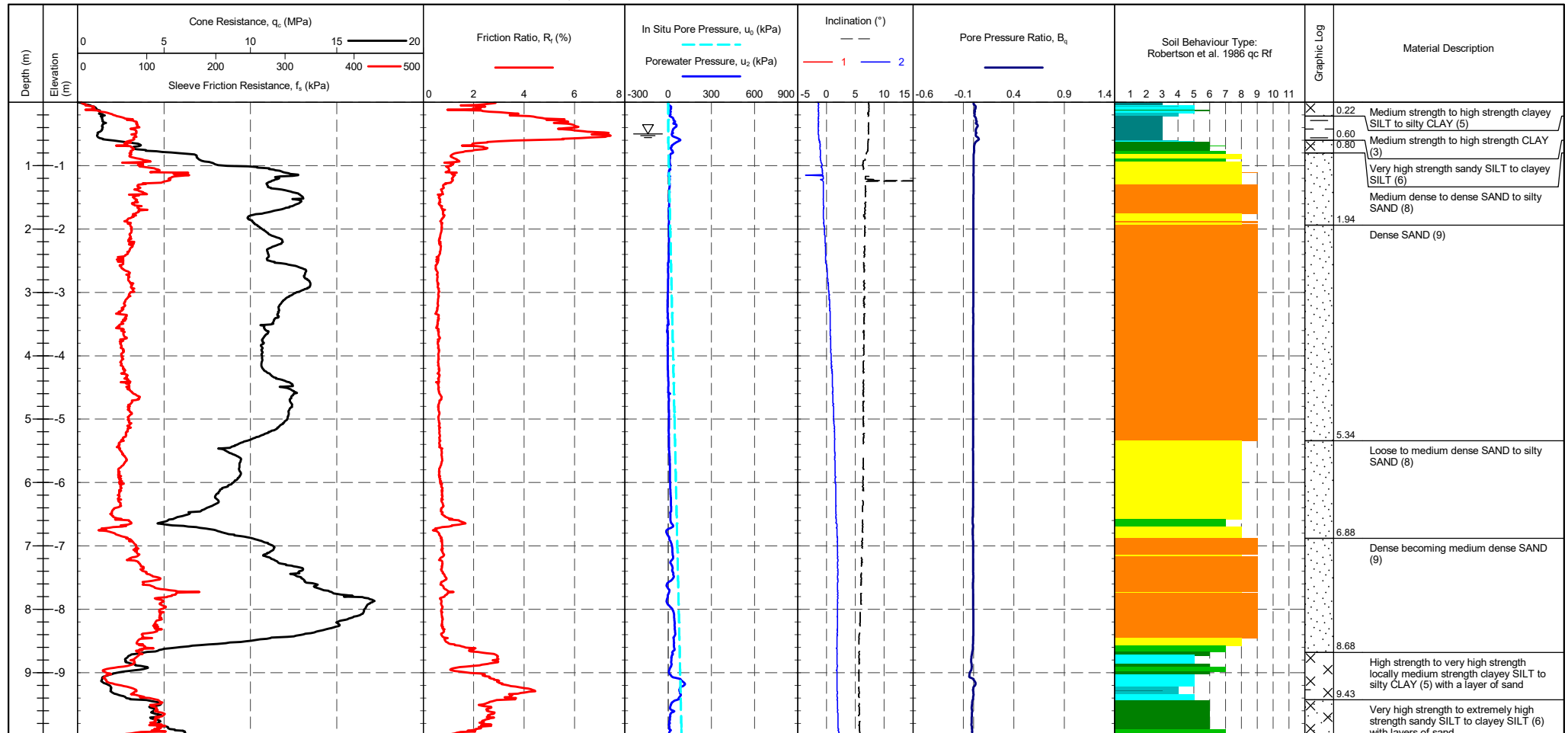
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

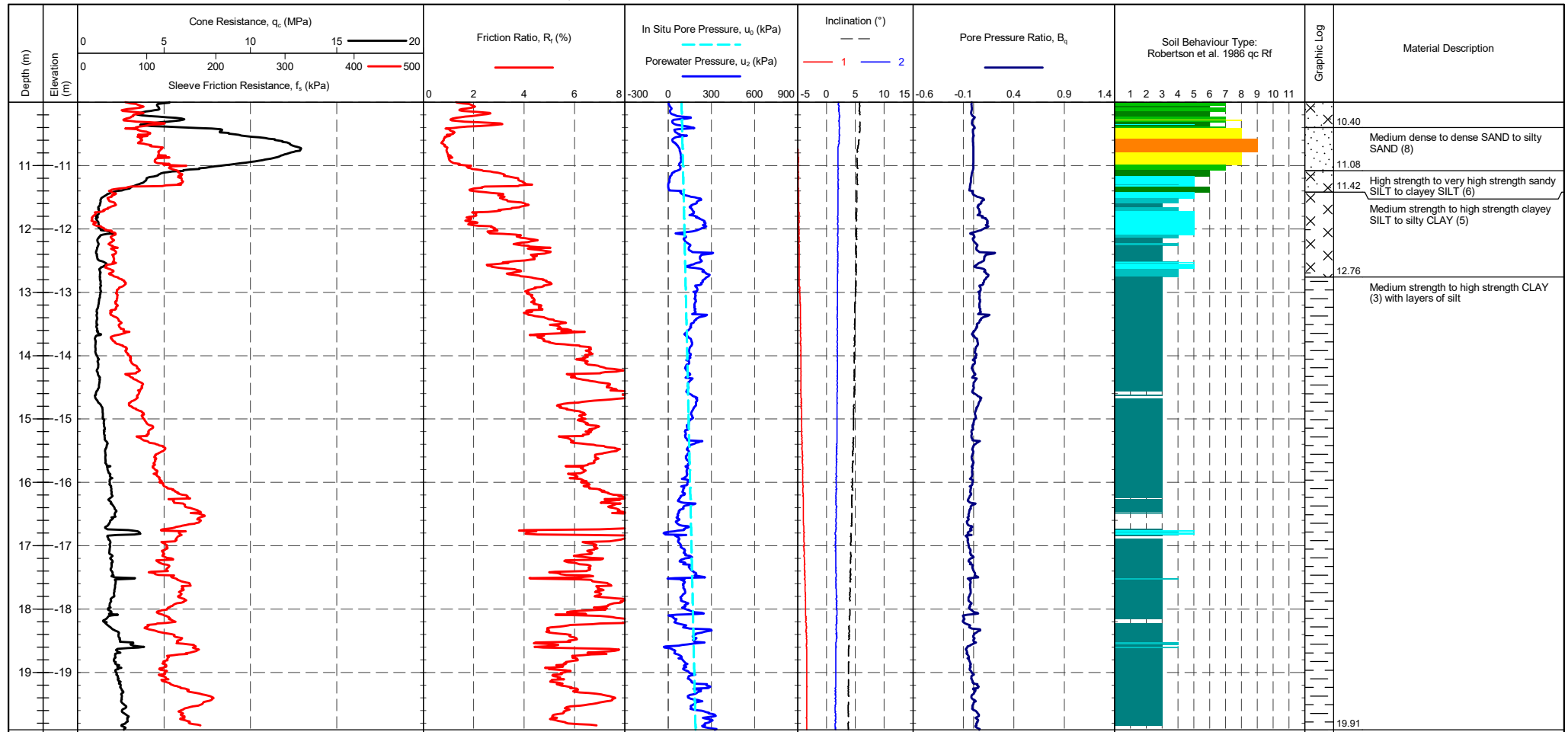
CPTU ZERO VALUES
Transducer Pre Post Difference
Tip 247 mV 244 mV -0.032 MPa
Sleeve 258 mV 252 mV -0.004 kPa
Pore Pressure 2 296 mV 258 mV -0.009 kPa
X-Y Inclinator 1769 mV 1778 mV

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 - Gravely SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level
Dissipation Test

PointID

CPT102

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depthRemark:
Test completed at target depth.SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022

CONE ID	: S15-CFIP.1817	TEST TYPE	: TE2
CALIBRATION DATE	: 11/12/2023	APPLICATION CLASS	: 2
CONE MODEL	: Subtraction	RIG	: CPT 017 - Griffen
CONE AREA	: 15cm ²	OPERATOR	: TR
CONE AREA RATIO	: 0.79	FRICTION REDUCER	: None
FILTER POSITION	: u2	WEATHER	: Sunny & Cold
FILTER TYPE	: HDPE	GROUNDWATER DEPTH	: Assumed for calculation purposes

CPTU ZERO VALUES			
Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

METHOD: Robertson et al. 1986 qc Rf

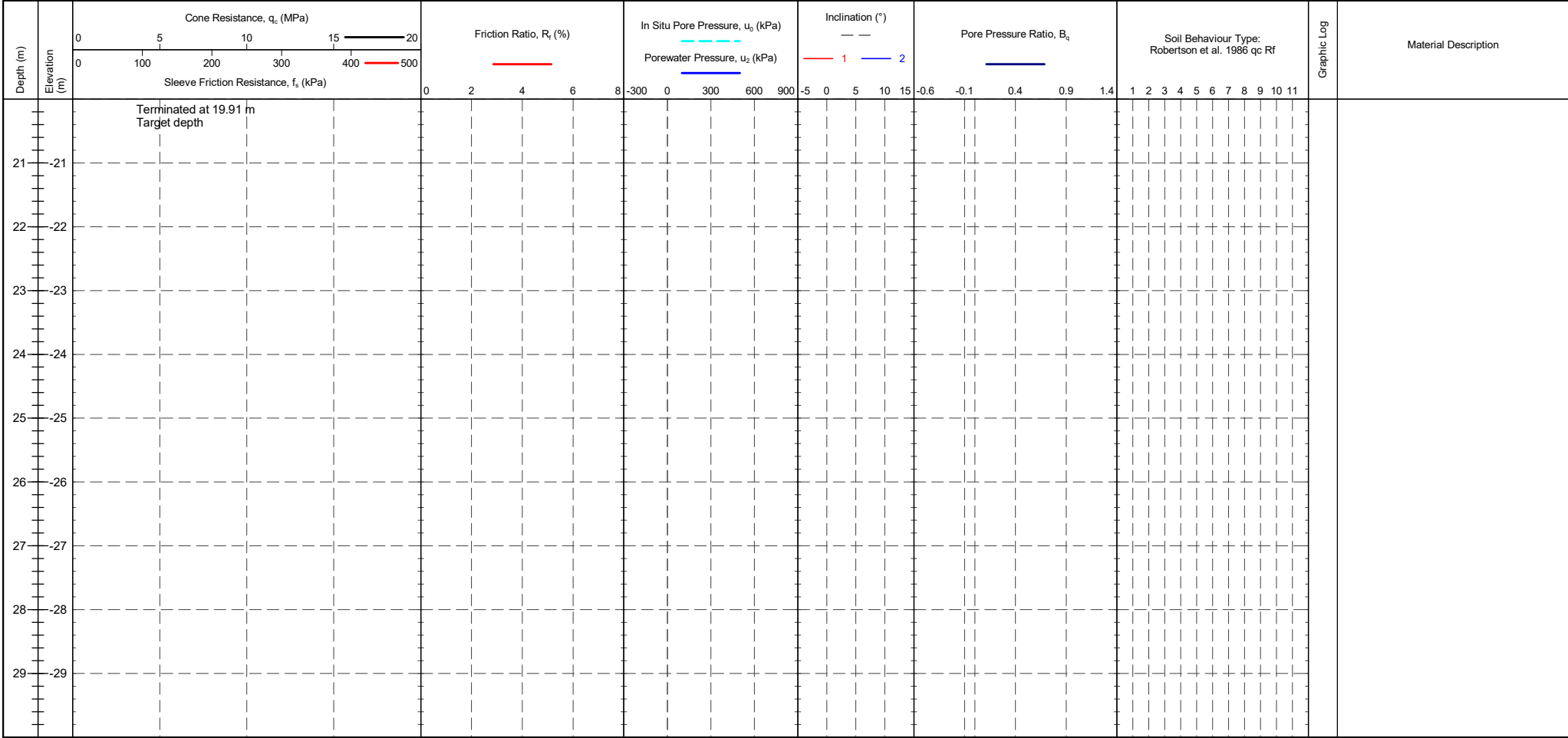
1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater
Level

Dissipation Test

PointID	CPT102
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CLIENT : LK Group PROJECT: Redwood SEN LOCATION : Rochdale PROJECT No. : 1250505	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : DW TERMINATION REASON : Target depth	Remark: Test completed at target depth.	SHEET : 3 OF 3 STATUS : Final TEST DATE : 25/11/2025 PLOT DATE : 03/12/2025 METHOD : ISO 22476-1:2022
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CONE ID : S15-CFIP.1817 CALIBRATION DATE : 11/12/2023 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold GROUNDWATER DEPTH : Assumed for calculation purposes	CPTU ZERO VALUES Transducer Pre Post Difference Tip 247 mV 244 mV -0.032 MPa Sleeve 258 mV 252 mV -0.004 kPa Pore Pressure 2 296 mV 258 mV -0.009 kPa X-Y Inclinator 1769 mV 1778 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
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PointID

CPT102

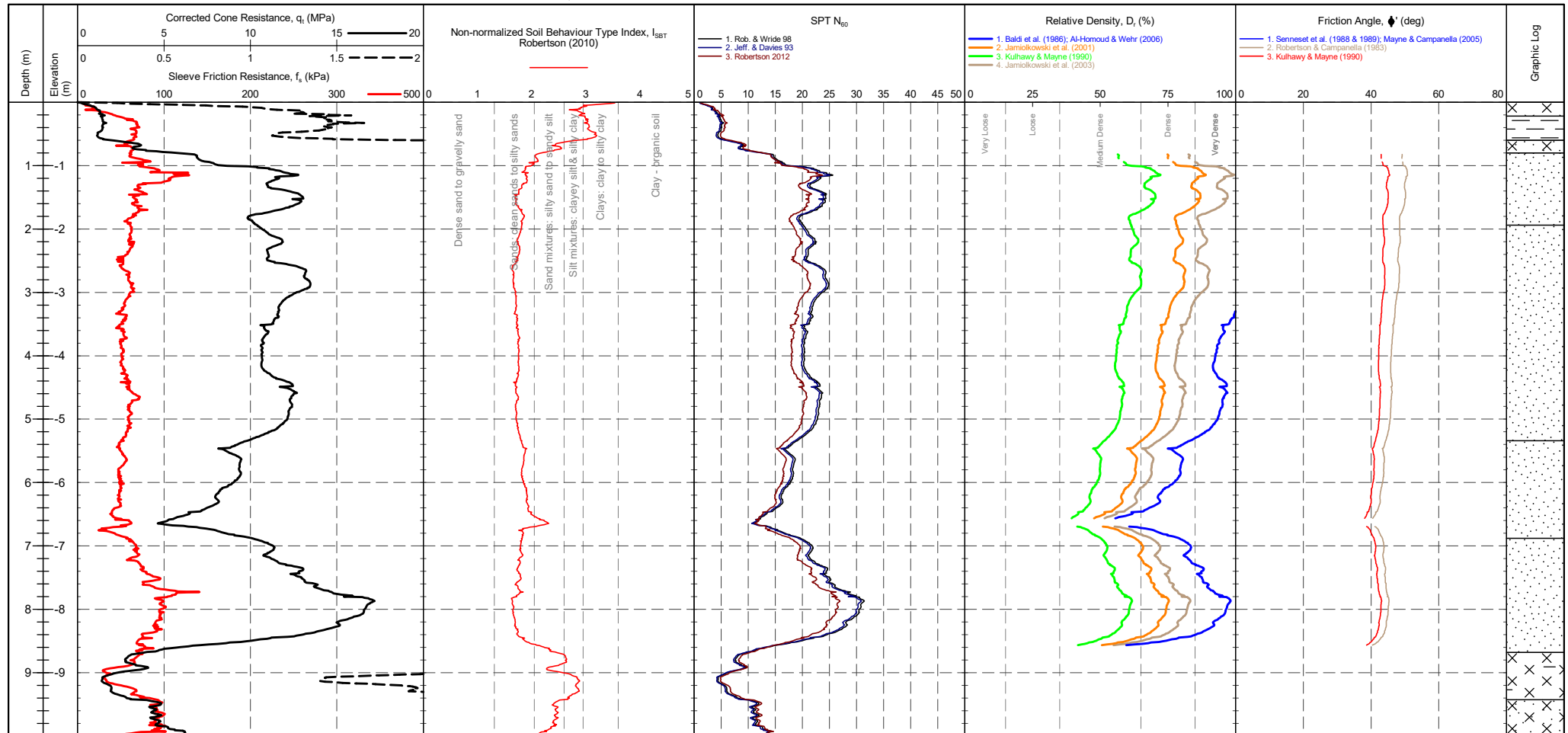
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
 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 017 - Griffen
OPERATOR	: TR
FRICTION REDUCER	: None
WEATHER	: Sunny & Cold

Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12				
Description	SBT Index, I _c	Description	SPPT N value, NSPT	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

PointID

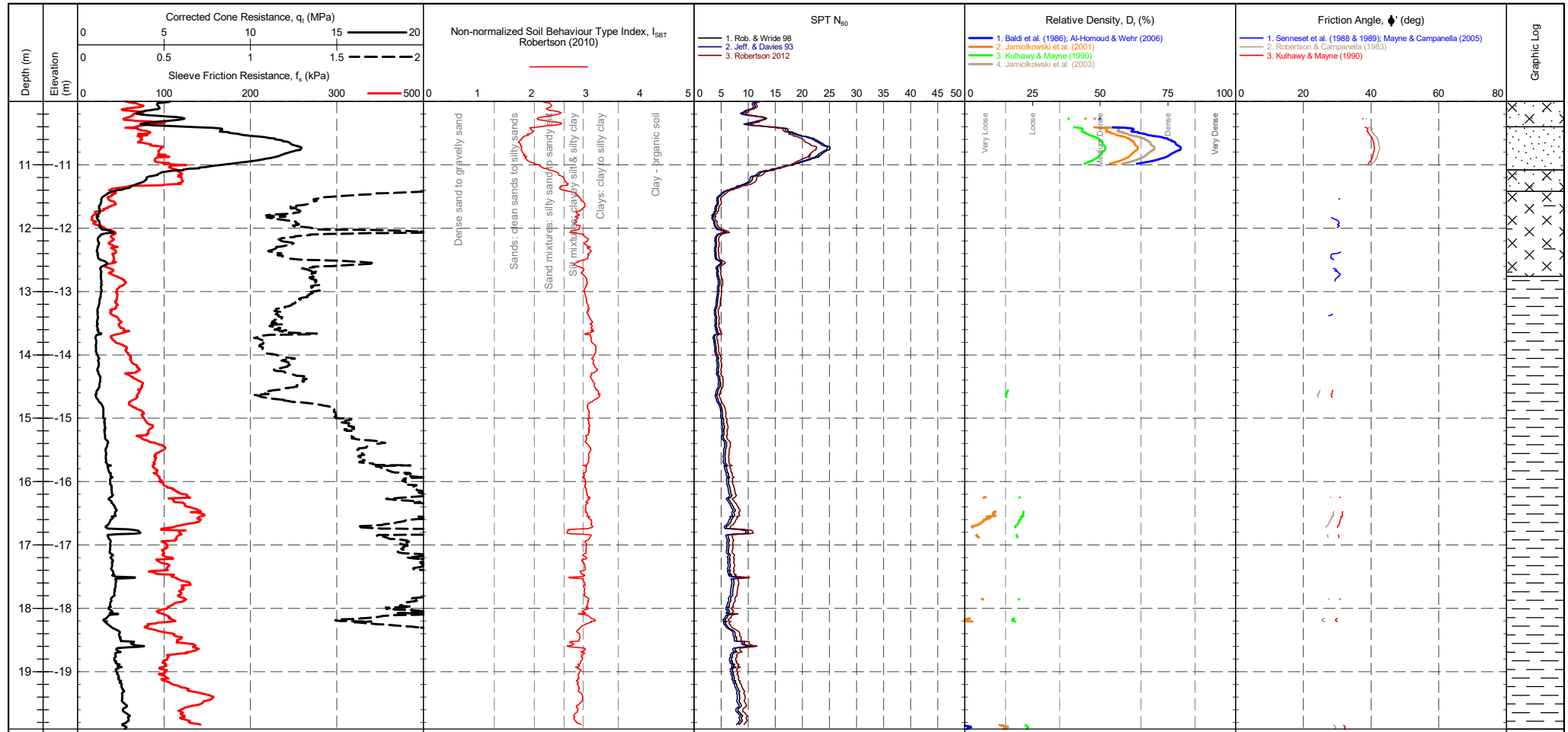
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
247 mV
258 mV
296 mV
1769 mV

Post
244 mV
252 mV
258 mV
1778 mV

Difference
-0.032 MPa
-0.004 kPa
-0.009 kPa

CPTU ZERO VALUES

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

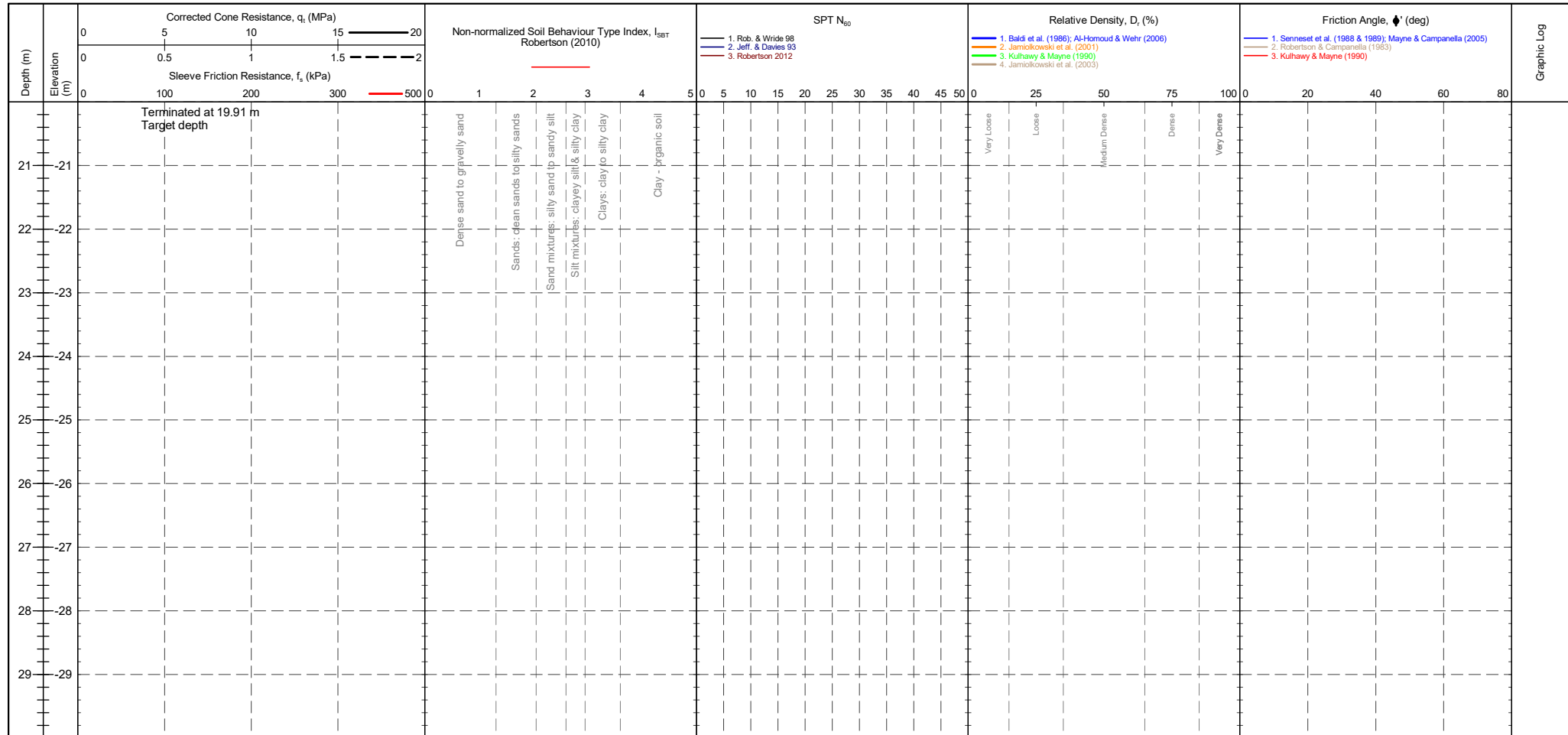
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
247 mV	244 mV	-0.032 MPa
258 mV	252 mV	-0.004 kPa
296 mV	258 mV	-0.009 kPa
1769 mV	1778 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level

Dissipation Test

PointID

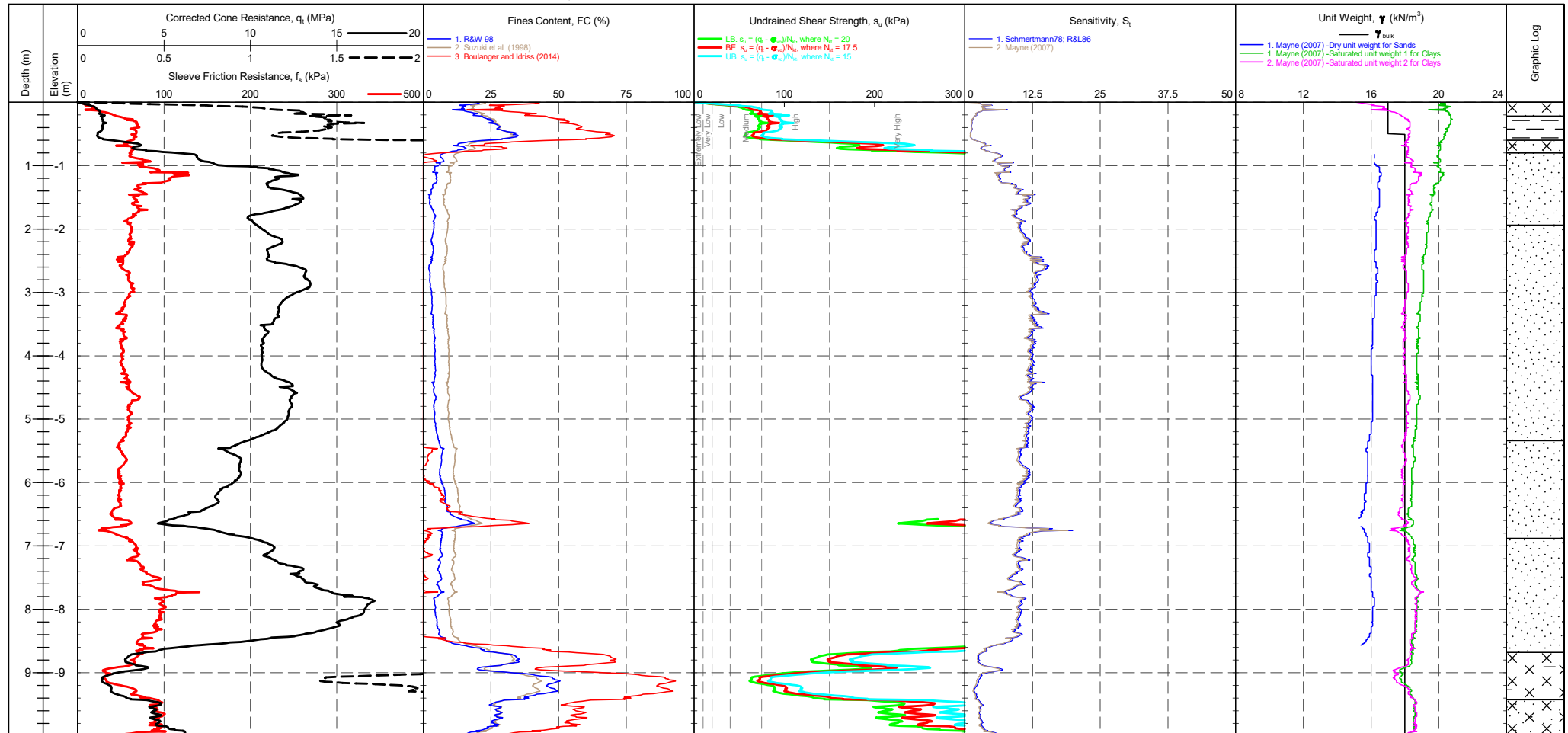
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre	Post	Difference
247 mV	244 mV	-0.032 MPa
258 mV	252 mV	-0.004 kPa
296 mV	258 mV	-0.009 kPa
1769 mV	1778 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

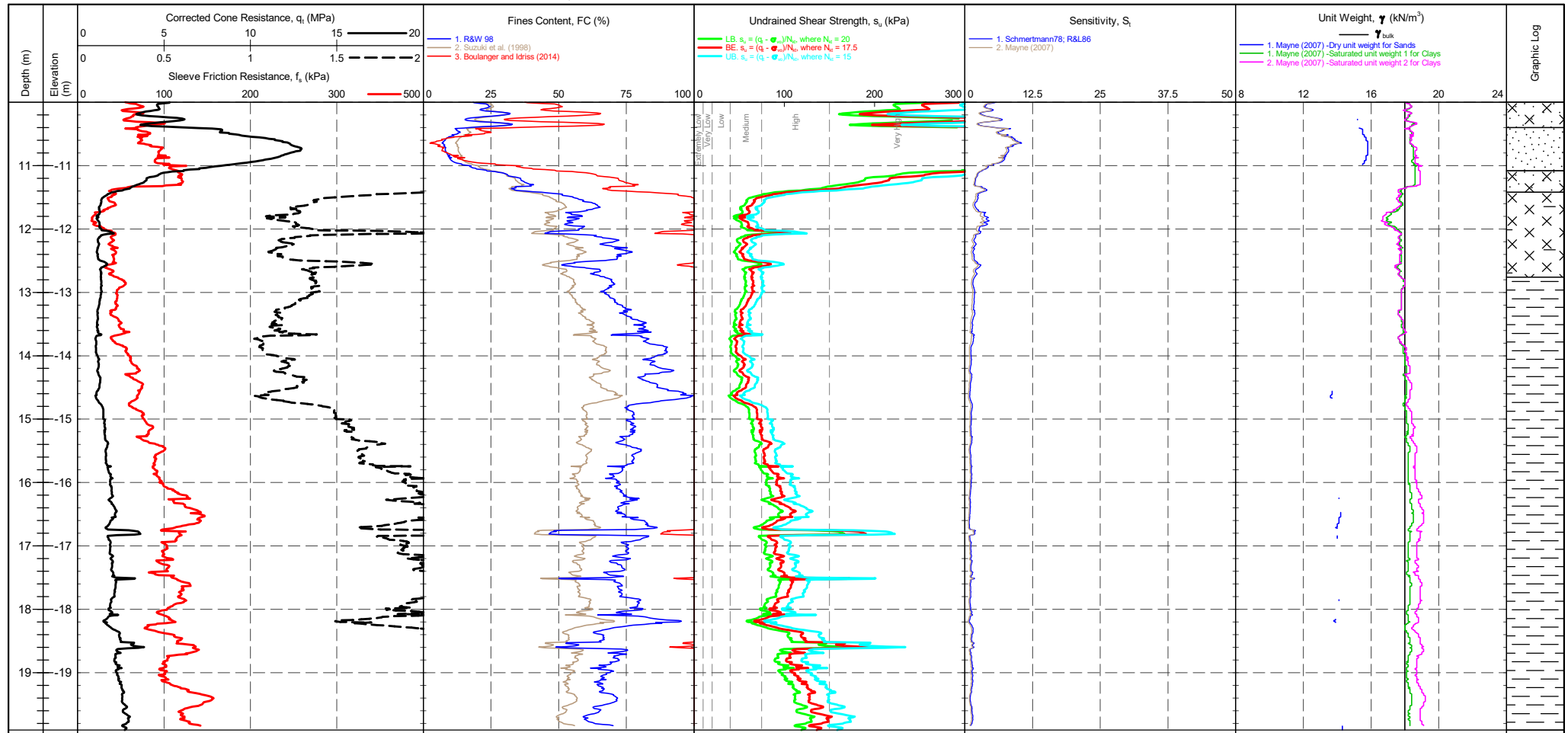
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer : Pre Post Difference
Tip : 247 mV 244 mV -0.032 MPa
Sleeve : 258 mV 252 mV -0.004 kPa
Pore Pressure 2 : 296 mV 258 mV -0.009 kPa
X-Y Inclinator : 1769 mV 1778 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

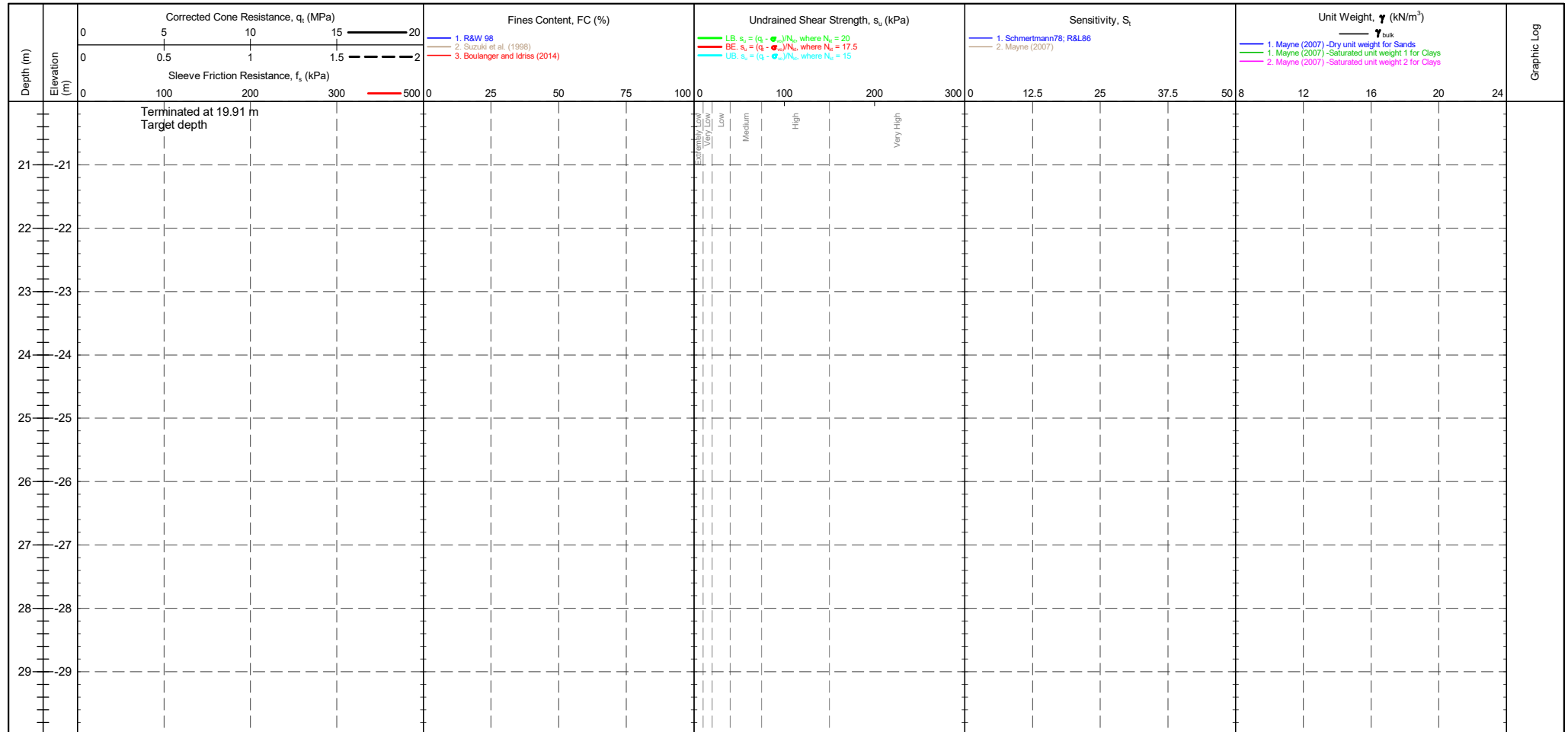
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer Pre Post Difference
Tip 247 mV 244 mV -0.032 MPa
Sleeve 258 mV 252 mV -0.004 kPa
Pore Pressure 2 296 mV 258 mV -0.009 kPa
X-Y Inclinator 1769 mV 1778 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

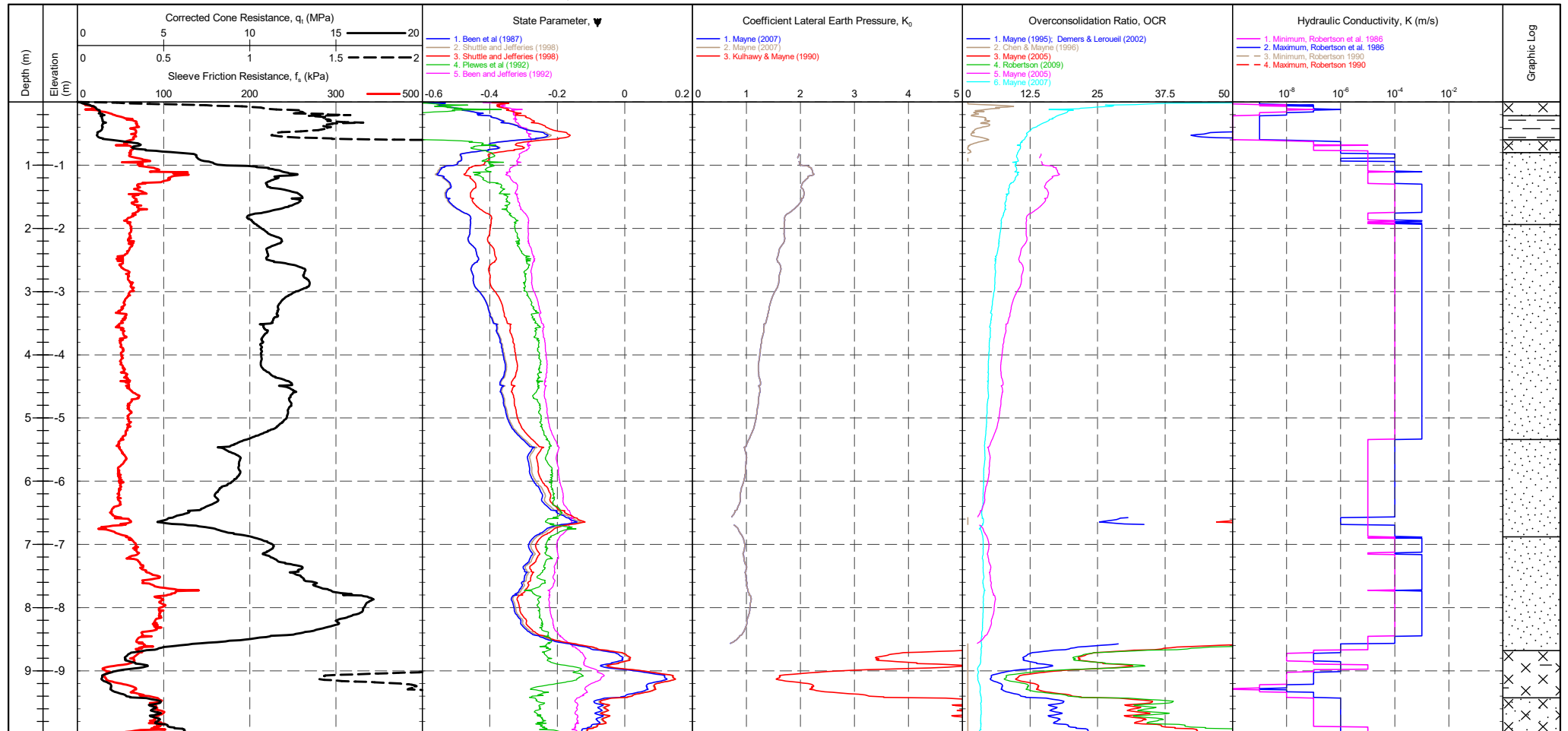
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

Groundwater Level
Dissipation Test

PointID

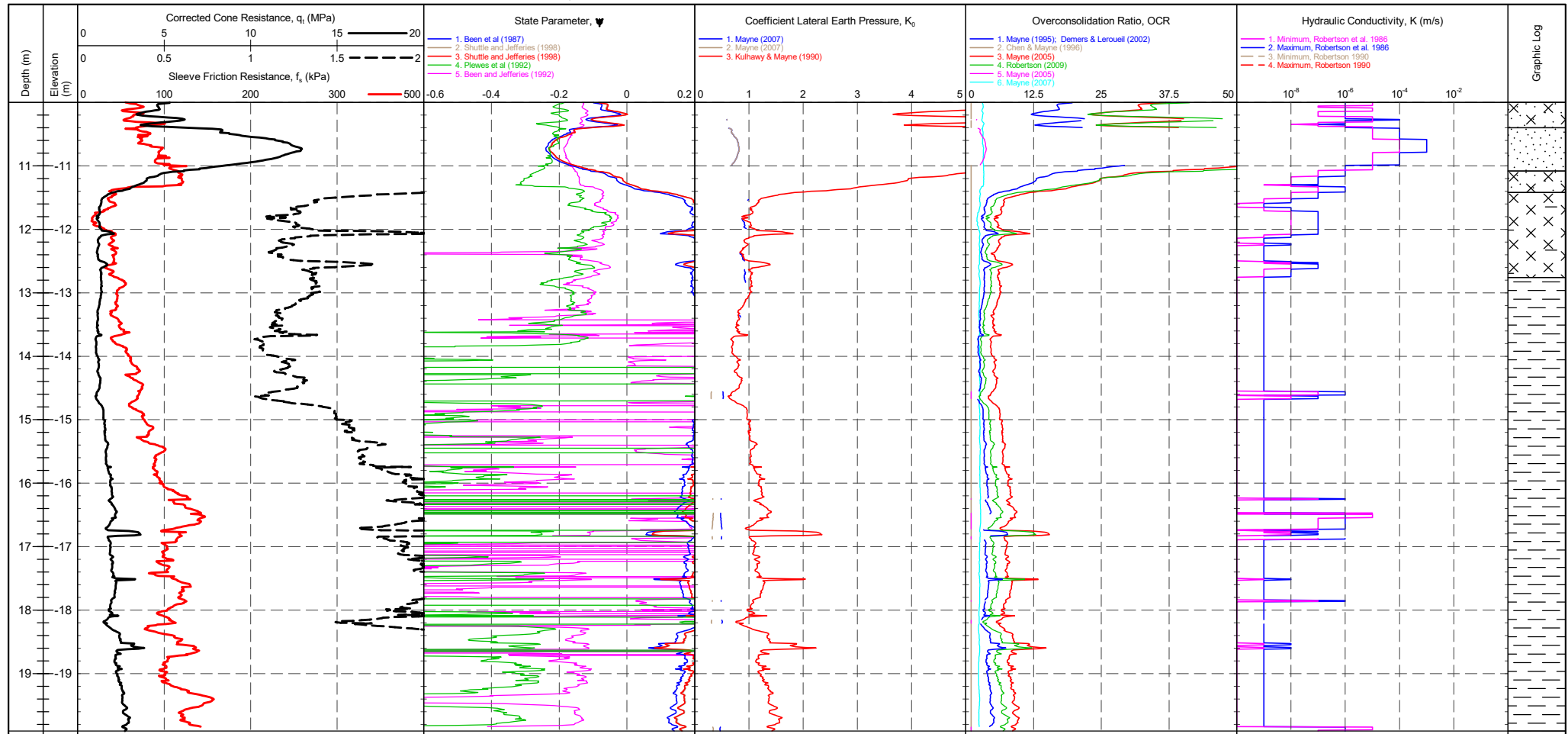
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

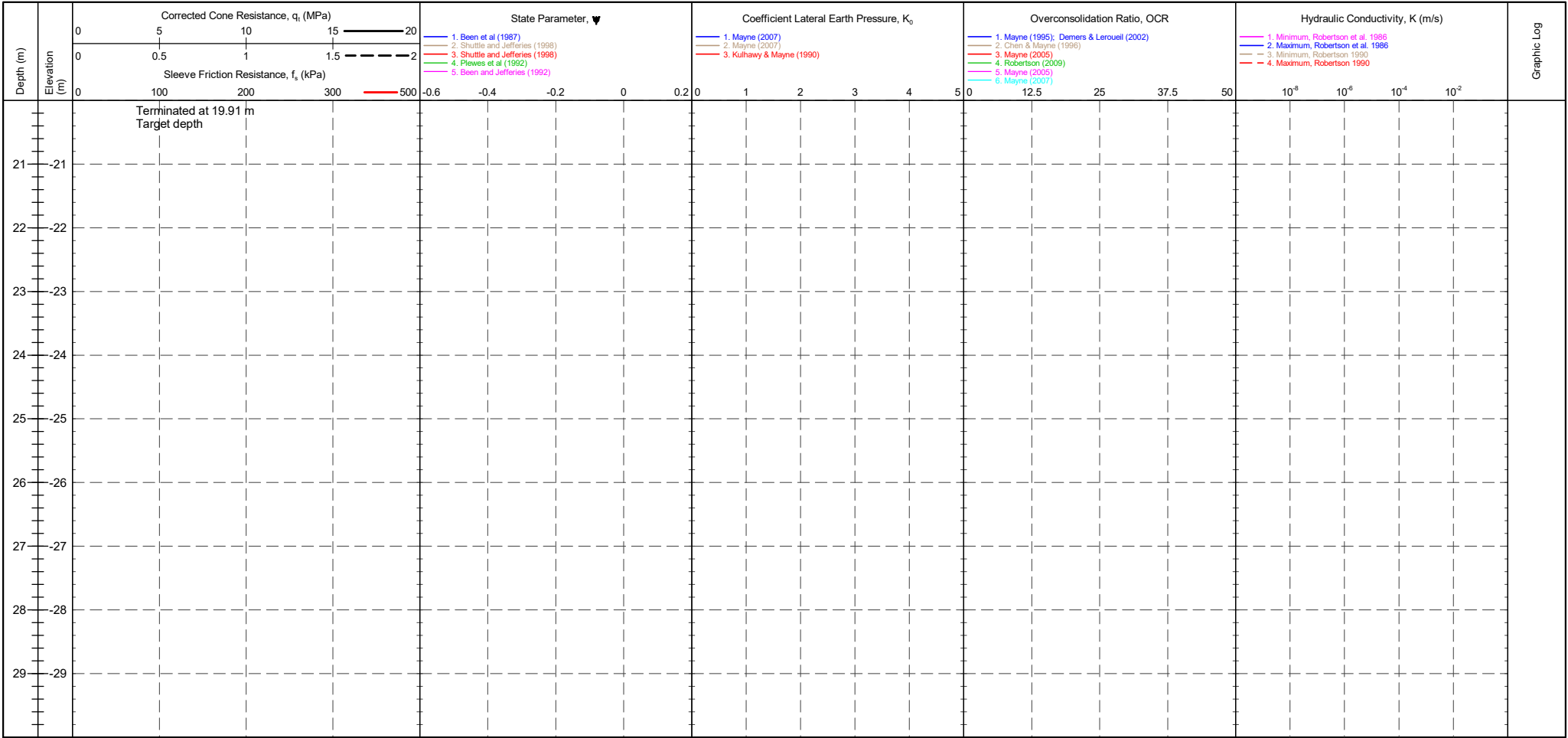
Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

Groundwater Level
Dissipation Test

PointID

CPT102

CLIENT : LK Group	EASTING : 0.000 m	Remark:	SHEET : 3 OF 3
PROJECT: Redwood SEN	NORTHING : 0.000 m	Test completed at target depth.	STATUS : Final
LOCATION : Rochdale	ELEVATION : 0.000 m OD		TEST DATE : 25/11/2025
PROJECT No. : 1250505	CHECKED BY : DW		PLOT DATE : 03/12/2025
	TERMINATION REASON : Target depth		METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817	TEST TYPE : TE2	CPTU ZERO VALUES			Groundwater Level
CONE MODEL : Subtraction	APPLICATION CLASS : 2	Transducer	Pre	Post	
CONE AREA : 15cm ²	RIG : CPT 017 - Griffen	Tip	247 mV	244 mV	
CONE AREA RATIO : 0.79	OPERATOR : TR	Sleeve	258 mV	252 mV	
FILTER POSITION : u2	FRICITION REDUCER : None	Pore Pressure 2	296 mV	258 mV	
FILTER TYPE : HDPE	WEATHER : Sunny & Cold	X-Y Inclinator	1769 mV	1778 mV	
					Dissipation Test

PointID

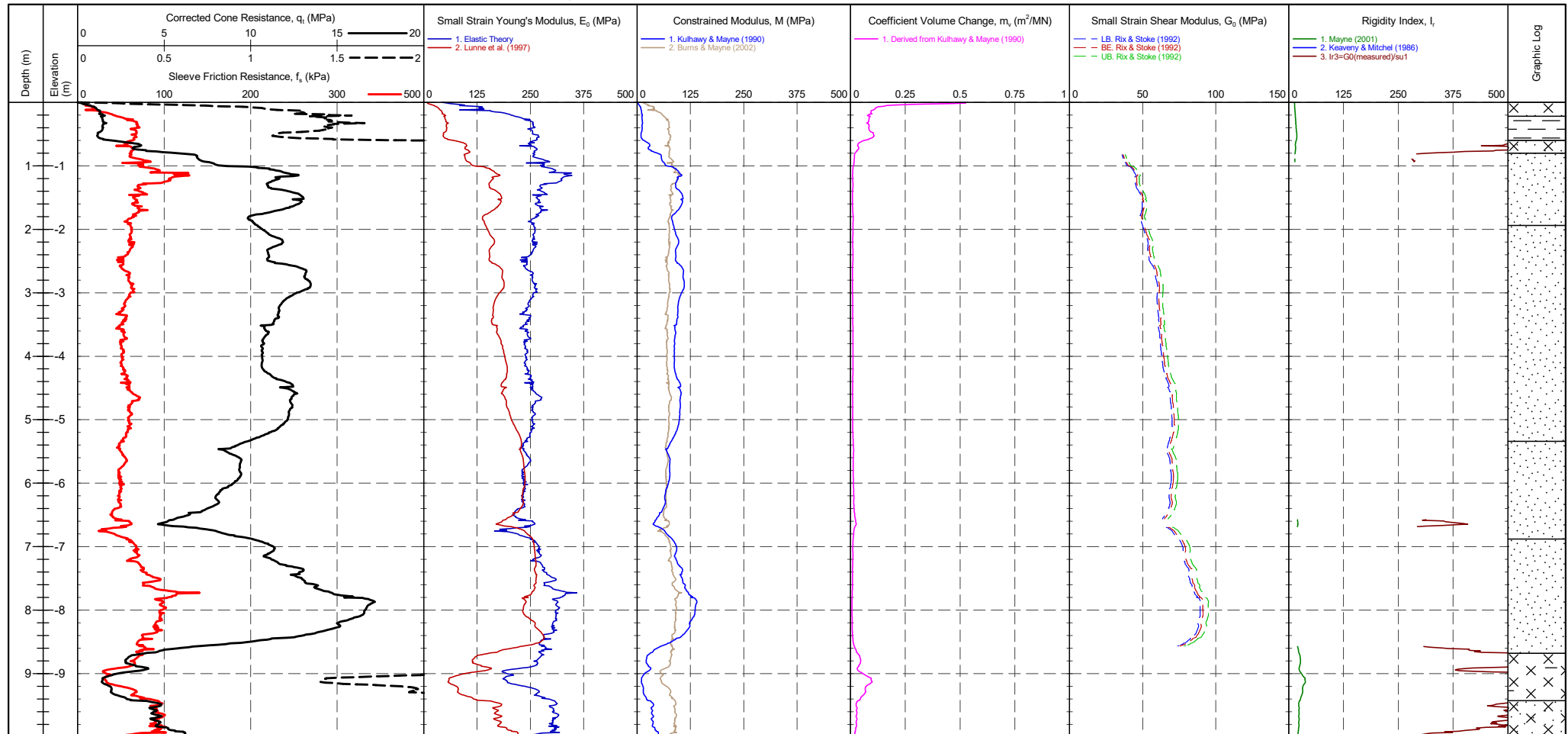
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

Groundwater Level
Dissipation Test

PointID

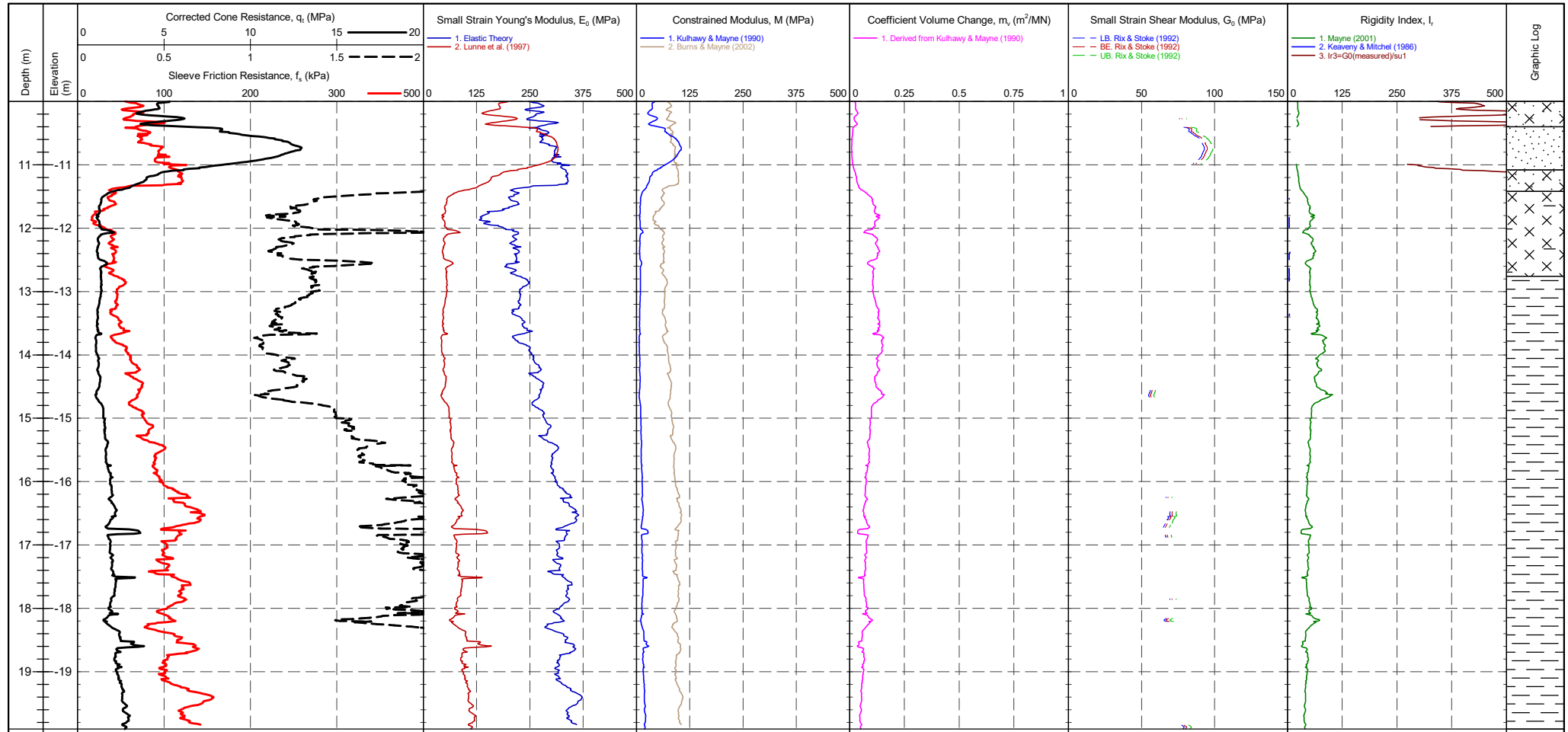
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

Groundwater Level
Dissipation Test

PointID

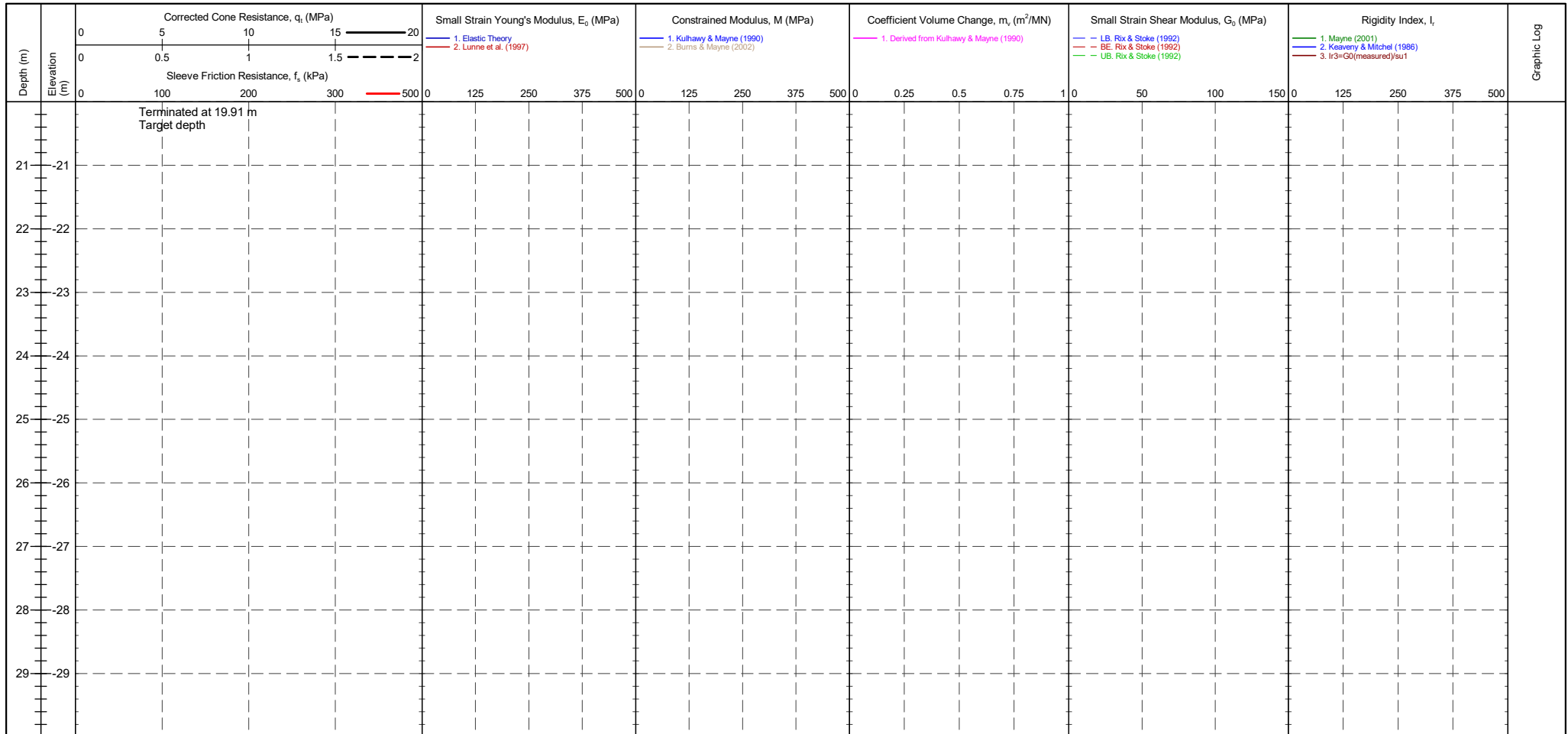
CPT102

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

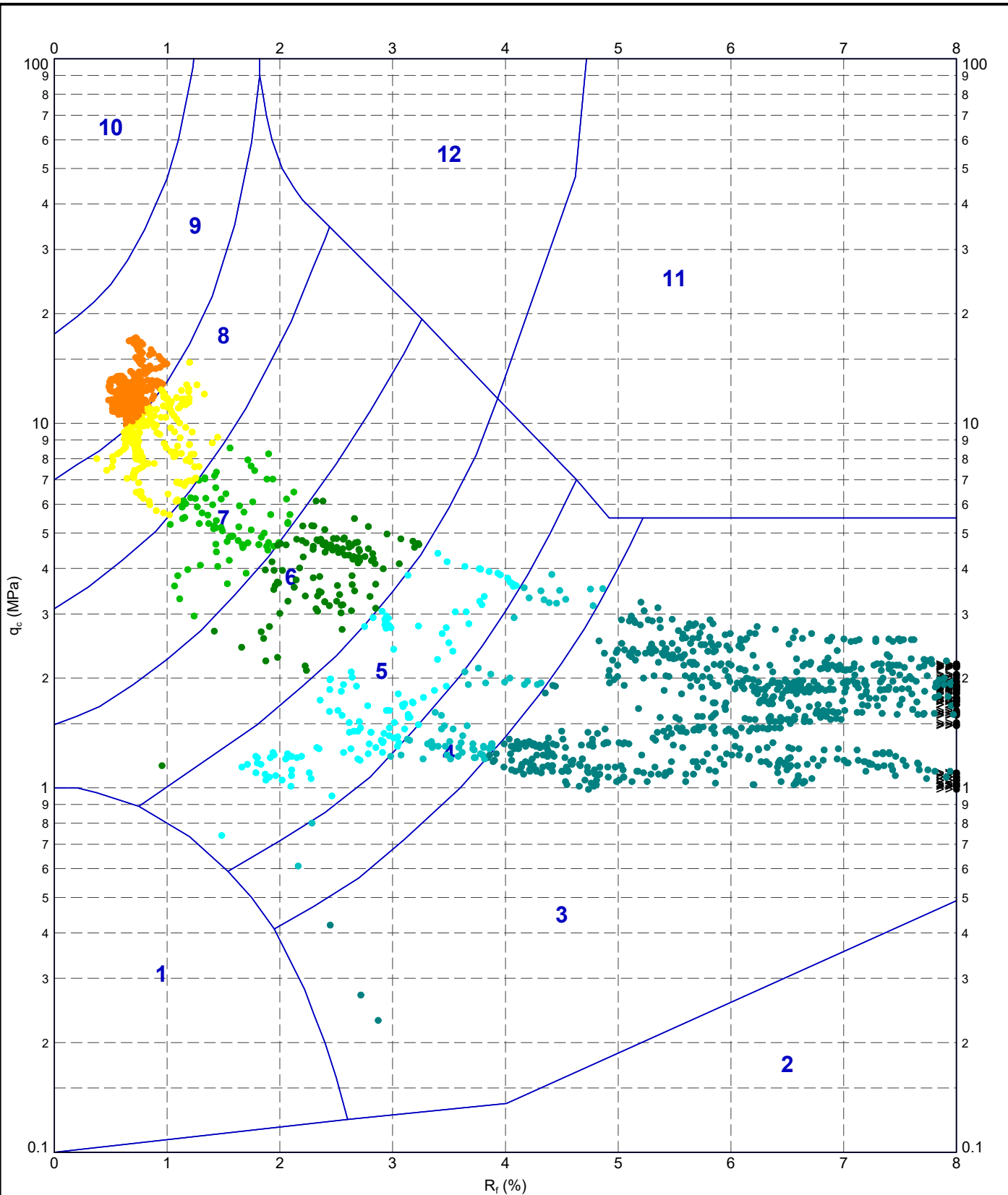
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	244 mV	-0.032 MPa
Sleeve	258 mV	252 mV	-0.004 kPa
Pore Pressure 2	296 mV	258 mV	-0.009 kPa
X-Y Inclinator	1769 mV	1778 mV	

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. Rf AP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:24 To:03.00.08 D:\git\Lab and In Situ Tool - DGD In Situ SI 2.02.0 2017-07-10 Proj In Situ SI 2.02.0 2017-07-10



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

	TITLE LK Group Rochdale Redwood SEN Robertson et al. 1986 q _c vs. R _f - CPT102	DRAWN	DATE	03/12/2025	
		CHECKED	DATE	03/12/2025	
		SCALE			A4
		Not To Scale			
		PROJECT No		FIGURE No	

1250505	
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PointID

CPT103

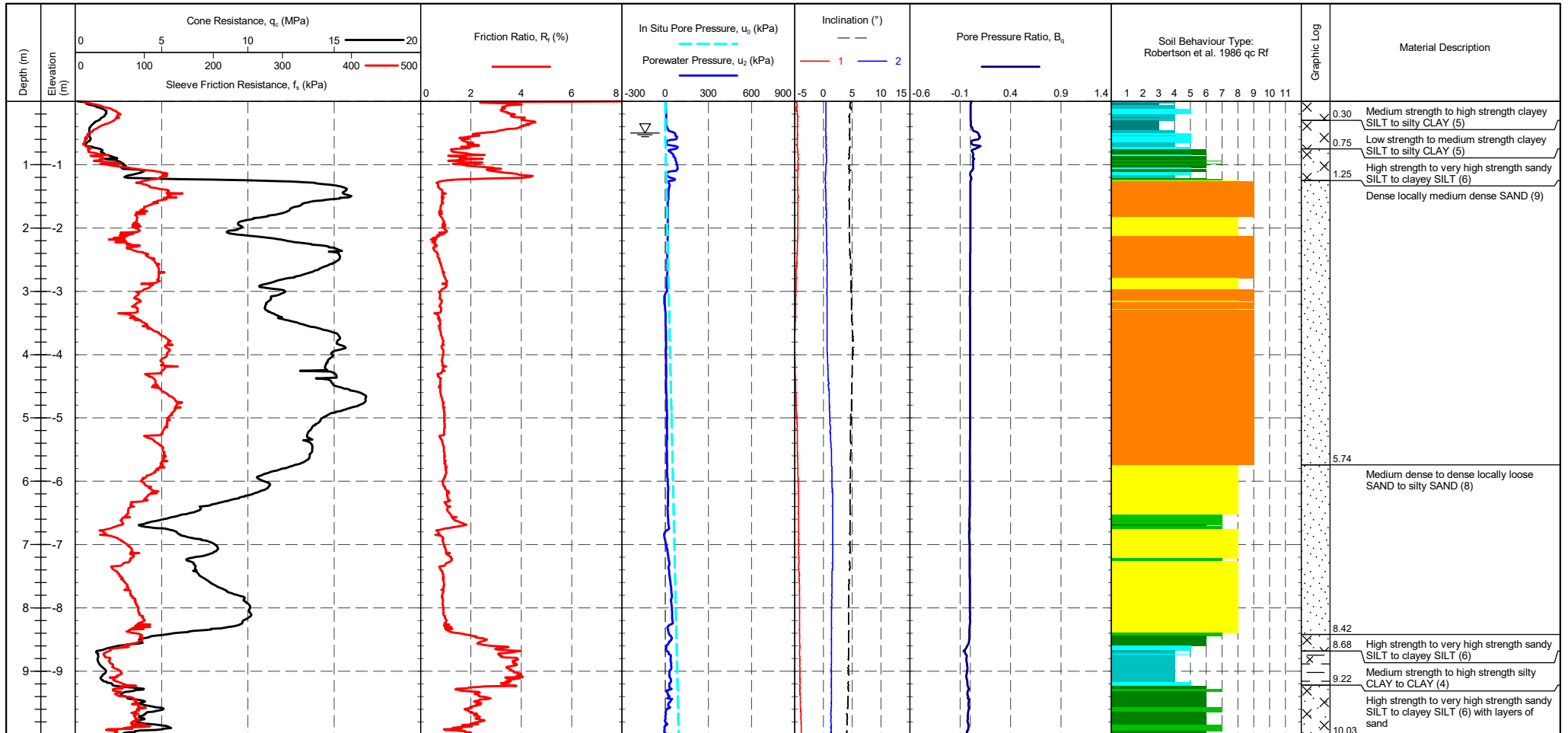
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

METHOD: Robertson et al. 1986 qc Rf

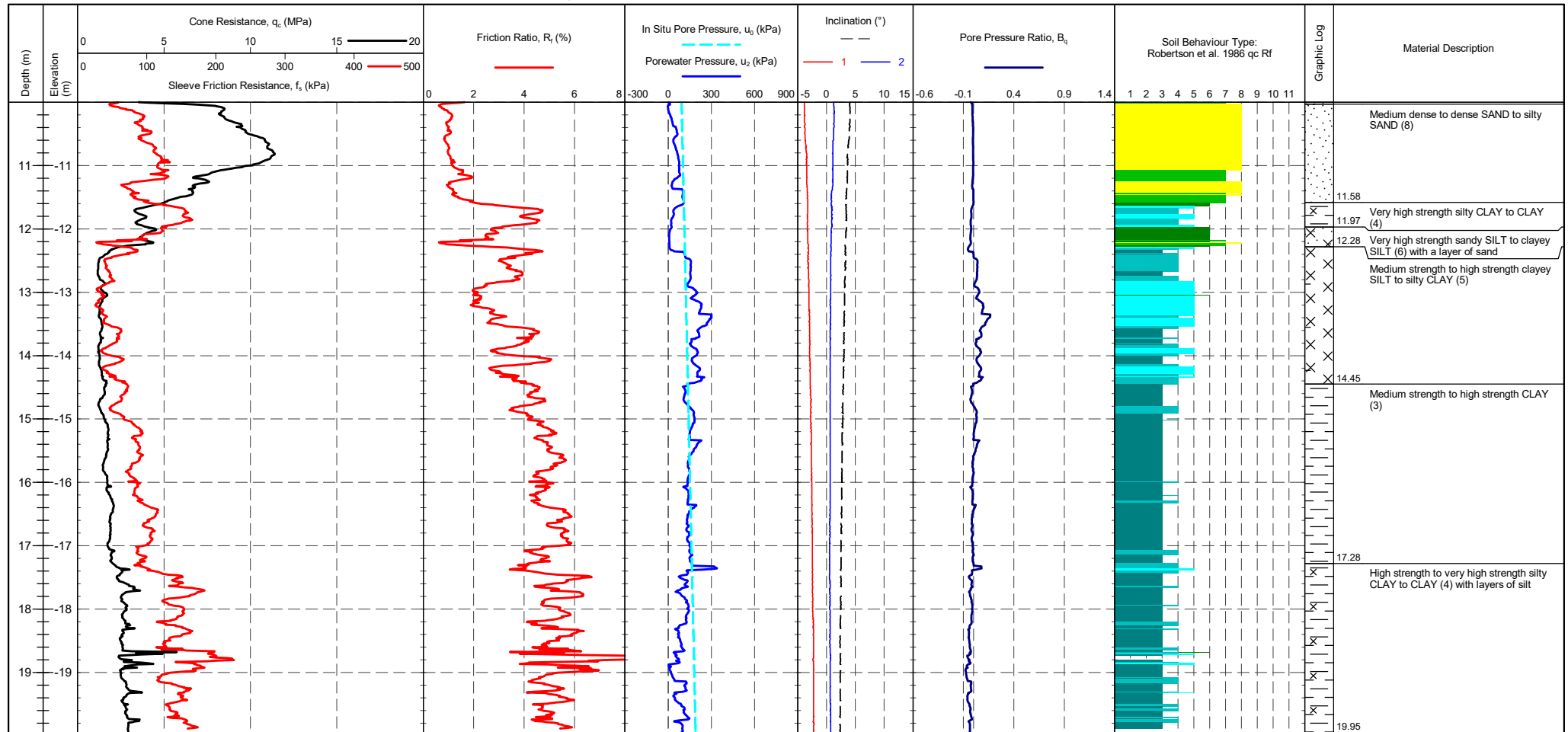
1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

CPT103

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depthRemark:
Test completed at target depth.SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022

CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

METHOD: Robertson et al. 1986 q_c R_f

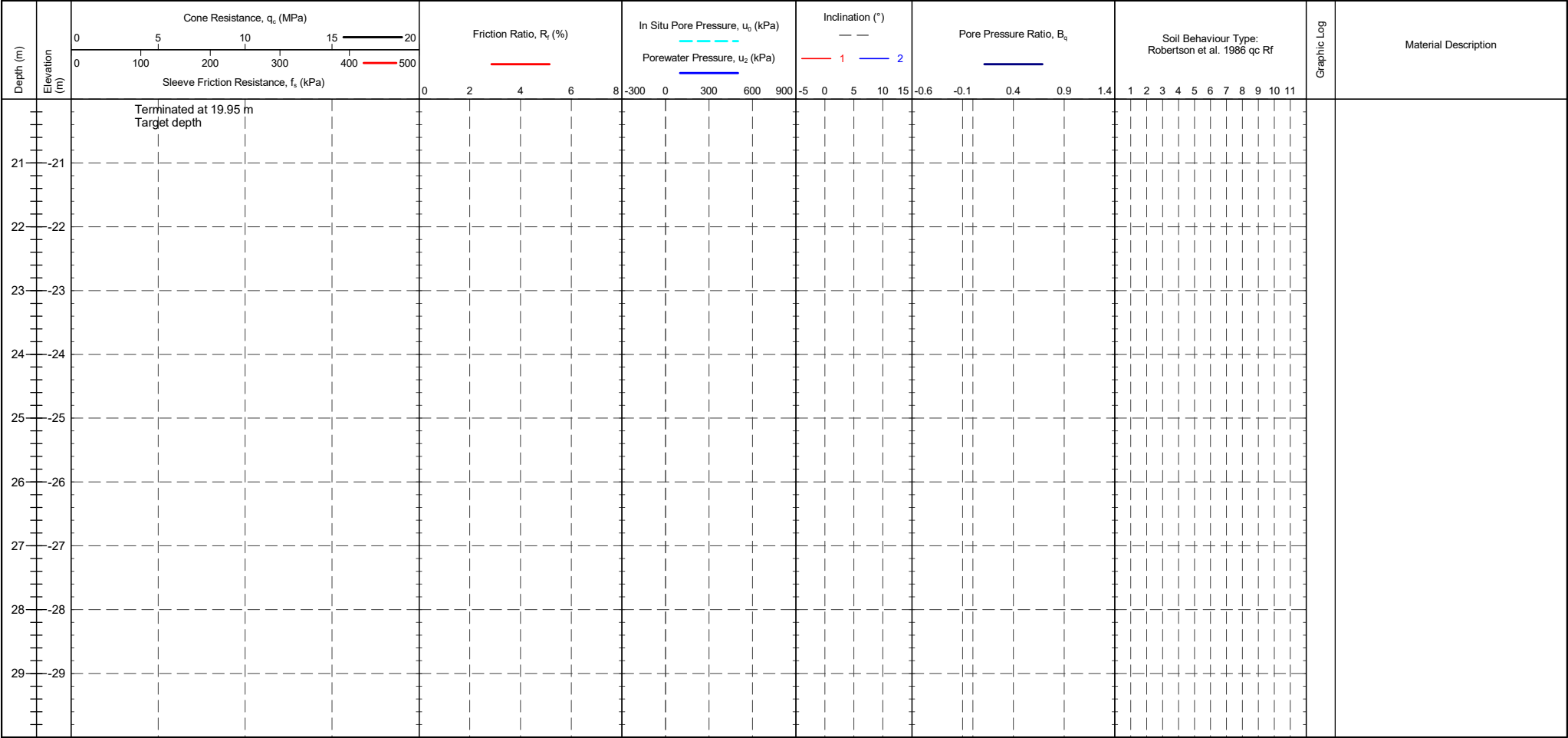
1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater
Level

Dissipation Test

PointID	CPT103
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CLIENT : LK Group PROJECT: Redwood SEN LOCATION : Rochdale PROJECT No. : 1250505	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : DW TERMINATION REASON : Target depth	Remark: Test completed at target depth.	SHEET : 3 OF 3 STATUS : Final TEST DATE : 25/11/2025 PLOT DATE : 03/12/2025 METHOD : ISO 22476-1:2022
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CONE ID : S15-CFIP.1817 CALIBRATION DATE : 11/12/2023 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold GROUNDWATER DEPTH : Assumed for calculation purposes	CPTU ZERO VALUES Transducer Pre Post Difference Tip 248 mV 244 mV -0.043 MPa Sleeve 256 mV 252 mV -0.003 kPa Pore Pressure 2 277 mV 291 mV 0.003 kPa X-Y Inclinometer 2026 mV 2045 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
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PointID

CPT103

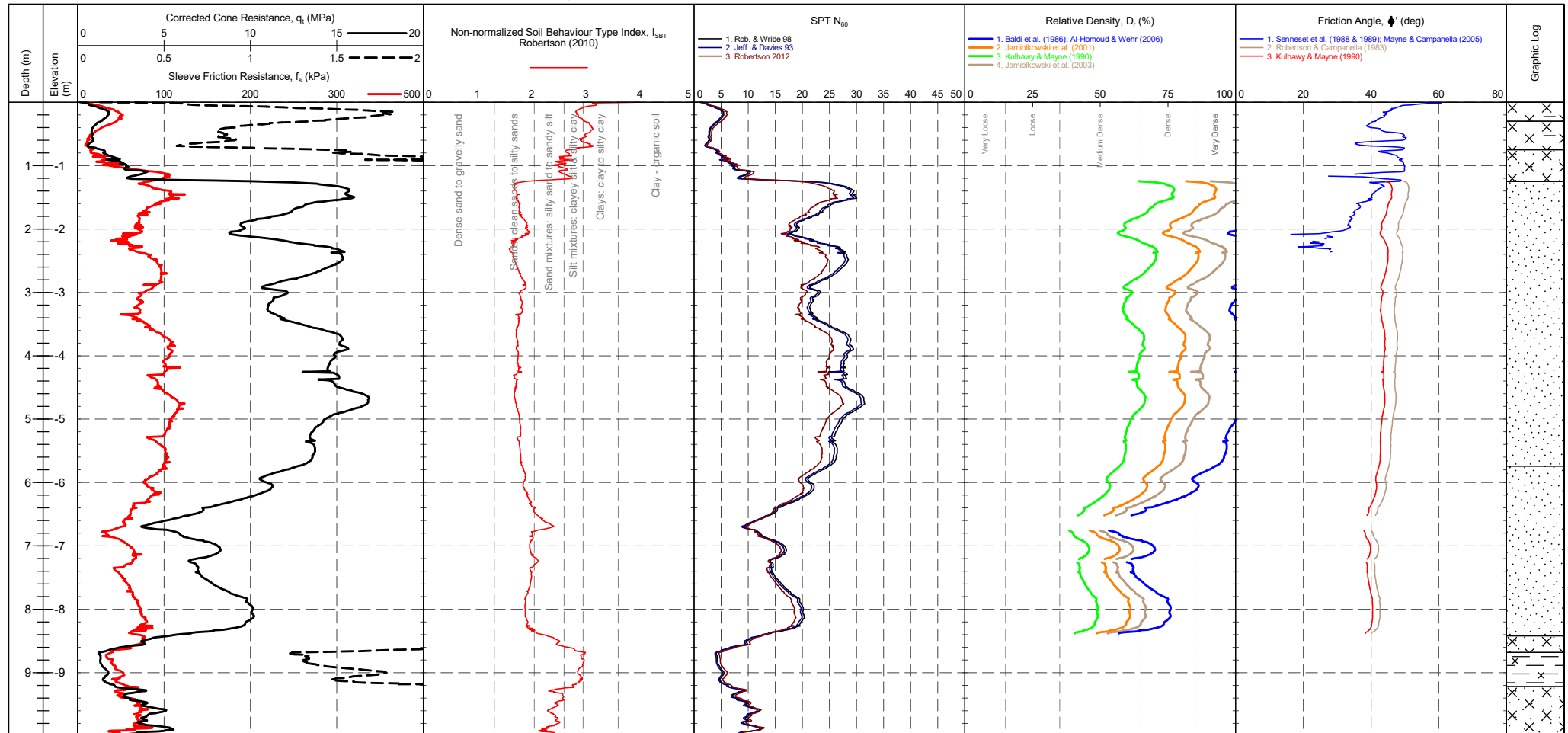
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre : 248 mV
Post : 244 mV
Difference : -0.043 MPa
256 mV
252 mV
-0.003 kPa
277 mV
291 mV
0.003 kPa
2026 mV
2045 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12					
Description	SBT Index, I _c	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

PointID

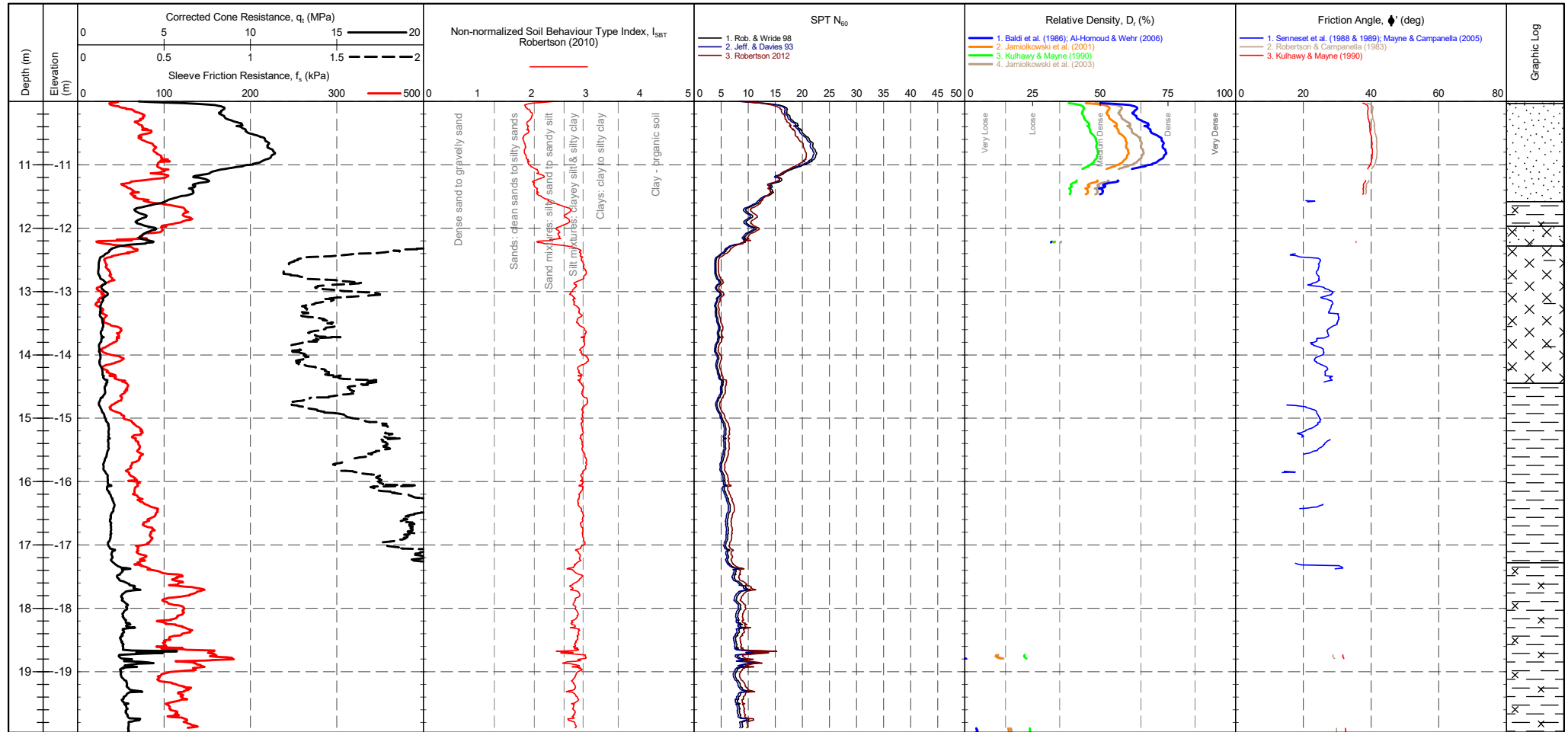
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer : Pre Post Difference
Tip : 248 mV 244 mV -0.043 MPa
Sleeve : 256 mV 252 mV -0.003 kPa
Pore Pressure 2 : 277 mV 291 mV 0.003 kPa
X-Y Inclinator : 2026 mV 2045 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

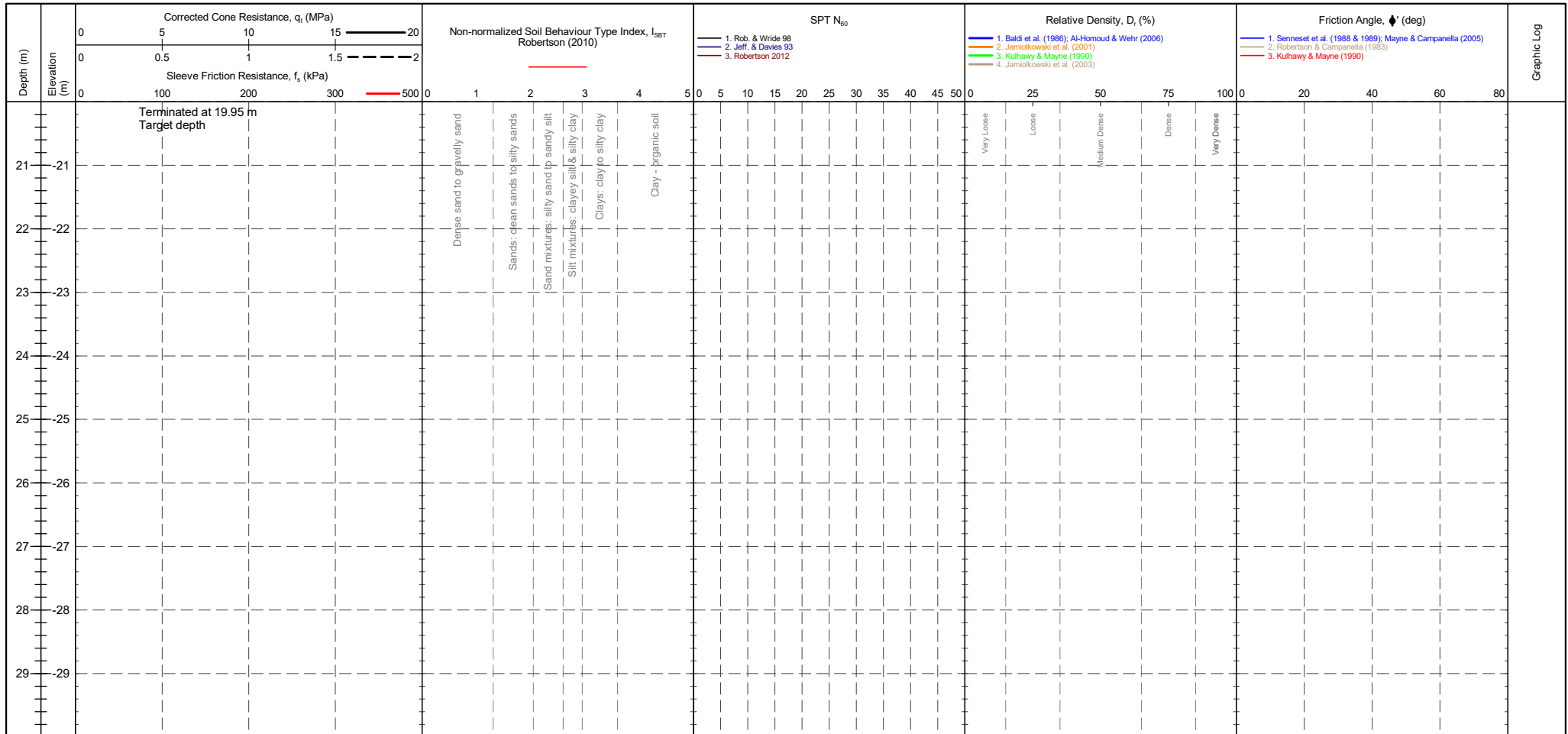
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
248 mV
256 mV
277 mV
2026 mV

Post
244 mV
252 mV
291 mV
2045 mV

Difference
-0.043 MPa
-0.003 kPa
0.003 kPa

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

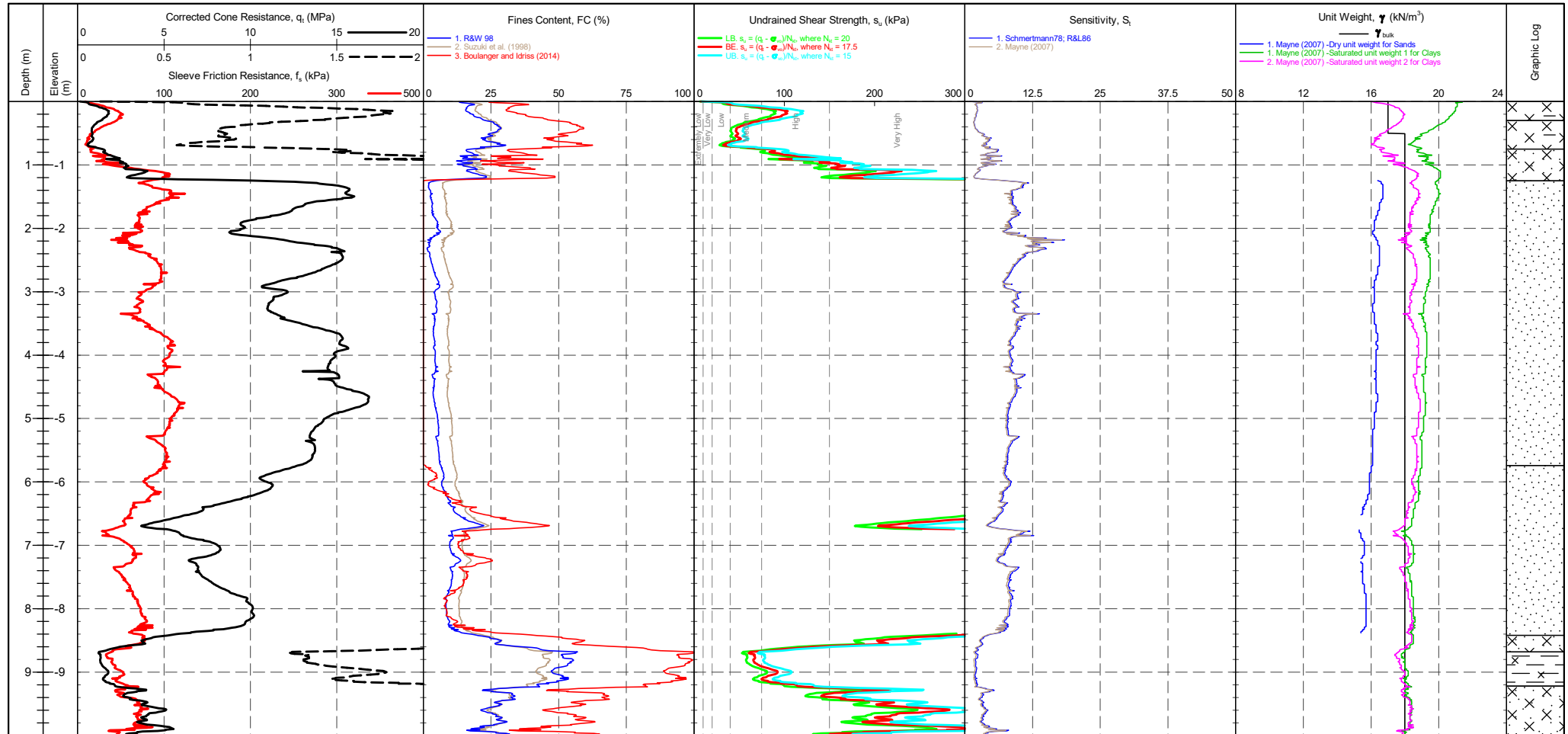
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre	Post	Difference
248 mV	244 mV	-0.043 MPa
256 mV	252 mV	-0.003 kPa
277 mV	291 mV	0.003 kPa
2026 mV	2045 mV	

CPTU ZERO VALUES

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

PointID

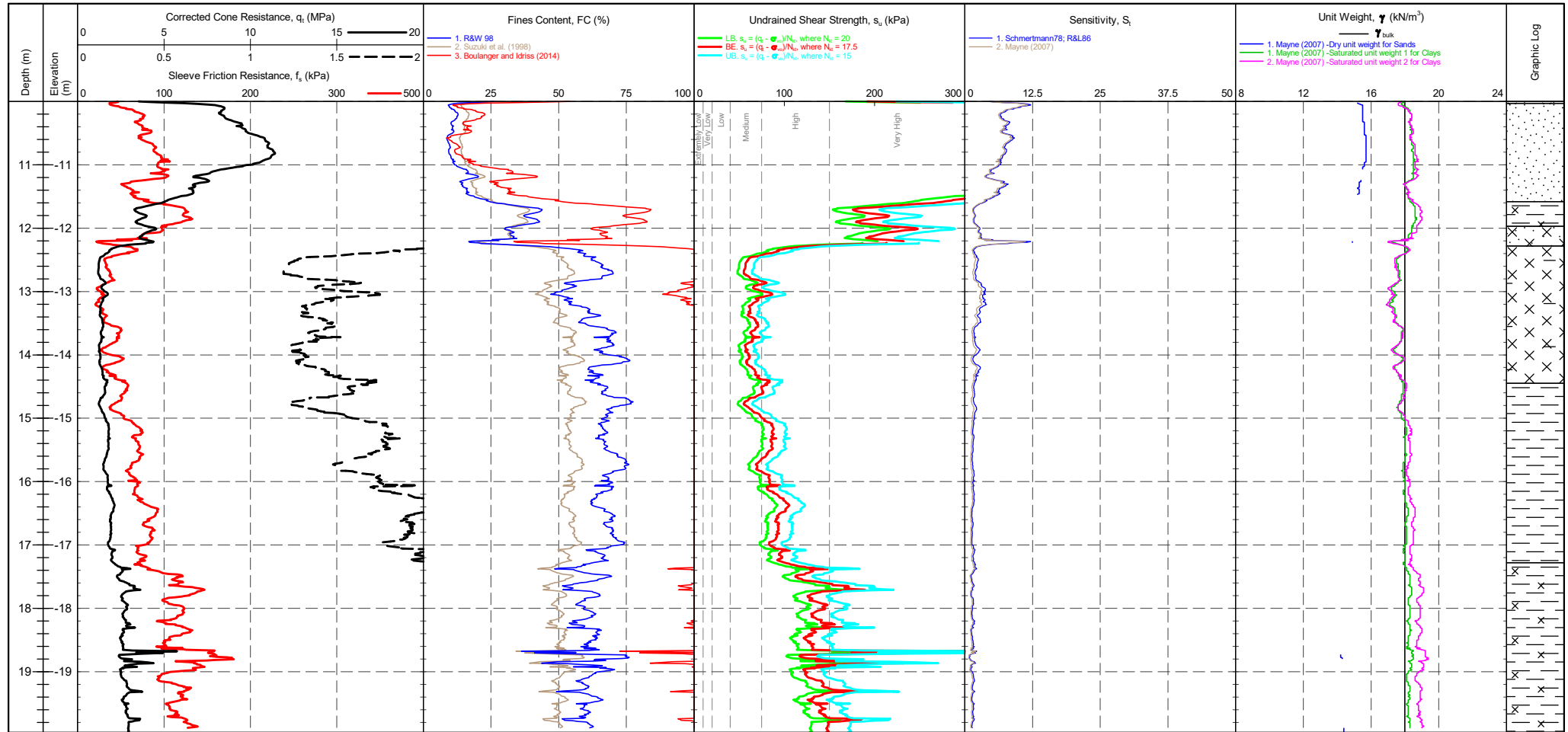
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator
Pre
248 mV
256 mV
277 mV
2026 mV
Post
244 mV
252 mV
291 mV
2045 mV
Difference
-0.043 MPa
-0.003 kPa
0.003 kPa

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

PointID

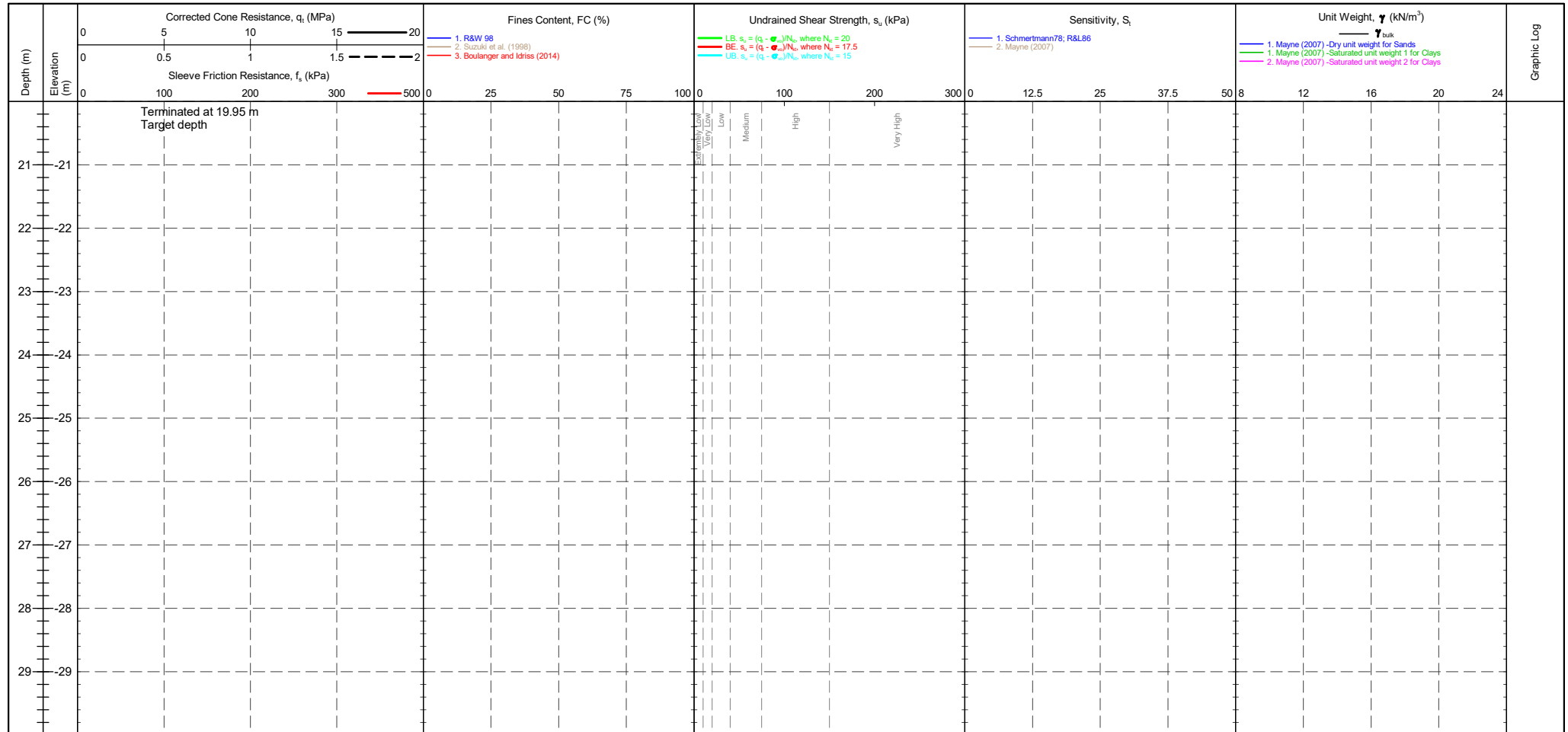
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer Pre Post Difference
Tip 248 mV 244 mV -0.043 MPa
Sleeve 256 mV 252 mV -0.003 kPa
Pore Pressure 2 277 mV 291 mV 0.003 kPa
X-Y Inclinator 2026 mV 2045 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

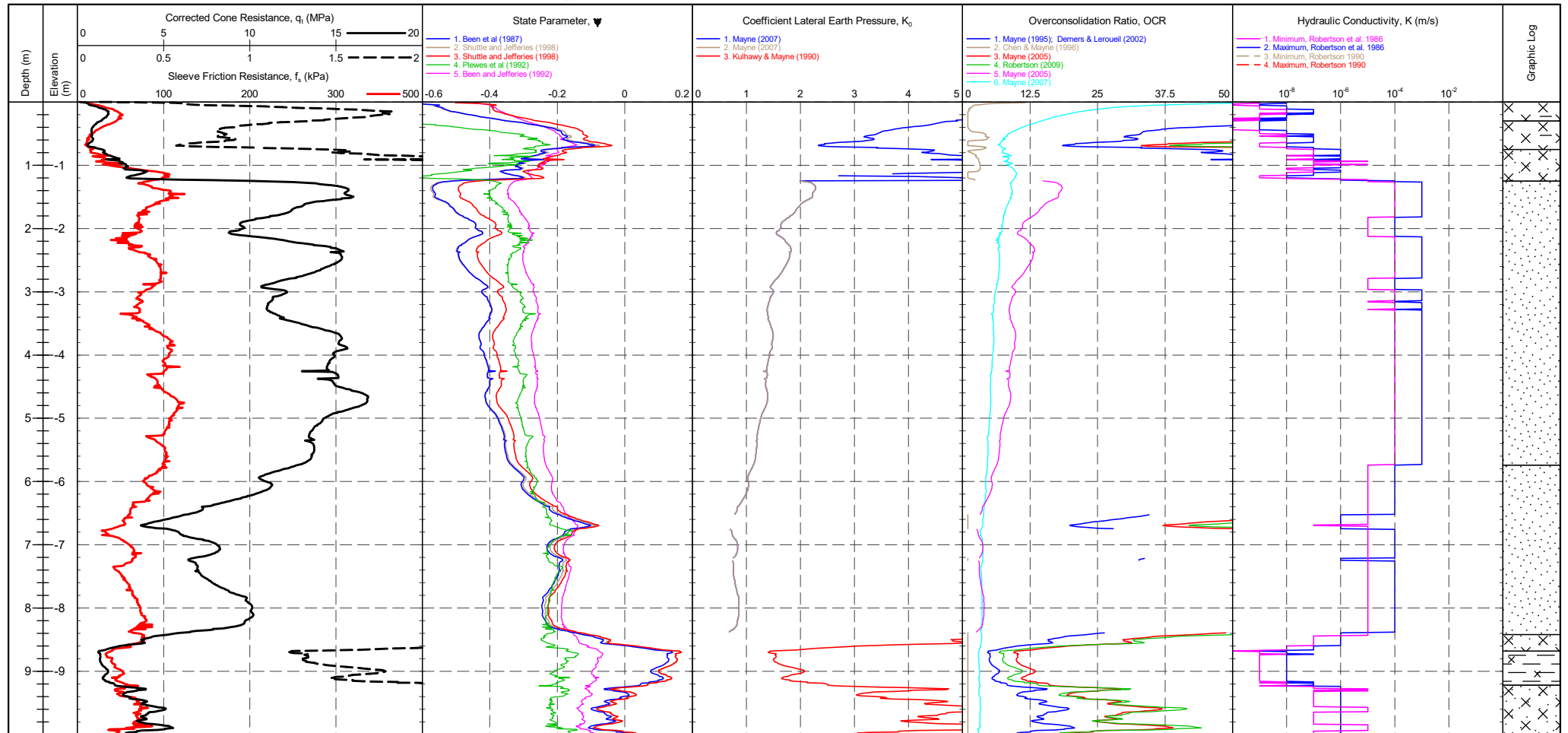
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

Groundwater Level
Dissipation Test

PointID

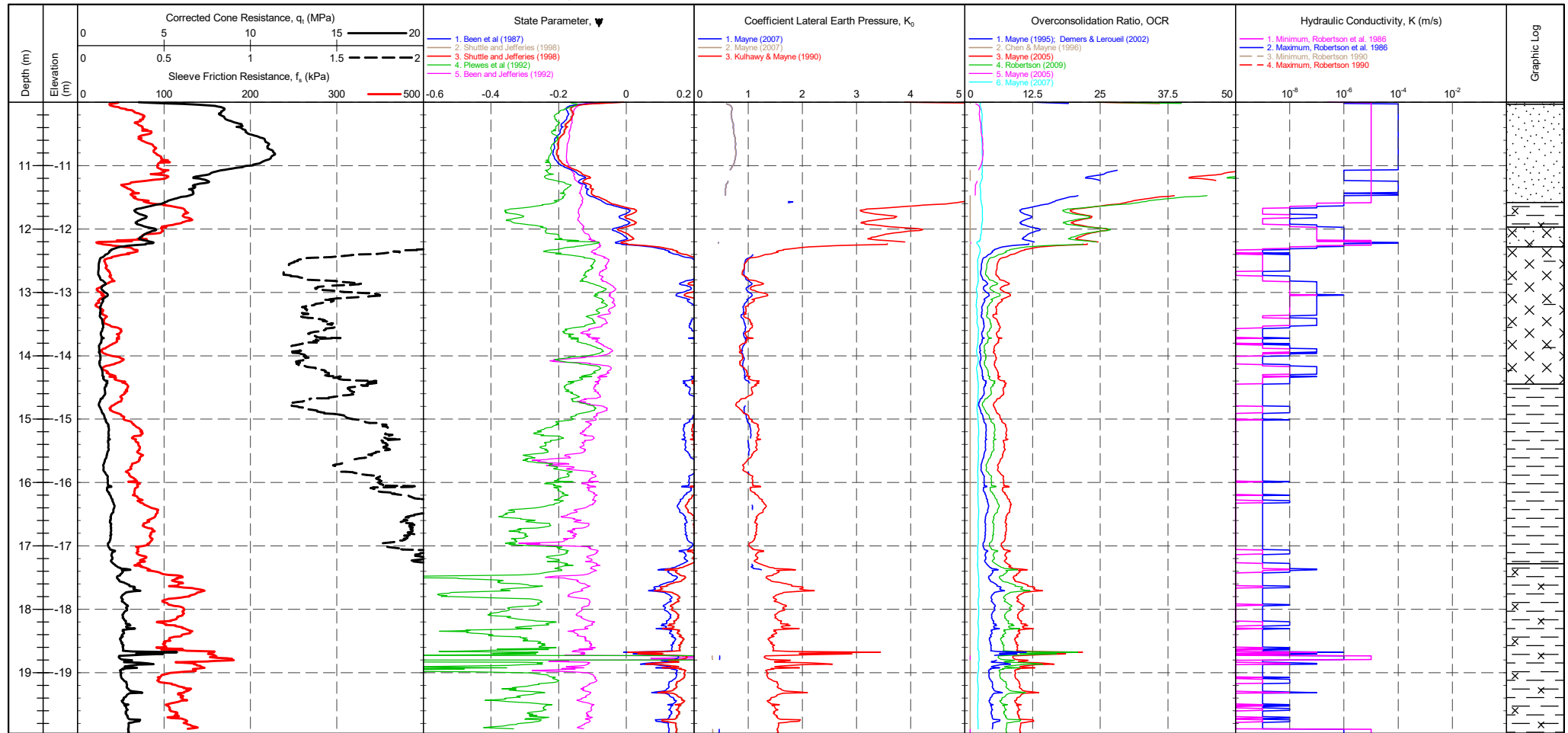
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

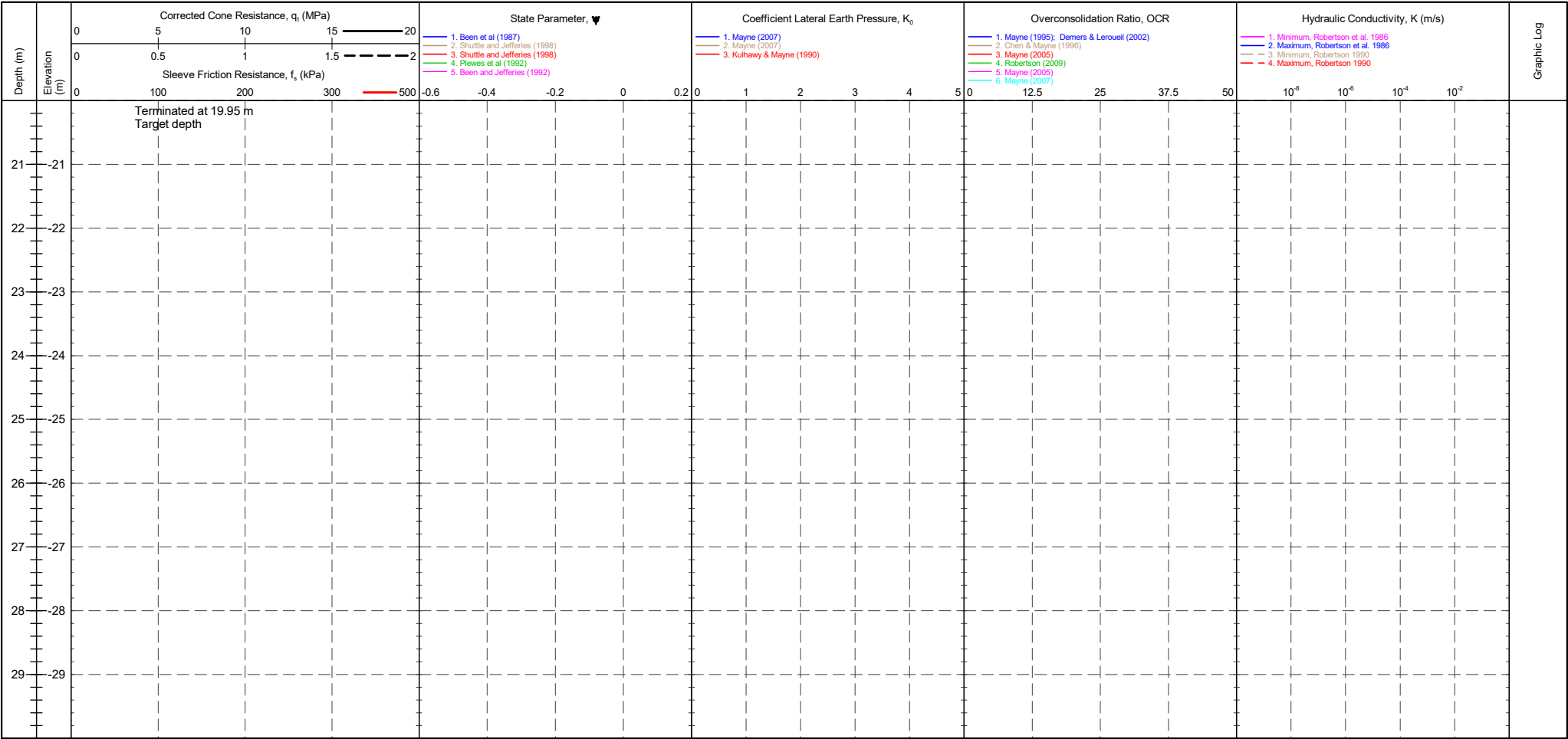
CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

Groundwater Level
Dissipation Test

PointID	CPT103
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CLIENT : LK Group PROJECT: Redwood SEN LOCATION : Rochdale PROJECT No. : 1250505	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : DW TERMINATION REASON : Target depth	Remark: Test completed at target depth.	SHEET : 3 OF 3 STATUS : Final TEST DATE : 25/11/2025 PLOT DATE : 03/12/2025 METHOD : ISO 22476-1:2022
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CONE ID : S15-CFIP.1817 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold	Transducer Pre Post Difference Tip 248 mV 244 mV -0.043 MPa Sleeve 256 mV 252 mV -0.003 kPa Pore Pressure 2 277 mV 291 mV 0.003 kPa X-Y Inclinator 2026 mV 2045 mV	CPTU ZERO VALUES	Groundwater Level Dissipation Test
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PointID

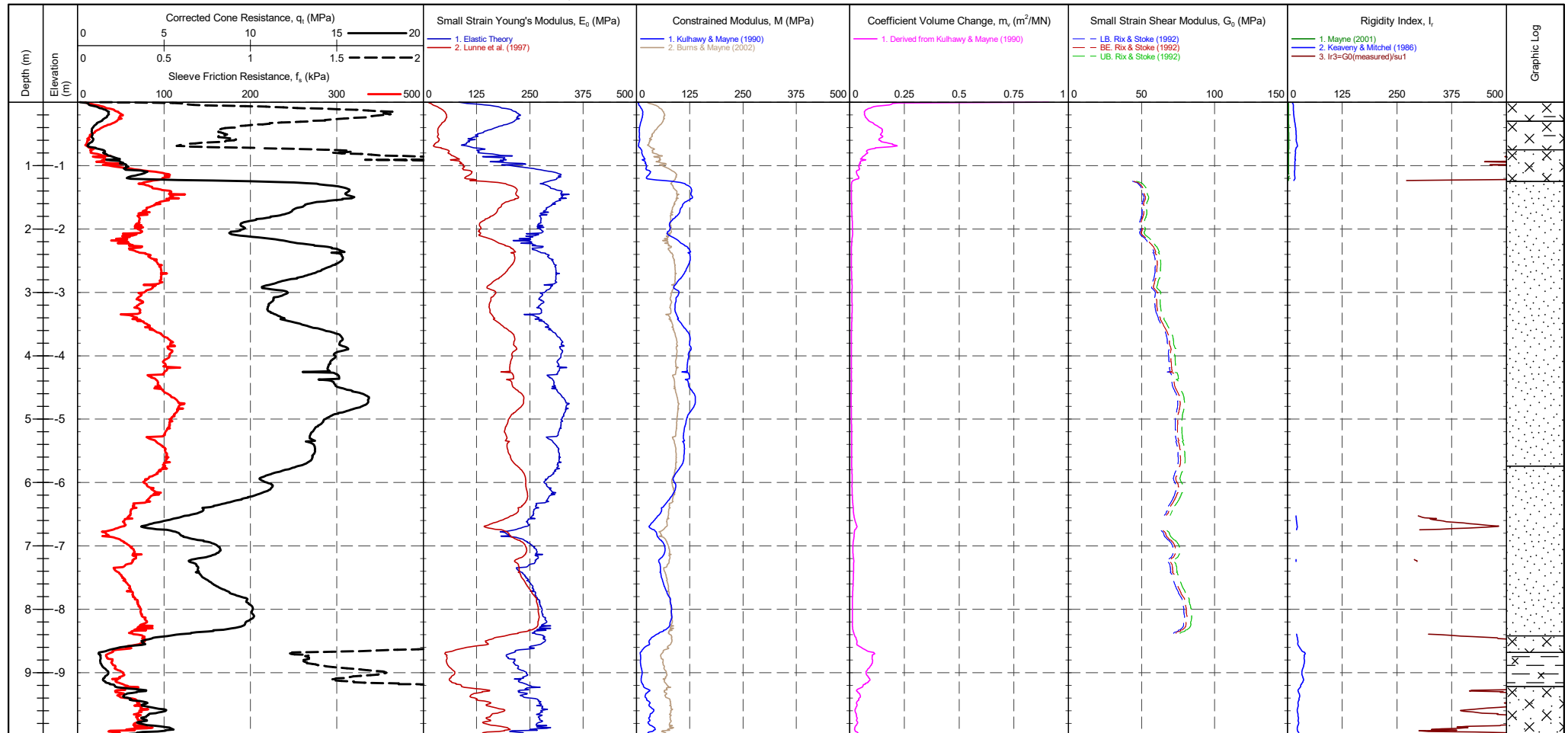
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

Groundwater Level
Dissipation Test

PointID

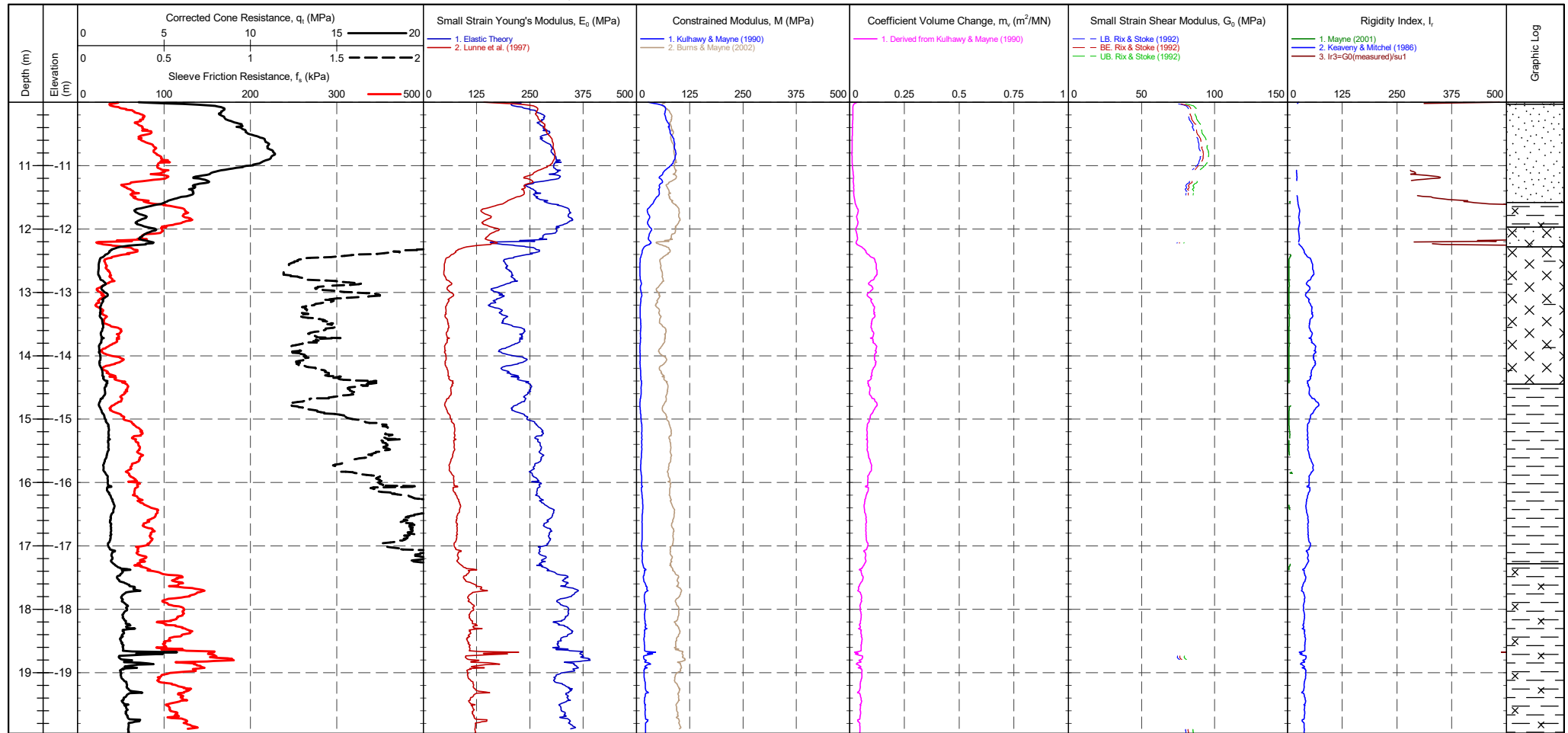
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

Groundwater Level
Dissipation Test

PointID

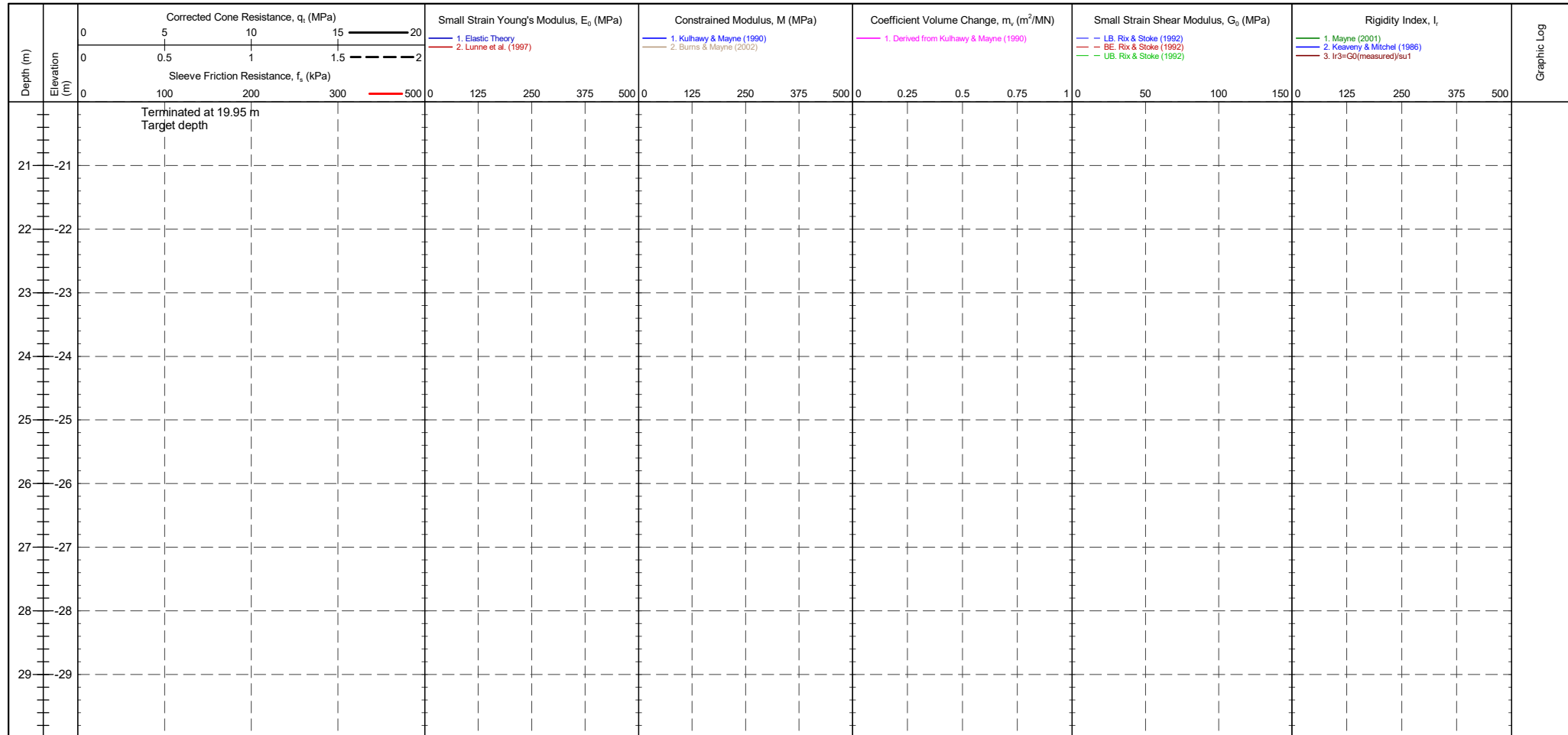
CPT103

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

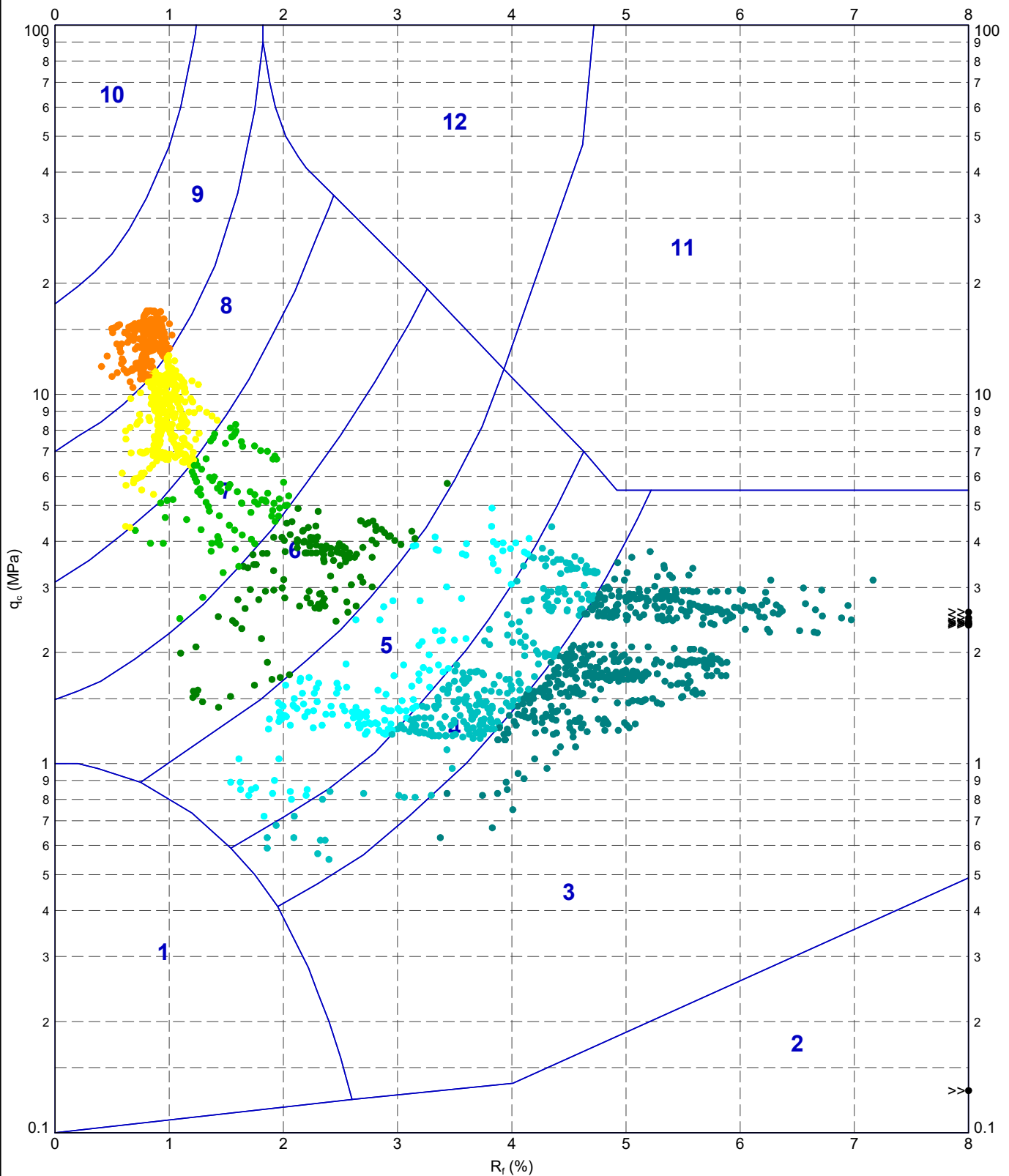
CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	248 mV	244 mV	-0.043 MPa
Sleeve	256 mV	252 mV	-0.003 kPa
Pore Pressure 2	277 mV	291 mV	0.003 kPa
X-Y Inclinator	2026 mV	2045 mV	

Groundwater Level

Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:27 To:03.00.08 D:\git\Lab and In Situ\Tool - DGD\ In Situ SI 2.02.0 2017-07-10 Proj In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 q_c vs. R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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

LK Group
Rochdale
Redwood SEN
Robertson et al. 1986 q_c vs. R_f - CPT103

DRAWN

DATE

03/12/2025

CHECKED

DATE

03/12/2025

SCALE

Not To Scale

A4

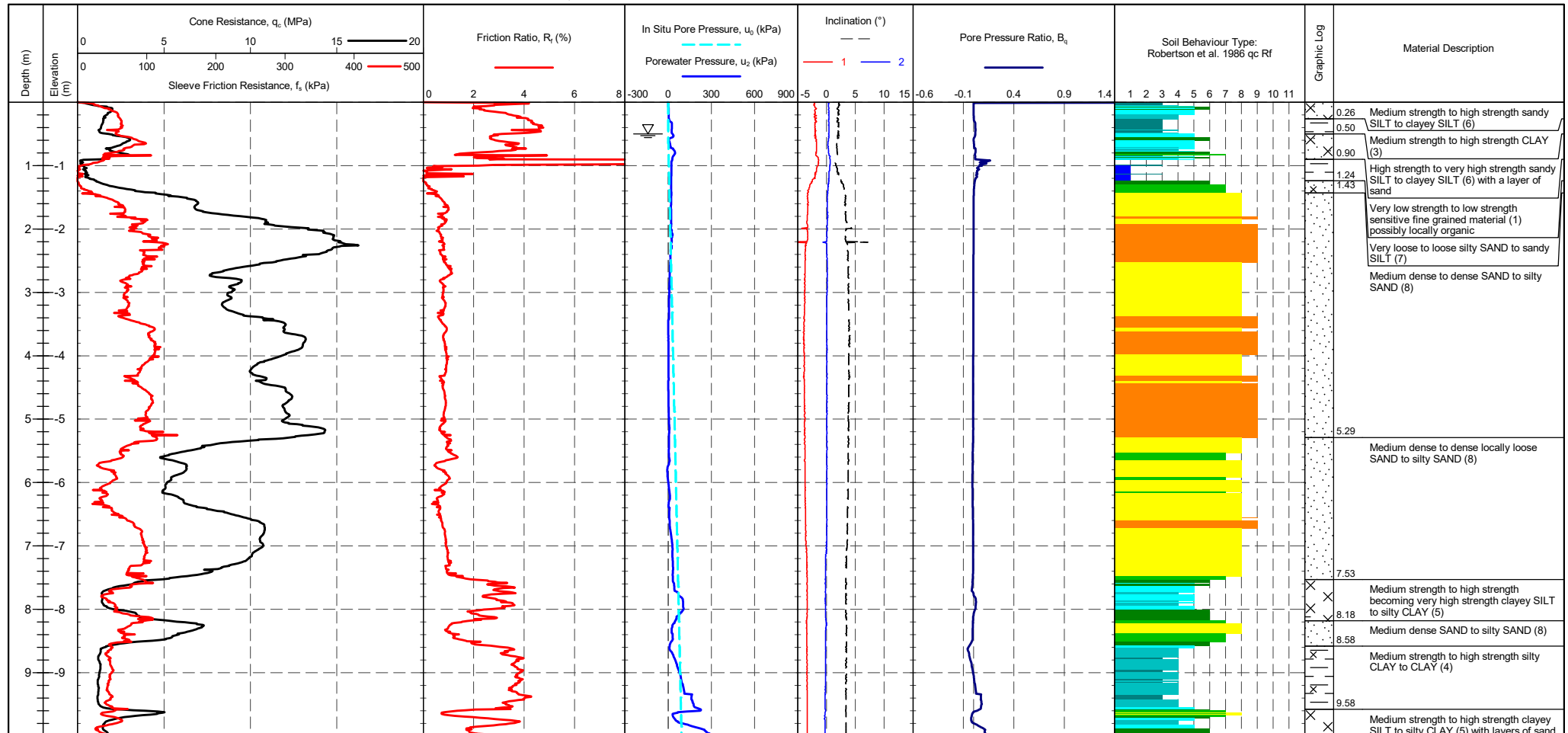
PROJECT No

1250505

FIGURE No

PointID

CPT104

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depthRemark:
Test completed at target depth.SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022

CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

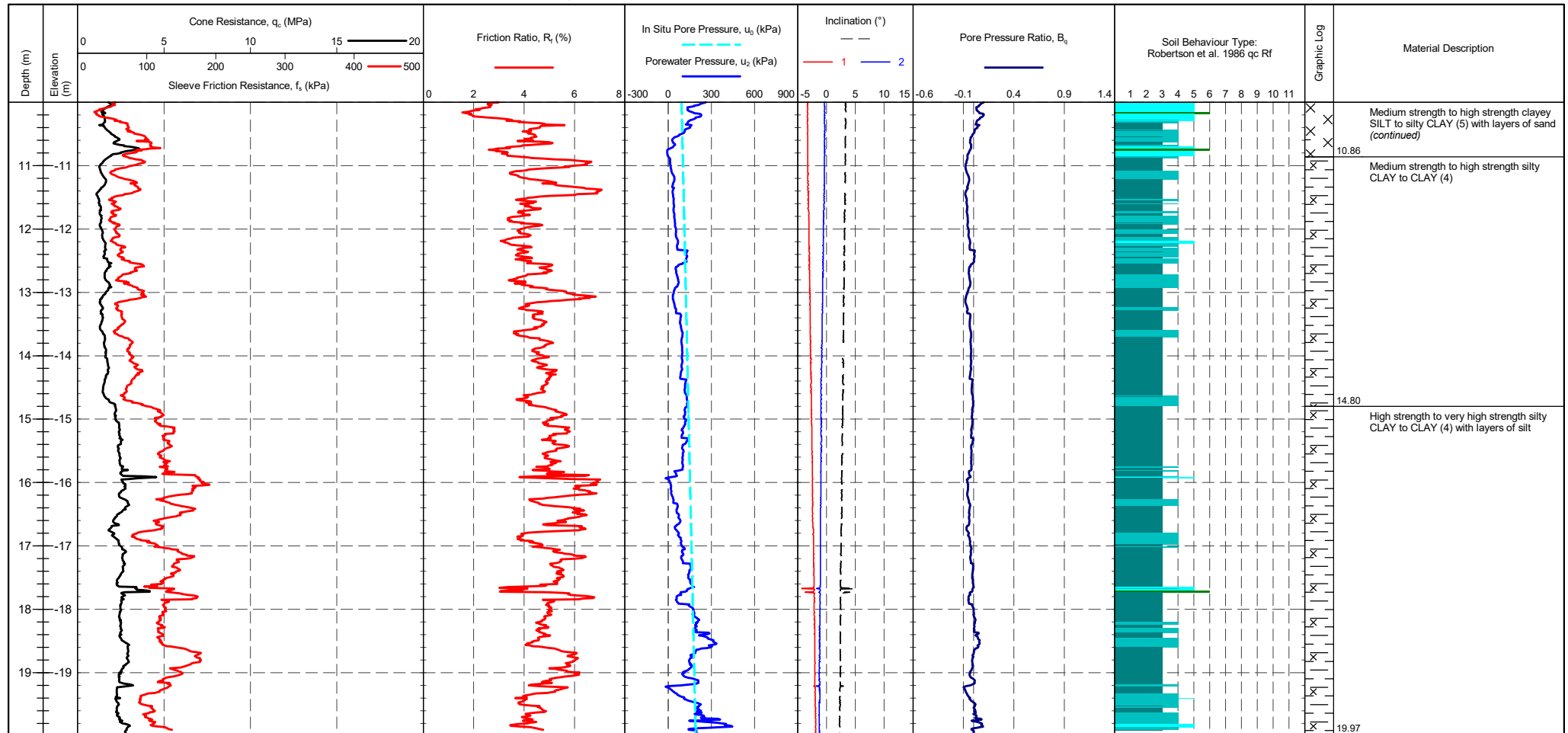
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

METHOD: Robertson et al. 1986 $q_c R_f$

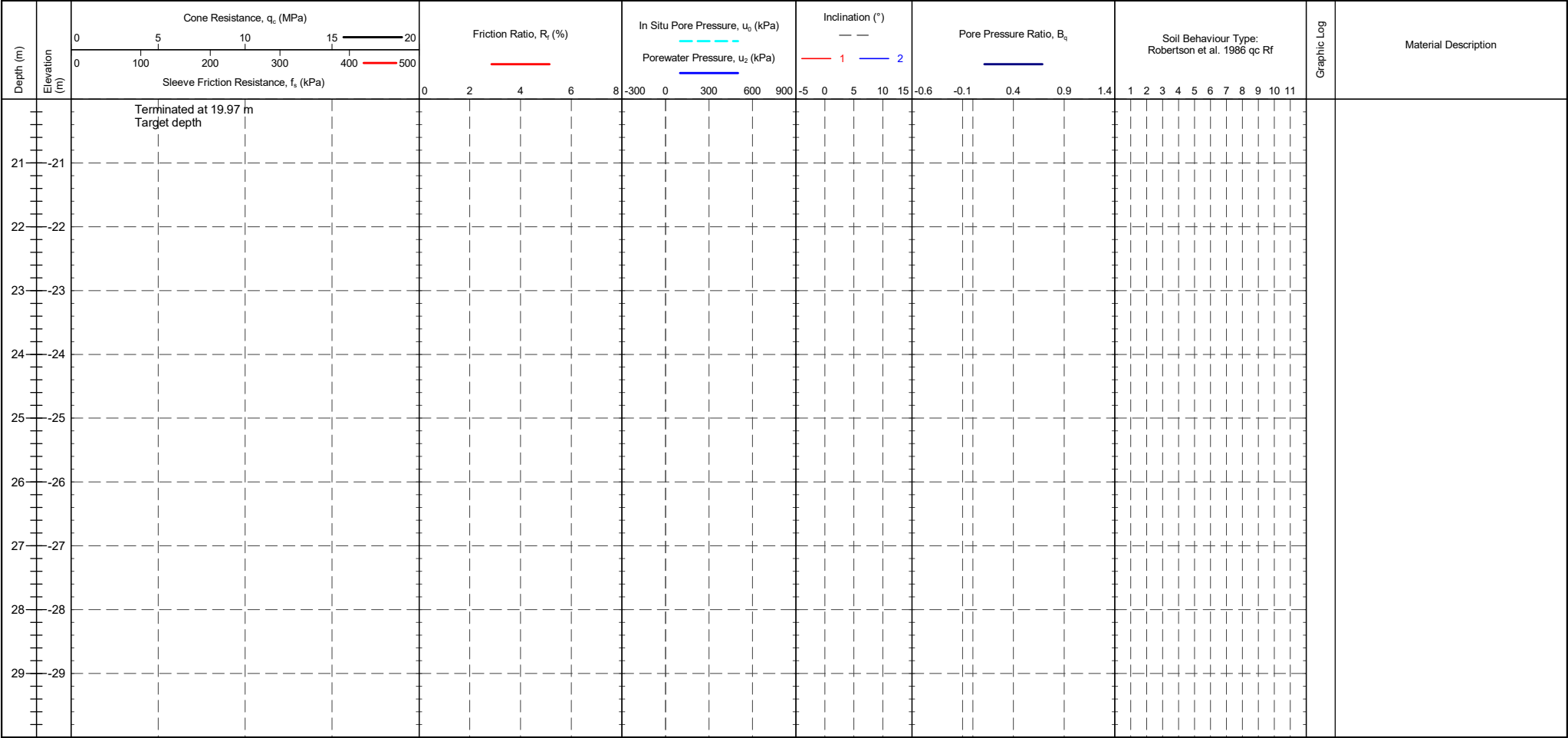
1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID	CPT104
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CLIENT : LK Group PROJECT: Redwood SEN LOCATION : Rochdale PROJECT No. : 1250505	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : DW TERMINATION REASON : Target depth	Remark: Test completed at target depth.	SHEET : 3 OF 3 STATUS : Final TEST DATE : 25/11/2025 PLOT DATE : 03/12/2025 METHOD : ISO 22476-1:2022
---	---	--	---



CONE ID : S15-CFIP.1817 CALIBRATION DATE : 11/12/2023 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold GROUNDWATER DEPTH : Assumed for calculation purposes	CPTU ZERO VALUES Transducer Pre Post Difference Tip 247 mV 243 mV -0.043 MPa Sleeve 257 mV 249 mV -0.006 kPa Pore Pressure 2 301 mV 275 mV -0.006 kPa X-Y Inclinometer 2273 mV 2302 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
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PointID

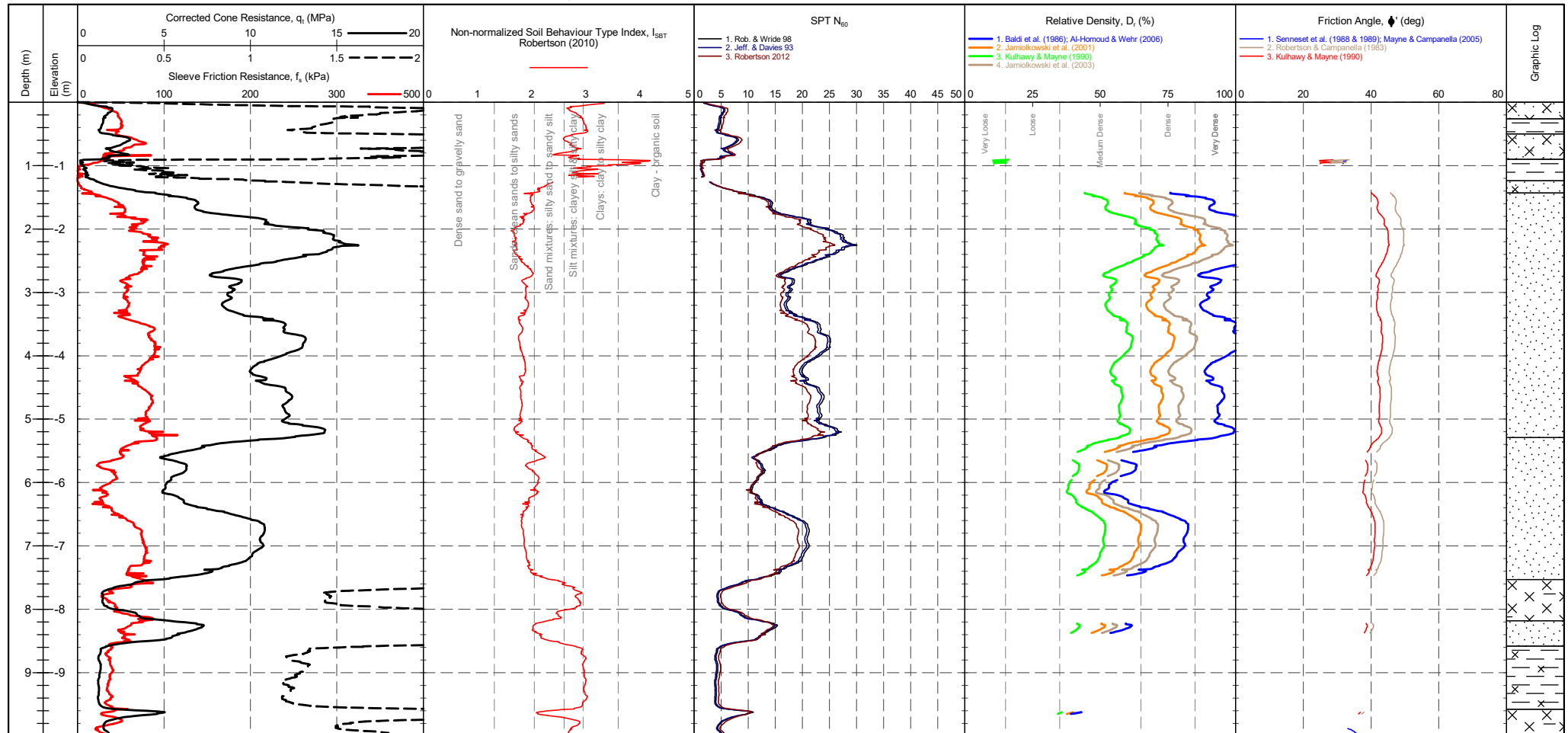
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

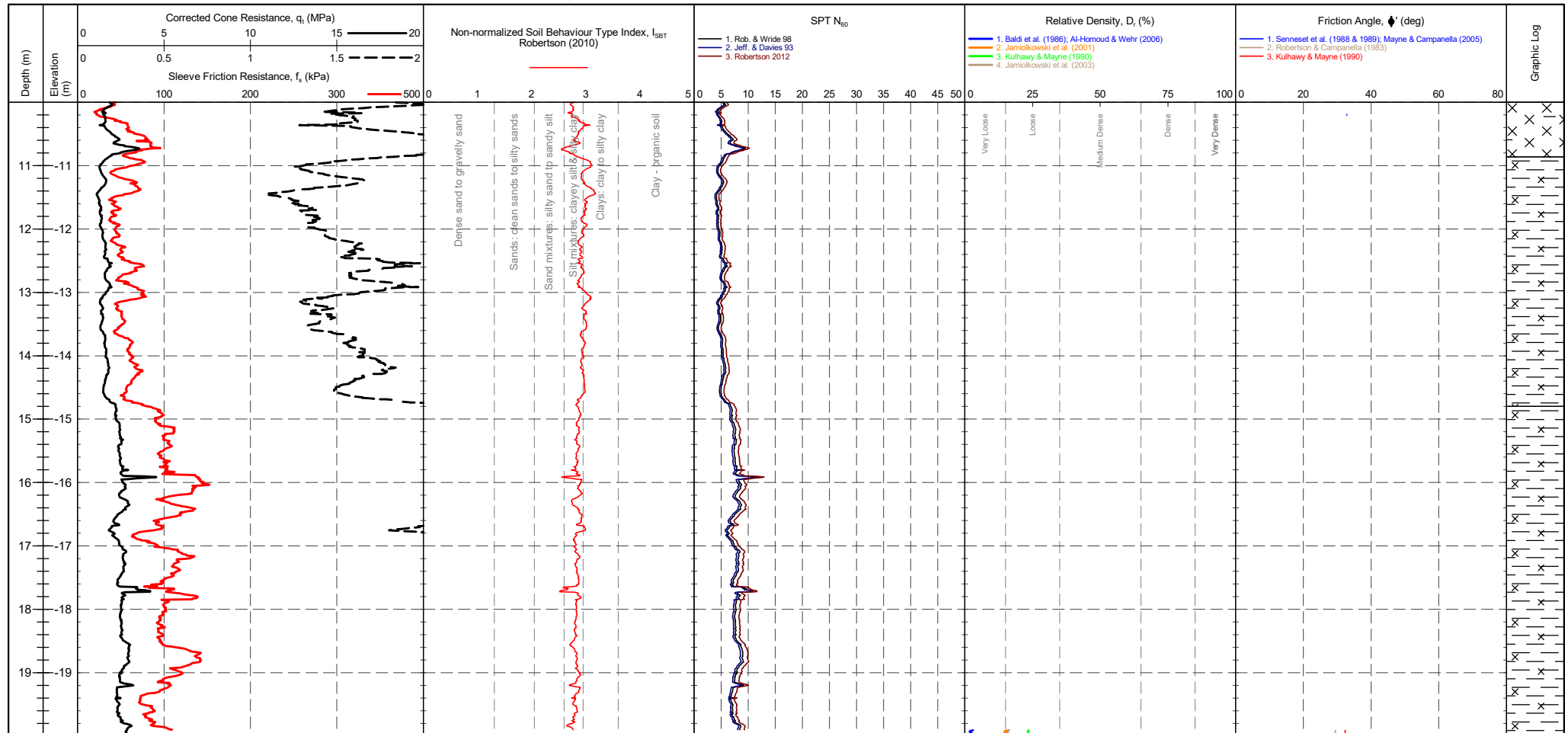
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

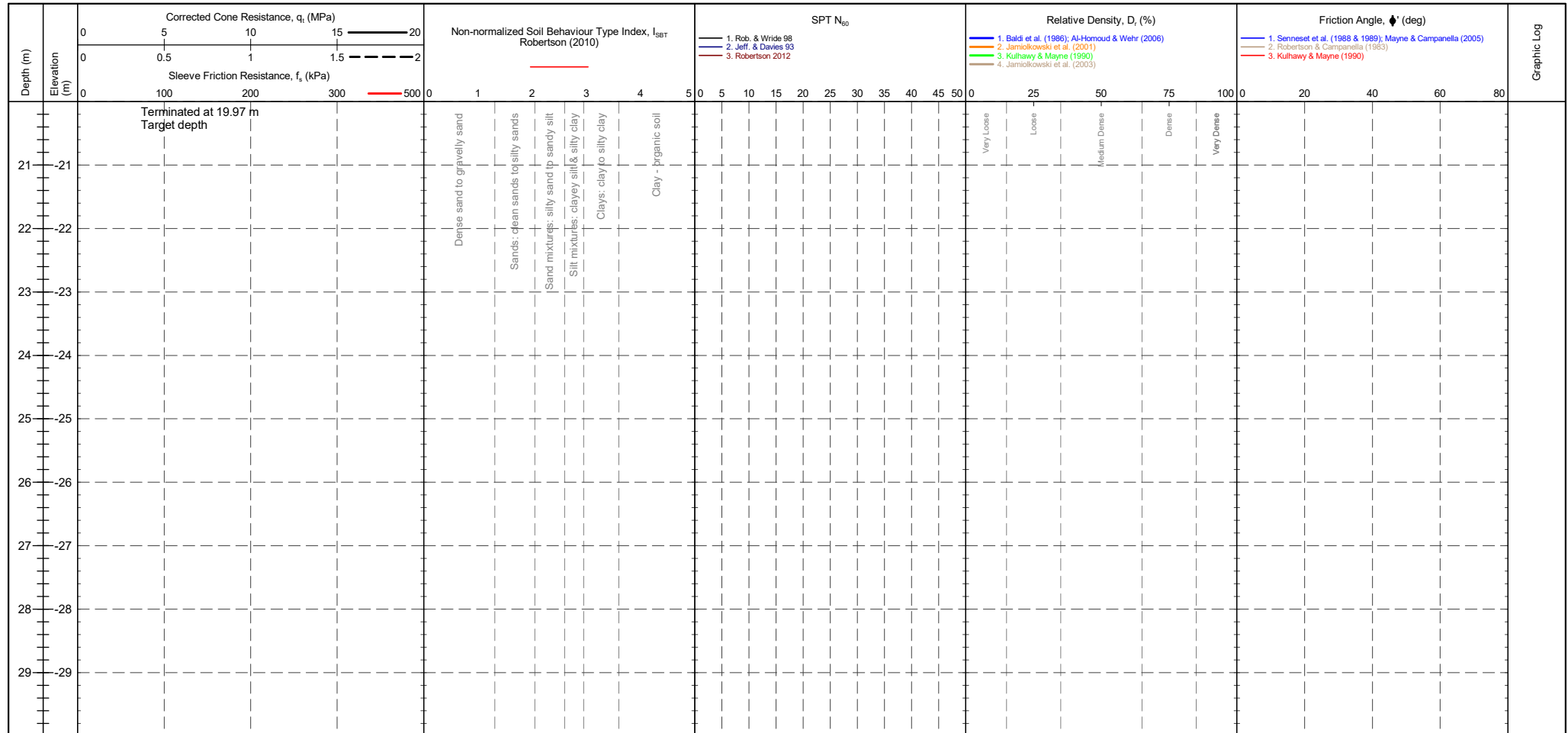
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
247 mV	243 mV	-0.043 MPa
257 mV	249 mV	-0.006 kPa
301 mV	275 mV	-0.006 kPa
2273 mV	2302 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

CPT104

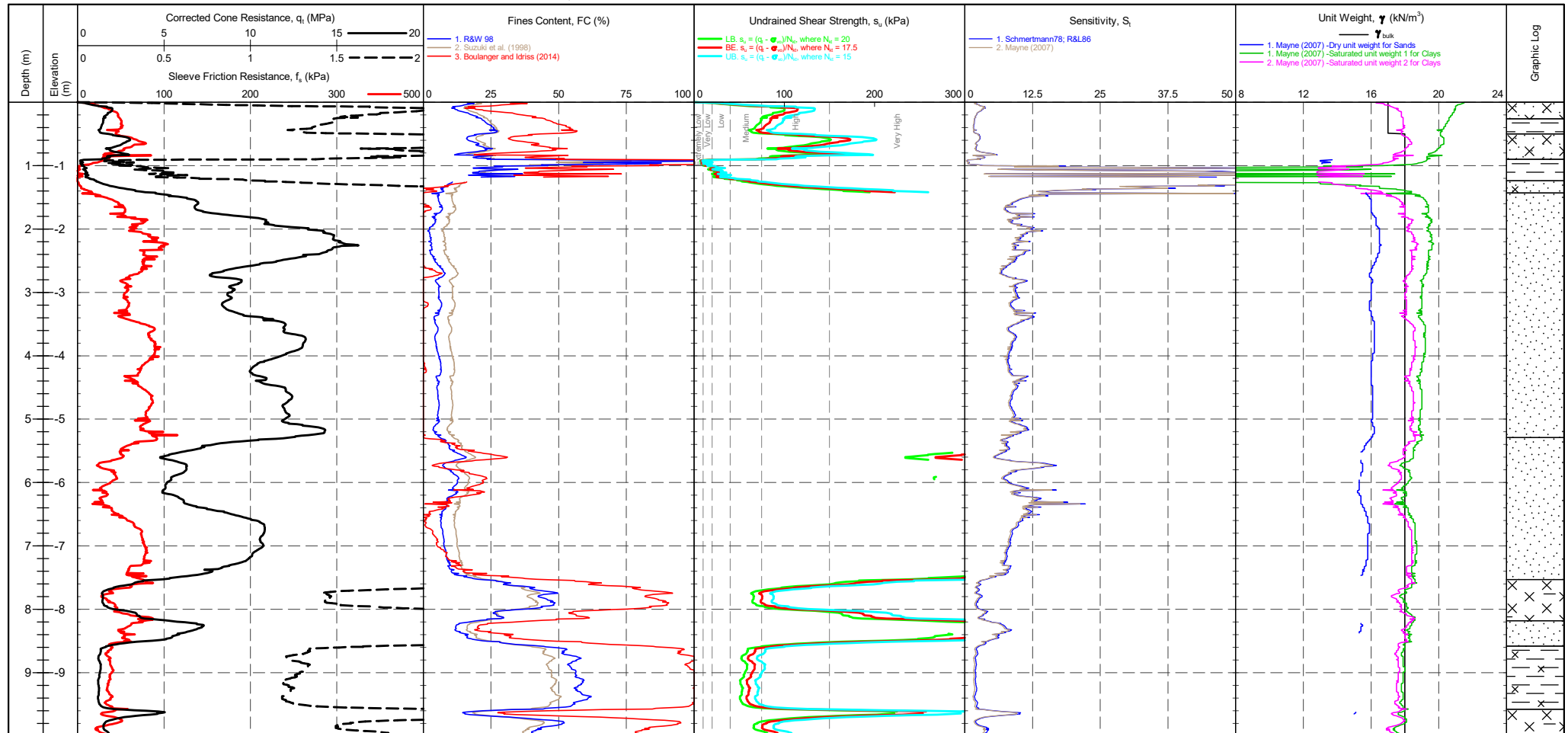
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre	Post	Difference
247 mV	243 mV	-0.043 MPa
257 mV	249 mV	-0.006 kPa
301 mV	275 mV	-0.006 kPa
2273 mV	2302 mV	

CPTU ZERO VALUES

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

PointID

CPT104

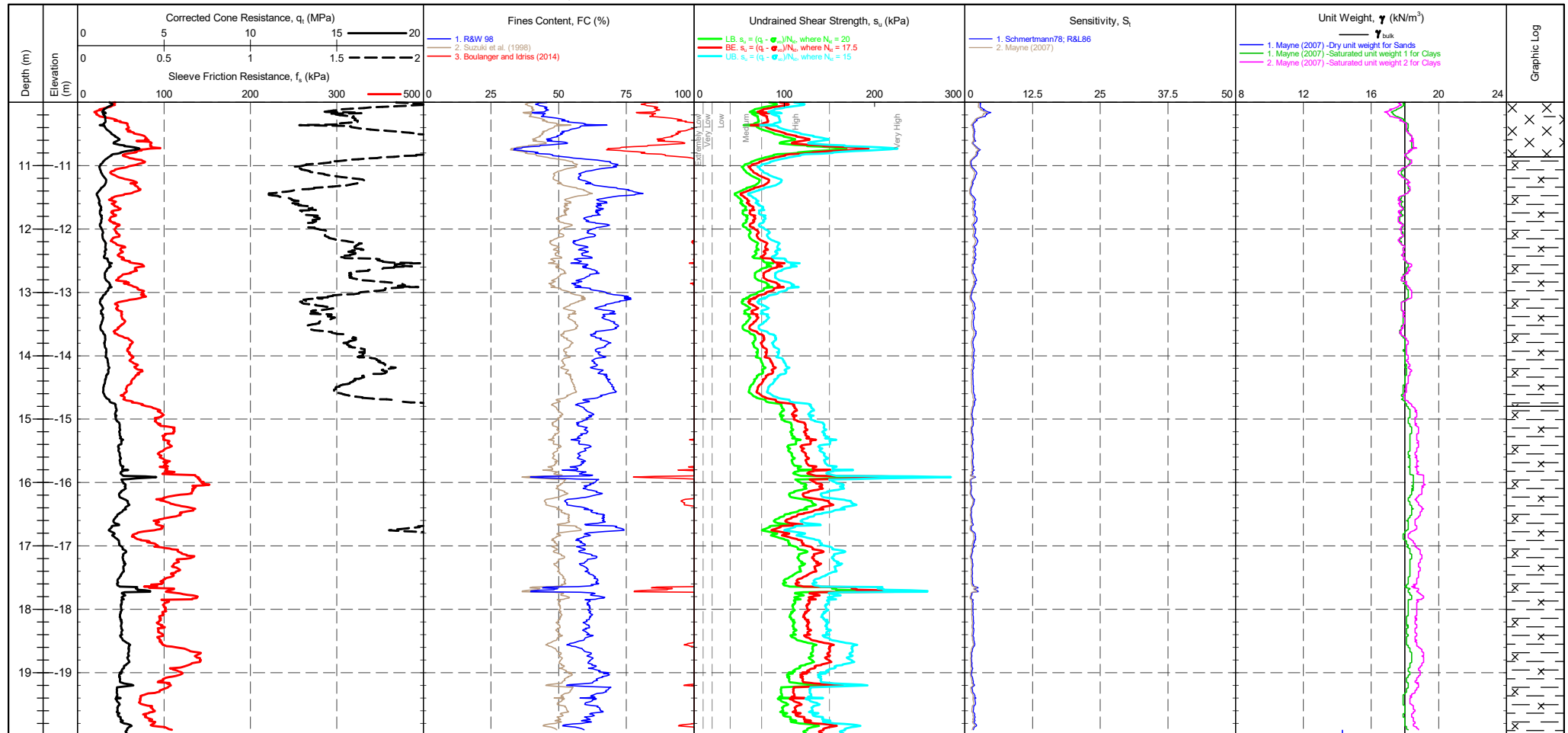
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip : 247 mV
Sleeve : 257 mV
Pore Pressure 2 : 301 mV
X-Y Inclinator : 2273 mV
Pre : 243 mV
Post : 249 mV
Difference : -0.043 MPa
-0.006 kPa
-0.006 kPa
2302 mV

CPTU ZERO VALUES

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

PointID

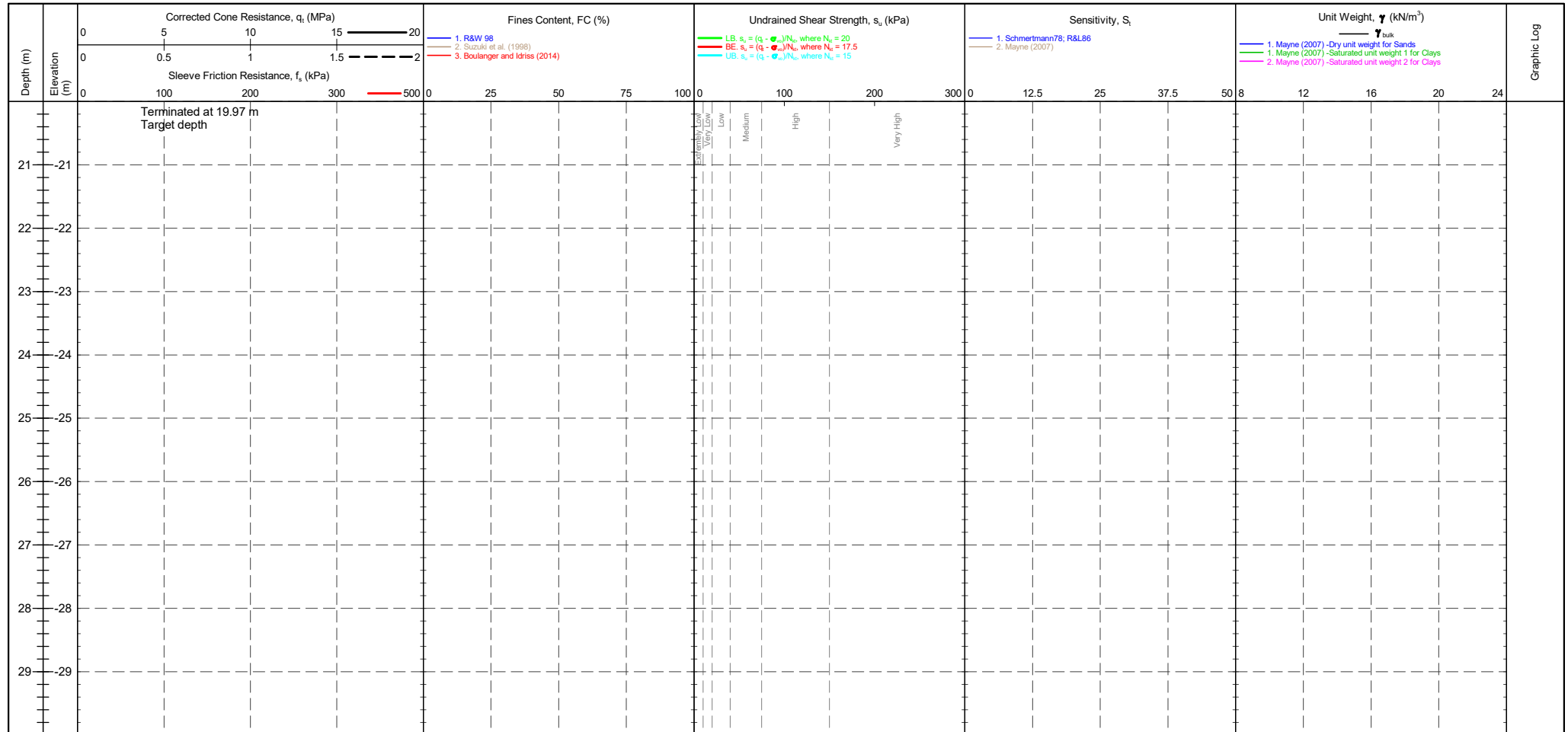
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer Pre Post Difference
Tip 247 mV 243 mV -0.043 MPa
Sleeve 257 mV 249 mV -0.006 kPa
Pore Pressure 2 301 mV 275 mV -0.006 kPa
X-Y Inclinator 2273 mV 2302 mV

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

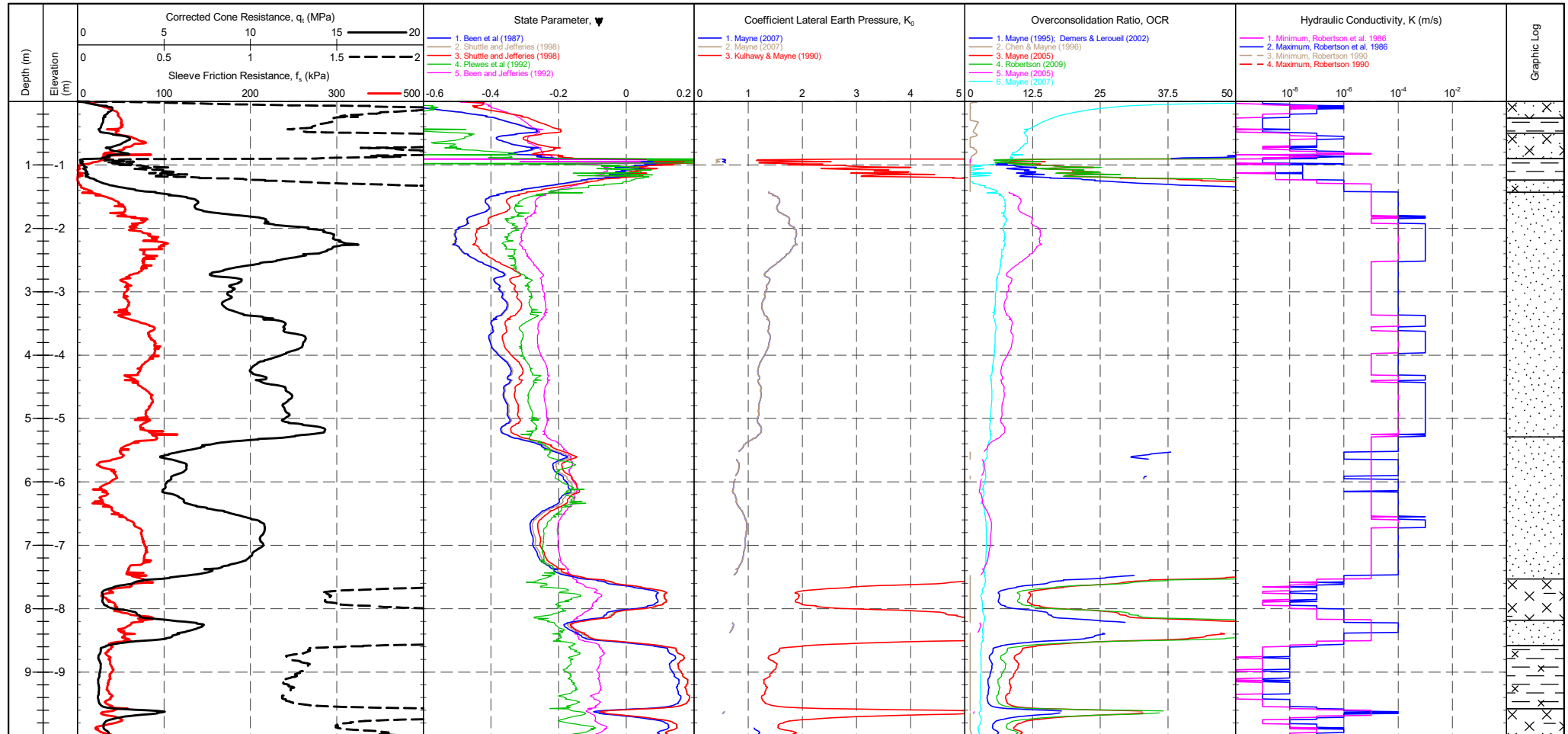
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

Groundwater Level
Dissipation Test

PointID

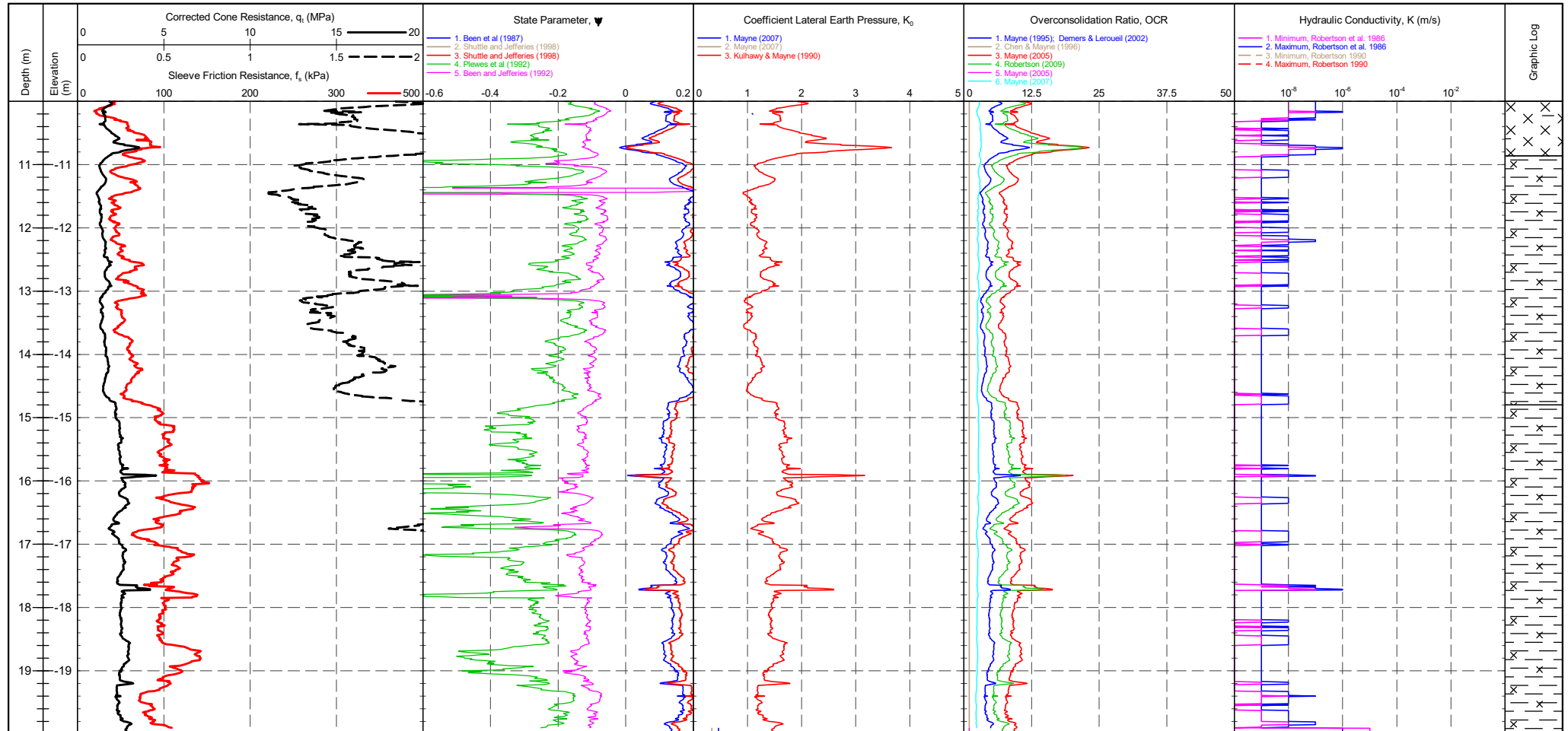
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

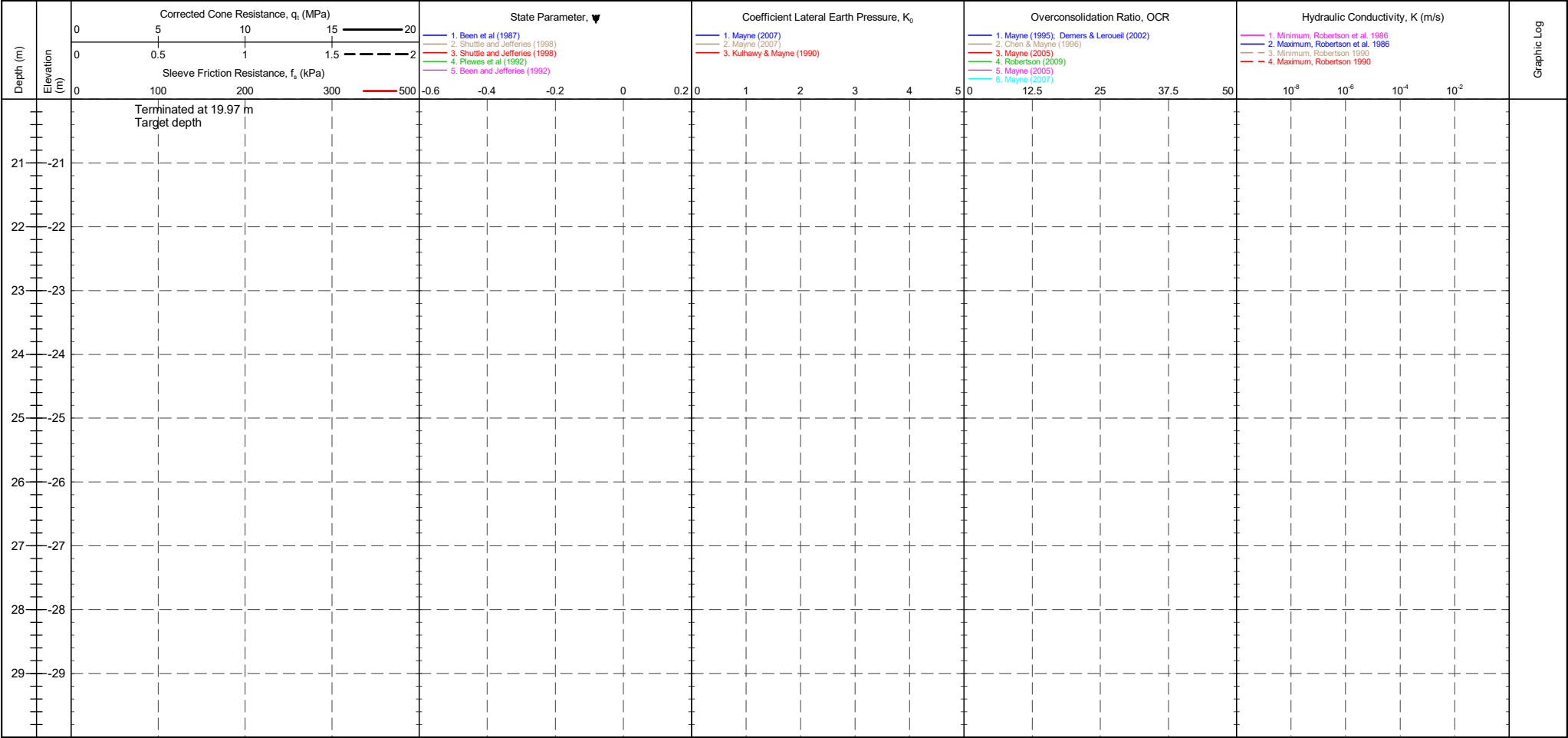
CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

Groundwater Level
Dissipation Test

PointID	CPT104
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CLIENT : LK Group PROJECT: Redwood SEN LOCATION : Rochdale PROJECT No. : 1250505	EASTING : 0.000 m NORTHING : 0.000 m ELEVATION : 0.000 m OD CHECKED BY : DW TERMINATION REASON : Target depth	Remark: Test completed at target depth.	SHEET : 3 OF 3 STATUS : Final TEST DATE : 25/11/2025 PLOT DATE : 03/12/2025 METHOD : ISO 22476-1:2022
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CONE ID : S15-CFIP.1817 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold	Transducer Pre Post Difference Tip 247 mV 243 mV -0.043 MPa Sleeve 257 mV 249 mV -0.006 kPa Pore Pressure 2 301 mV 275 mV -0.006 kPa X-Y Inclinator 2273 mV 2302 mV	CPTU ZERO VALUES	Groundwater Level Dissipation Test
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PointID

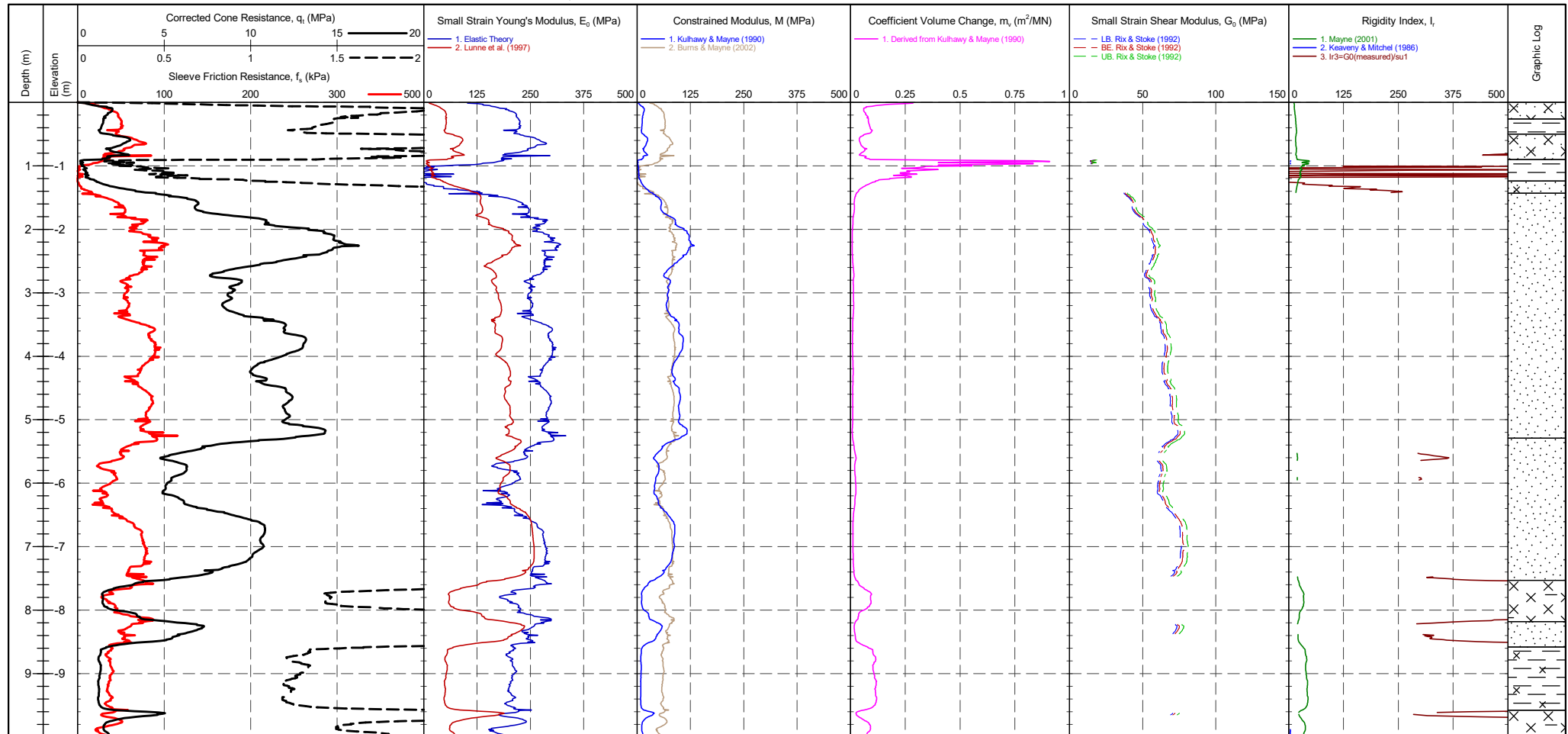
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

Groundwater Level
Dissipation Test

PointID

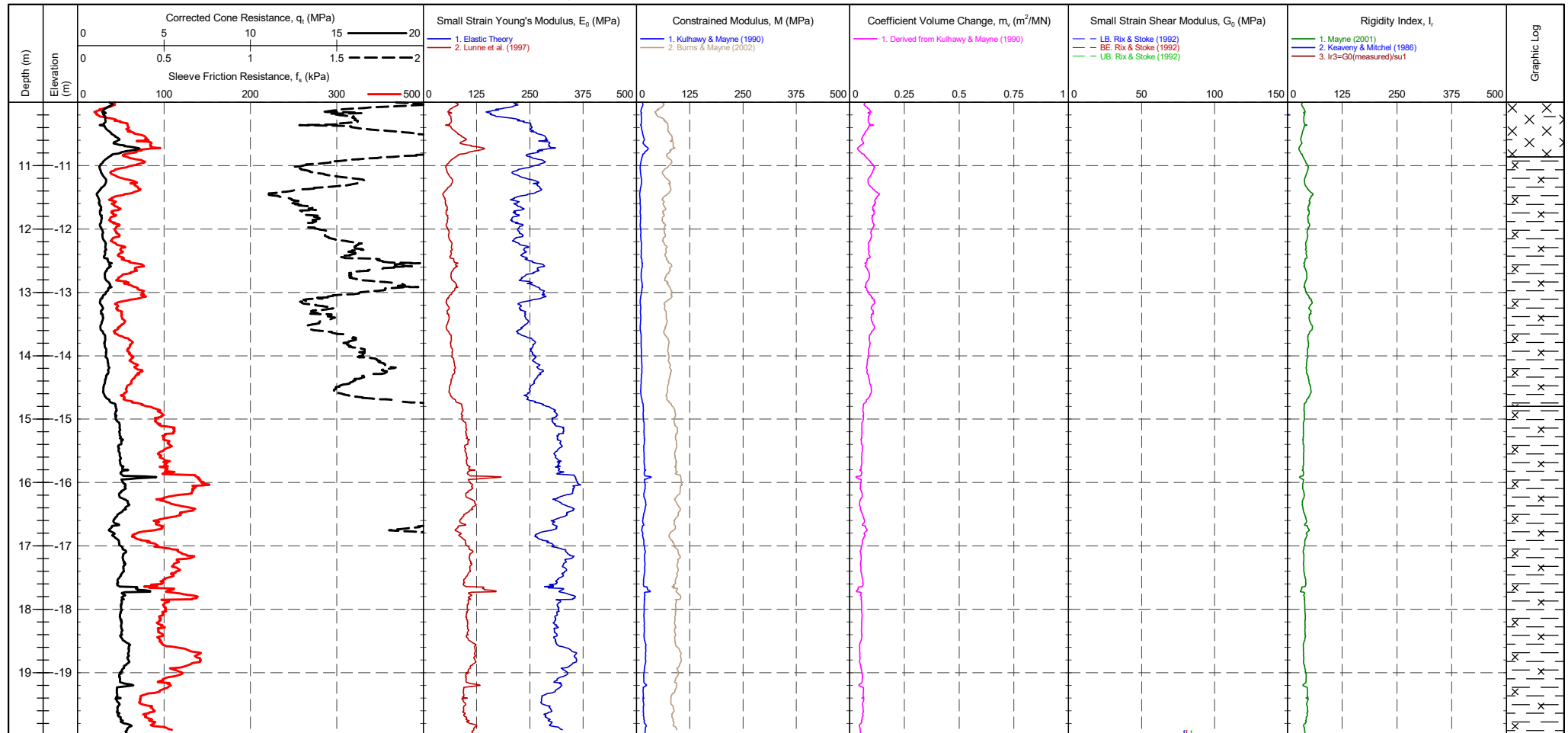
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

Groundwater Level
Dissipation Test

PointID

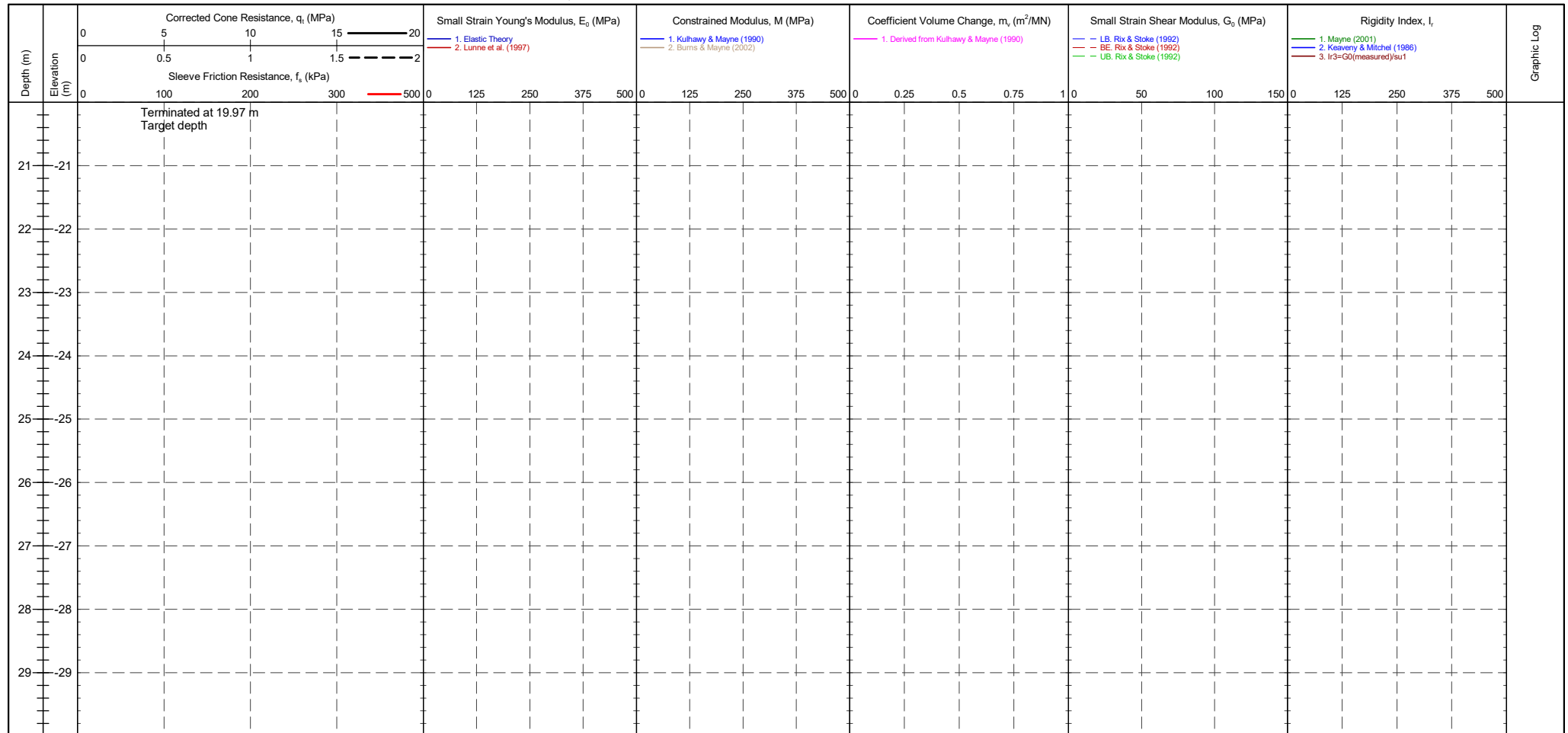
CPT104

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 25/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

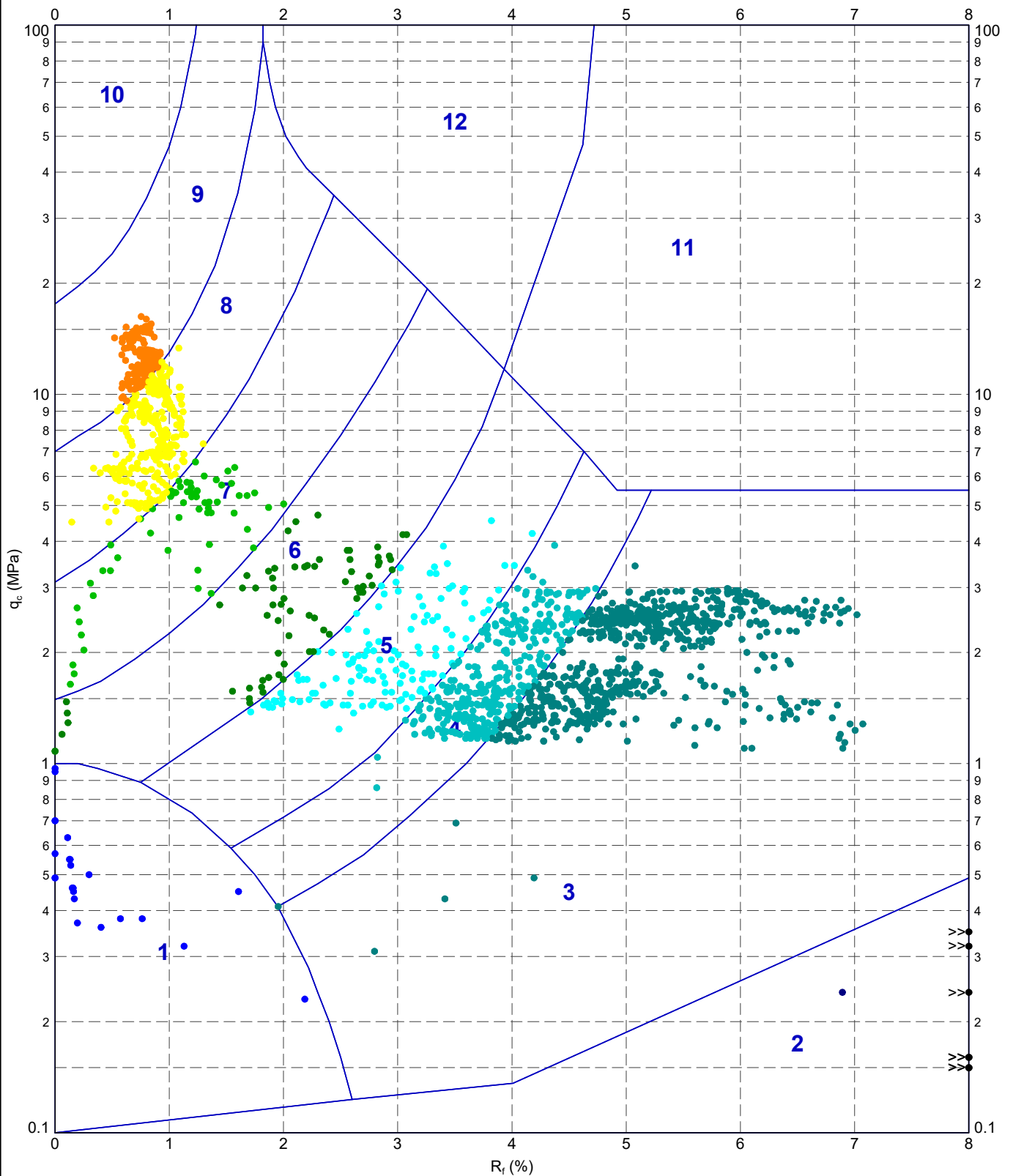
CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	247 mV	243 mV	-0.043 MPa
Sleeve	257 mV	249 mV	-0.006 kPa
Pore Pressure 2	301 mV	275 mV	-0.006 kPa
X-Y Inclinator	2273 mV	2302 mV	

Groundwater Level

Dissipation Test

220629-ADVANCED REPORT INSTITUSI 2.02.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF MAP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:30 10.03.00.08 Dattel Lab and In Situ Tool - DGD In Situ SI 2.02.0 2017-07-10 Pdf In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 q_c vs. R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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

LK Group
Rochdale
Redwood SEN
Robertson et al. 1986 q_c vs. R_f - CPT104

DRAWN

DATE

03/12/2025

CHECKED

DATE

03/12/2025

SCALE

Not To Scale

A4

PROJECT No

1250505

FIGURE No

PointID

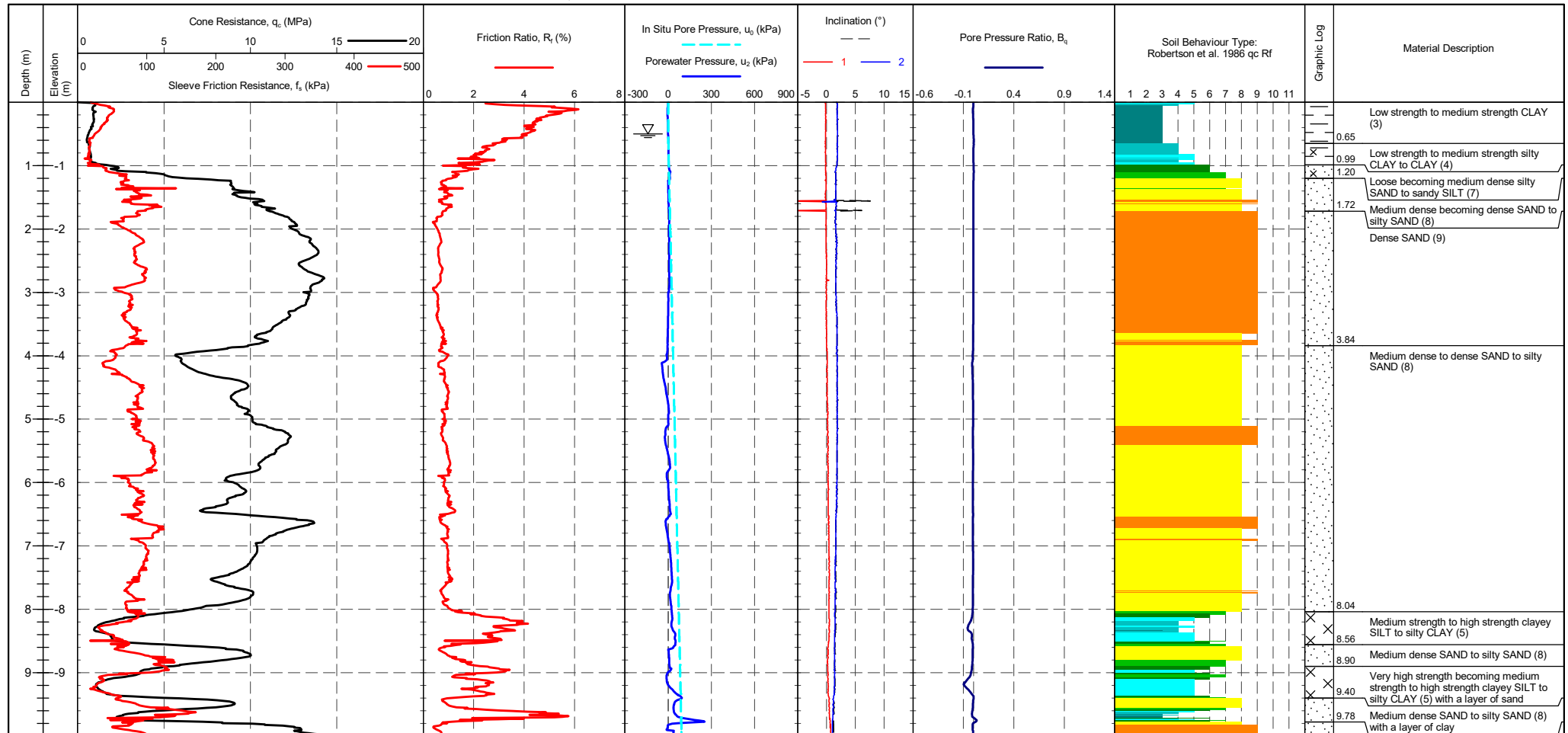
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

METHOD: Robertson et al. 1986 $q_c R_f$

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

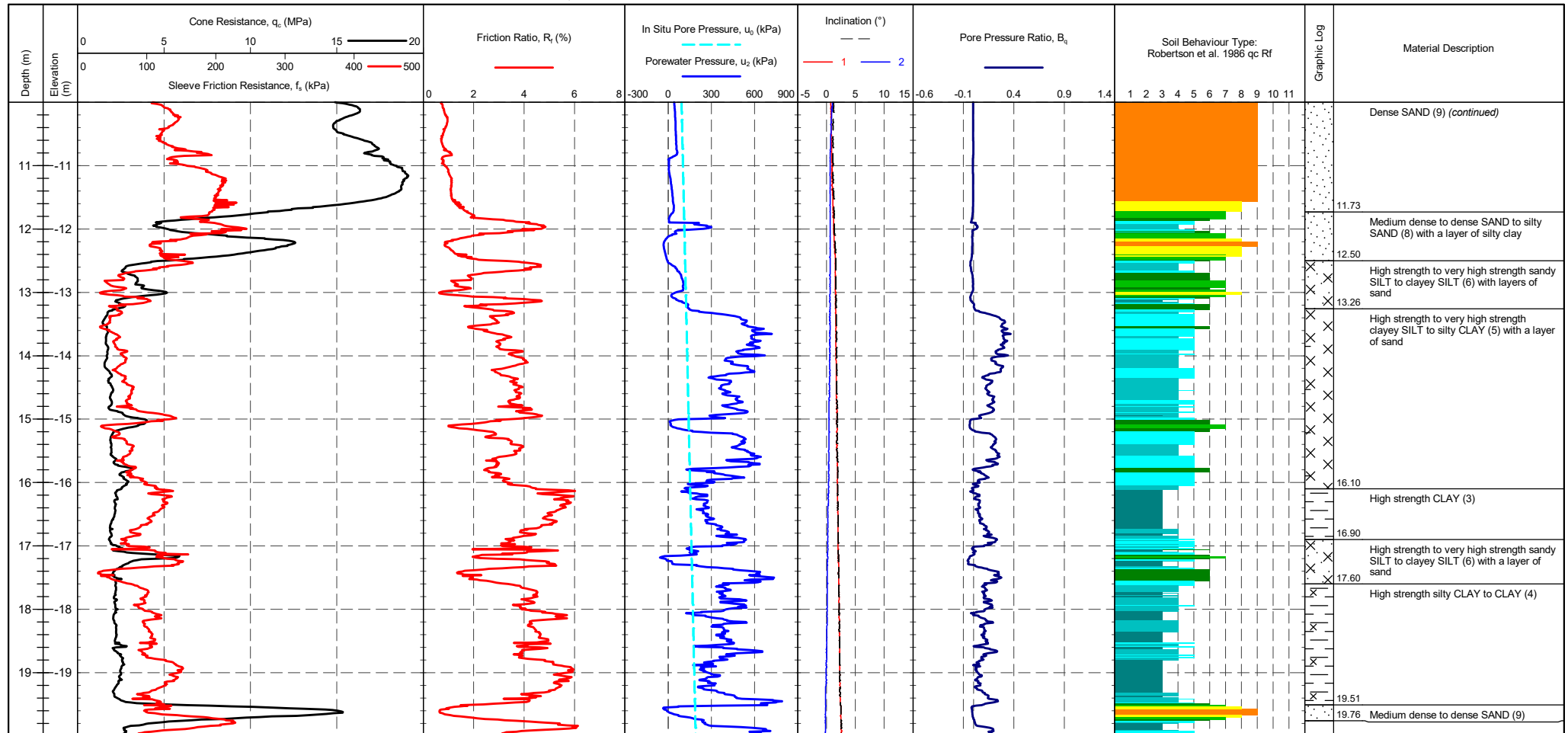
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES
Transducer Pre Post Difference
Tip 251 mV 246 mV -0.054 MPa
Sleeve 255 mV 252 mV -0.002 kPa
Pore Pressure 2 290 mV 270 mV -0.005 kPa
X-Y Inclinator 2481 mV 2459 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 - Gravely SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level
Dissipation Test

PointID

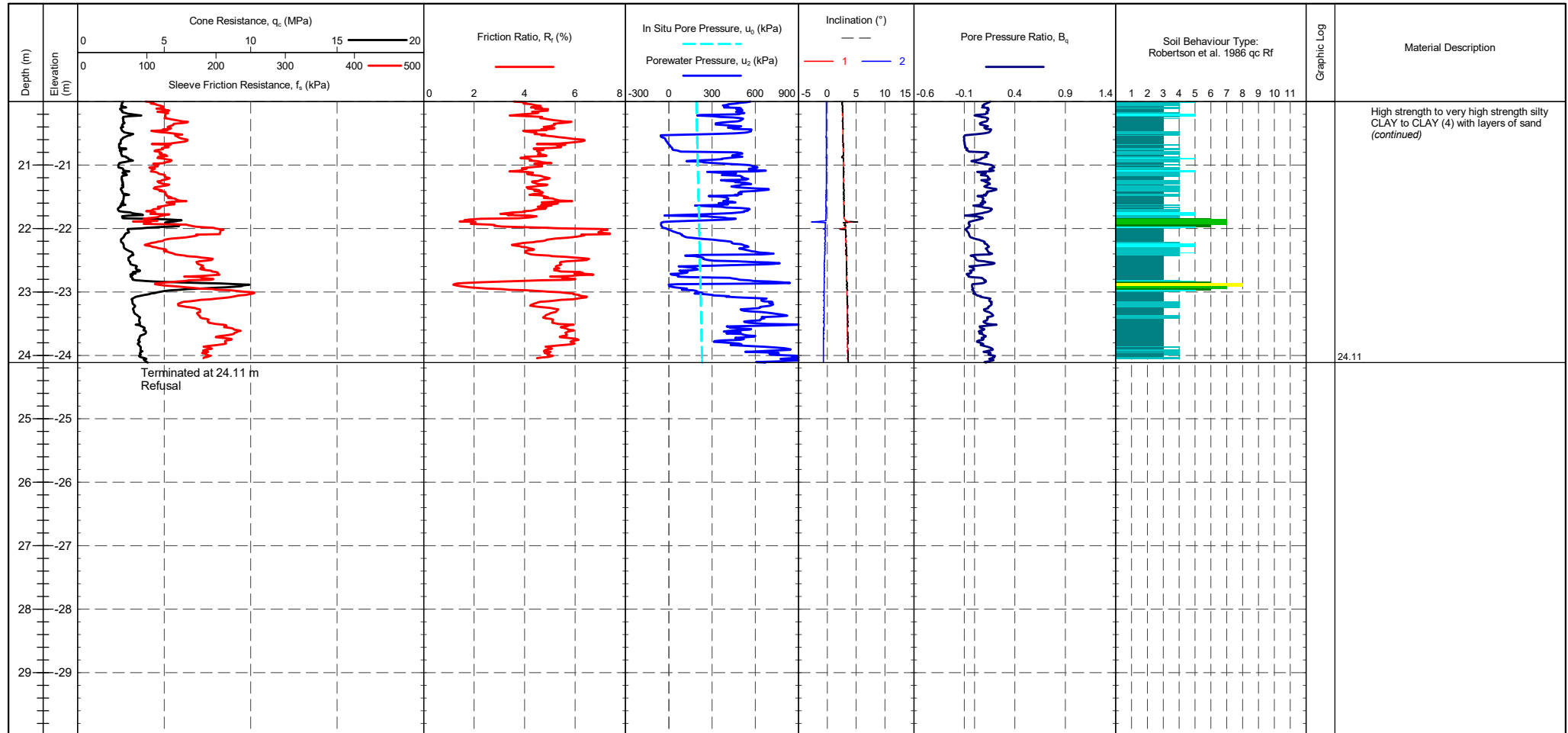
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817 CALIBRATION DATE : 11/12/2023 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold GROUNDWATER DEPTH : Assumed for calculation purposes		CPTU ZERO VALUES Transducer Pre Post Difference Tip 251 mV 246 mV -0.054 MPa Sleeve 255 mV 252 mV -0.002 kPa Pore Pressure 2 290 mV 270 mV -0.005 kPa X-Y Inclinator 2481 mV 2459 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
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PointID

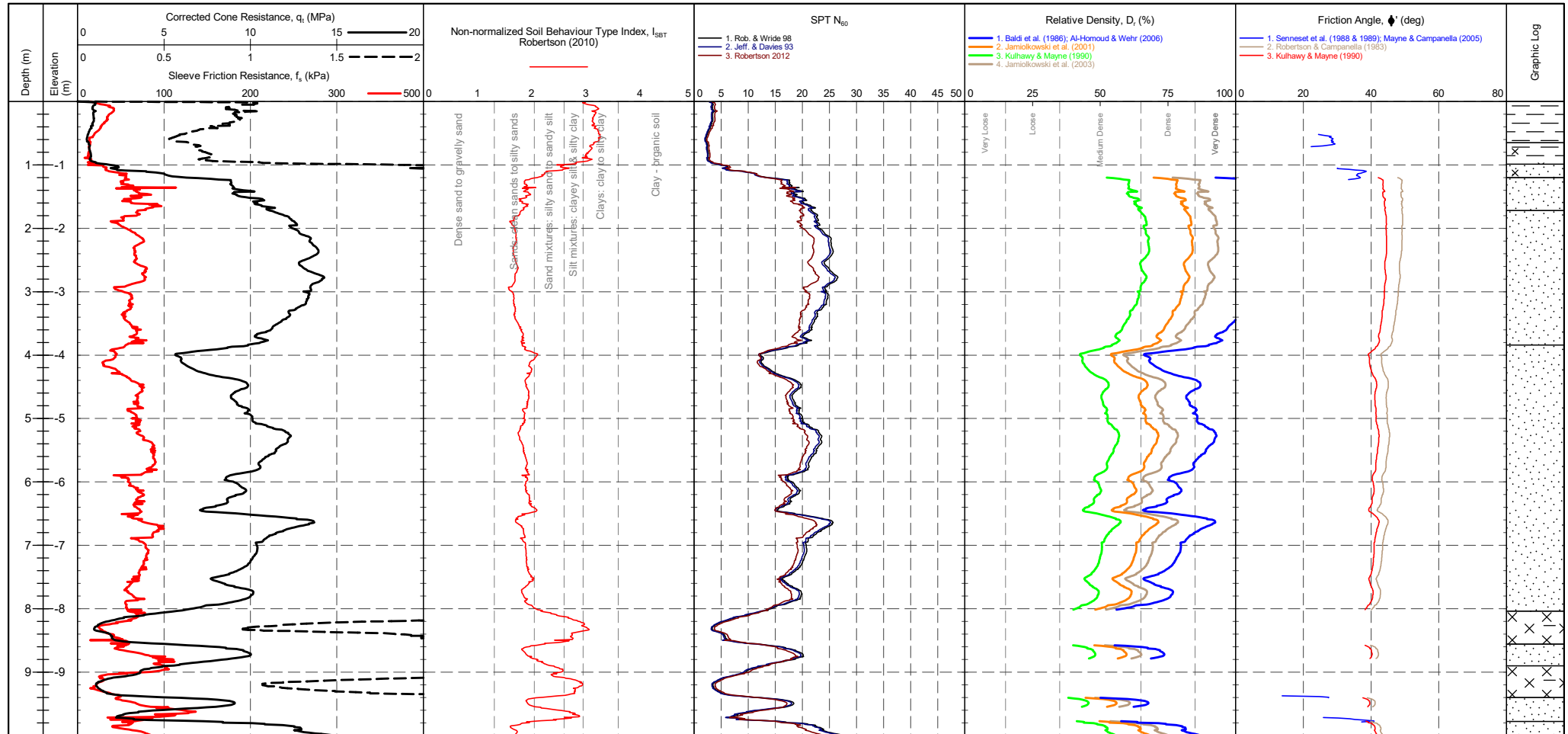
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

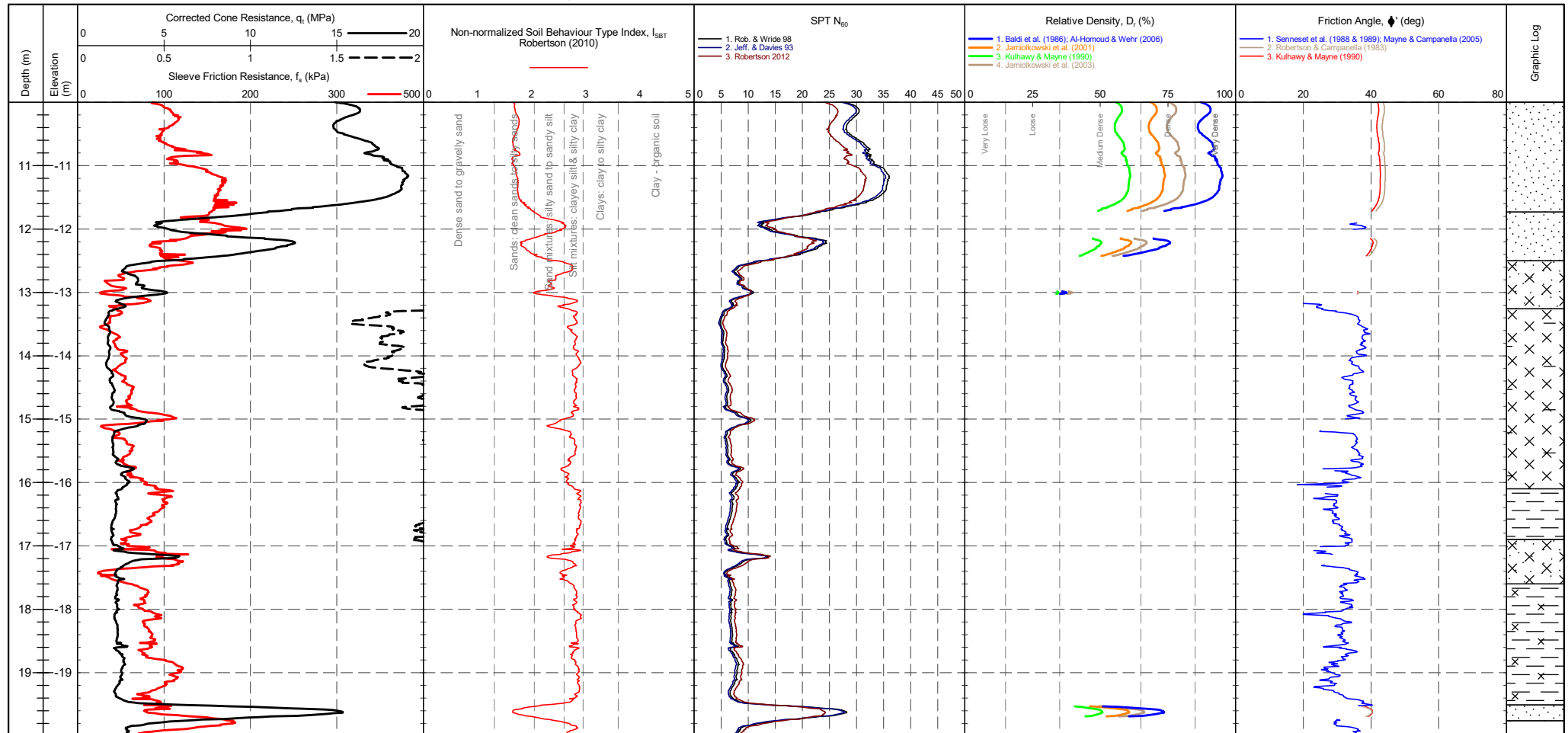
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
251 mV	246 mV	-0.054 MPa
255 mV	252 mV	-0.002 kPa
290 mV	270 mV	-0.005 kPa
2481 mV	2459 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

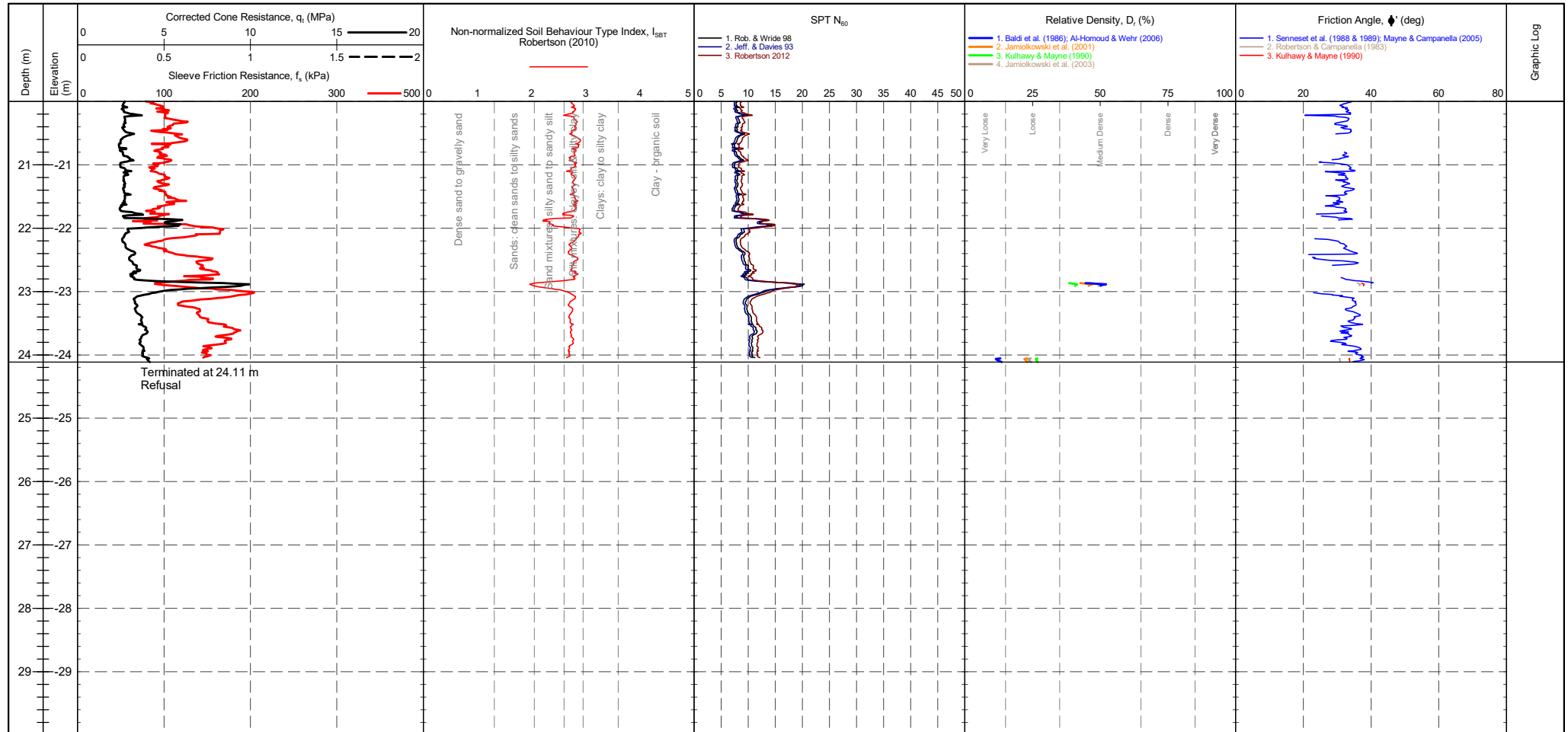
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre :
Post :
Difference :
251 mV : 246 mV : -0.054 MPa
255 mV : 252 mV : -0.002 kPa
290 mV : 270 mV : -0.005 kPa
2481 mV : 2459 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	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

PointID

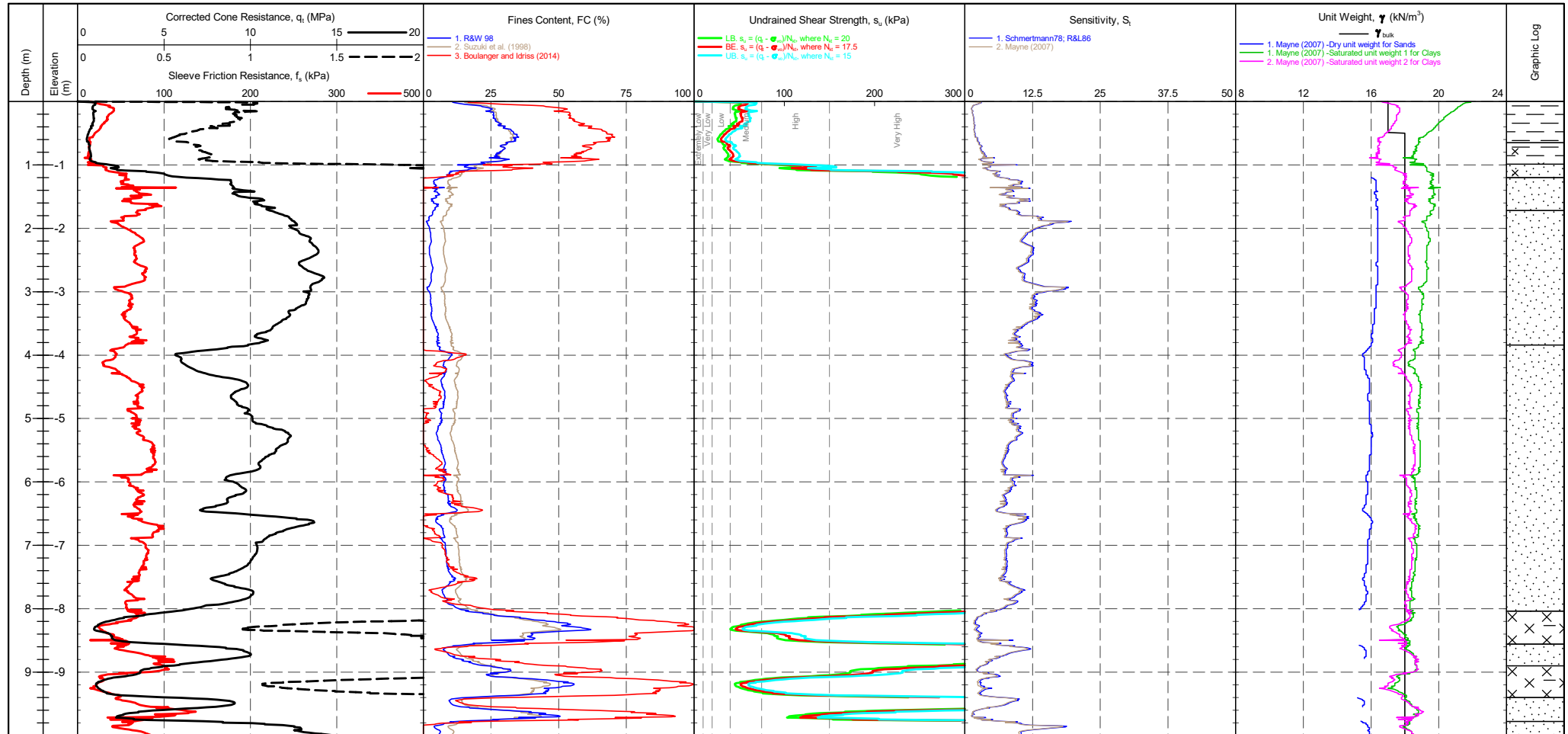
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
251 mV
255 mV
290 mV
2481 mV

Post
246 mV
252 mV
270 mV
2459 mV

Difference
-0.054 MPa
-0.002 kPa
-0.005 kPa

CPTU ZERO VALUES

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

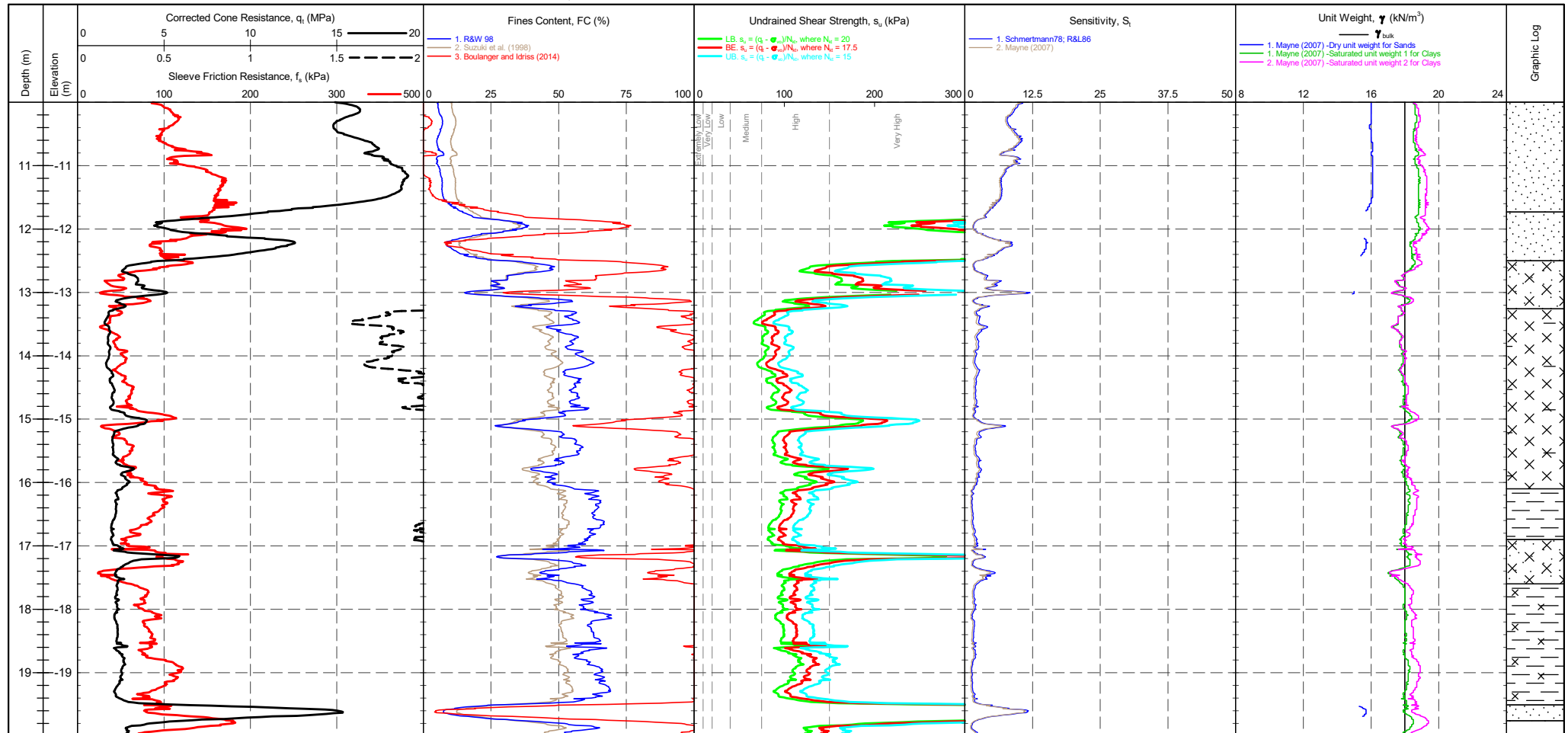
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
251 mV
255 mV
290 mV
2481 mV

Post
246 mV
252 mV
270 mV
2459 mV

Difference
-0.054 MPa
-0.002 kPa
-0.005 kPa

CPTU ZERO VALUES

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

PointID

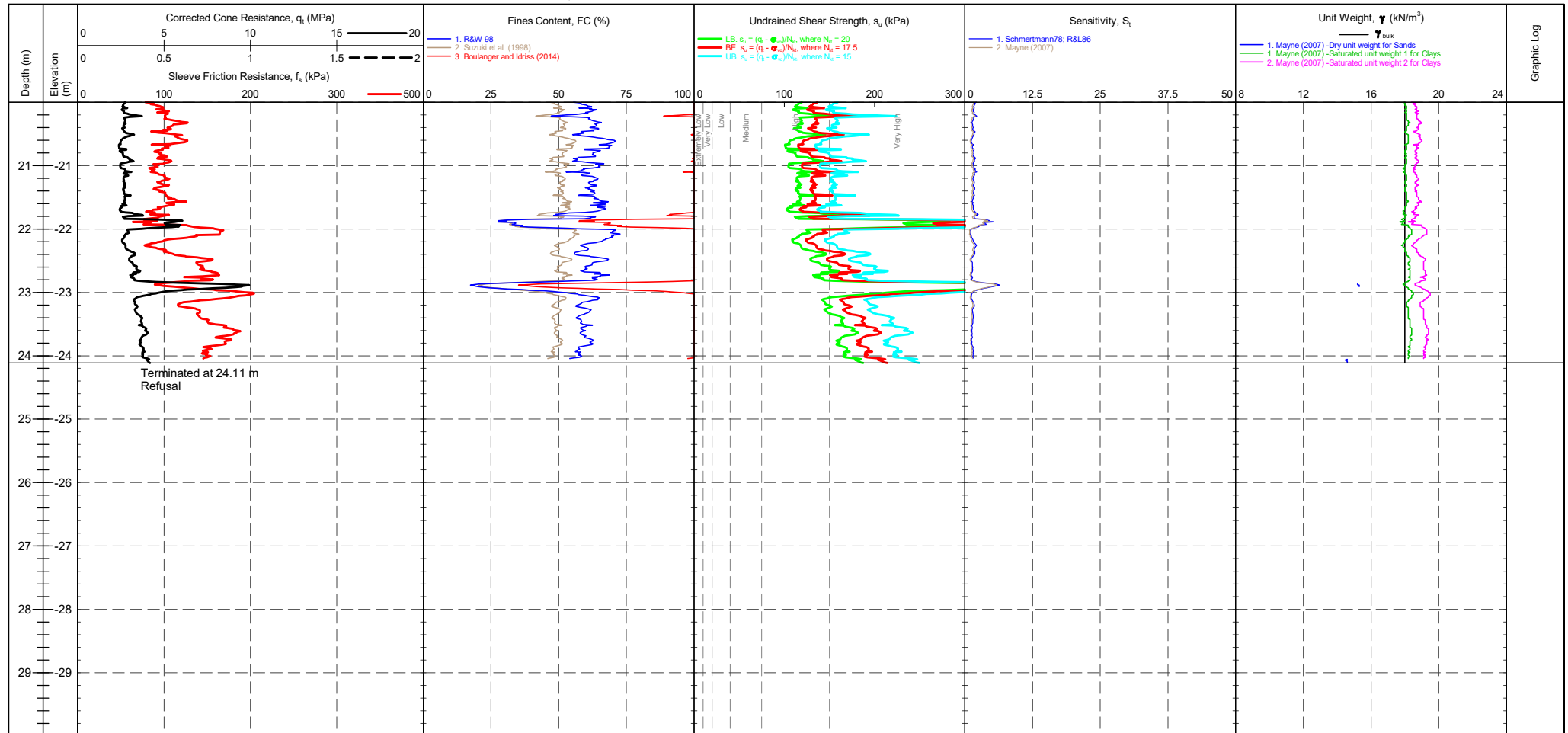
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer

Pre	Post	Difference
Tip	251 mV	246 mV
Sleeve	255 mV	252 mV
Pore Pressure 2	290 mV	270 mV
X-Y Inclinator	2481 mV	2459 mV

CPTU ZERO VALUES

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

PointID

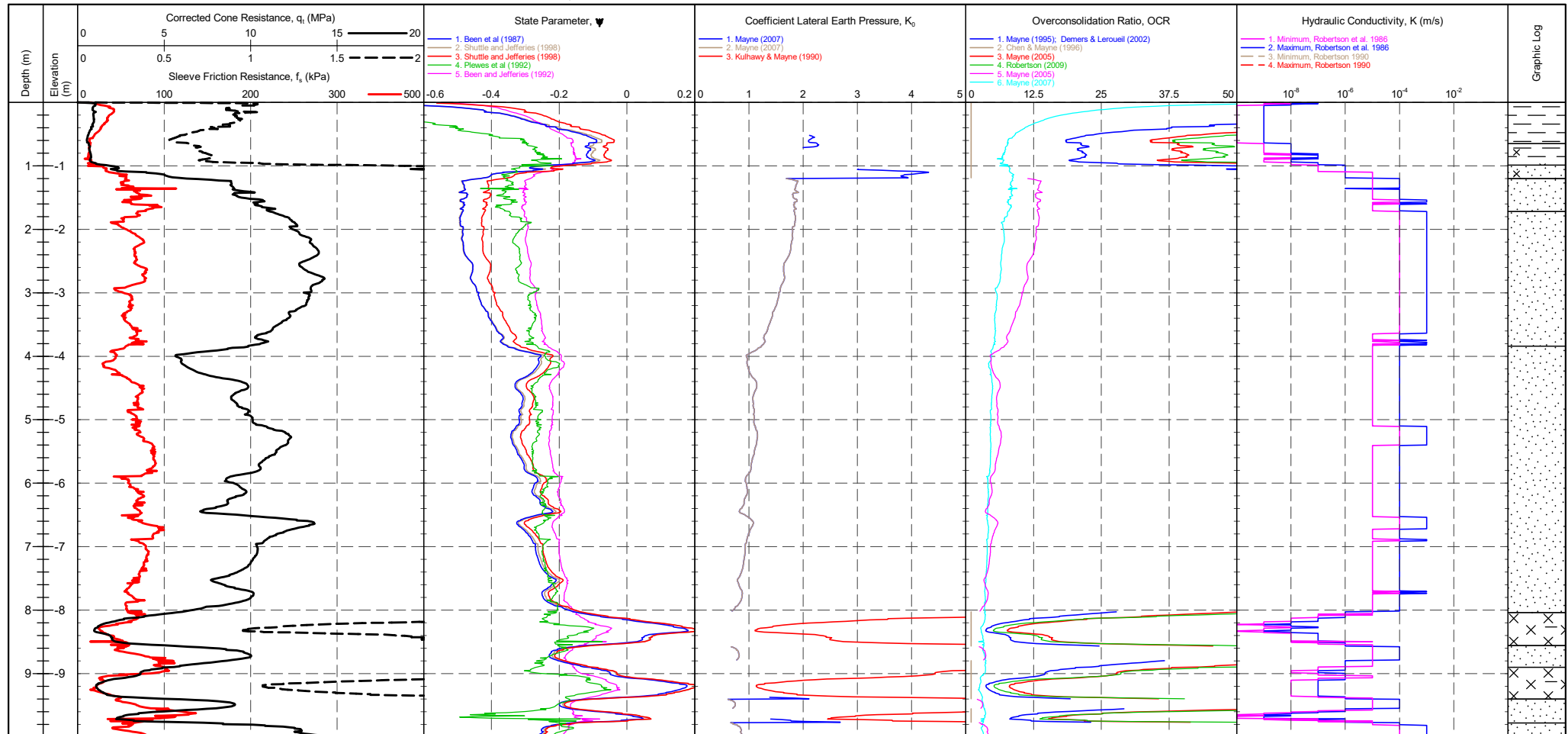
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

Groundwater Level
Dissipation Test

PointID

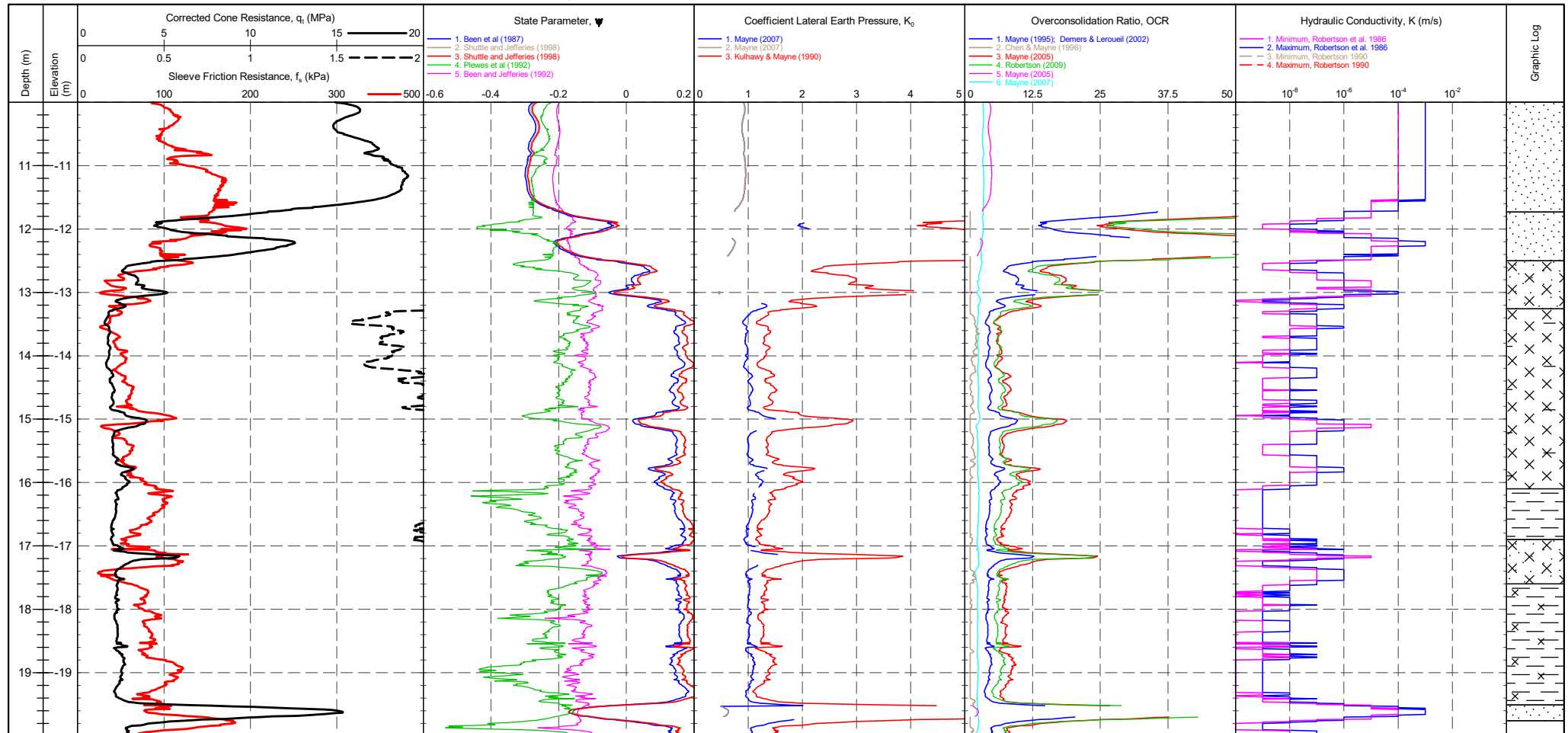
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

Groundwater Level
Dissipation Test

PointID

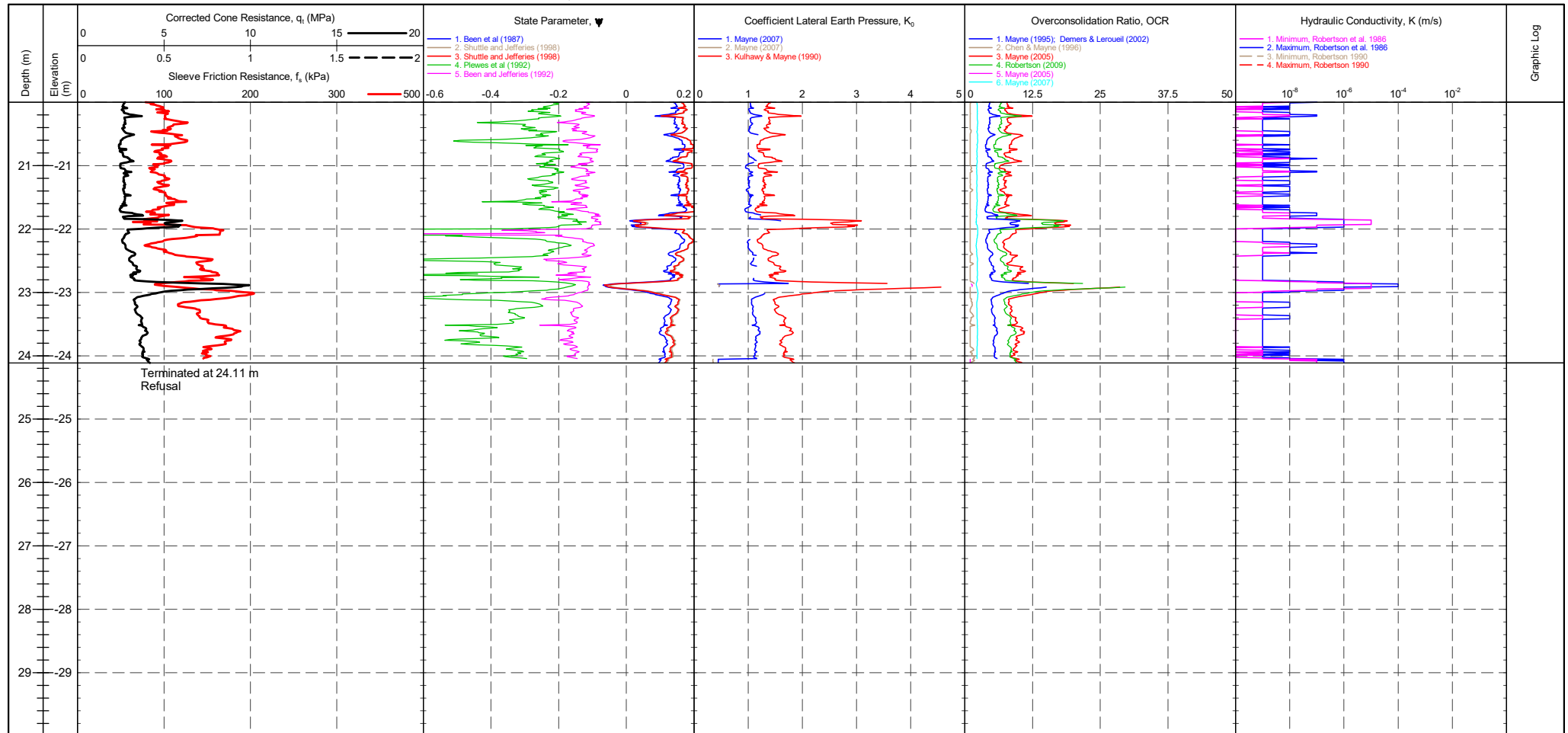
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

Groundwater Level
Dissipation Test

PointID

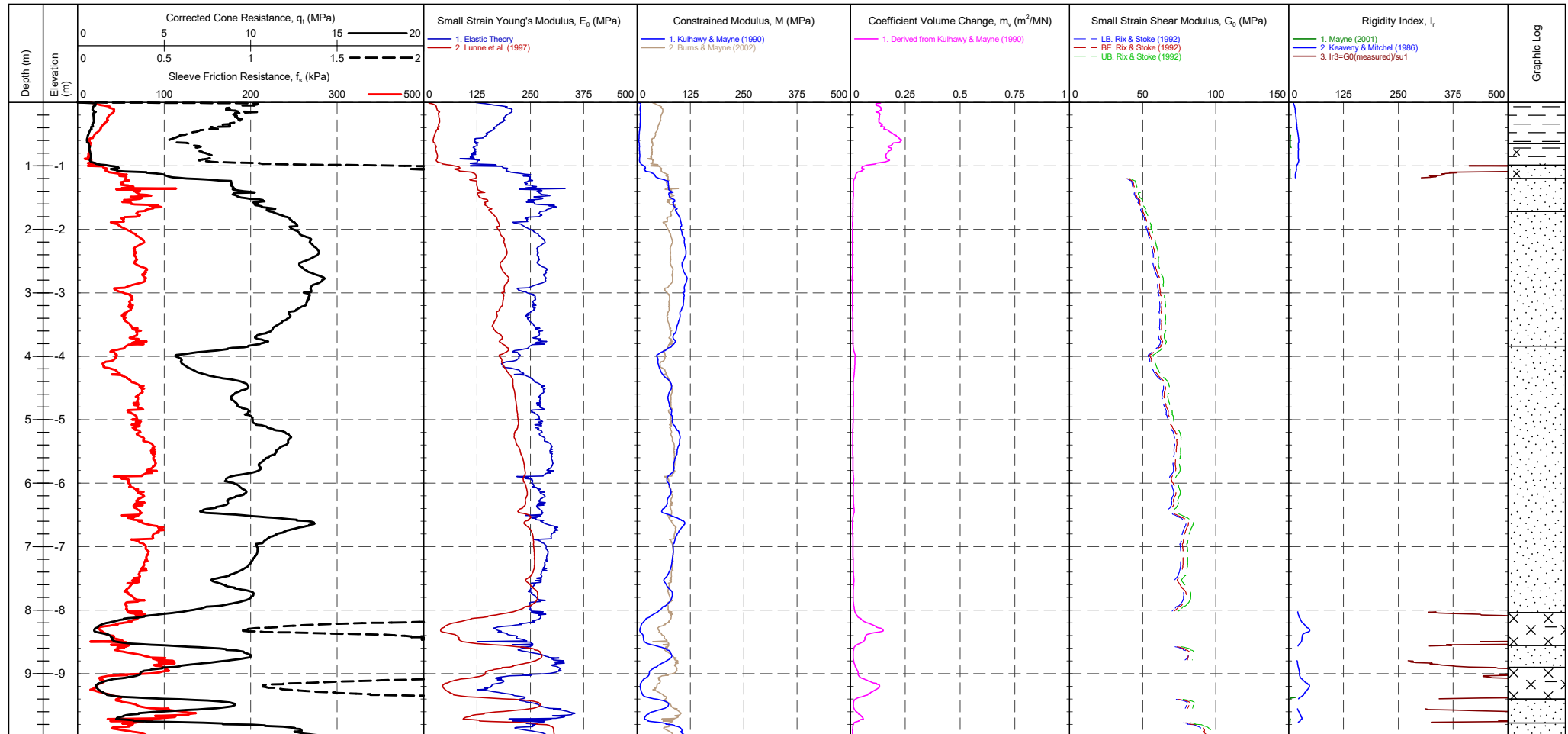
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

Groundwater Level
Dissipation Test

PointID

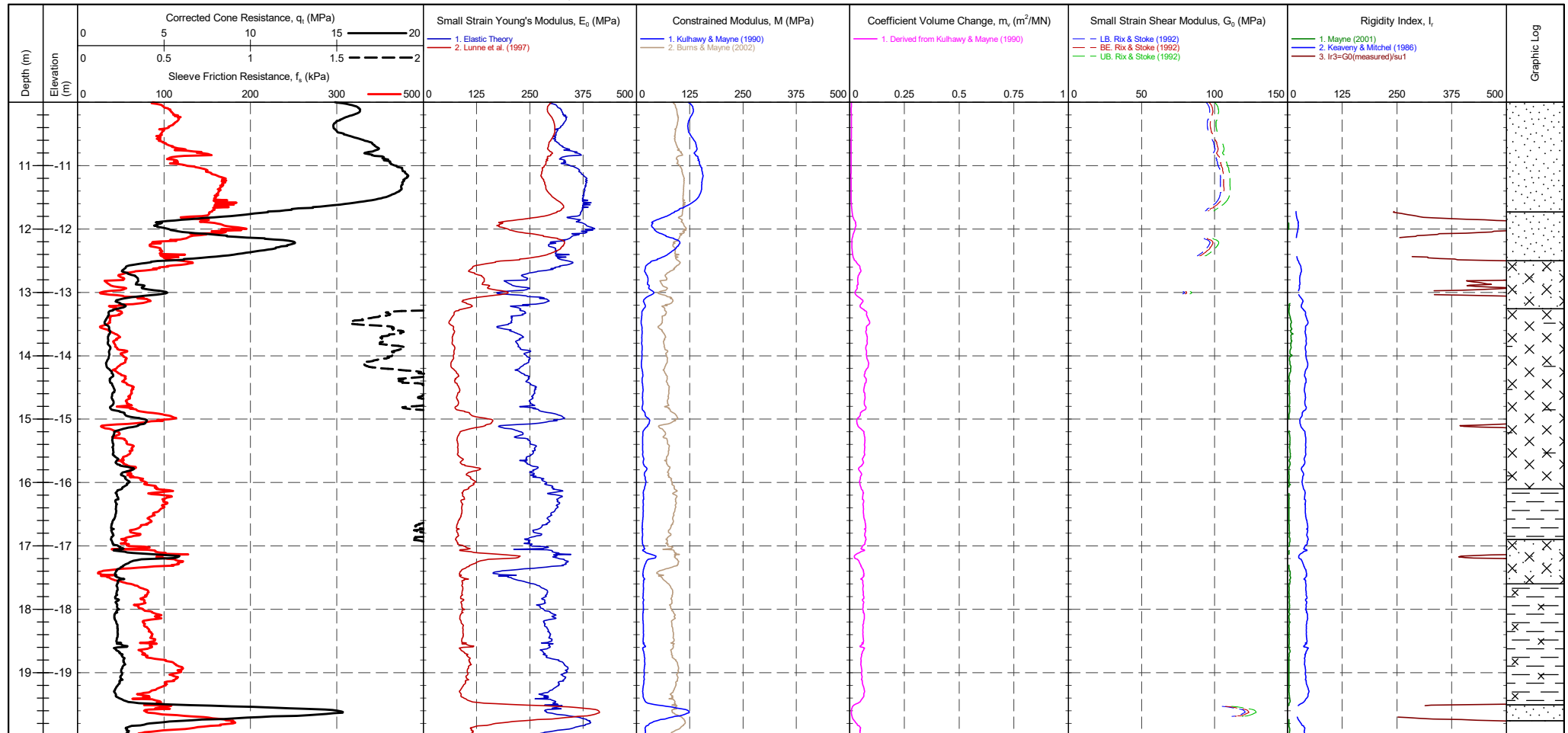
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

Groundwater Level
Dissipation Test

PointID

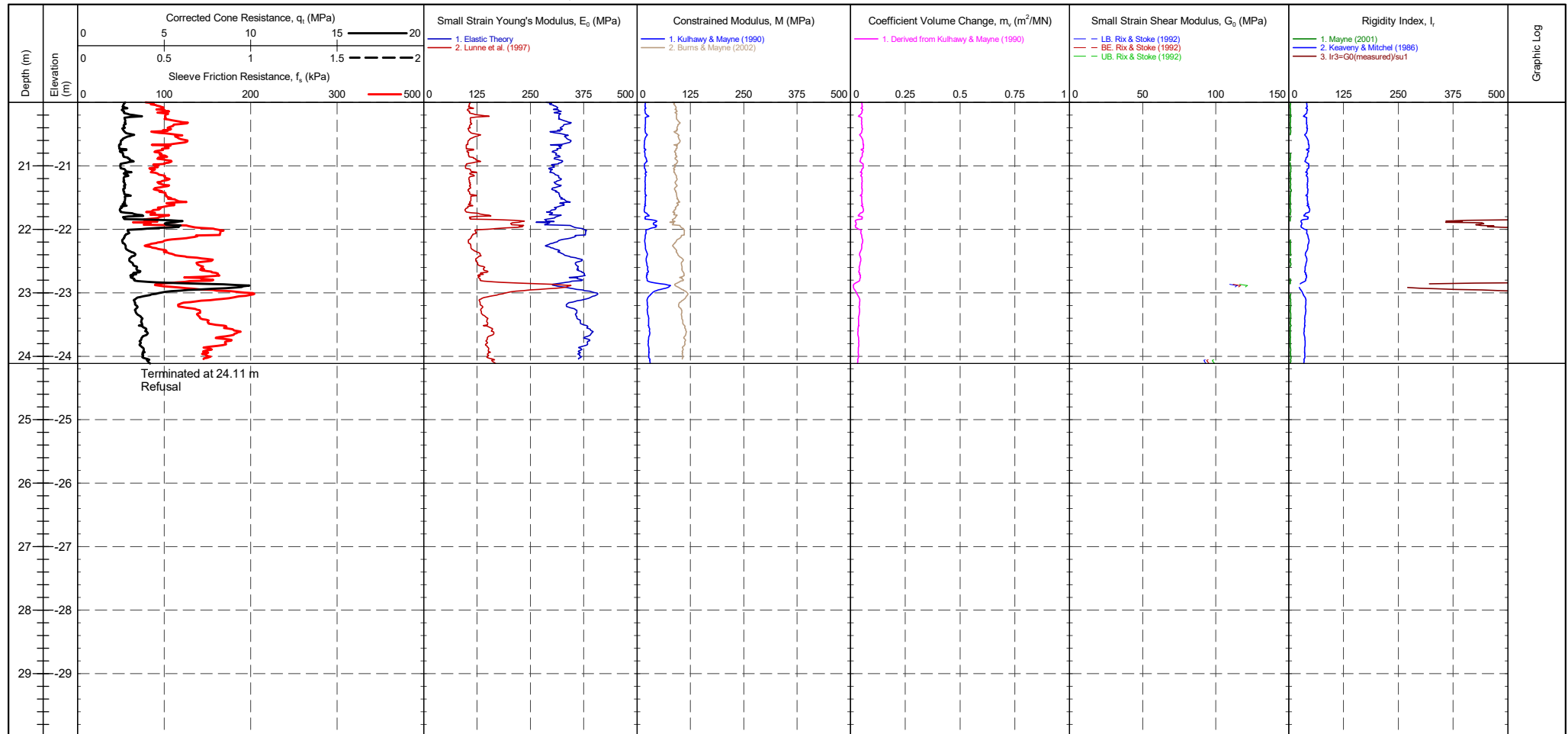
CPT105

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CONE MODEL : Subtraction
CONE AREA : 15cm^2
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

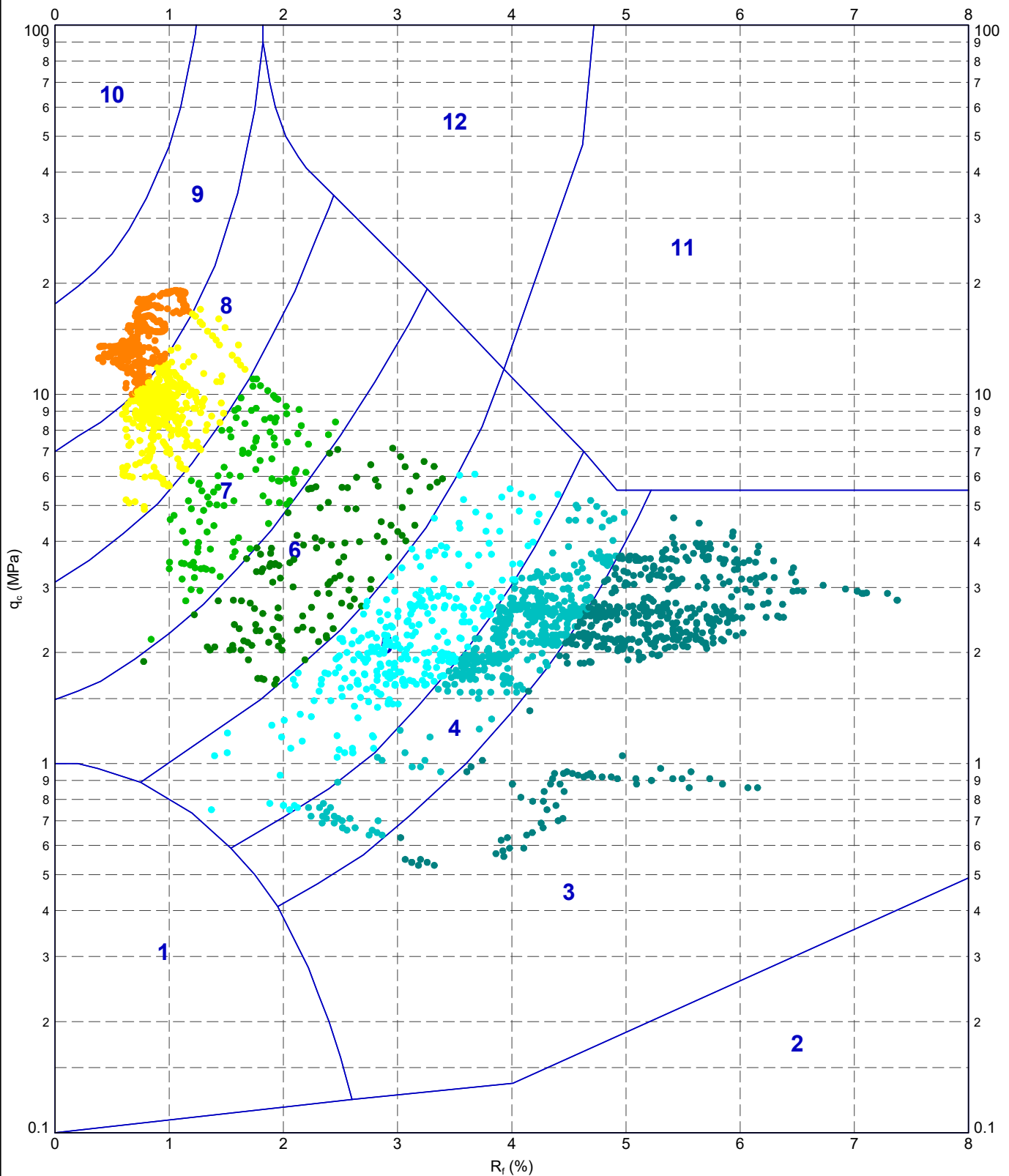
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	251 mV	246 mV	-0.054 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	290 mV	270 mV	-0.005 kPa
X-Y Inclinator	2481 mV	2459 mV	

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:33 10.03.00.08 Dattel Lab and In Situ Tool - DGO Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10



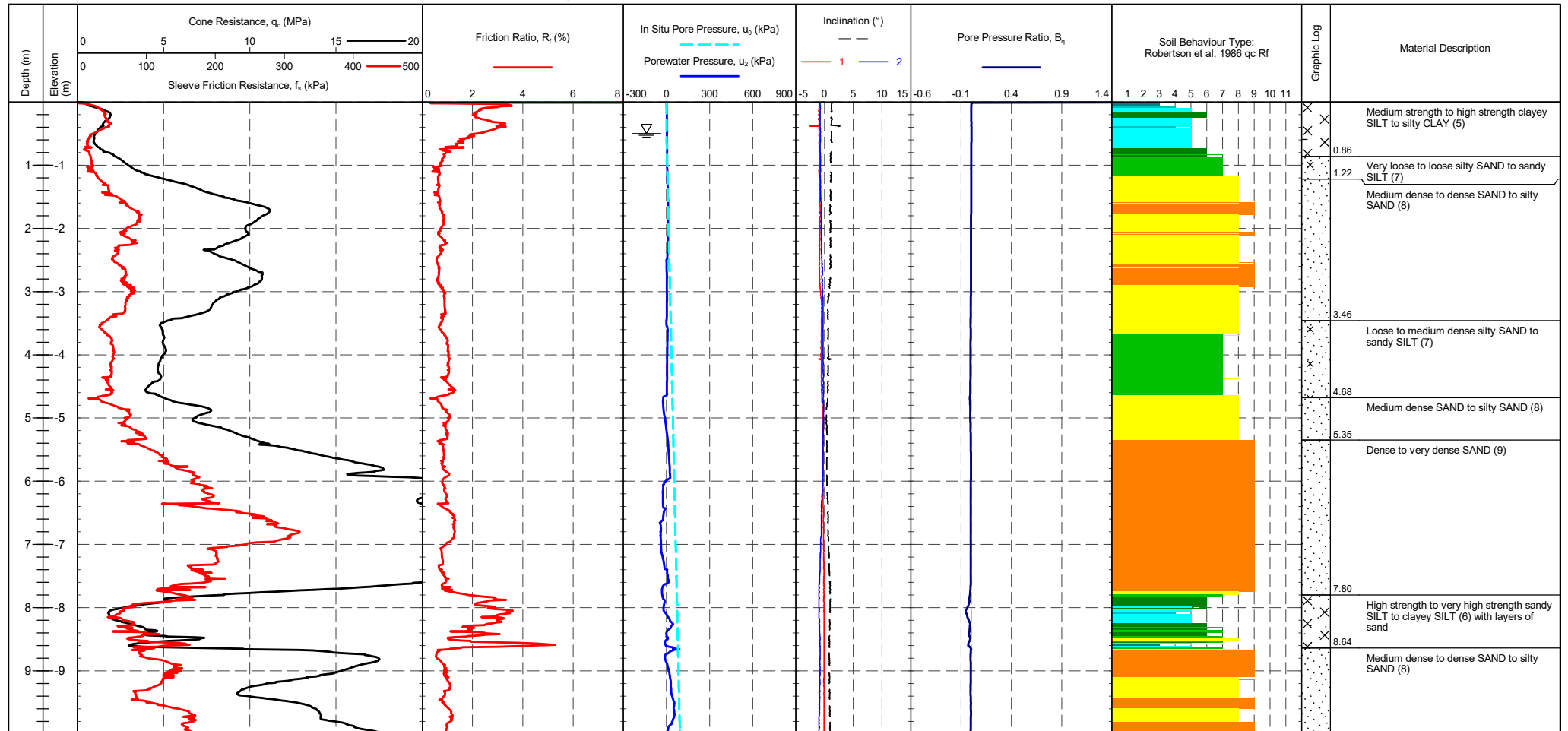
METHOD: Robertson et al. 1986 qc Rf

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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 |

	TITLE LK Group Rochdale Redwood SEN Robertson et al. 1986 qc vs. Rf - CPT105	DRAWN	DATE 03/12/2025
		CHECKED	DATE 03/12/2025
		SCALE Not To Scale	A4
		PROJECT No 1250505	FIGURE No

PointID

CPT106

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : RefusalRemark:
Test refused on total pressure.SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPETEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposesCPTU ZERO VALUES
Transducer Pre Post Difference
Tip 250 mV 247 mV -0.032 MPa
Sleeve 255 mV 251 mV -0.003 kPa
Pore Pressure 2 270 mV 252 mV -0.004 kPa
X-Y Inclinator 2343 mV 2402 mV

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

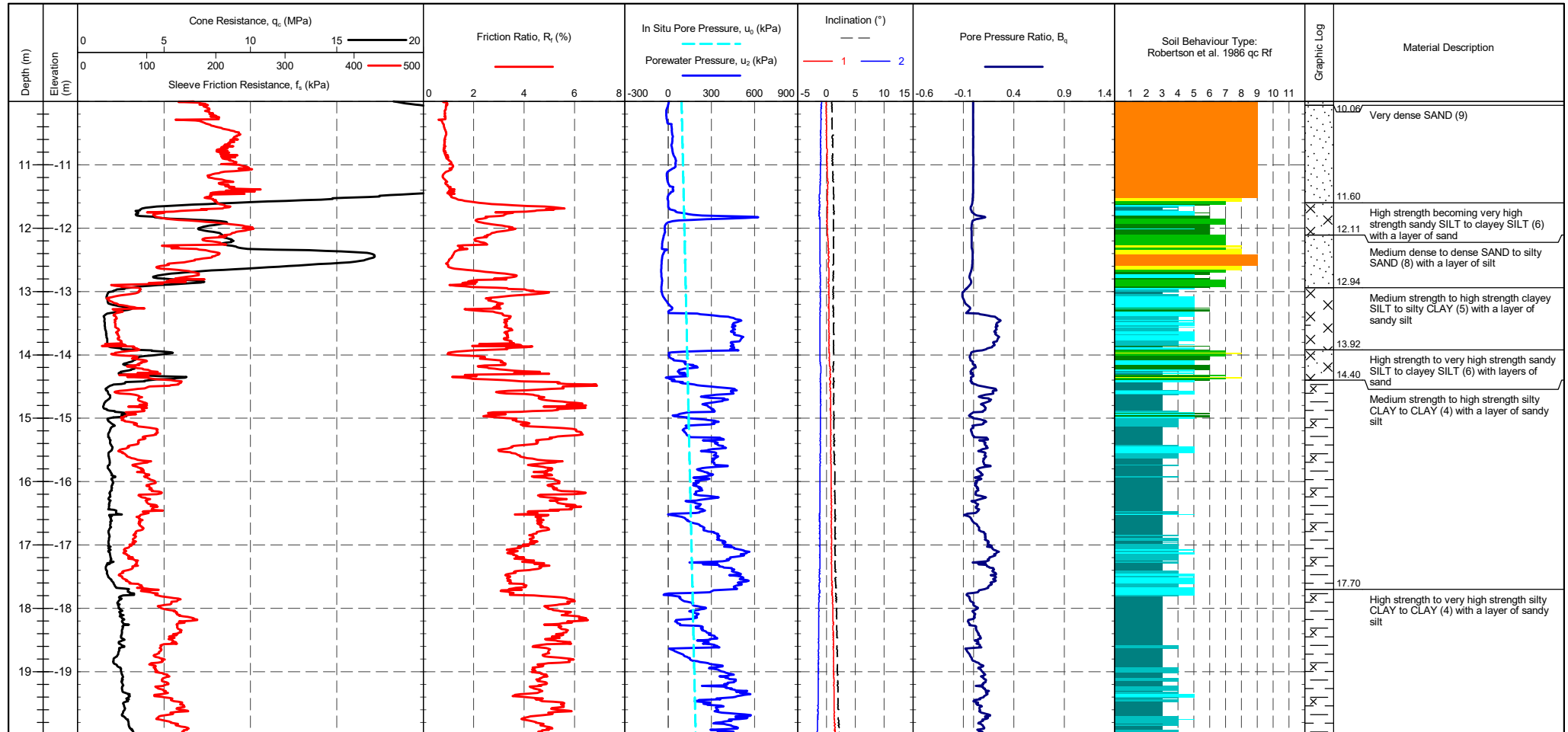
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

METHOD: Robertson et al. 1986 $q_c R_f$

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level
Dissipation Test

PointID

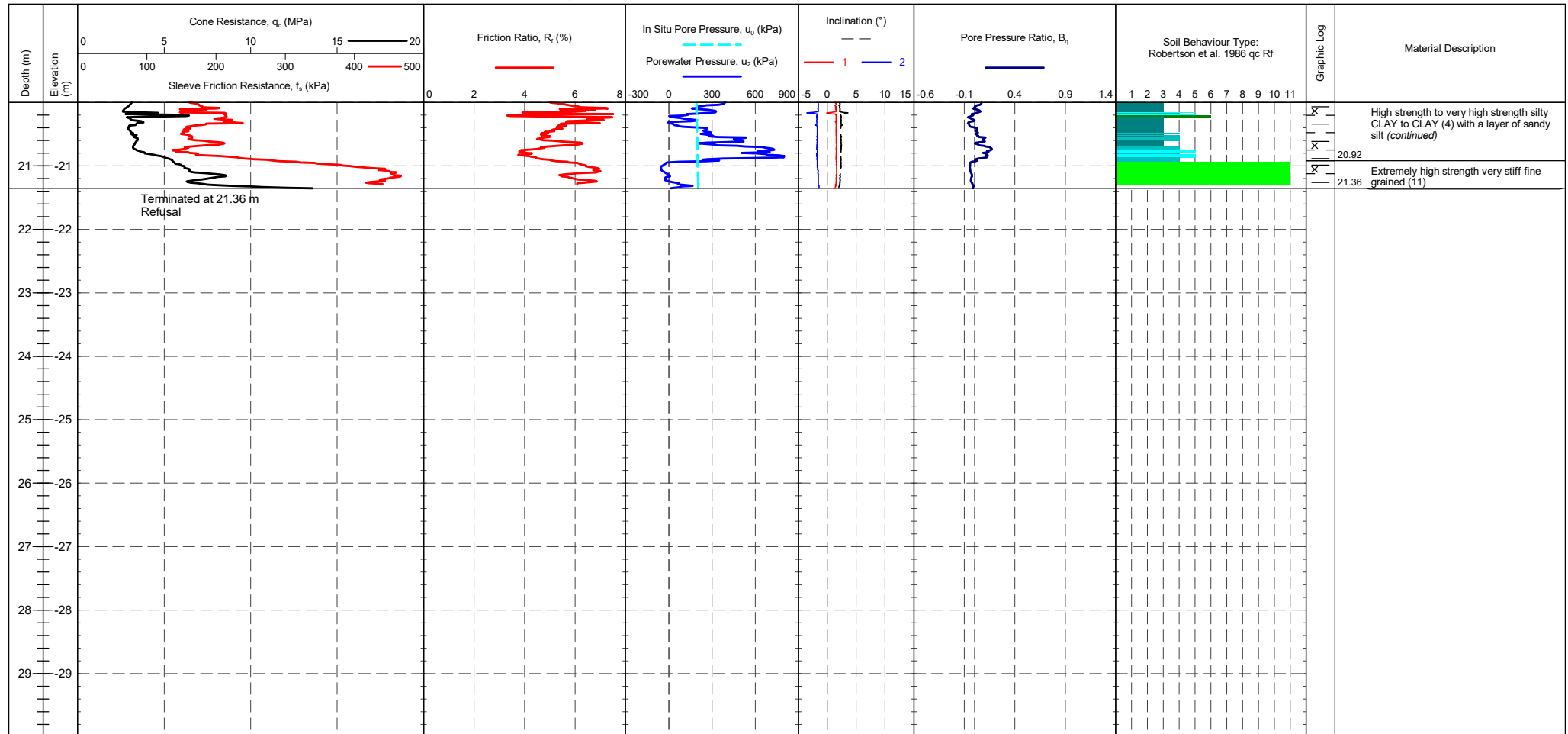
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817	TEST TYPE : TE2	CPTU ZERO VALUES				METHOD: Robertson et al. 1986 qc Rf				Groundwater Level Dissipation Test
CALIBRATION DATE : 11/12/2023	APPLICATION CLASS : 2	Transducer	Pre	Post	Difference	1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND		
CONE MODEL : Subtraction	RIG : CPT 017 - Griffen	Tip	250 mV	247 mV	-0.032 MPa	2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND		
CONE AREA : 15cm ²	OPERATOR : TR	Sleeve	255 mV	251 mV	-0.003 kPa	3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained		
CONE AREA RATIO : 0.79	FRICTION REDUCER : None	Pore Pressure 2	270 mV	252 mV	-0.004 kPa	4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND		
FILTER POSITION : u2	WEATHER : Sunny & Cold	X-Y Inclinator	2343 mV	2402 mV						
FILTER TYPE : HDPE	GROUNDWATER DEPTH : Assumed for calculation purposes									

PointID

CPT106

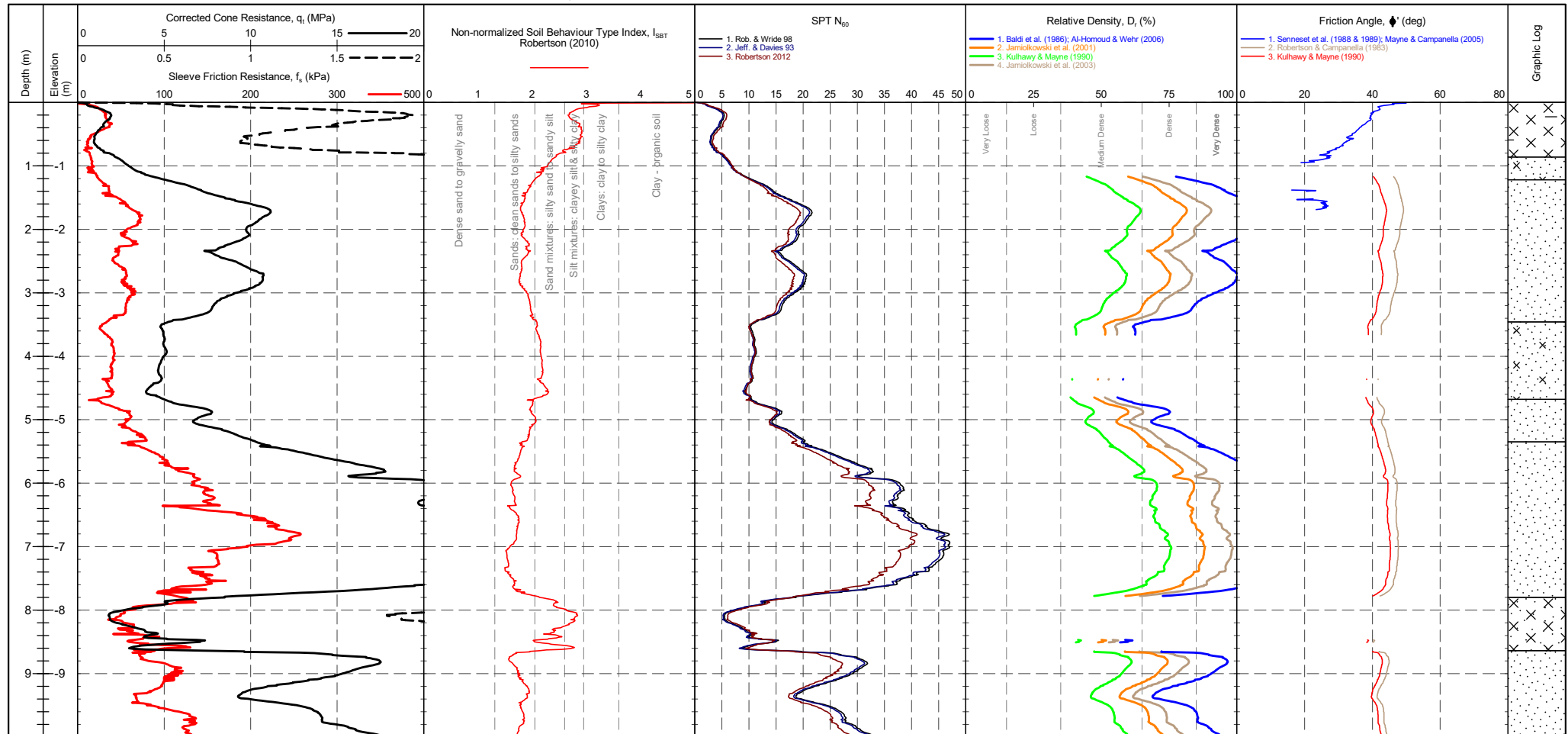
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
 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 017 - Griffen
OPERATOR	: TR
FRICTION REDUCER	: None
WEATHER	: Sunny & Cold

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12				
Description	SBT Index, I _c	Description	SPt N value, NSPT	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

PointID

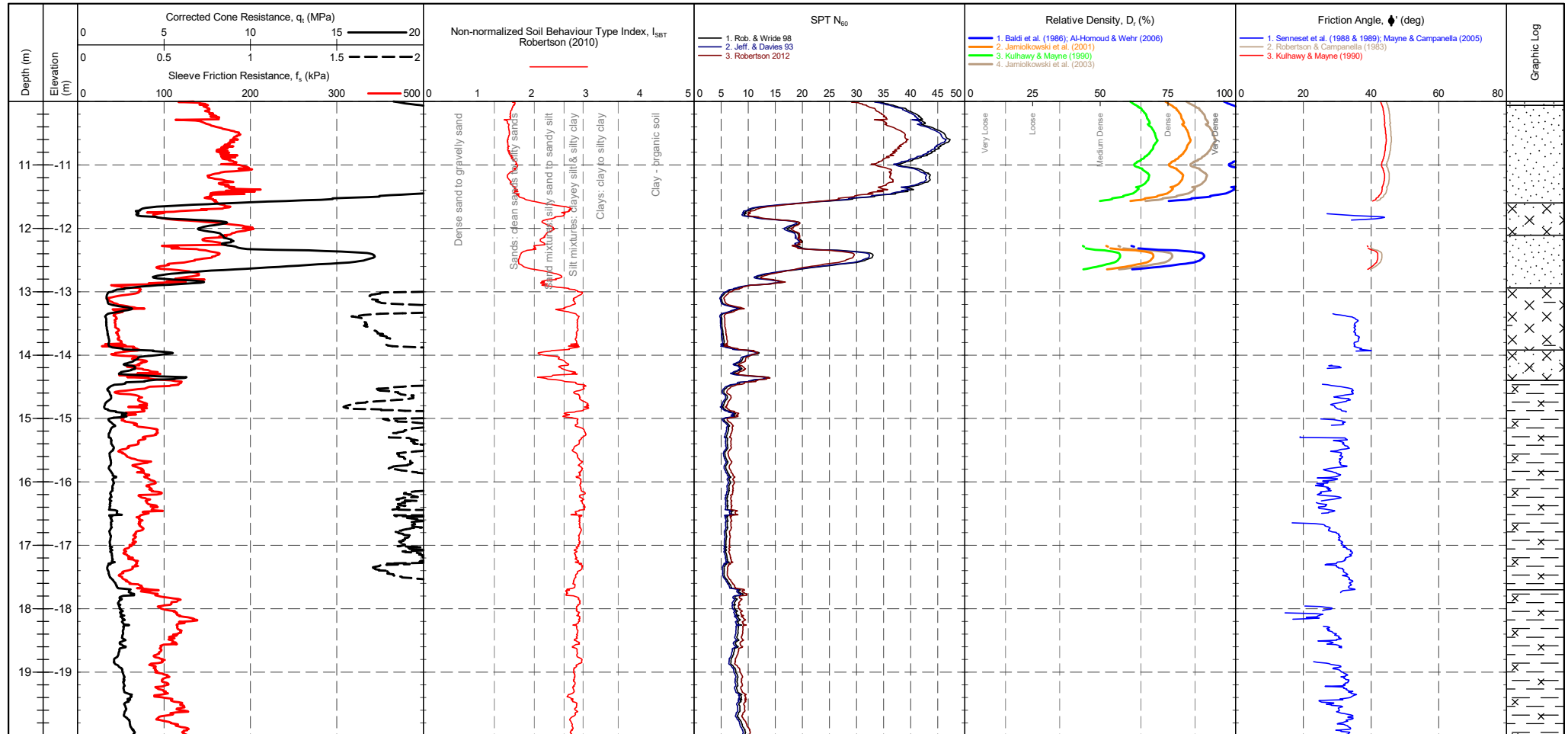
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
250 mV	247 mV	-0.032 MPa
255 mV	251 mV	-0.003 kPa
270 mV	252 mV	-0.004 kPa
2343 mV	2402 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12					
Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

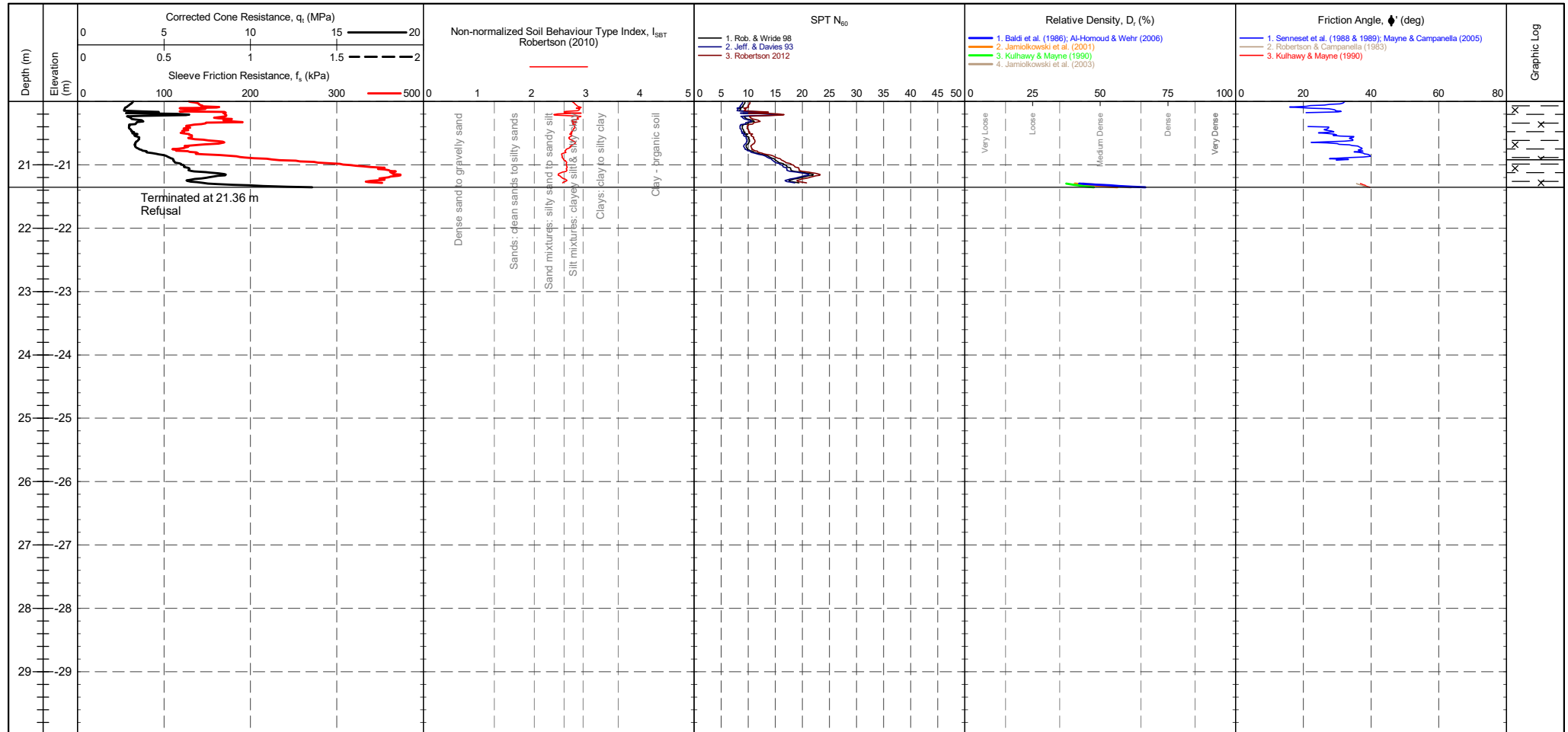
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

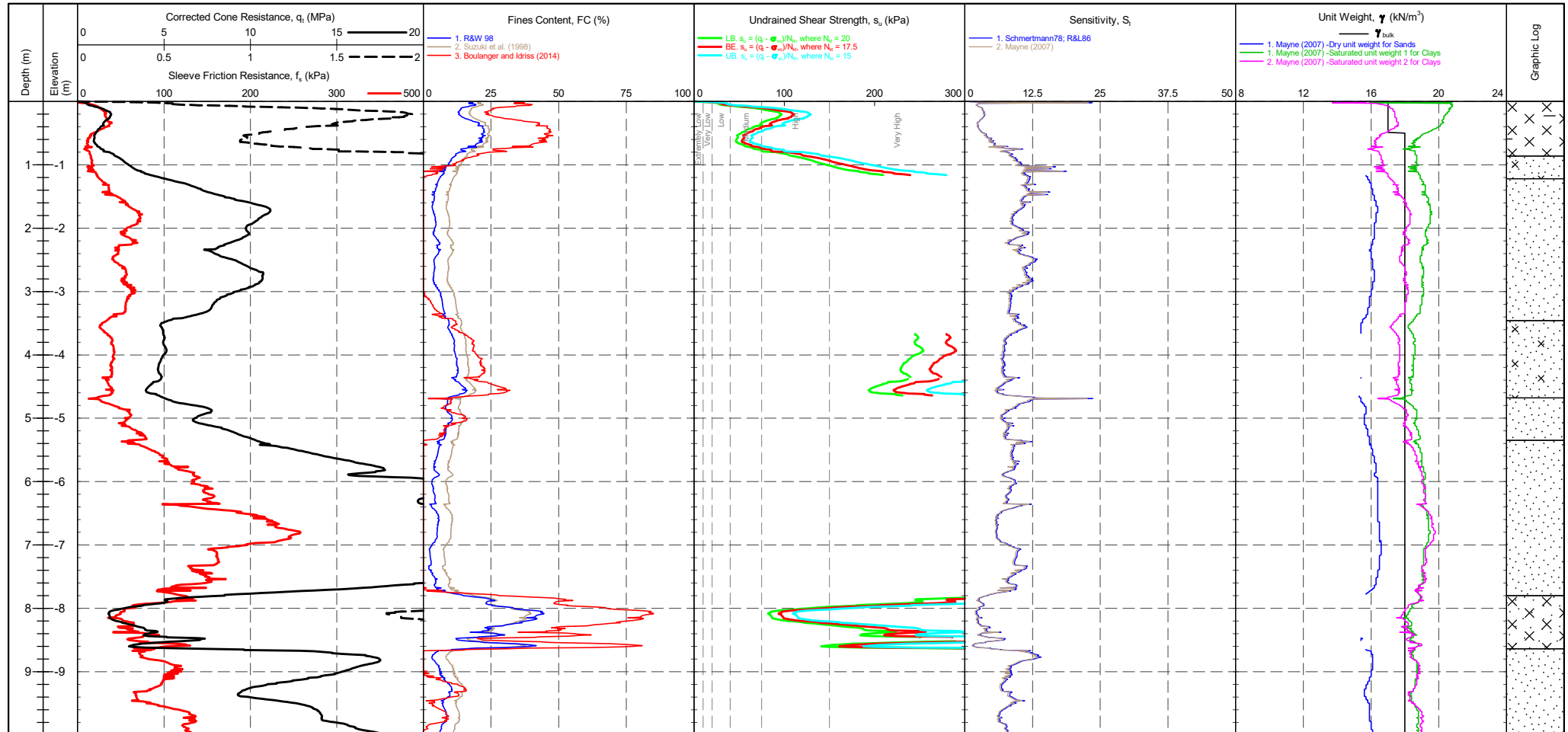
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
250 mV	247 mV	-0.032 MPa
255 mV	251 mV	-0.003 kPa
270 mV	252 mV	-0.004 kPa
2343 mV	2402 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

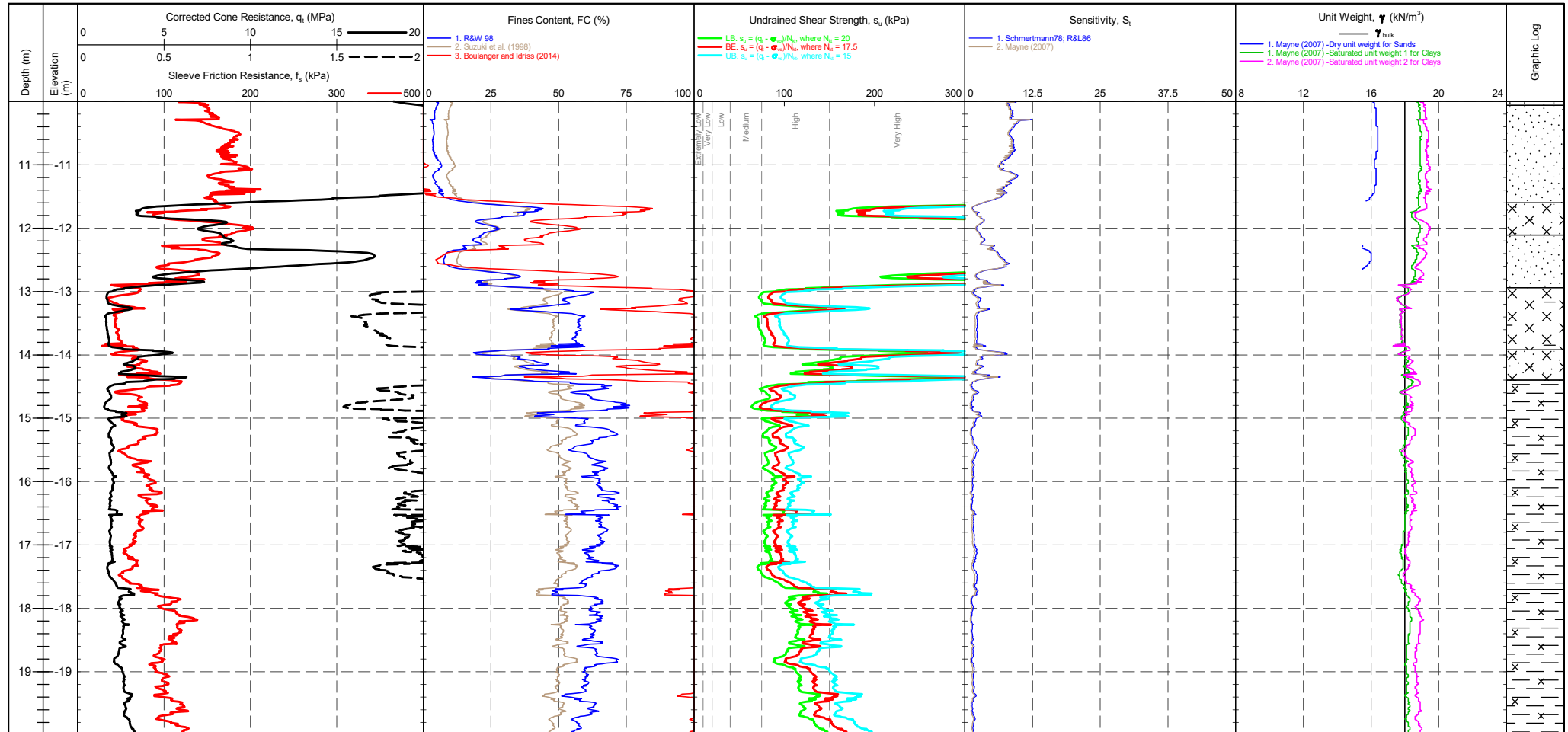
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 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

PointID

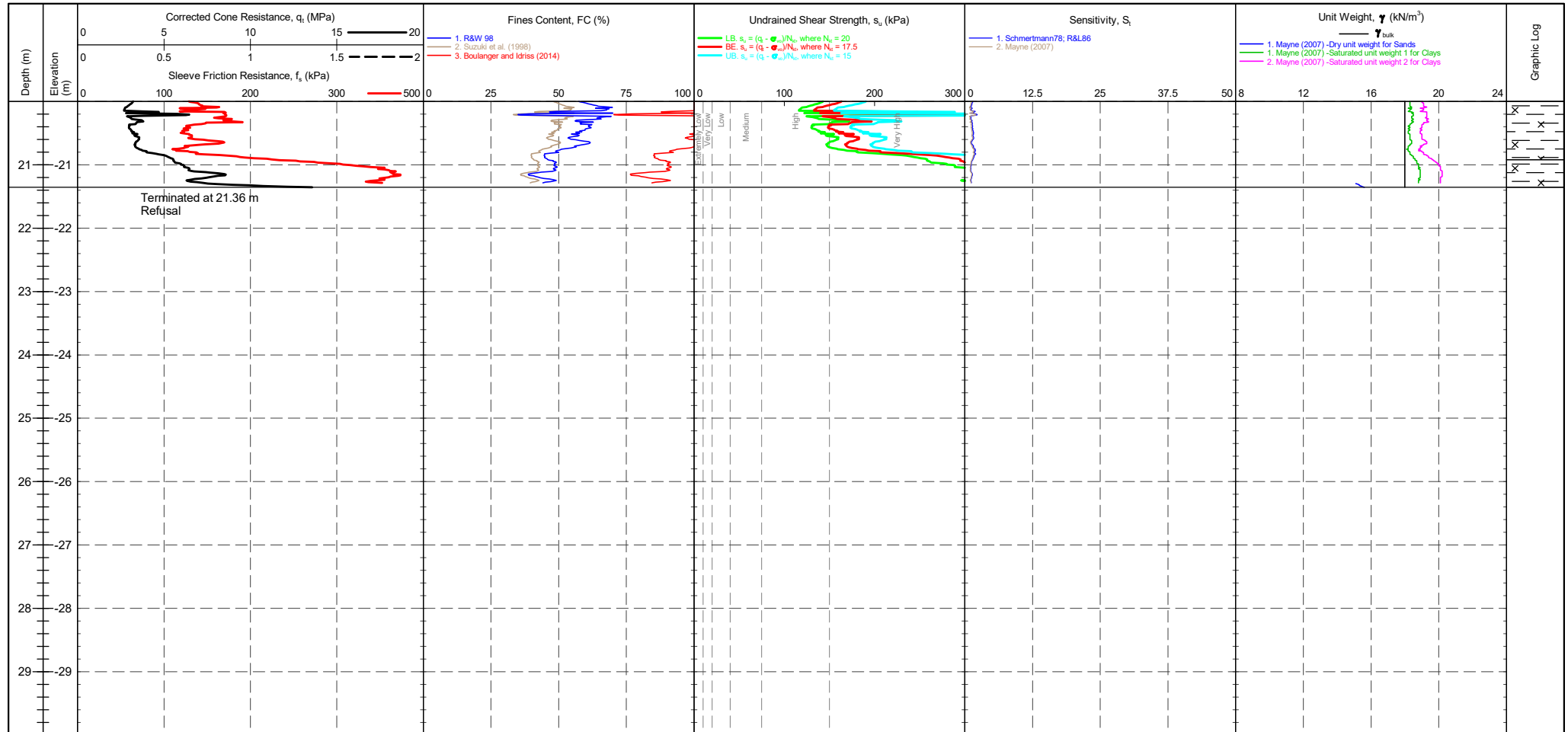
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

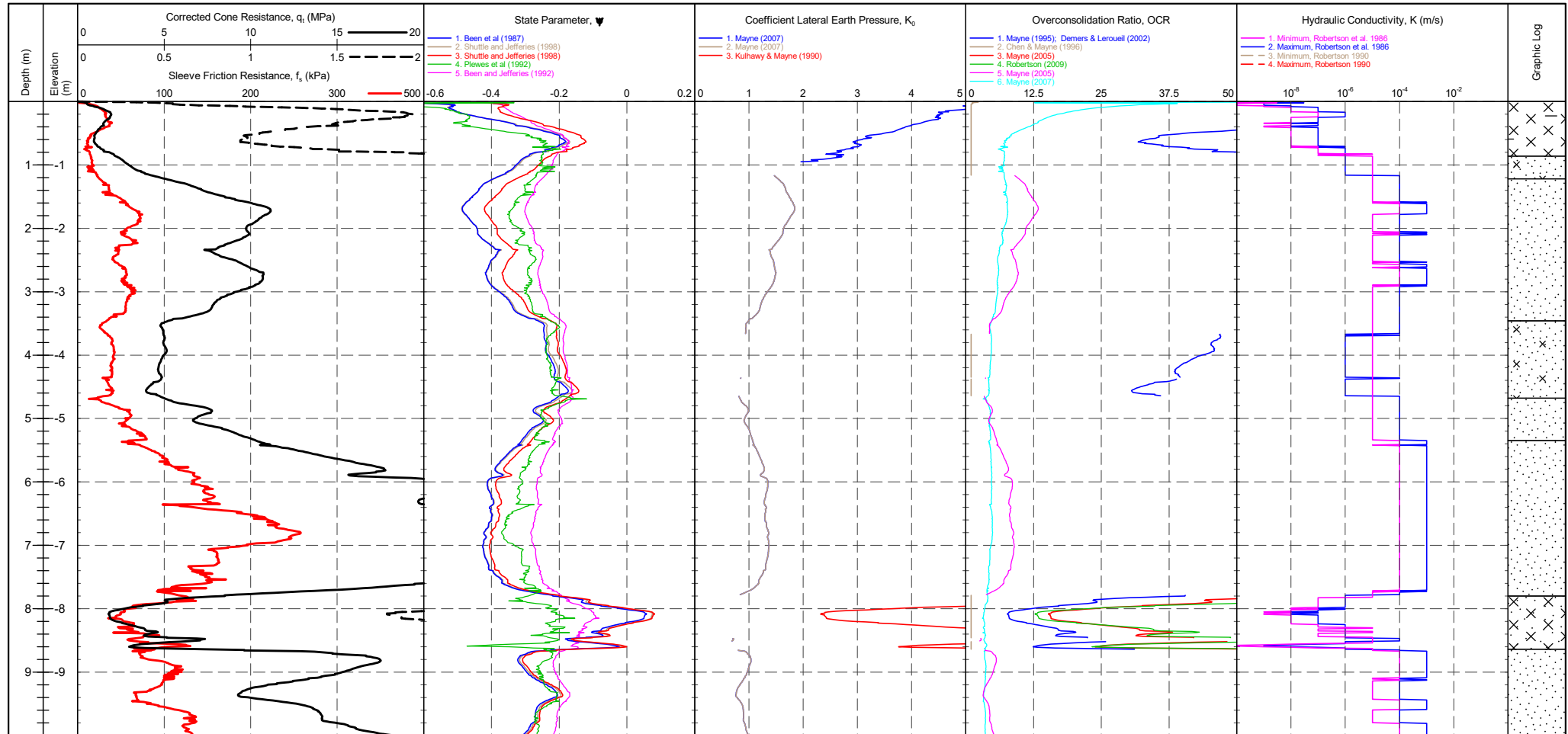
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

Groundwater Level
Dissipation Test

PointID

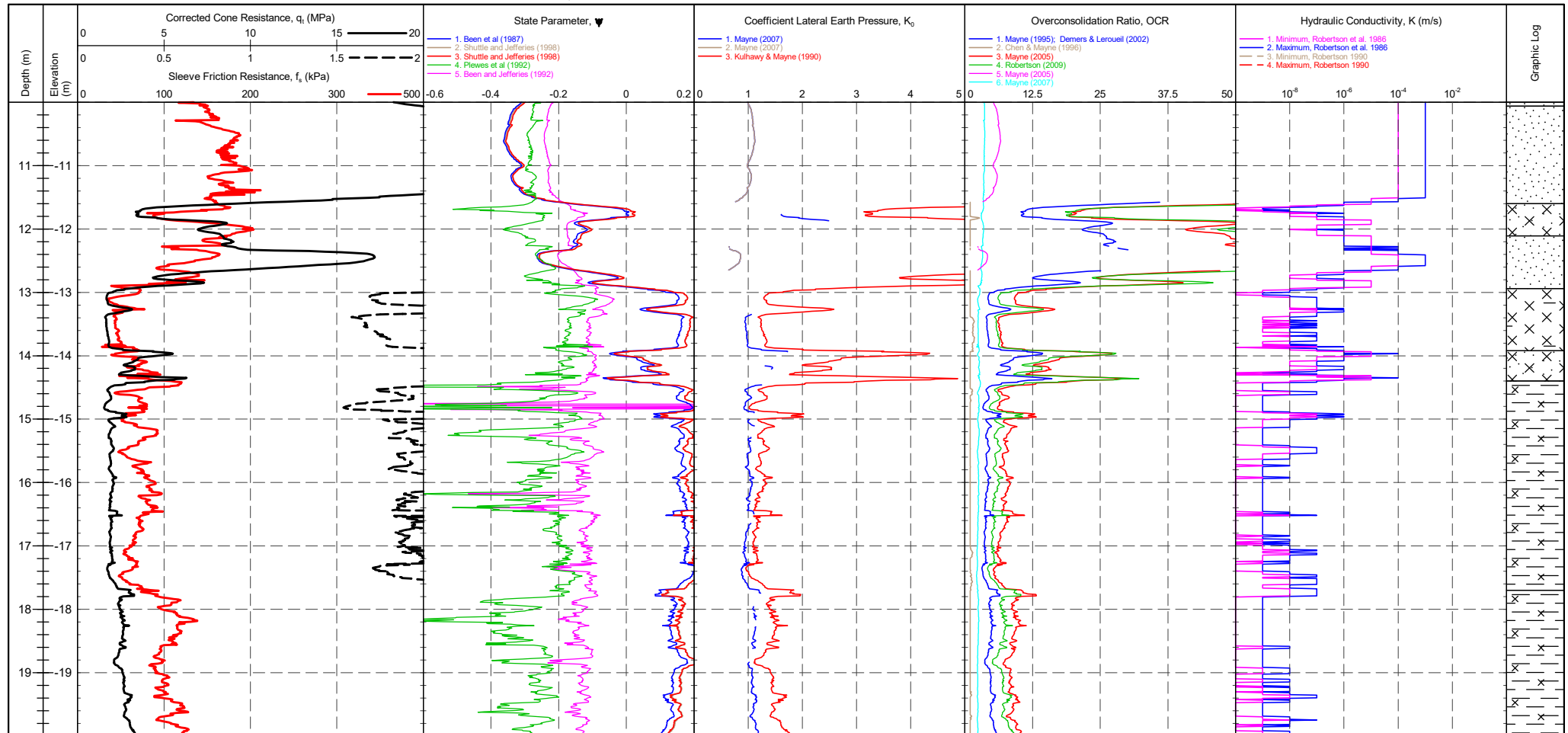
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

Groundwater Level
Dissipation Test

PointID

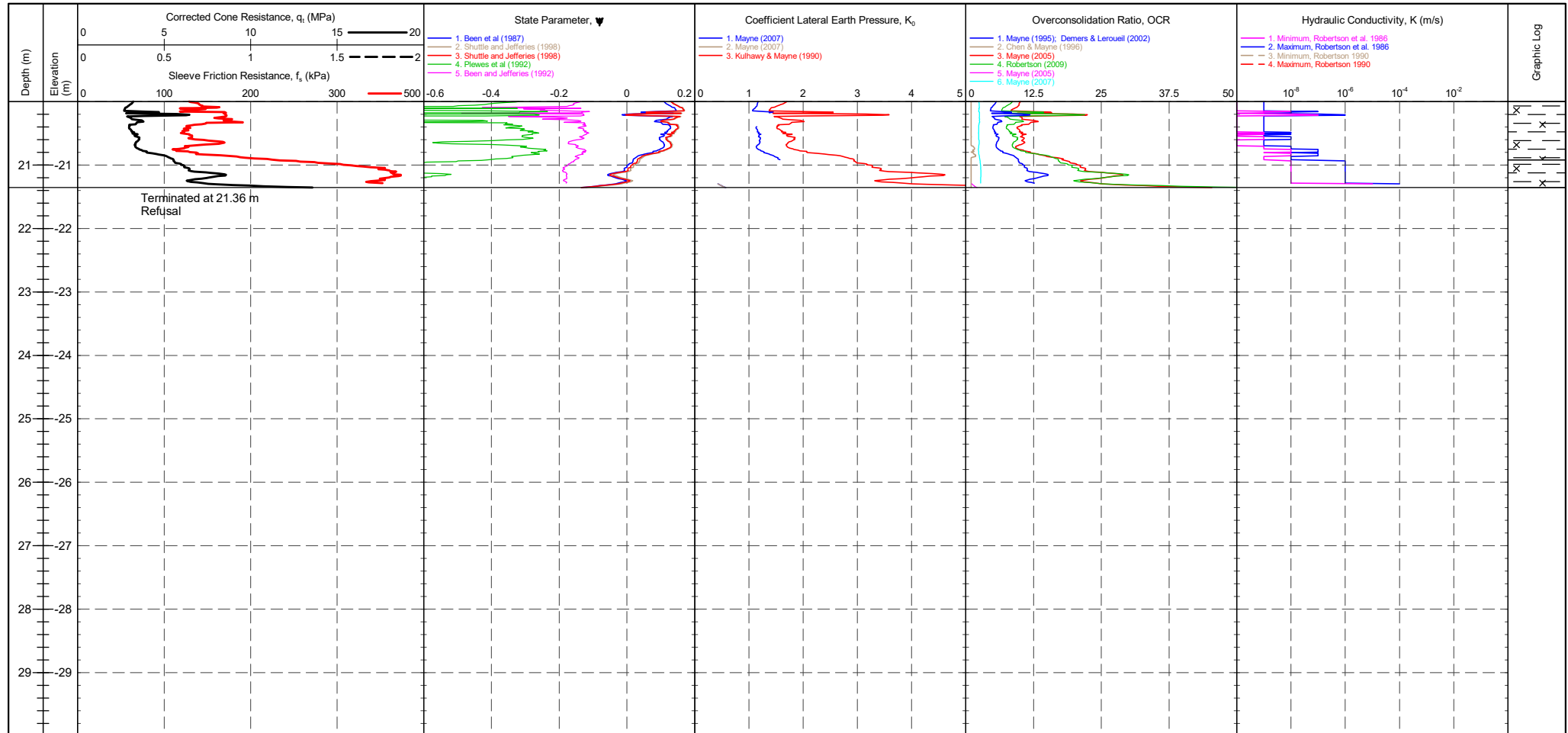
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

Groundwater Level
Dissipation Test

PointID

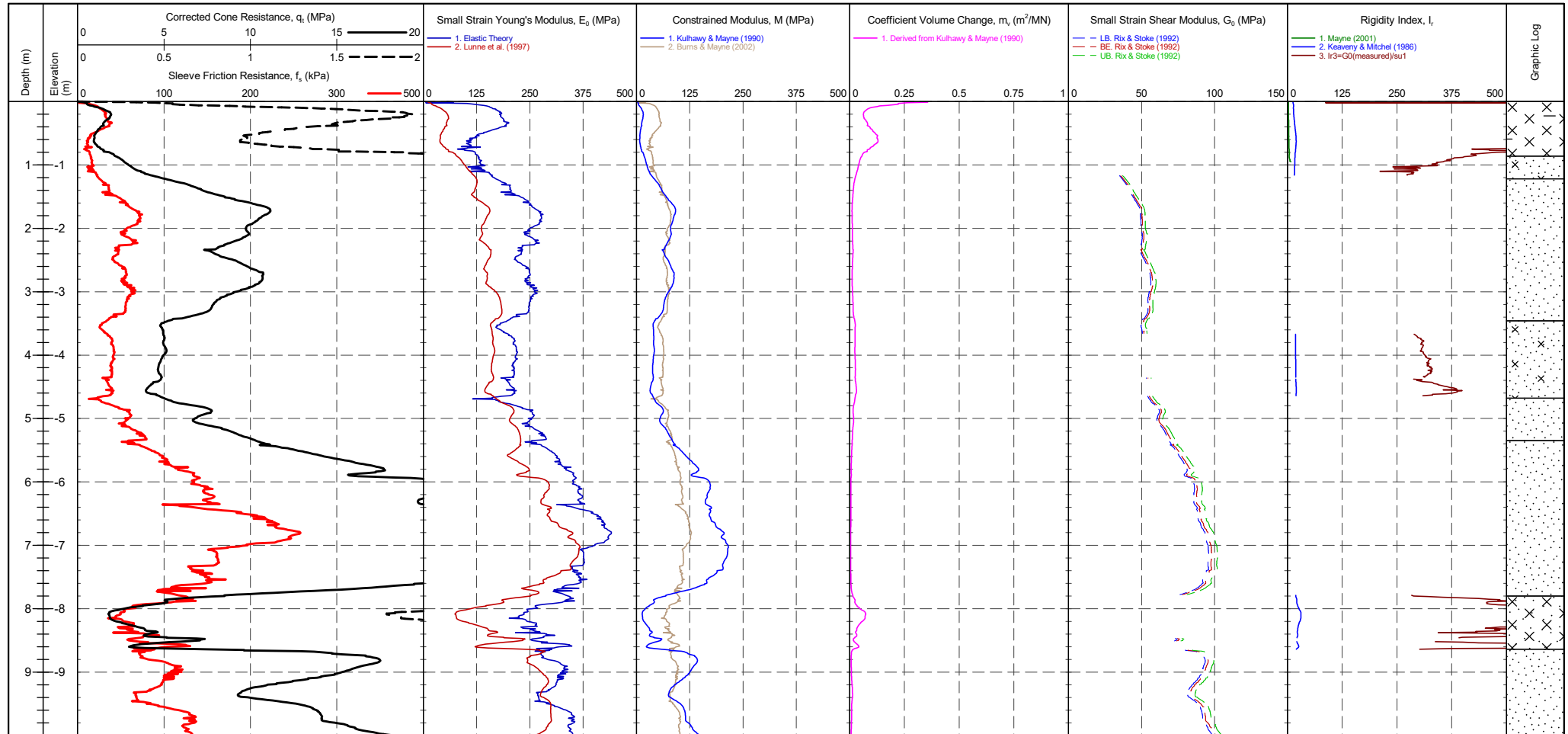
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

Groundwater Level
Dissipation Test

PointID

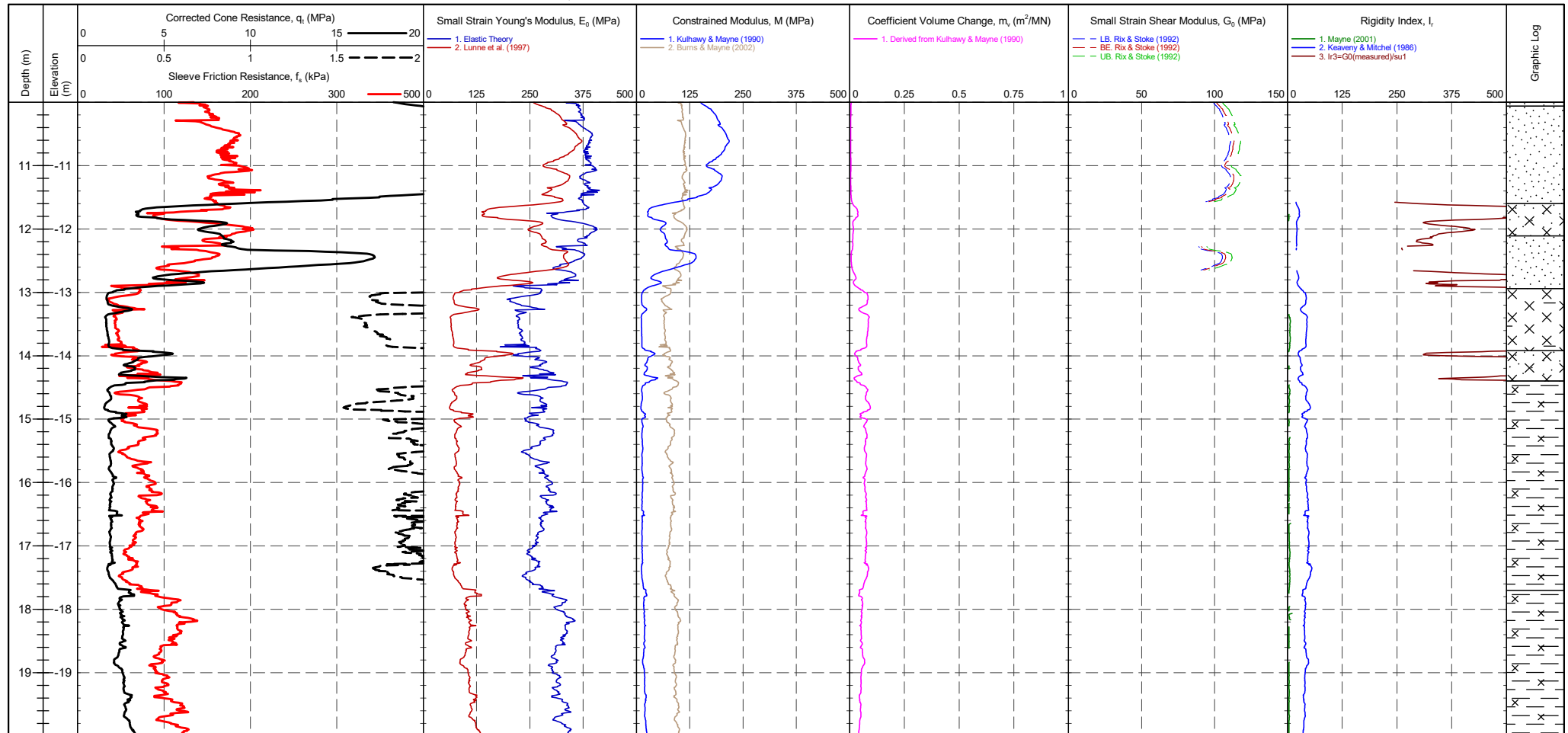
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	250 mV	247 mV	-0.032 MPa
Sleeve	255 mV	251 mV	-0.003 kPa
Pore Pressure 2	270 mV	252 mV	-0.004 kPa
X-Y Inclinator	2343 mV	2402 mV	

Groundwater Level
Dissipation Test

PointID

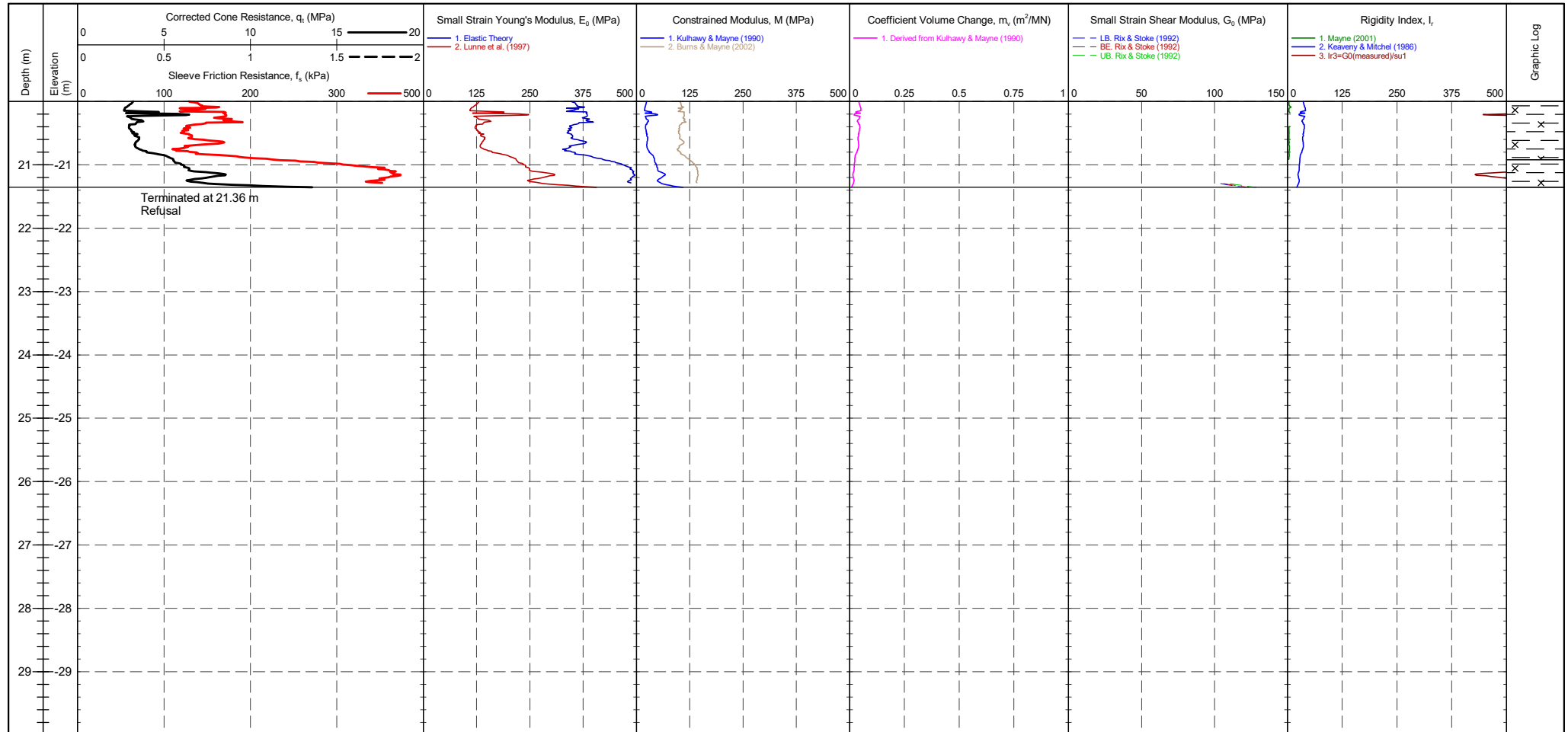
CPT106

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Refusal

Remark:
Test refused on total pressure.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



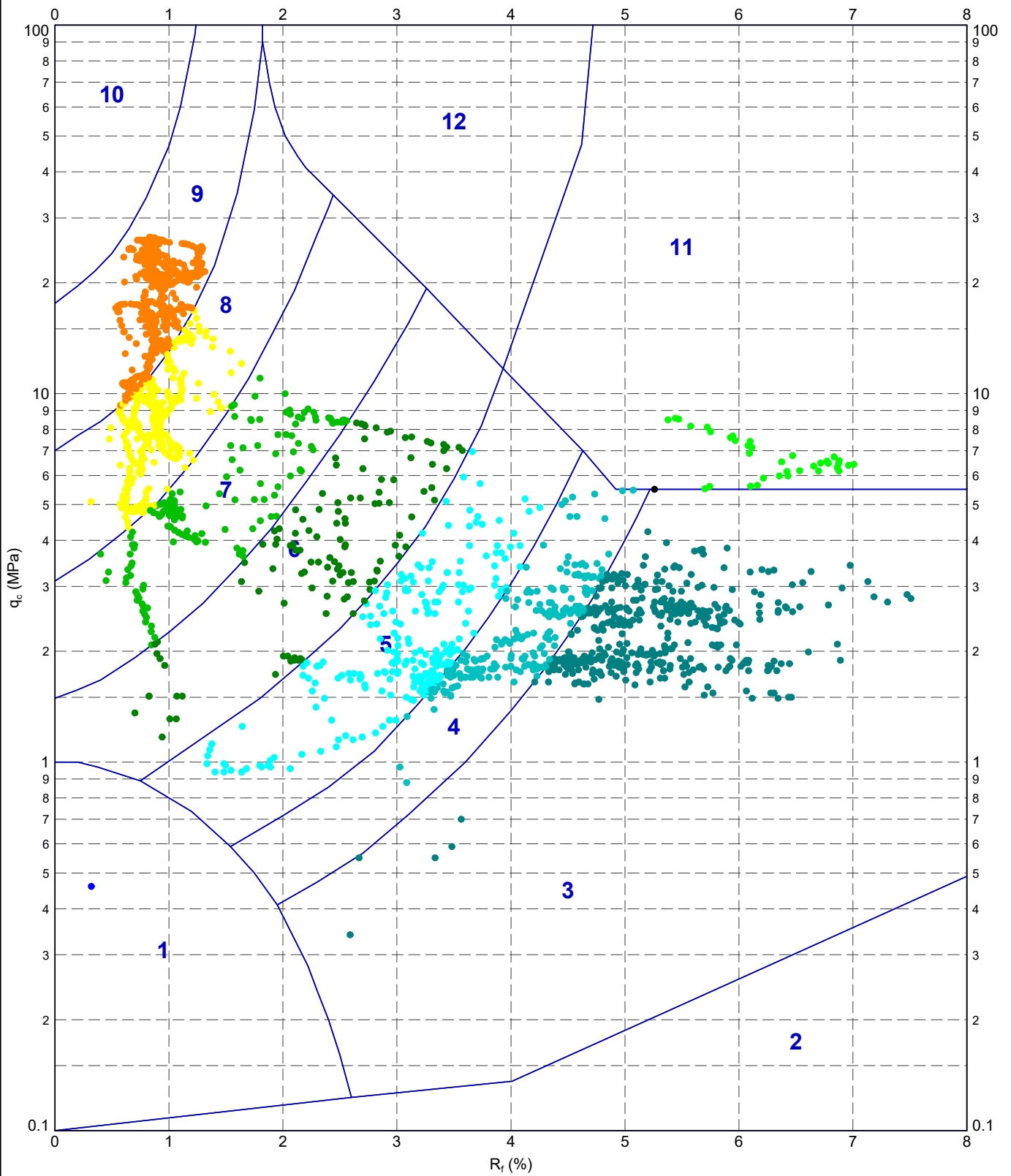
CONE ID : S15-CFIP.1817
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES
Transducer Pre Post Difference
Tip 250 mV 247 mV -0.032 MPa
Sleeve 255 mV 251 mV -0.003 kPa
Pore Pressure 2 270 mV 252 mV -0.004 kPa
X-Y Inclinator 2343 mV 2402 mV

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:36 10.03.00.08 Dattel Lab and In Situ Tool - DGO In Situ SI 2.02.0 2017-07-10 Pdf In Situ SI 2.02.0 2017-07-10



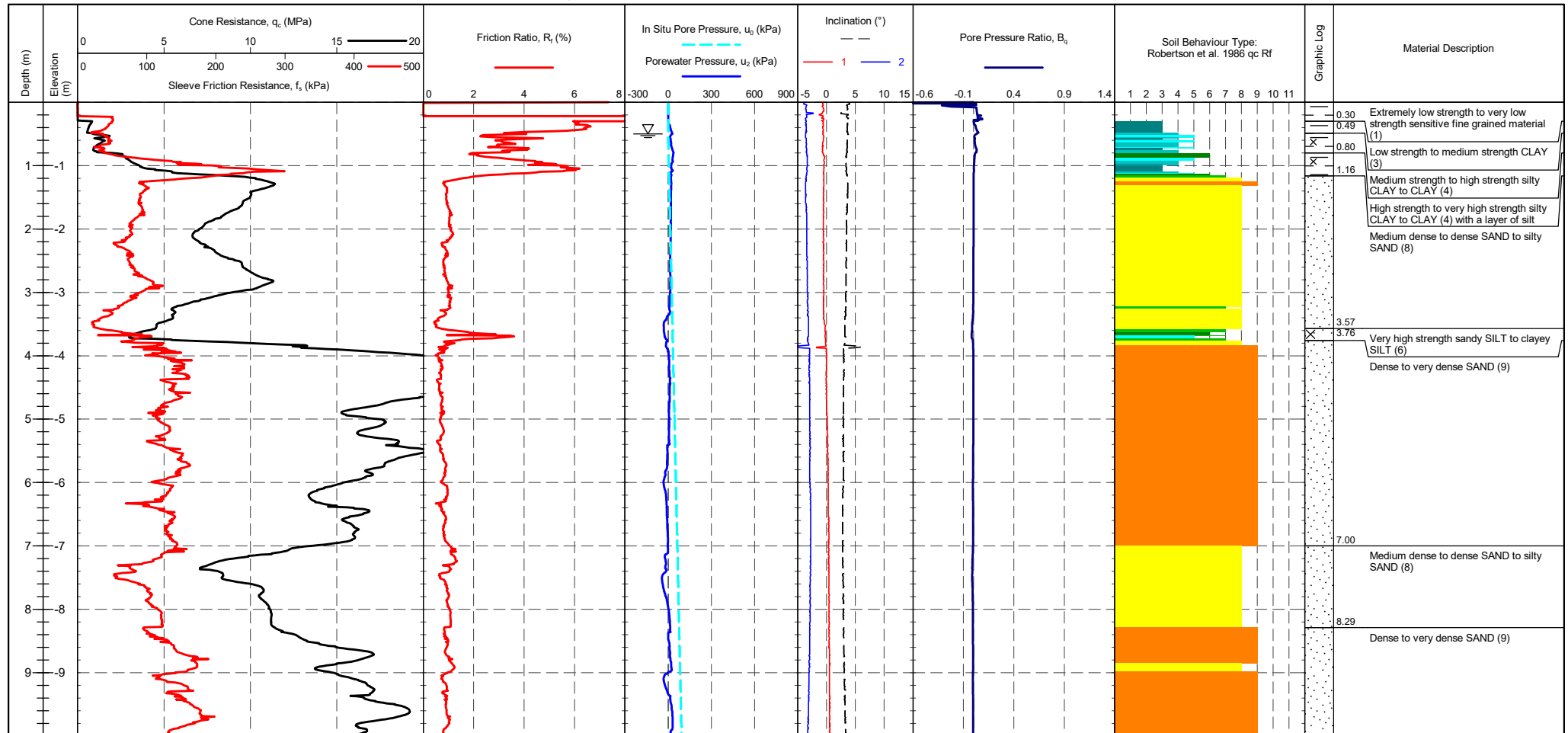
METHOD: Robertson et al. 1986 q_c vs. R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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 |

	TITLE LK Group Rochdale Redwood SEN Robertson et al. 1986 q_c vs. R_f - CPT106	DRAWN	DATE 03/12/2025
		CHECKED	DATE 03/12/2025
		SCALE Not To Scale	A4
		PROJECT No 1250505	FIGURE No

PointID

CPT107

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depthRemark:
Test completed at target depth.SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022

CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravelly SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

CPT107

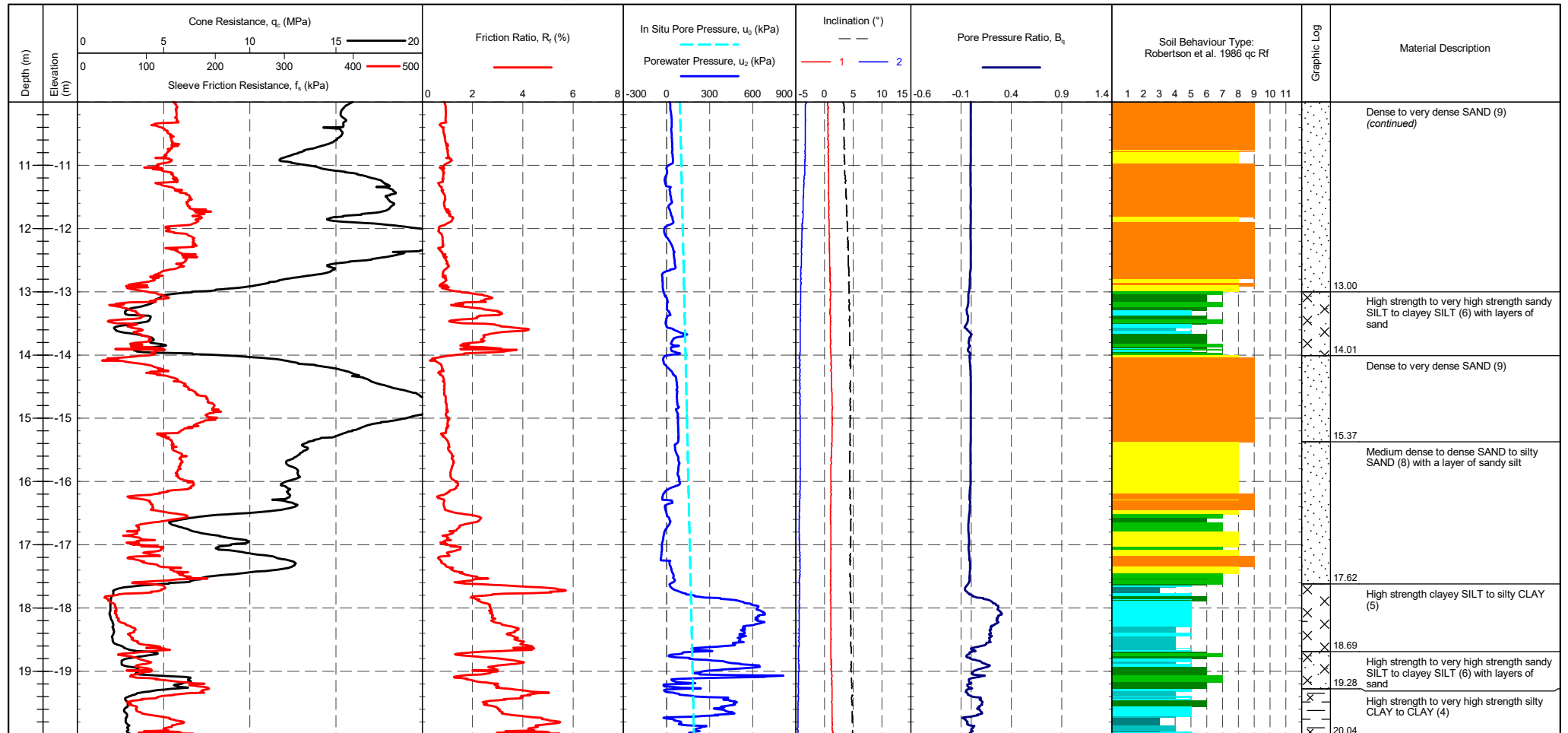
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

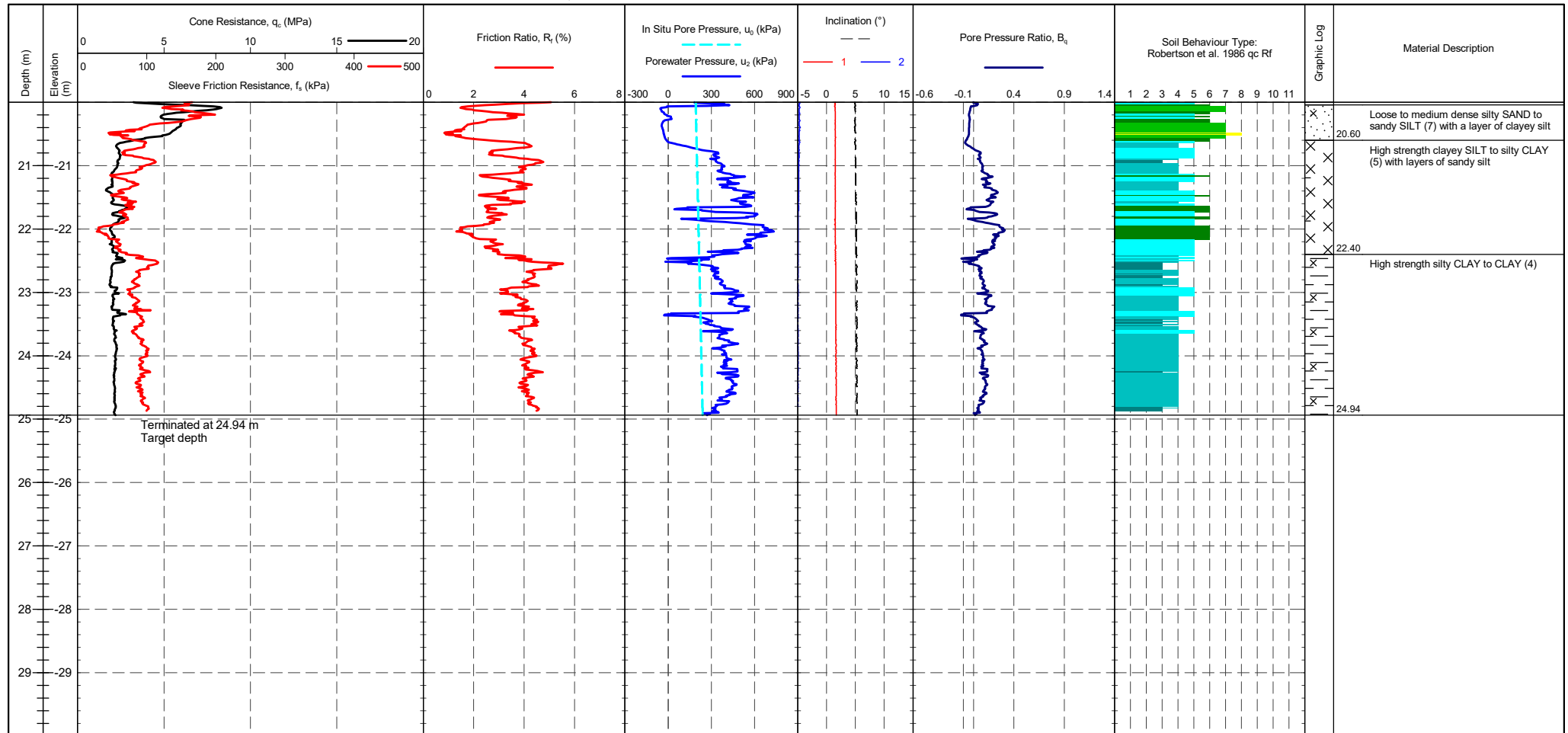
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

METHOD: Robertson et al. 1986 qc Rf

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

CPT107

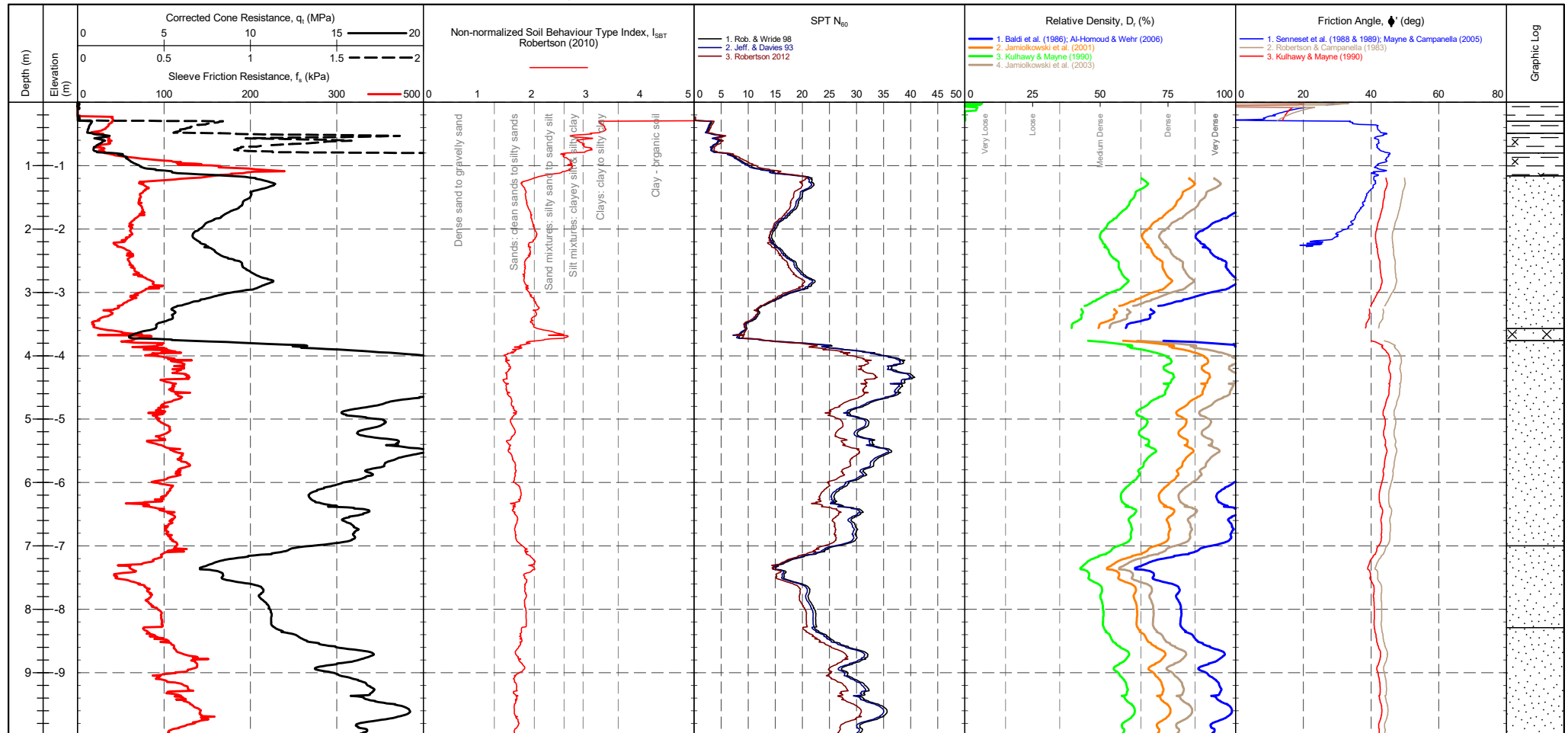
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

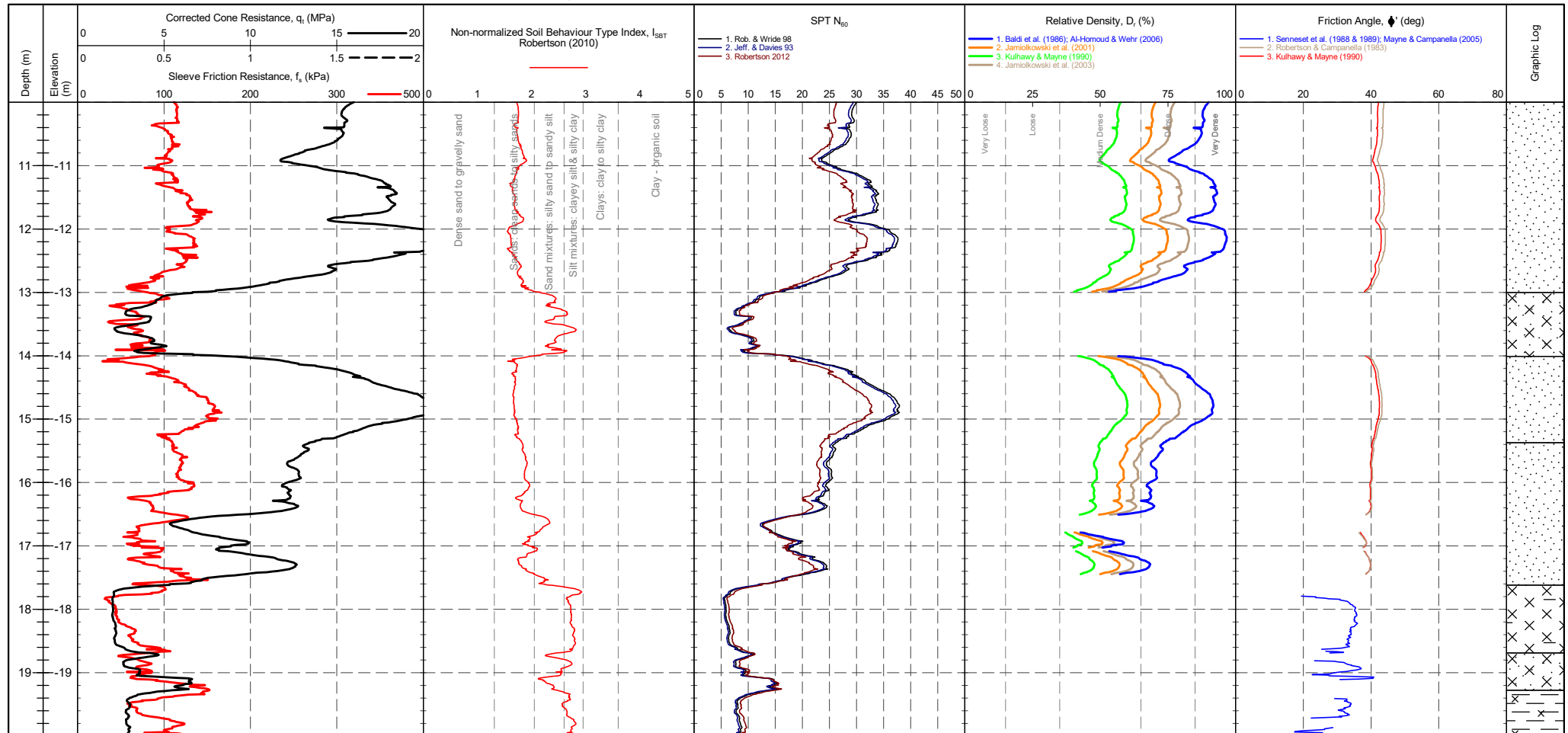
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12					
Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

CPT107

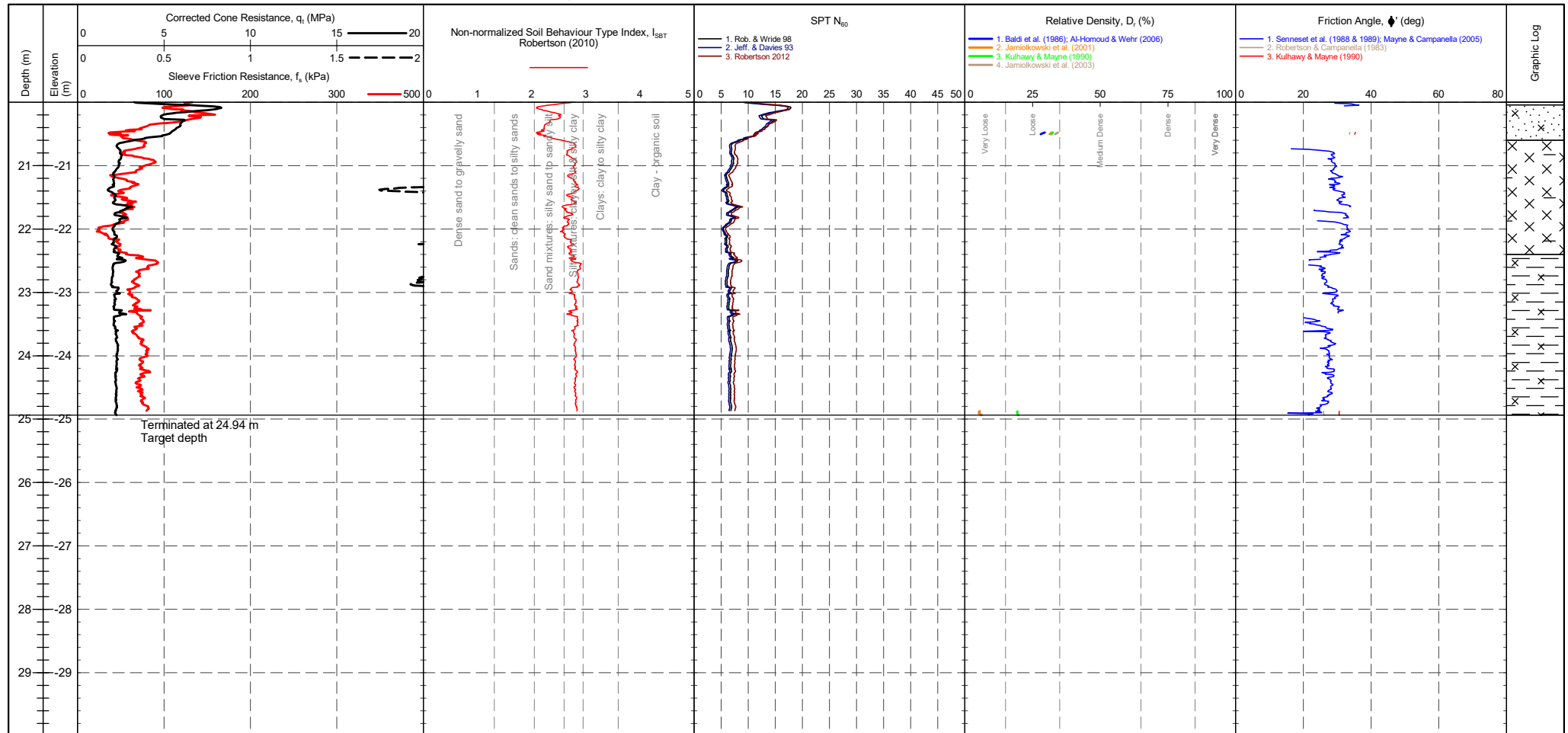
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

CPTU ZERO VALUES

Pre	Post	Difference
249 mV	246 mV	-0.032 MPa
255 mV	252 mV	-0.002 kPa
284 mV	325 mV	0.01 kPa
2432 mV	2461 mV	

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

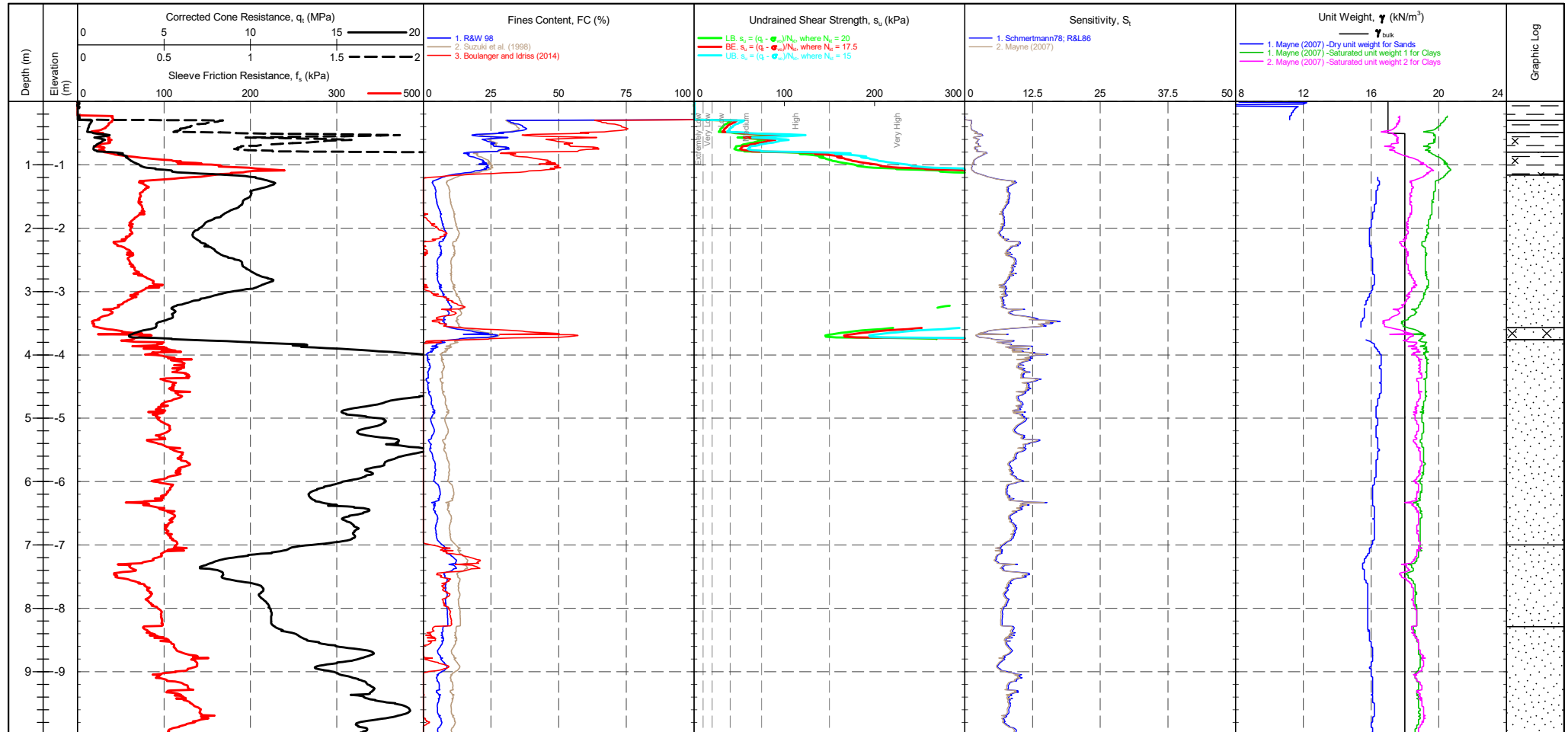
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

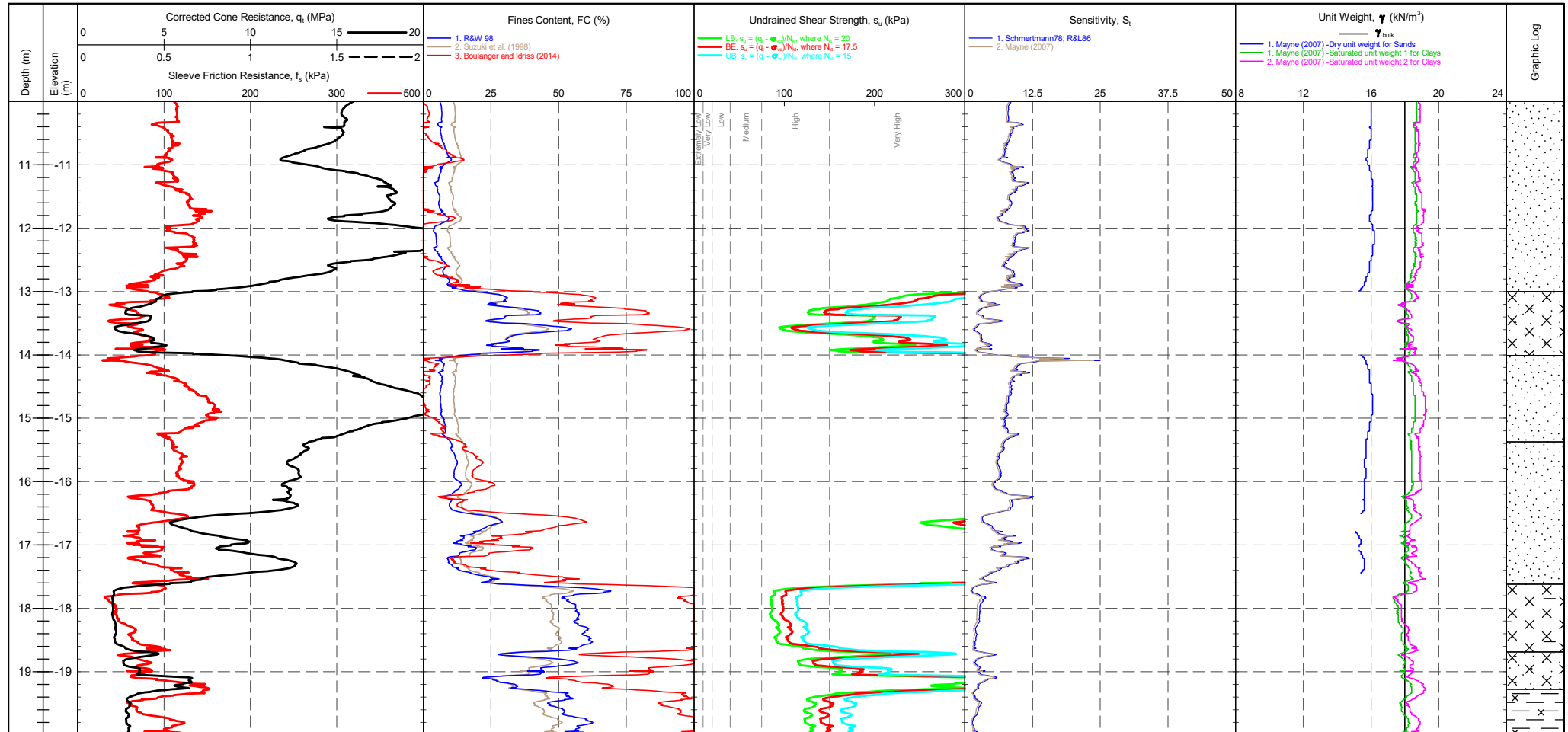
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer Pre Post Difference
Tip 249 mV 246 mV -0.032 MPa
Sleeve 255 mV 252 mV -0.002 kPa
Pore Pressure 2 284 mV 325 mV 0.01 kPa
X-Y Inclinator 2432 mV 2461 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

PointID

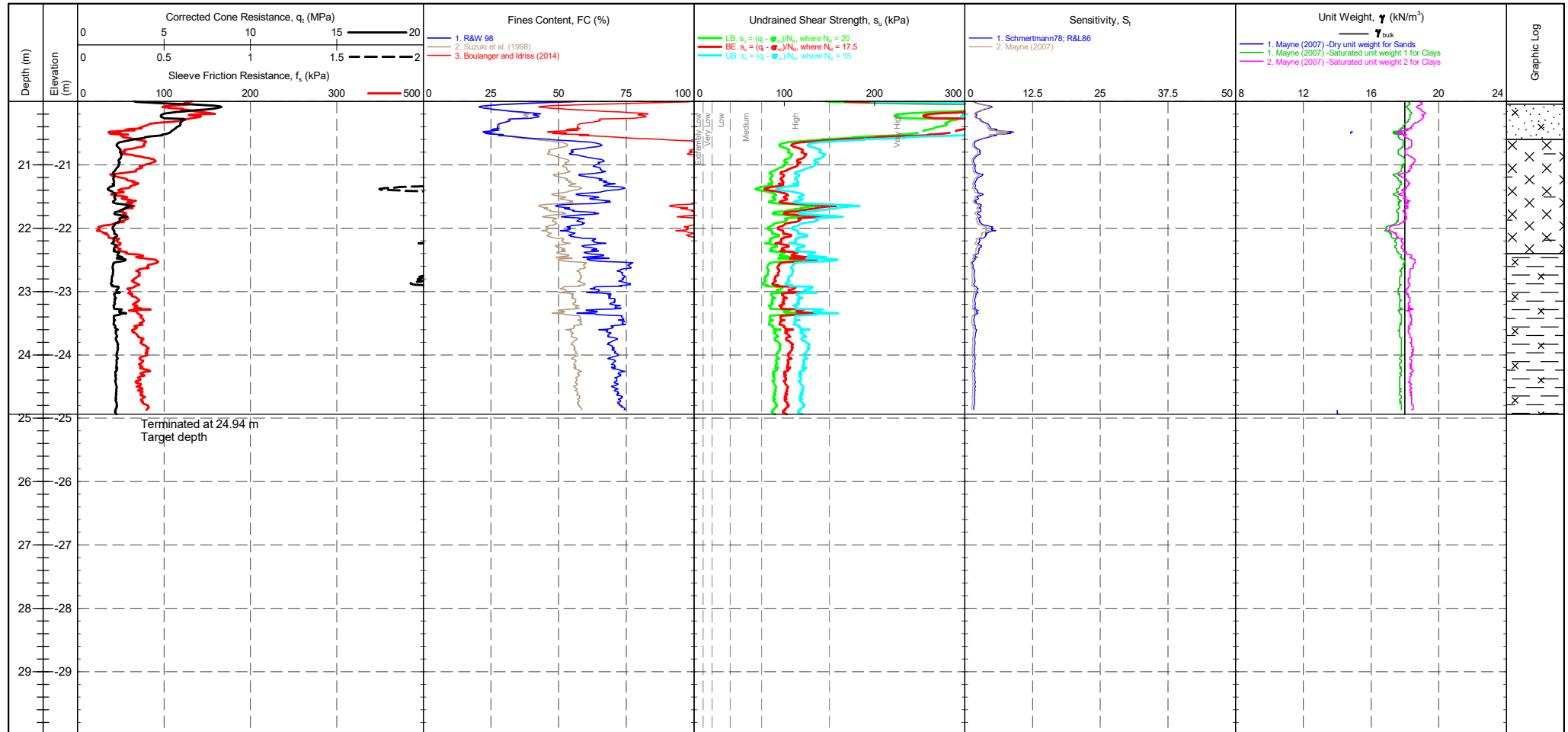
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

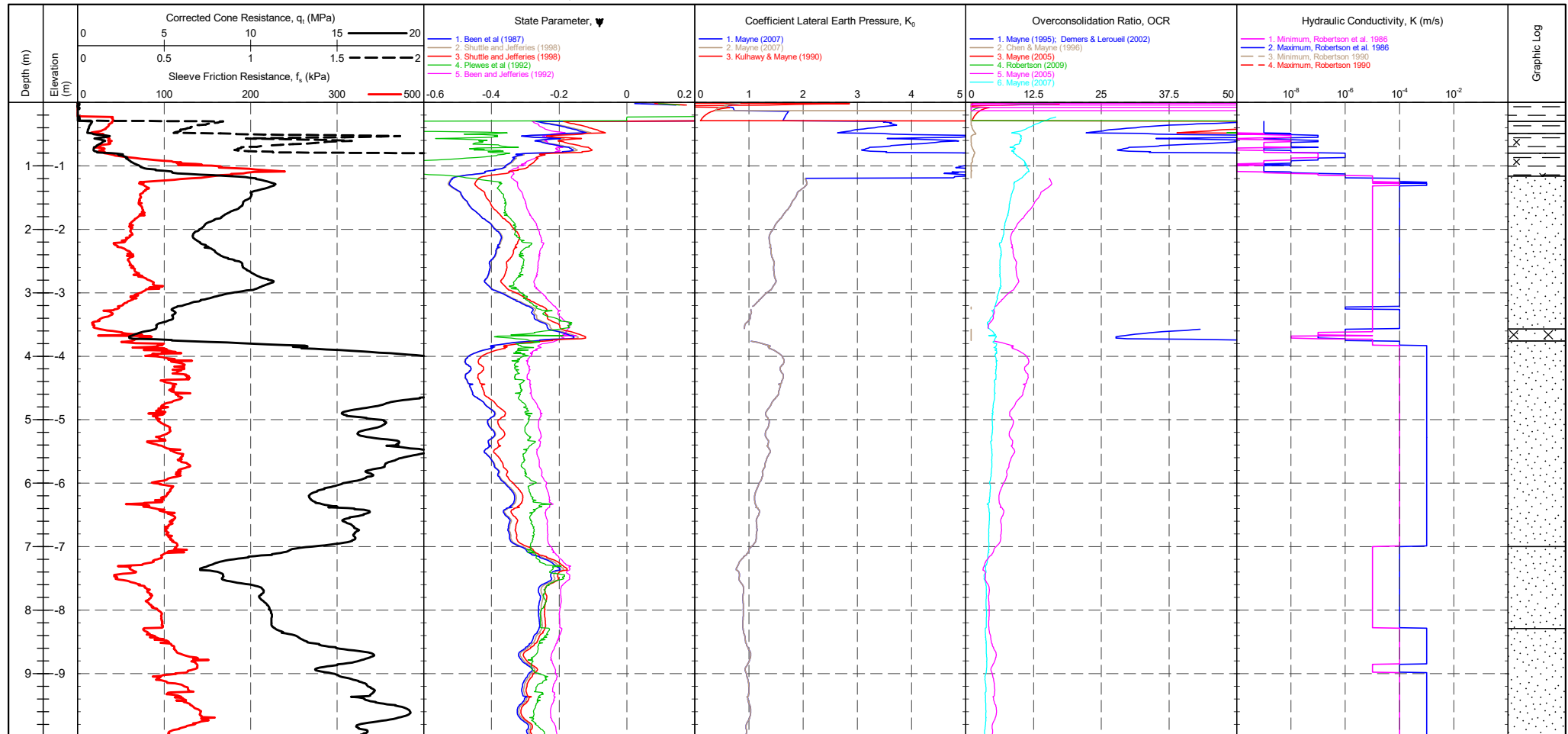
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

Groundwater Level
Dissipation Test

PointID

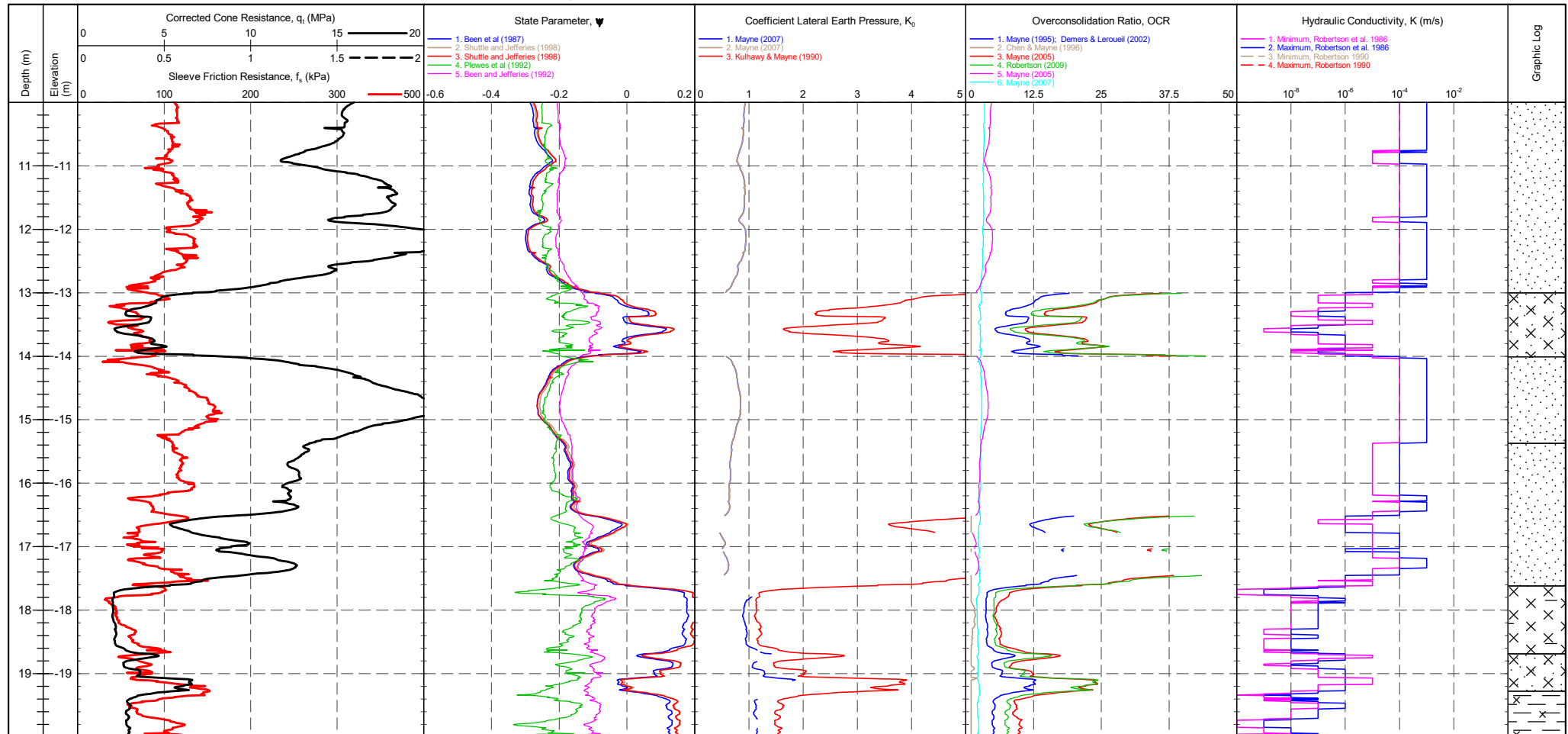
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

Groundwater Level
Dissipation Test

PointID

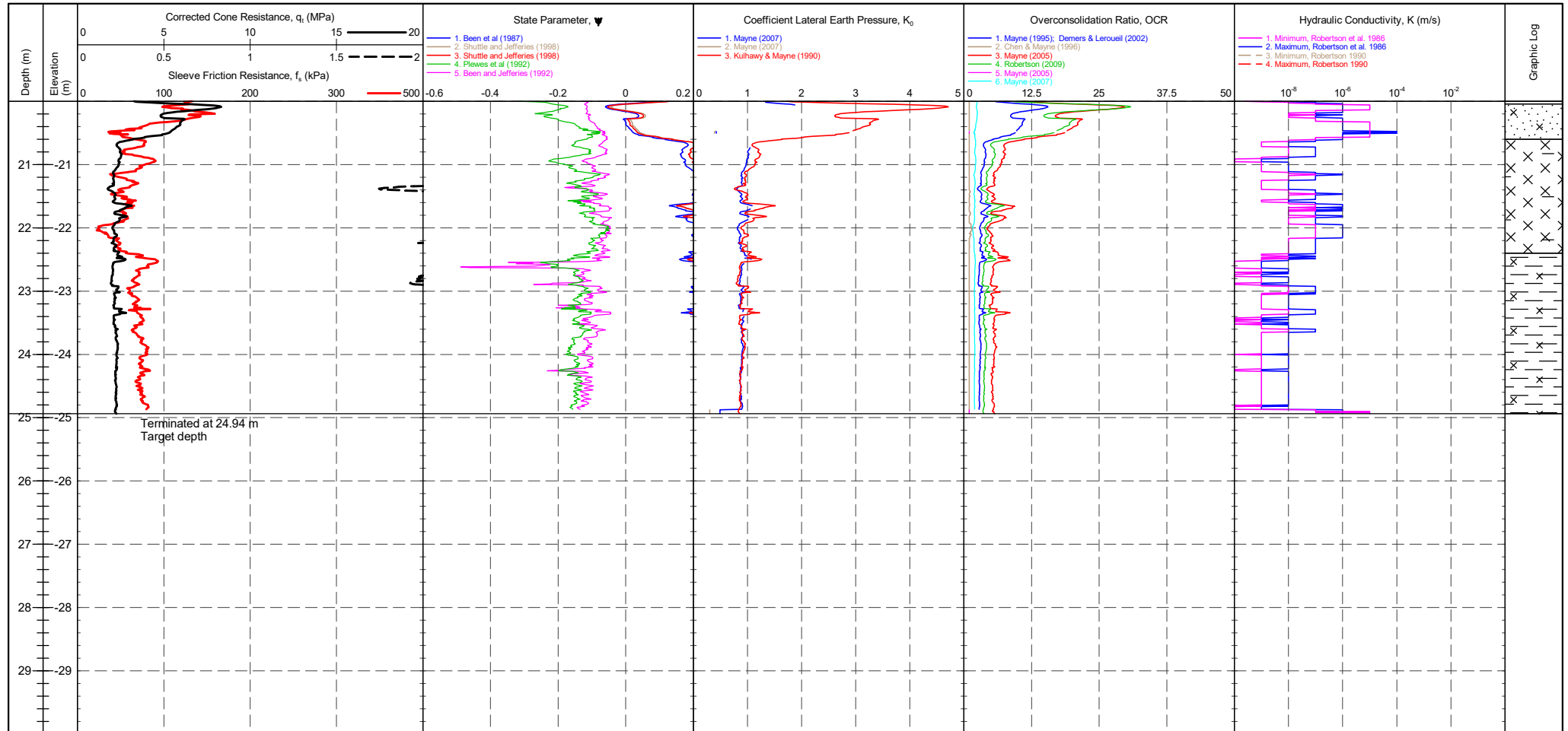
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

Groundwater Level
Dissipation Test

PointID

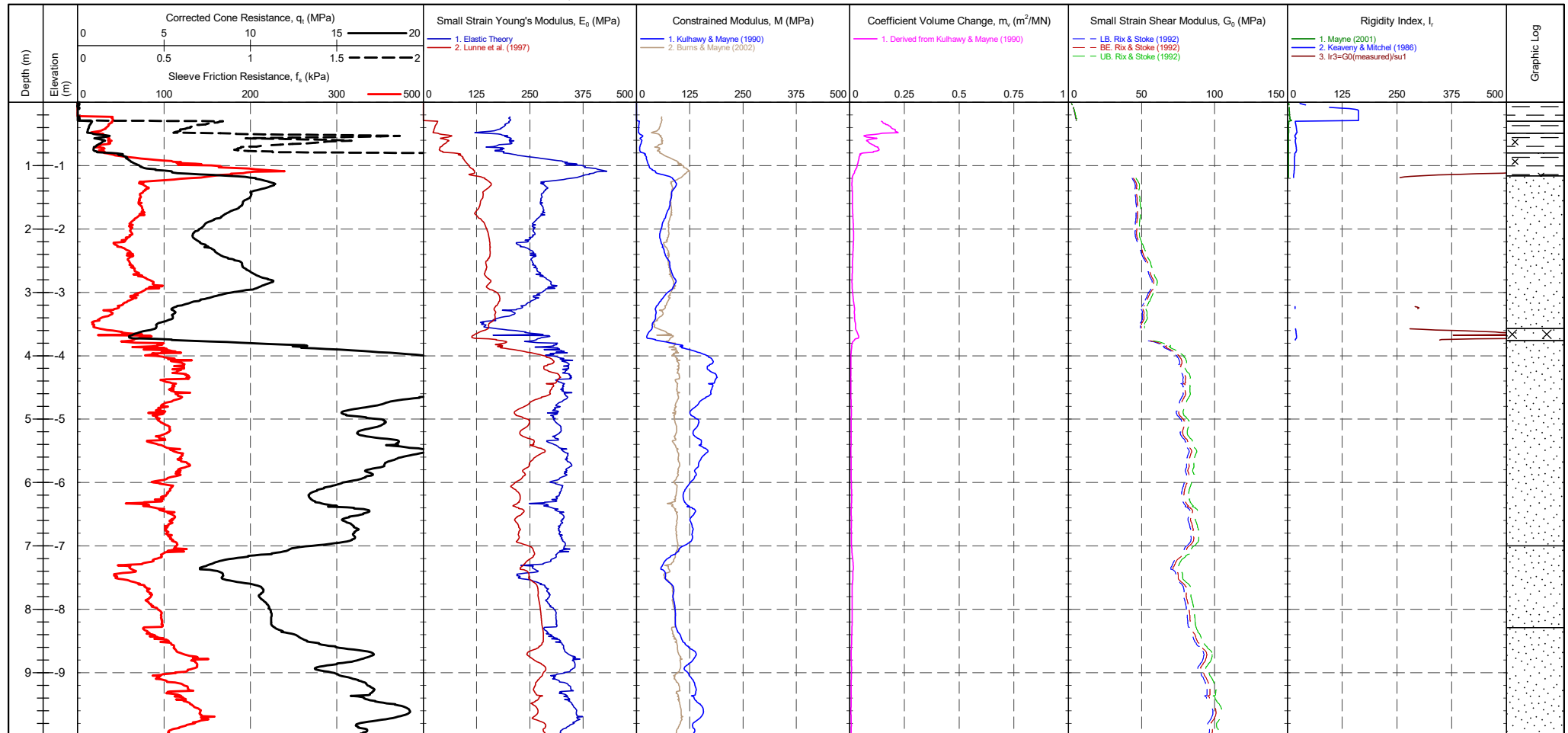
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

Groundwater Level
Dissipation Test

PointID

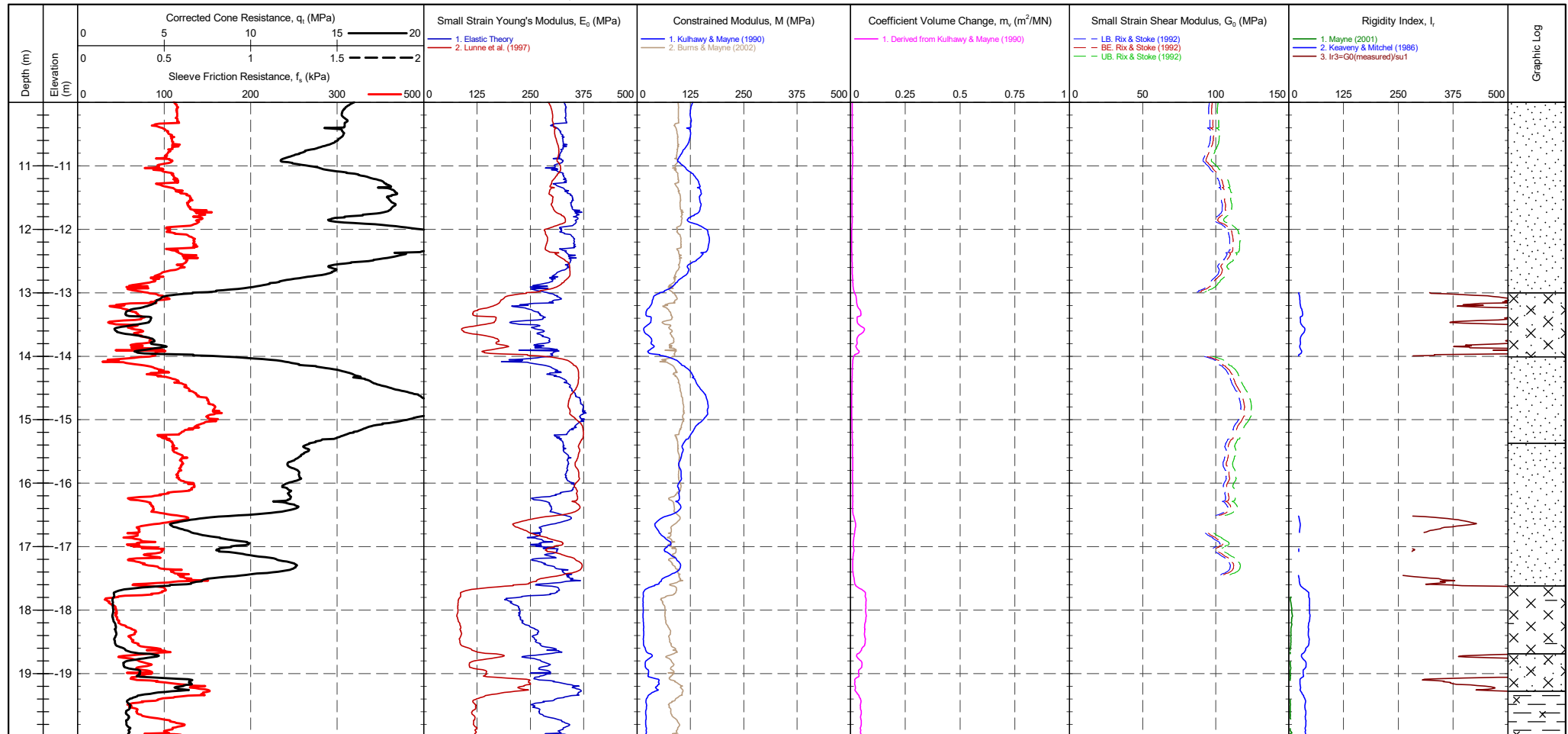
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

Groundwater Level
Dissipation Test

PointID

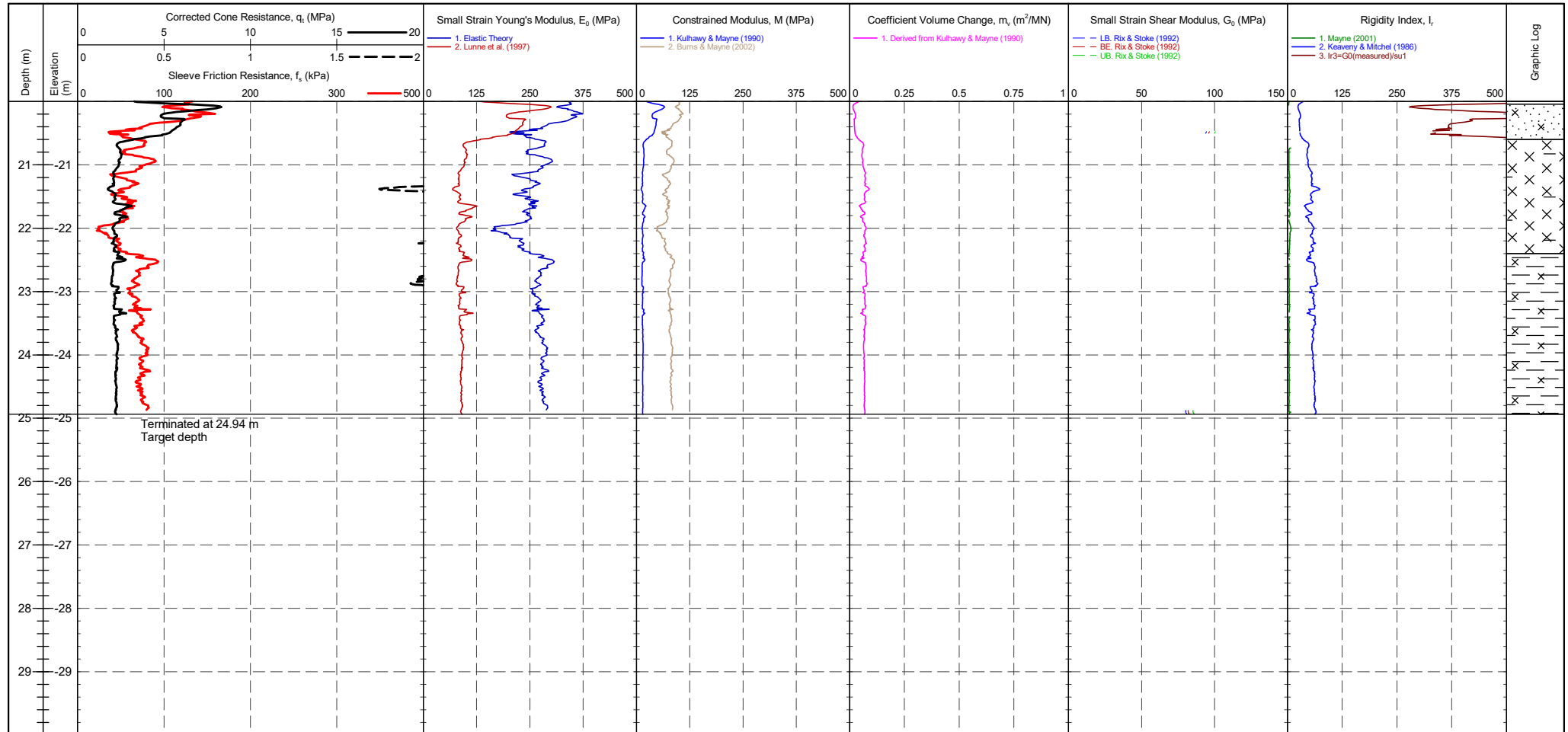
CPT107

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CONE MODEL : Subtraction
CONE AREA : 15cm^2
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

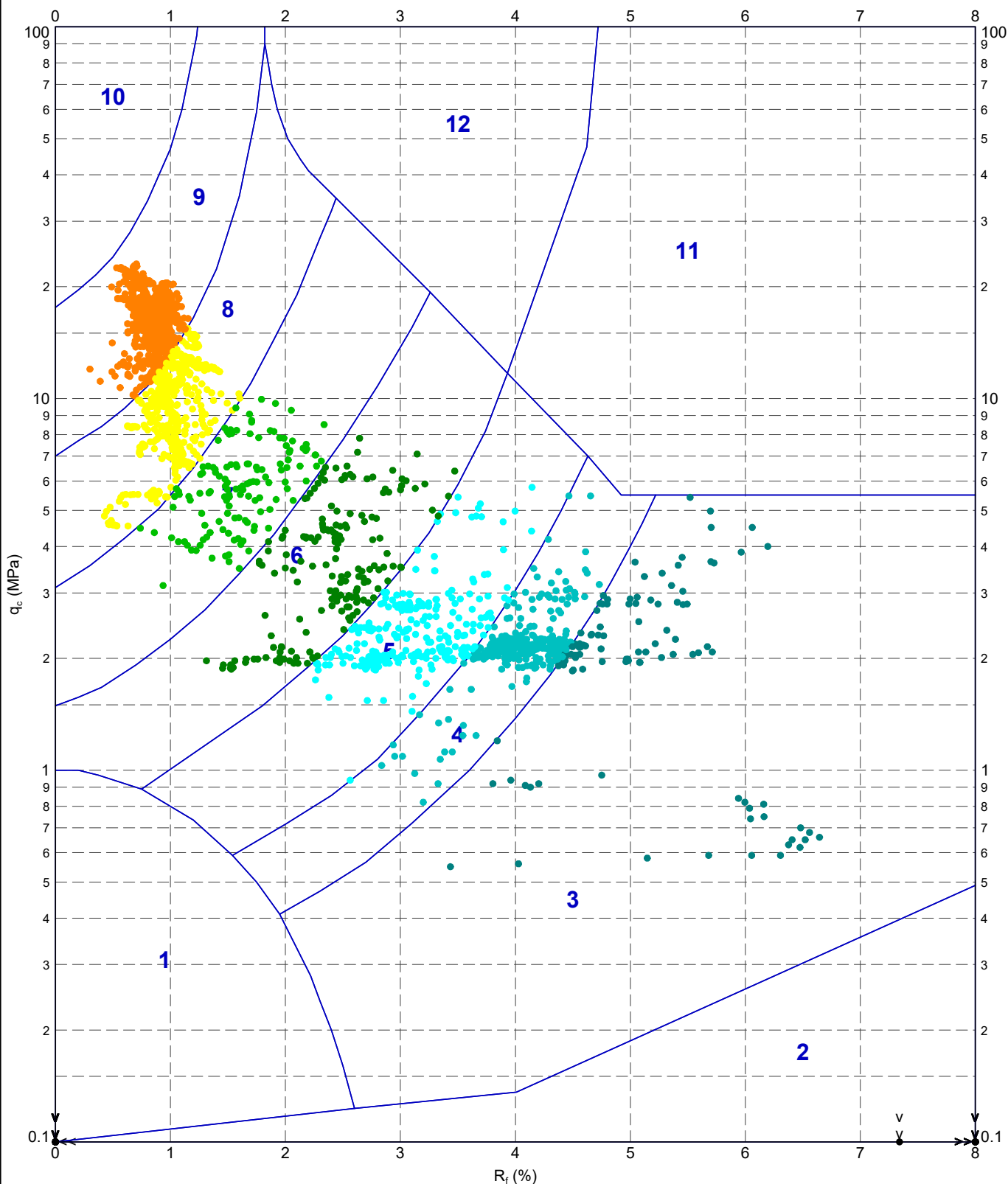
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	249 mV	246 mV	-0.032 MPa
Sleeve	255 mV	252 mV	-0.002 kPa
Pore Pressure 2	284 mV	325 mV	0.01 kPa
X-Y Inclinator	2432 mV	2461 mV	

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. RF AP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:40 10.03.00.08 Dattel Lab and In Situ Tool - DGO Lib In Situ SI 2.02.0 2017-07-10 Proj In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 q_c R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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

LK Group
Rochdale
Redwood SEN
Robertson et al. 1986 q_c vs. R_f - CPT107

DRAWN

DATE

03/12/2025

CHECKED

DATE

03/12/2025

SCALE

Not To Scale

A4

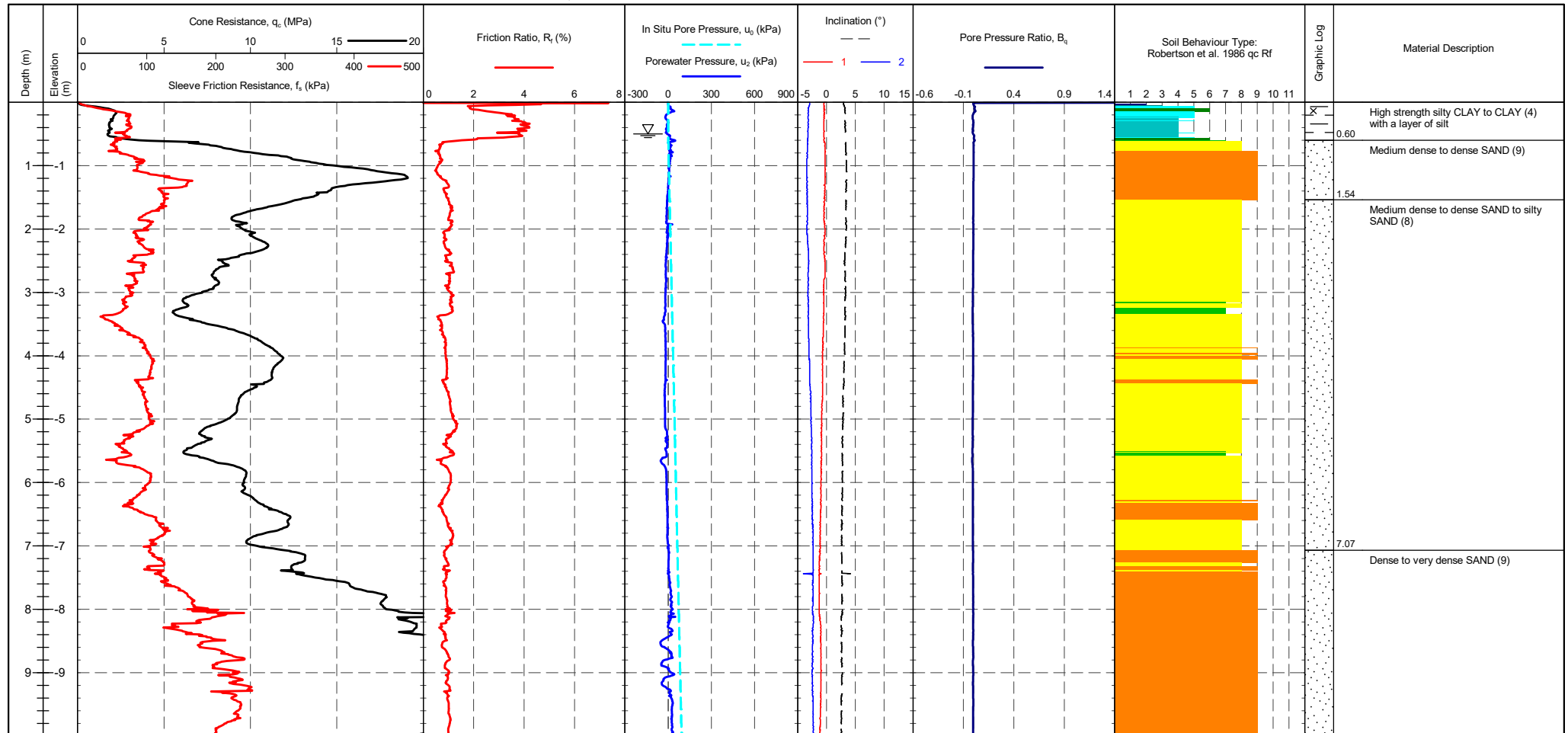
PROJECT No

1250505

FIGURE No

PointID

CPT108

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depthRemark:
Test completed at target depth.SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022

CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES
Transducer : Pre Post Difference
Tip : 245 mV 246 mV 0.011 MPa
Sleeve : 256 mV 253 mV -0.002 kPa
Pore Pressure 2 : 348 mV 276 mV -0.018 kPa
X-Y Inclinator : 2462 mV 2492 mV

METHOD: Robertson et al. 1986 qc Rf

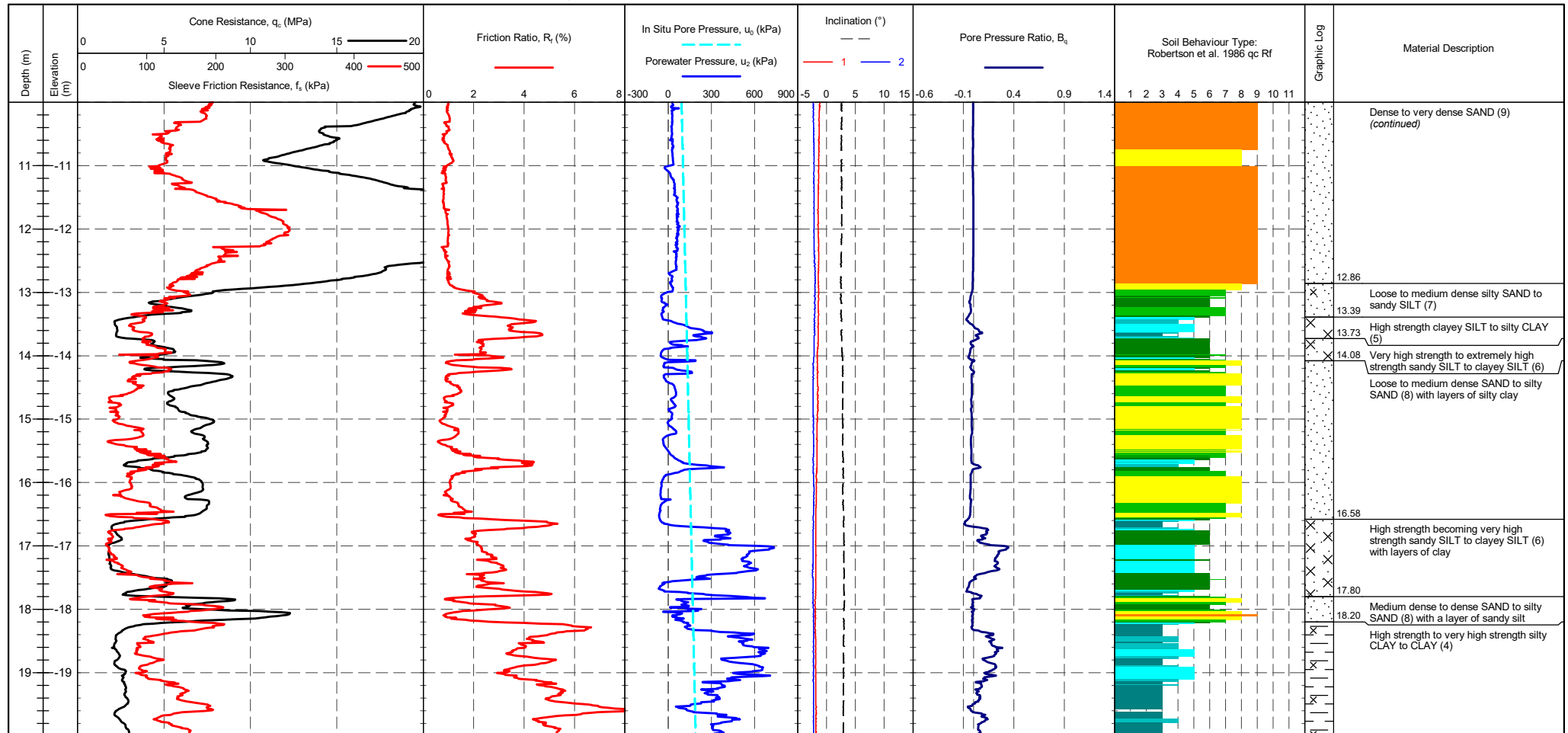
1 - Sensitive fine grained material
2 - Organic material
3 - CLAY
4 - Silty CLAY to CLAY
5 - Clayey SILT to silty CLAY
6 - Sandy SILT to clayey SILT
7 - Silty SAND to sandy SILT
8 - SAND to silty SAND
9 - SAND
10 - Gravelly SAND to SAND
11 - Very stiff fine grained
12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

CPT108

CLIENT : LK Group
PROJECT: Redwood SENLOCATION : Rochdale
PROJECT No. : 1250505EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depthRemark:
Test completed at target depth.SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022

CONE ID : S15-CFIP.1817
CALIBRATION DATE : 11/12/2023
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold
GROUNDWATER DEPTH : Assumed for calculation purposes

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

METHOD: Robertson et al. 1986 $q_c R_f$

1 - Sensitive fine grained material	5 - Clayey SILT to silty CLAY	9 - SAND
2 - Organic material	6 - Sandy SILT to clayey SILT	10 - Gravely SAND to SAND
3 - CLAY	7 - Silty SAND to sandy SILT	11 - Very stiff fine grained
4 - Silty CLAY to CLAY	8 - SAND to silty SAND	12 - SAND to clayey SAND

Groundwater Level

Dissipation Test

PointID

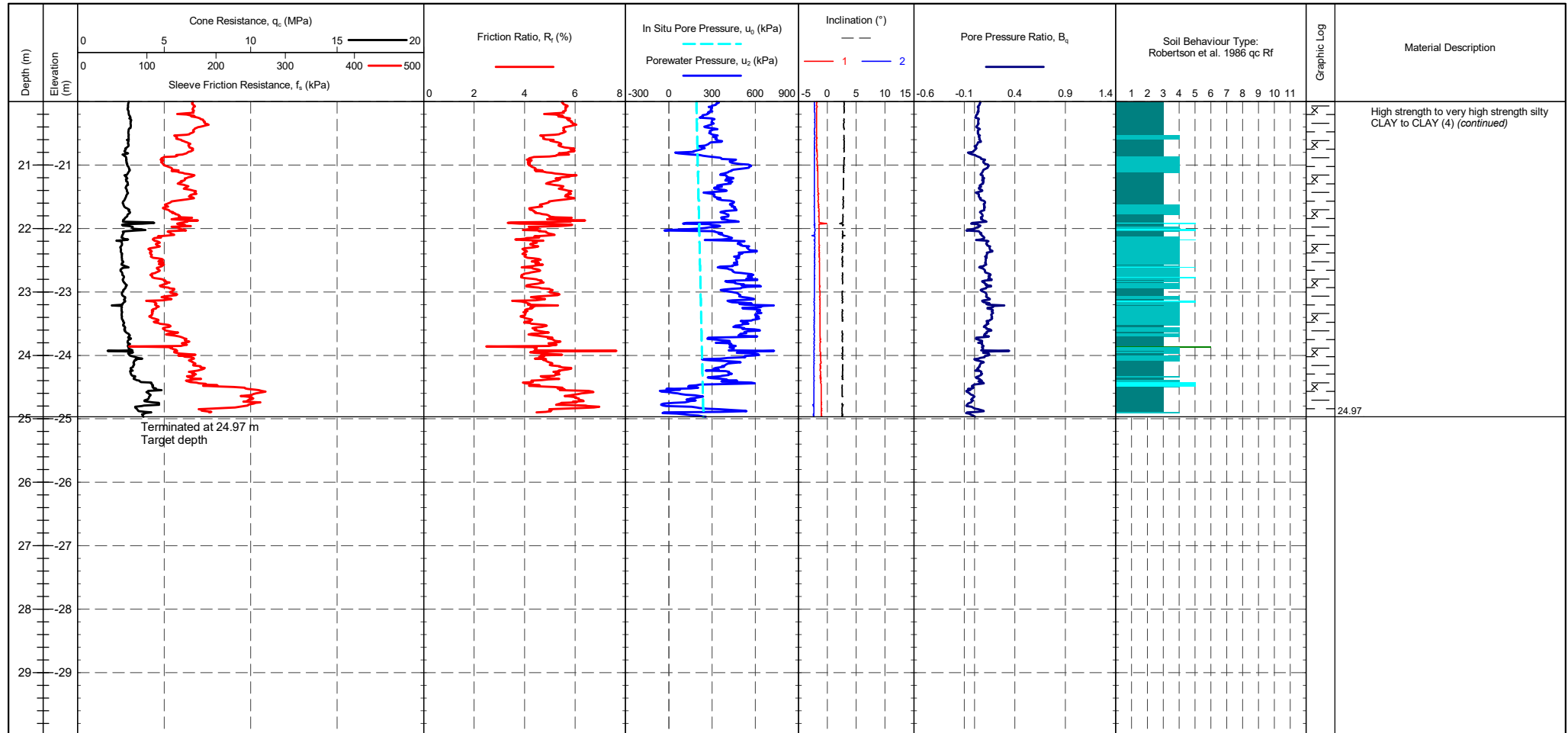
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817 CALIBRATION DATE : 11/12/2023 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 017 - Griffen OPERATOR : TR FRICTION REDUCER : None WEATHER : Sunny & Cold GROUNDWATER DEPTH : Assumed for calculation purposes		CPTU ZERO VALUES Transducer Pre Post Difference Tip 245 mV 246 mV 0.011 MPa Sleeve 256 mV 253 mV -0.002 kPa Pore Pressure 2 348 mV 276 mV -0.018 kPa X-Y Inclinator 2462 mV 2492 mV		METHOD: Robertson et al. 1986 q _c R _f 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 - Gravely SAND to SAND 11 - Very stiff fine grained 12 - SAND to clayey SAND			Groundwater Level Dissipation Test
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PointID

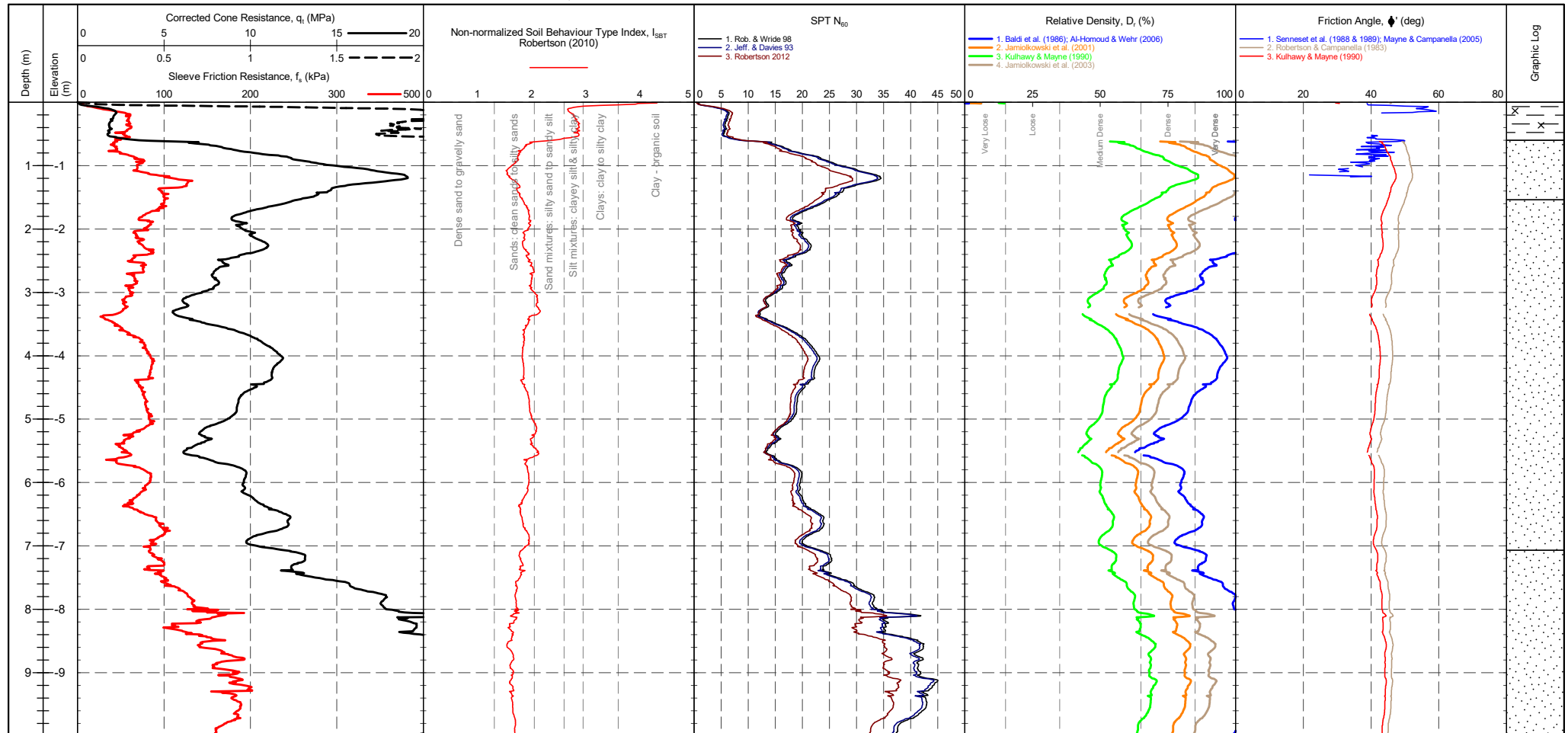
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre
245 mV
256 mV
348 mV
2462 mV

Post
246 mV
253 mV
276 mV
2492 mV

Difference
0.011 MPa
-0.002 kPa
-0.018 kPa

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

CPT108

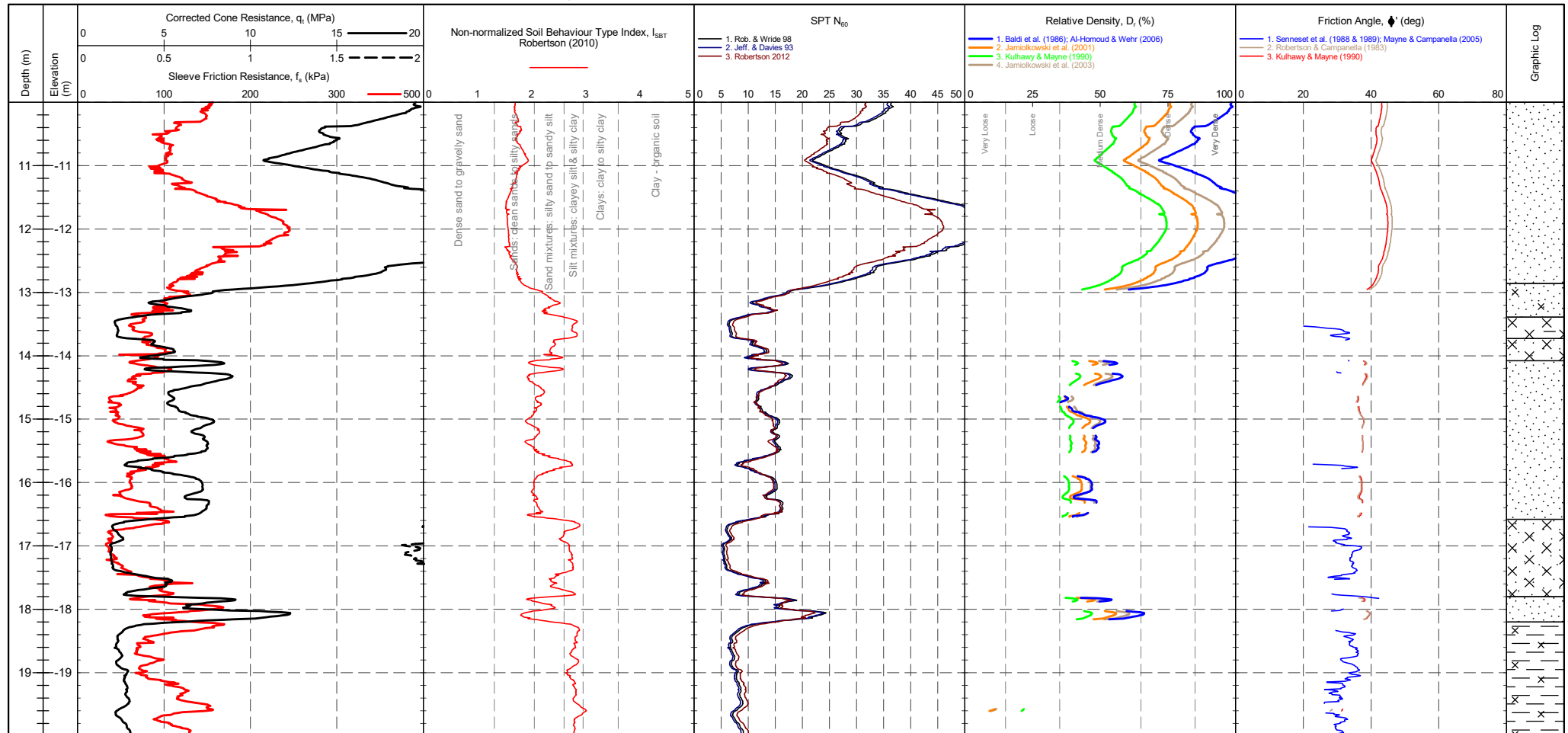
CLIENT : LK Group
PROJECT: Redwood SEN

LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre Post Difference
245 mV 246 mV 0.011 MPa
256 mV 253 mV -0.002 kPa
348 mV 276 mV -0.018 kPa
2462 mV 2492 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12

Description	SBT Index, I_c	Description	SPT N value, NSPT	Description	Relative Density D_r (%)
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

PointID

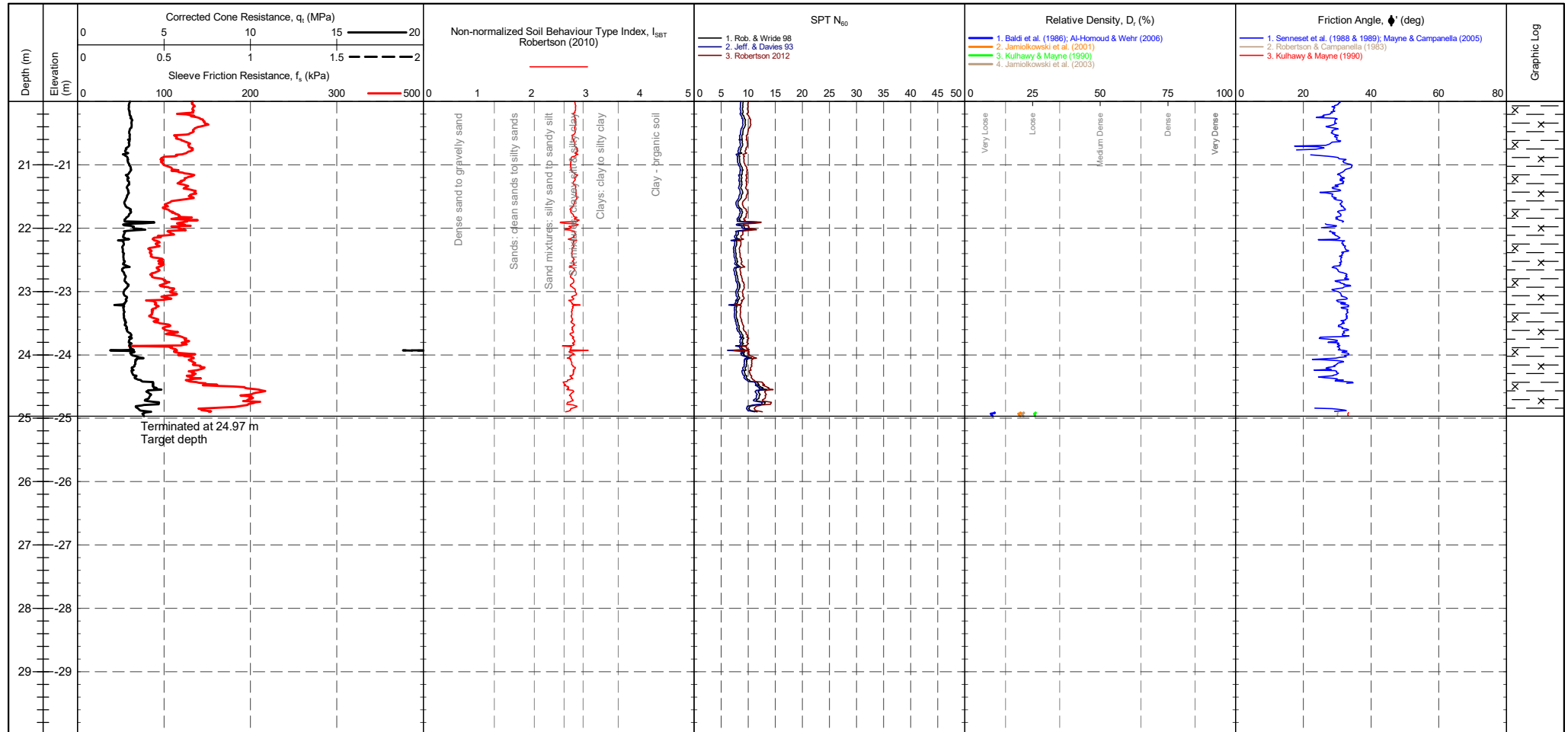
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer :
Tip :
Sleeve :
Pore Pressure 2 :
X-Y Inclinator :
CPTU ZERO VALUES
Pre : 245 mV
Post : 246 mV
Difference : 0.011 MPa
Pre : 256 mV
Post : 253 mV
Difference : -0.002 kPa
Pre : 348 mV
Post : 276 mV
Difference : -0.018 kPa
Pre : 2462 mV
Post : 2492 mV

GRANULAR SOILS (Sands & Gravels) Robertson et al. 1986 Zones 7-10 and Zone 12			
Description	SBT Index, I_c	Description	SPT N value, NSPT
Clays	2.95-3.60	Very Loose	0 - 4
Silt mixtures	2.60-2.95	Loose	4 - 10
Sand mixtures	2.05-2.60	Medium Dense	10 - 30
Sands	1.31-2.05	Dense	30 - 50
Gravelly sand	<1.31	Very Dense	>50

Groundwater Level
Dissipation Test

PointID

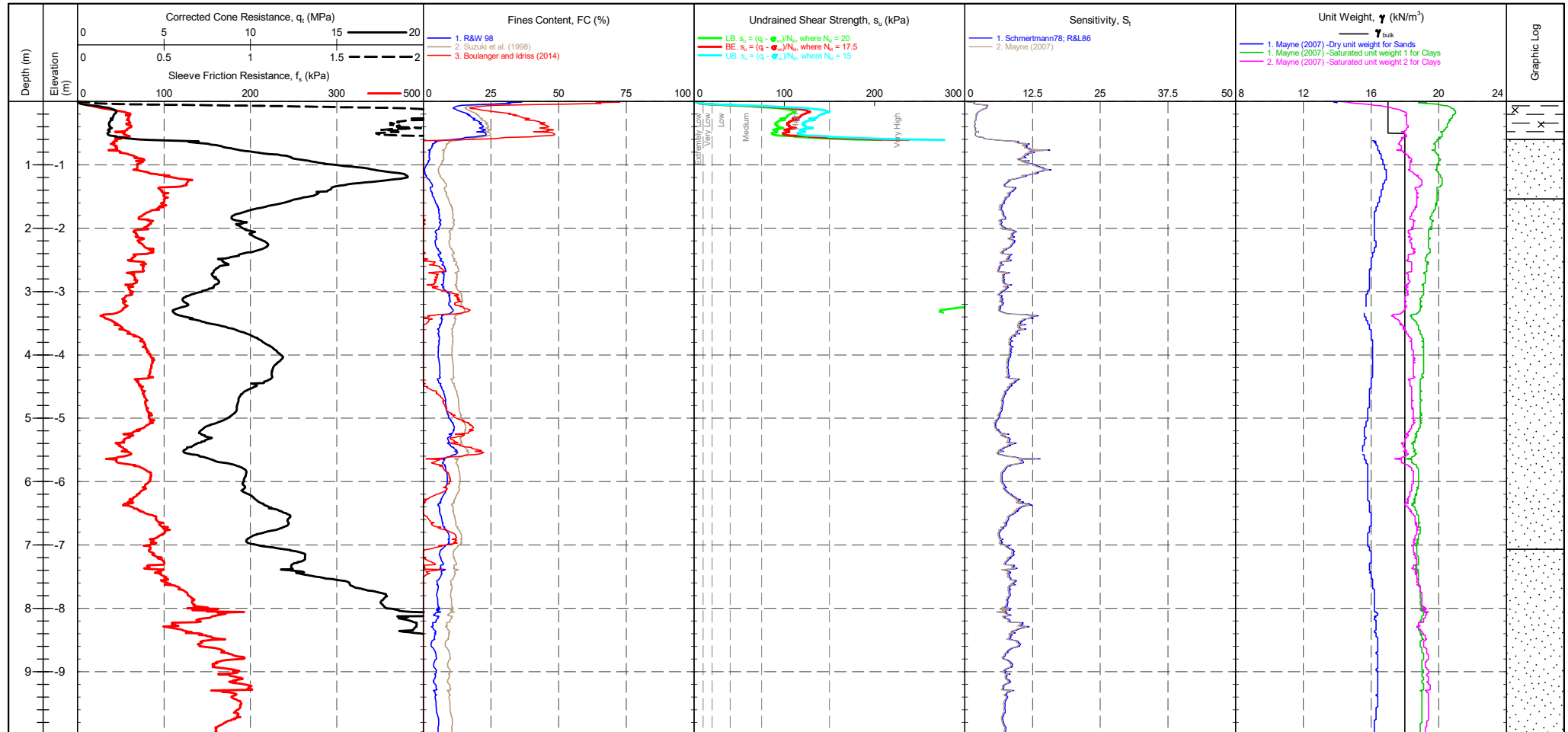
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

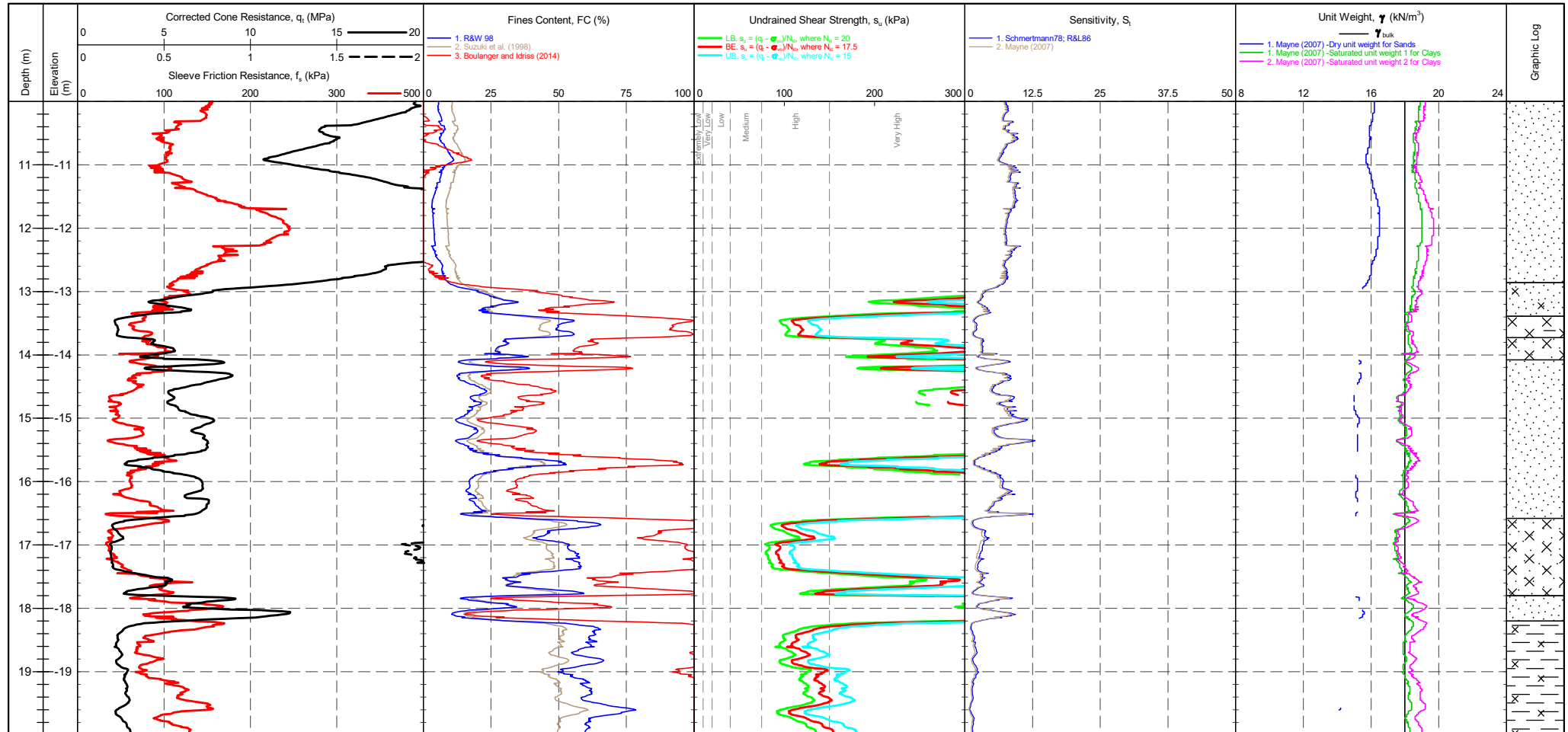
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer
Tip
Sleeve
Pore Pressure 2
X-Y Inclinator

Pre	Post	Difference
245 mV	246 mV	0.011 MPa
256 mV	253 mV	-0.002 kPa
348 mV	276 mV	-0.018 kPa
2462 mV	2492 mV	

CPTU ZERO VALUES

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

PointID

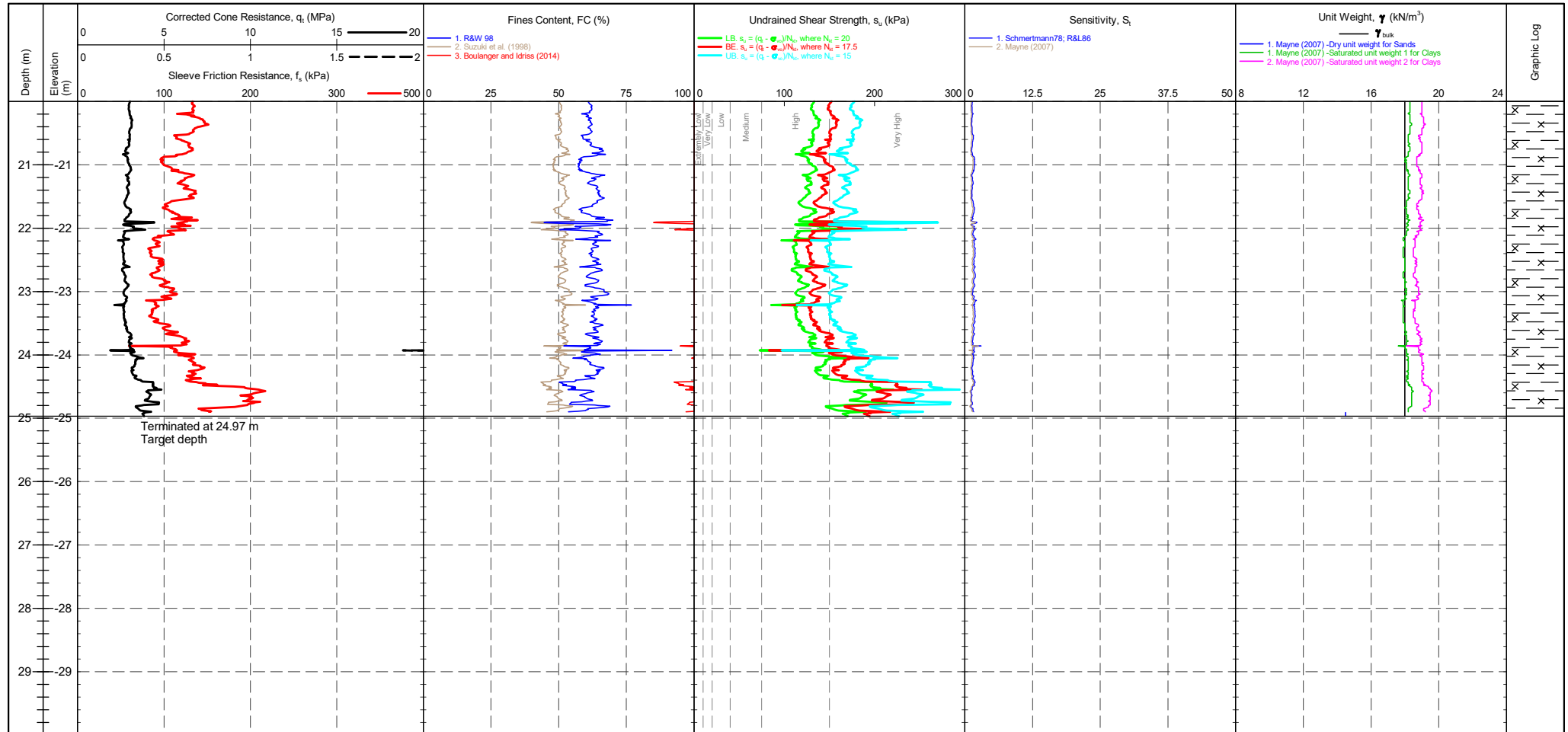
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

Transducer Pre Post Difference
Tip 245 mV 246 mV 0.011 MPa
Sleeve 256 mV 253 mV -0.002 kPa
Pore Pressure 2 348 mV 276 mV -0.018 kPa
X-Y Inclinator 2462 mV 2492 mV

COHESIVE SOILS (Clays & Silts) Robertson et al. 1986 Zones 1-6 and Zone 11

Term based on measurement	s_u (kPa)	Term based on measurement	s_u (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

PointID

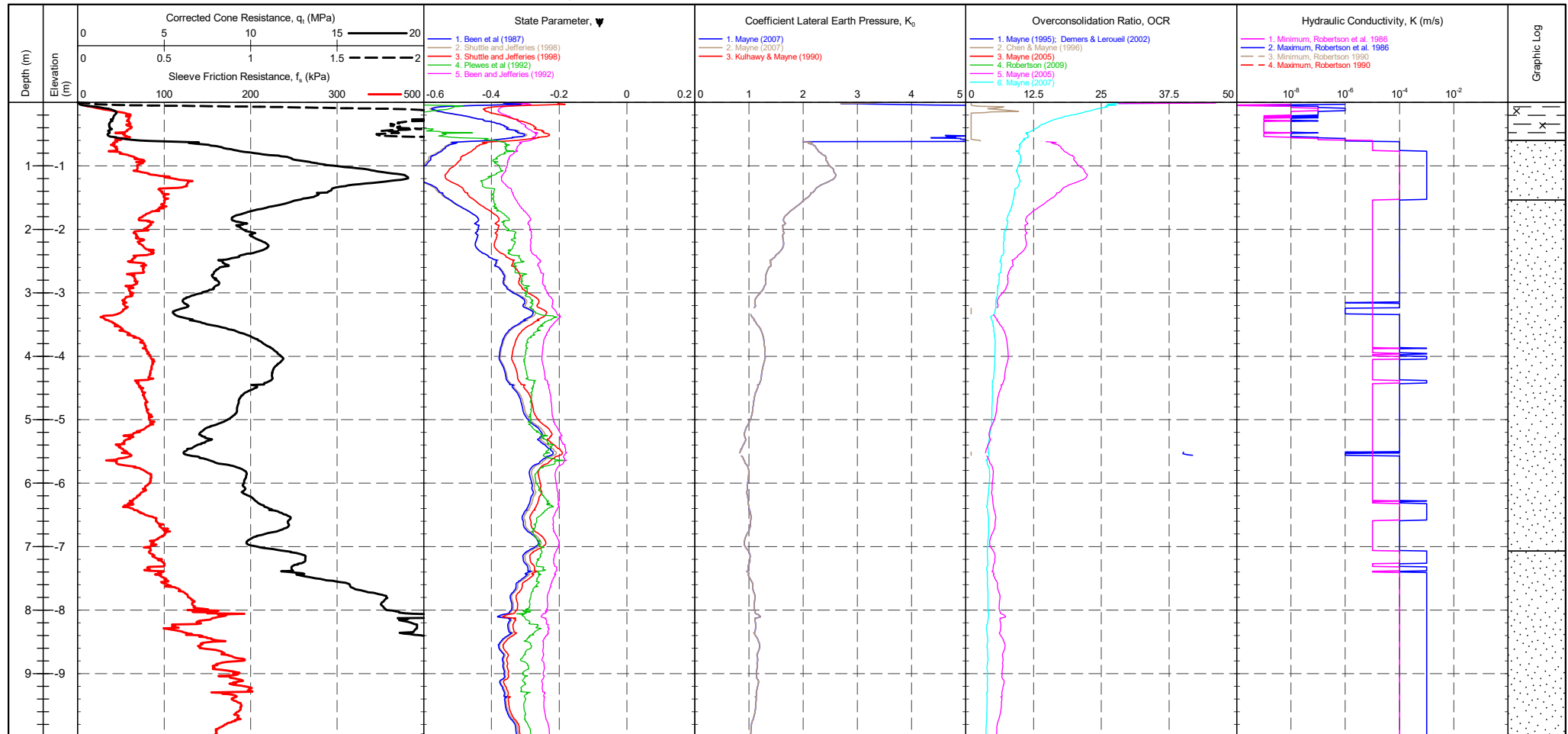
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

Groundwater Level
Dissipation Test

PointID

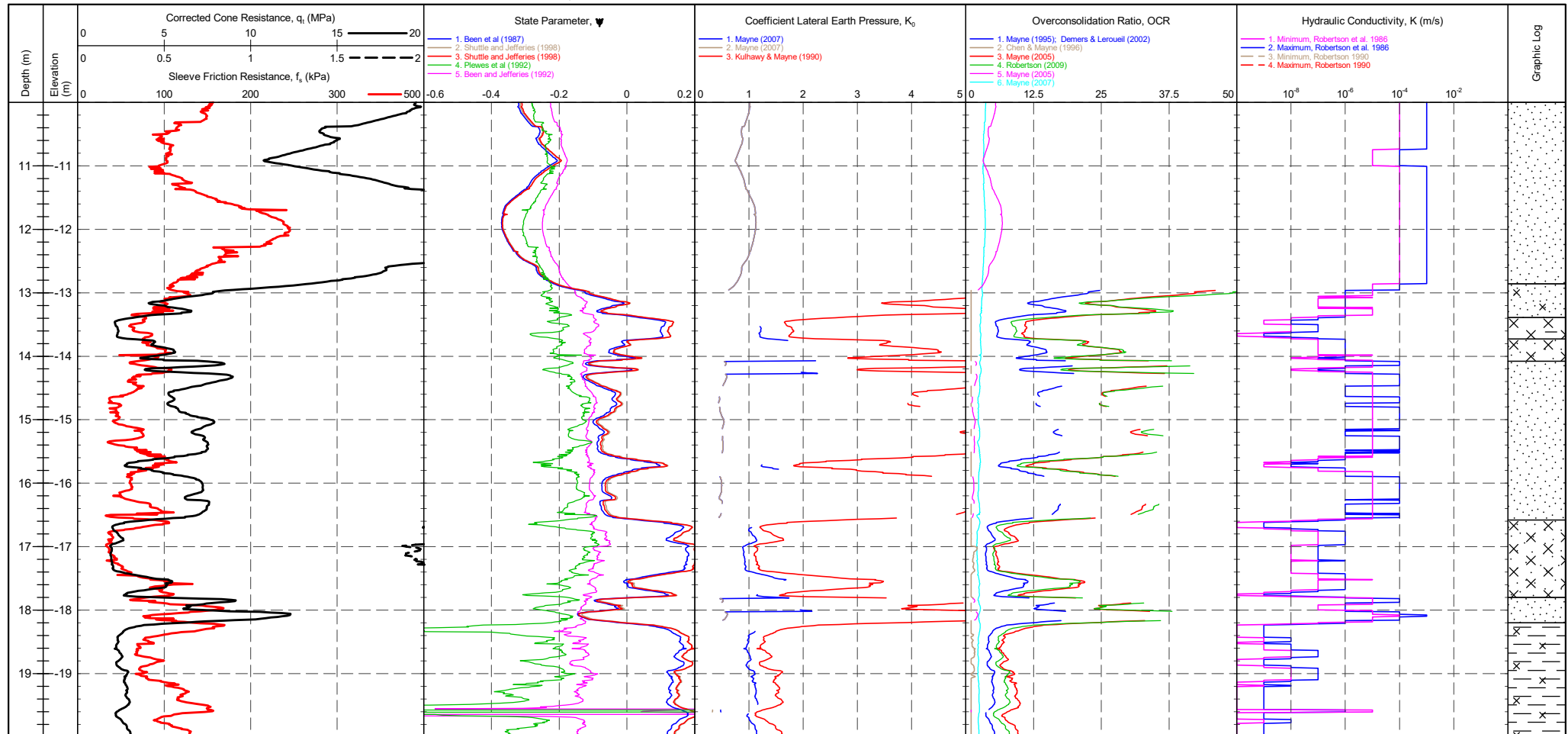
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

Groundwater Level
Dissipation Test

PointID

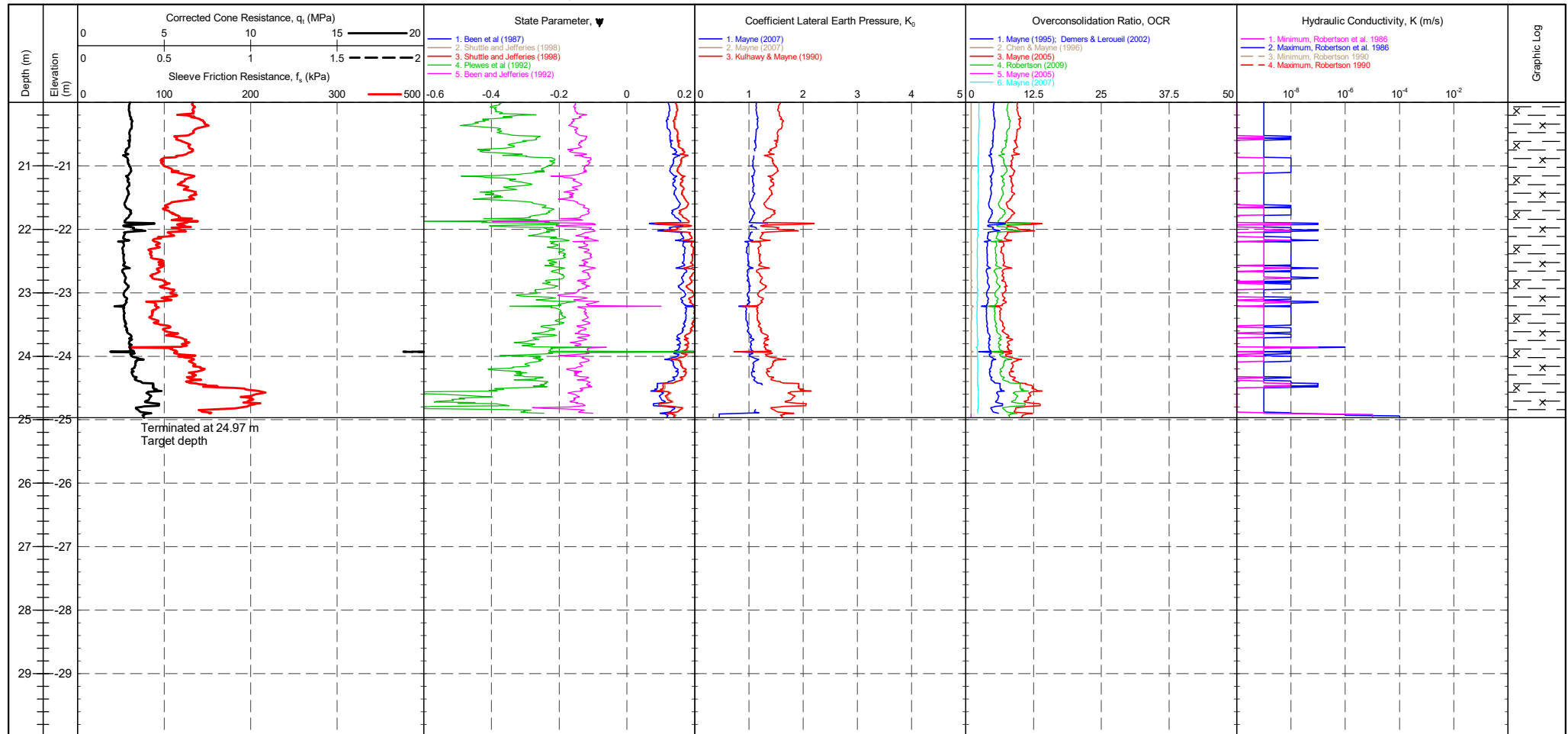
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

Groundwater Level
Dissipation Test

PointID

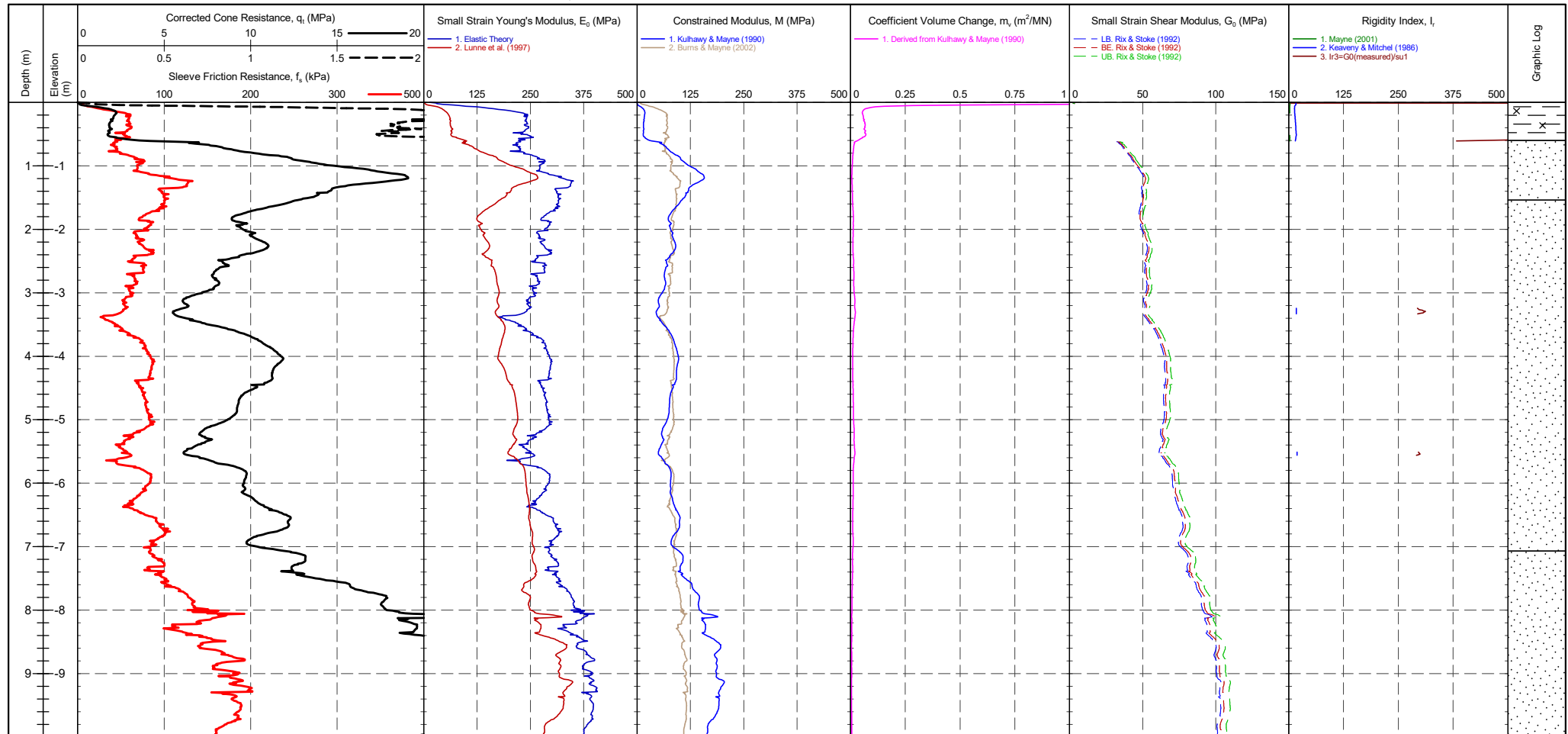
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 1 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

Groundwater Level
Dissipation Test

PointID

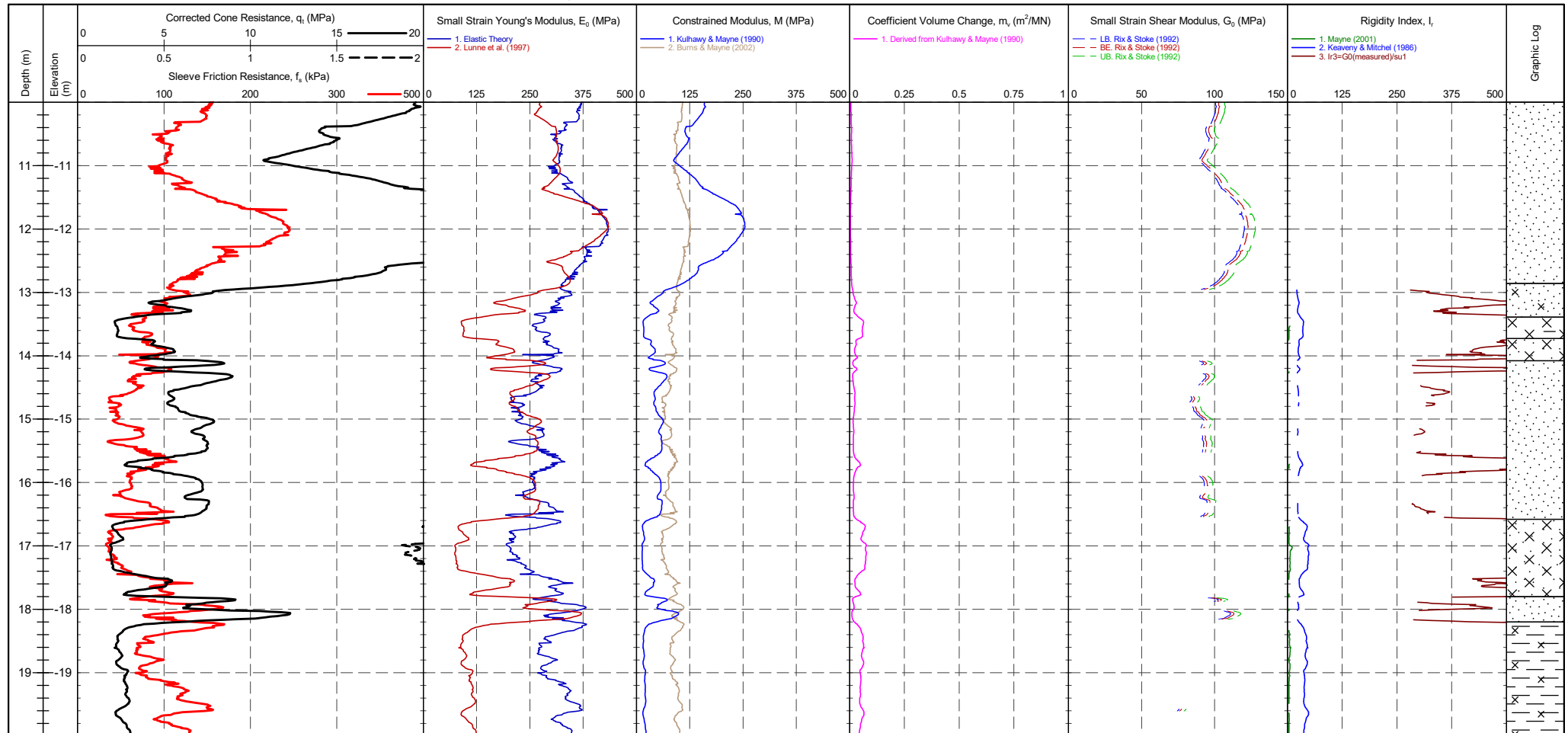
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 2 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
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 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

Groundwater Level
Dissipation Test

PointID

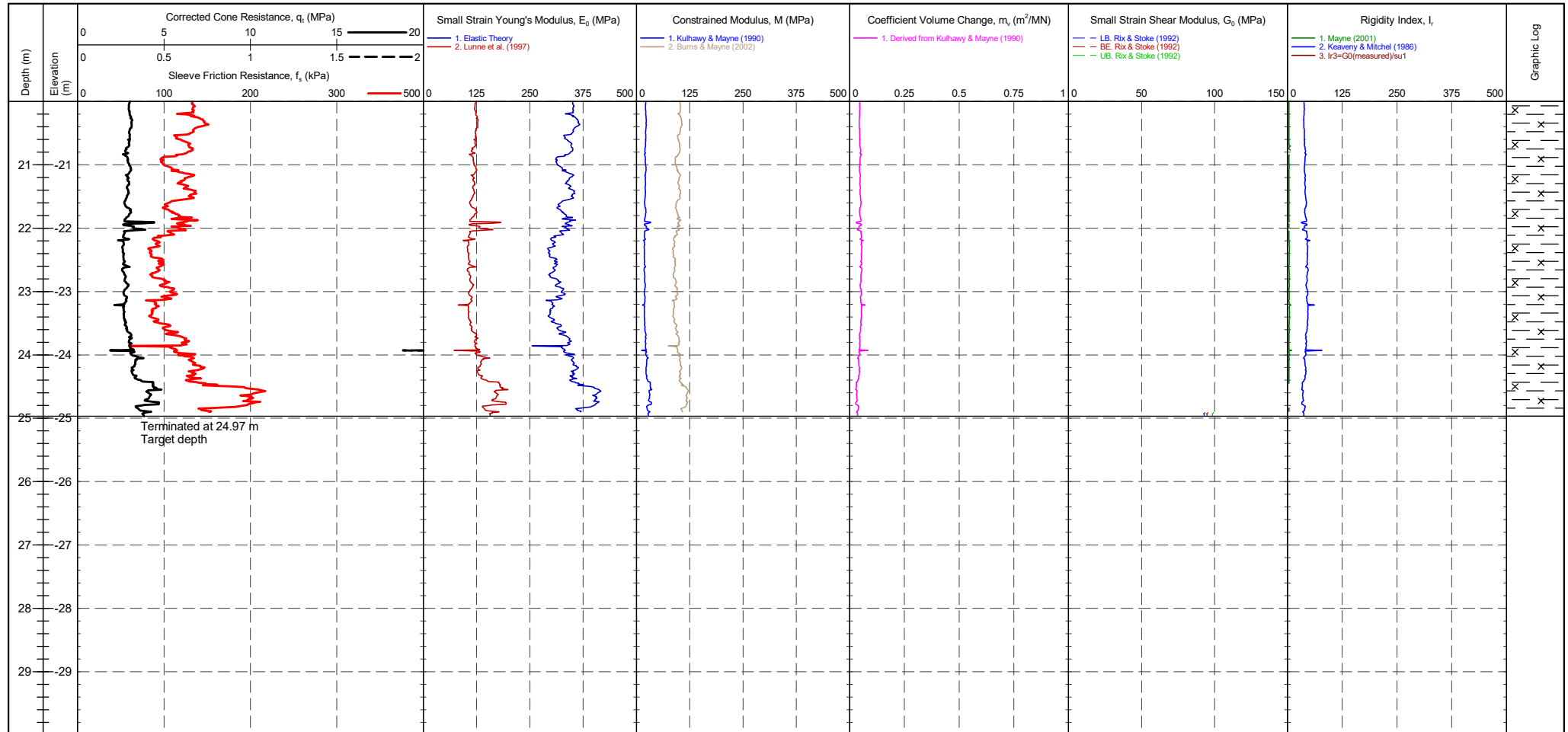
CPT108

CLIENT : LK Group
PROJECT: Redwood SEN
LOCATION : Rochdale
PROJECT No. : 1250505

EASTING : 0.000 m
NORTHING : 0.000 m
ELEVATION : 0.000 m OD
CHECKED BY : DW
TERMINATION REASON : Target depth

Remark:
Test completed at target depth.

SHEET : 3 OF 3
STATUS : Final
TEST DATE : 26/11/2025
PLOT DATE : 03/12/2025
METHOD : ISO 22476-1:2022



CONE ID : S15-CFIP.1817
CONE MODEL : Subtraction
CONE AREA : 15cm²
CONE AREA RATIO : 0.79
FILTER POSITION : u2
FILTER TYPE : HDPE

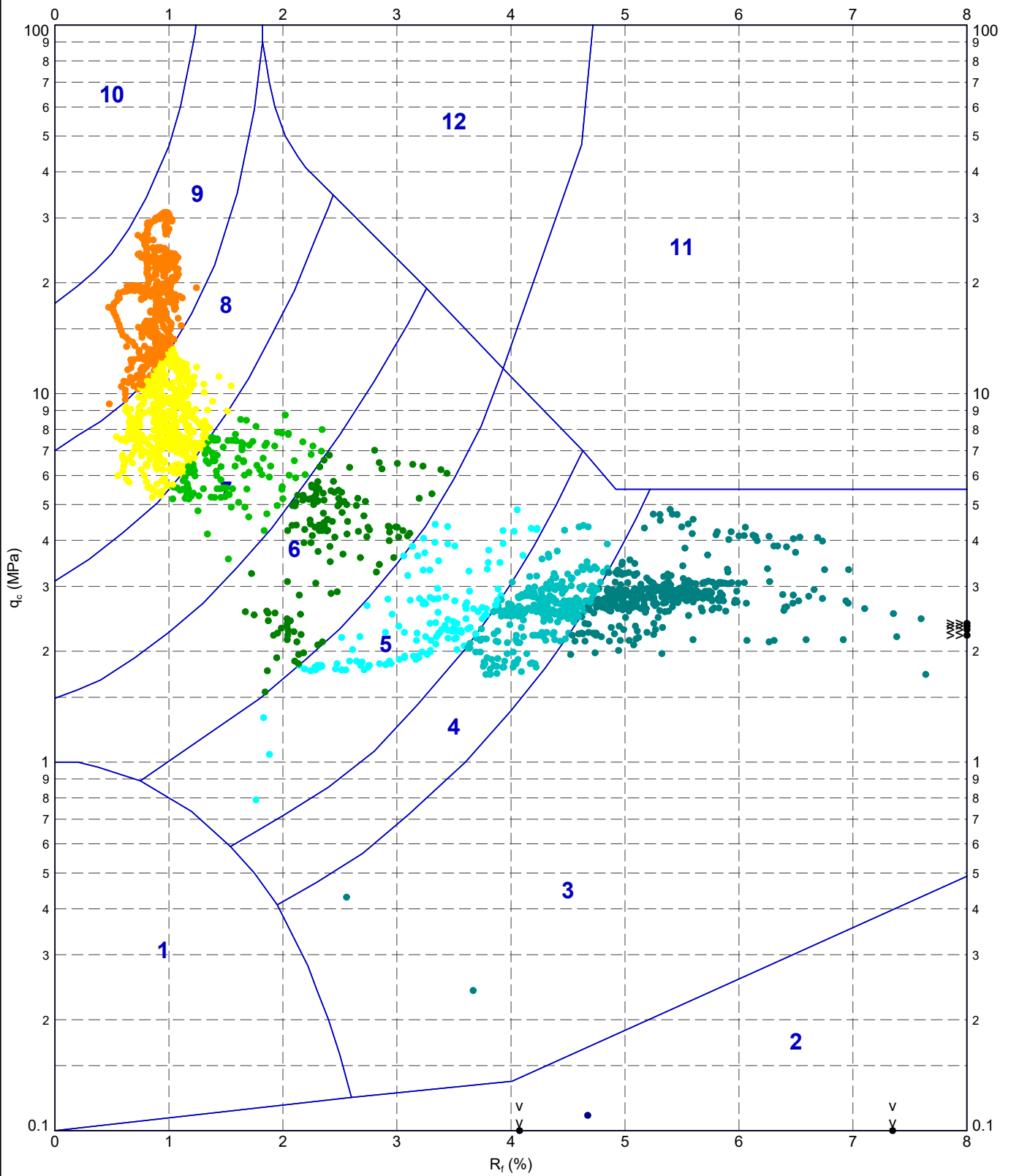
TEST TYPE : TE2
APPLICATION CLASS : 2
RIG : CPT 017 - Griffen
OPERATOR : TR
FRICTION REDUCER : None
WEATHER : Sunny & Cold

CPTU ZERO VALUES

Transducer	Pre	Post	Difference
Tip	245 mV	246 mV	0.011 MPa
Sleeve	256 mV	253 mV	-0.002 kPa
Pore Pressure 2	348 mV	276 mV	-0.018 kPa
X-Y Inclinator	2462 mV	2492 mV	

Groundwater Level
Dissipation Test

220629-ADVANCED REPORT INSTITUSI 202.1 LUB - CHLOE GLB Graph CPT ROBERTSON ET AL. 86 QC VS. Rf AP 1250505-REDWOOD SEN.GPJ <<DrawingFile>> 03/12/2025 14:43 To: 03/00.08 Dargel Lab and In Situ Tool - DGO Lib: In Situ SI 2.02.0 2017-07-10 Proj: In Situ SI 2.02.0 2017-07-10



METHOD: Robertson et al. 1986 q_c R_f

- | | | | |
|-------------------------------------|-------------------------------|------------------------------|------------------------------|
| 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

LK Group
Rochdale
Redwood SEN
Robertson et al. 1986 q_c vs. R_f - CPT108

DRAWN

DATE

03/12/2025

CHECKED

DATE

03/12/2025

SCALE

Not To Scale

A4

PROJECT No

1250505

FIGURE No



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 – Certificates of Analysis (Soil)

Certificate of Analysis

Certificate Number 25-28928

Issued: 18-Dec-25

Client LK Consult Limited
Unit 29
Eton Business Park
Eton Hill Road
Radcliffe
Manchester
M26 2ZS

Our Reference 25-28928

Client Reference ~ LKC251564

Order No ~ PO-C002180

Contract Title ~ Heywood Old Road, Middleton

Description 3 Soil samples.

Date Received 10-Dec-25

Date Started 10-Dec-25

Date Completed 18-Dec-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By



Louise Cook
Contracts Manager



Sample Deviations present. See Deviation Table Section for details.

Normec DETS Limited

Unit 2, Park Road Industrial Estate South, Consett, Co Durham, DH8 5PY
Tel: 01207 582333 • email: info-dets@normecgroup.com • normecdets.com

Summary of Chemical Analysis Soil Samples

Our Ref 25-28928

Client Ref ~ LKC251564

Contract Title ~ Heywood Old Road, Middleton

Lab No	2613260	2613261	2613262
Sample ID ~	CP101	CP101	CP101
Depth ~	1.20-1.65	3.30-3.75	4.60-4.95
Other ID ~			
Sample Type ~	SOIL	SOIL	SOIL
Sampling Date ~	n/s	n/s	n/s
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l	< 10	< 10	< 10
Inorganics						
pH	DETSC 2008#		pH	8.2	8.2	7.6
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.7	6.5	6.8
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l	< 1.0	< 1.0	< 1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	< 10	14	14

Information in Support of the Analytical Results

Our Ref 25-28928
 Client Ref ~ LKC251564
 Contract ~ Heywood Old Road, Middleton

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Incorrect container for tests
2613260	CP101 1.20-1.65 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2613261	CP101 3.30-3.75 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2613262	CP101 4.60-4.95 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

Normec DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 250µm sieve
 Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
 The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
 Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Key:

~ Sample details are provided by the client and can affect the validity of the results
 * -not accredited.
 # -MCERTS (accreditation only applies if report carries the MCERTS logo).
 \$ -subcontracted.
 n/s -not supplied.
 I/S -insufficient sample.
 U/S -unsuitable sample.
 t/f -to follow.
 nd -not detected.

End of Report Ver 25.10.03

Certificate of Analysis

Certificate Number 25-27757

Issued: 08-Dec-25

Client LK Consult Limited
Unit 29
Eton Business Park
Eton Hill Road
Radcliffe
Manchester
M26 2ZS

Our Reference 25-27757

Client Reference ~ LKC251564

Order No ~ PO-C002180

Contract Title ~ Heywood Old Road, Middleton

Description 6 Soil samples, 1 Leachate prepared by DETS sample.

Date Received 28-Nov-25

Date Started 28-Nov-25

Date Completed 08-Dec-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By



Louise Cook
Contracts Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 25-27757

Client Ref ~ LKC251564

Contract Title ~ Heywood Old Road, Middleton

Lab No	2606700	2606701	2606702	2606703	2606704	2606705
Sample ID ~	TP102	TP110	TP107	TP105	SD102	TP112
Depth ~	0.00-0.40	0.00-0.50	0.00-0.30	0.00-0.40	0.00-0.40	0.00-0.30
Other ID ~						
Sample Type ~	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date ~	26/11/2025	26/11/2025	26/11/2025	26/11/2025	26/11/2025	26/11/2025
Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Preparation									
Moisture Content	DETSC 1004	0.1	%	23	21	17	23	17	21
Metals									
Antimony	DETSC 2301*	1	mg/kg	1.3					
Arsenic	DETSC 2301#	0.2	mg/kg	16	22	19	13	18	19
Barium	DETSC 2301#	1.5	mg/kg	56					
Cadmium	DETSC 2301#	0.1	mg/kg	0.2	0.3	0.3	0.3	0.3	0.3
Chromium	DETSC 2301#	0.15	mg/kg	11	27	14	14	19	17
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	23	44	31	26	32	35
Lead	DETSC 2301#	0.3	mg/kg	46	93	94	54	72	79
Mercury	DETSC 2325#	0.05	mg/kg	0.12	0.21	0.16	0.10	0.11	0.18
Nickel	DETSC 2301#	1	mg/kg	9.1	19	14	12	18	16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301#	0.8	mg/kg		37	26	23	28	32
Zinc	DETSC 2301#	1	mg/kg	51	90	60	61	71	70
Inorganics									
pH	DETSC 2008#		pH	7.6	6.5	6.5	5.8	6.0	5.9
Organic matter	DETSC 2002#	0.1	%		4.4	4.3	6.2	2.6	4.6
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l		24	20	20	12	20
Petroleum Hydrocarbons									
Aliphatic C5-C6: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01					
Aliphatic C6-C8: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01					
Aliphatic C8-C10: HS_1D_AL	DETSC 3321*	0.01	mg/kg	< 0.01					
Aliphatic C10-C12: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5					
Aliphatic C12-C16: EH_CU_1D_AL	DETSC 3072#	1.2	mg/kg	< 1.2					
Aliphatic C16-C21: EH_CU_1D_AL	DETSC 3072#	1.5	mg/kg	< 1.5					
Aliphatic C21-C35: EH_CU_1D_AL	DETSC 3072#	3.4	mg/kg	< 3.4					
Aliphatic C35-C40: EH_CU_1D_AL	DETSC 3072*	3.4	mg/kg	< 3.4					
Aliphatic C10-C44: EH_CU_1D_AL	DETSC 3072*	10	mg/kg	< 10					
Aliphatic C5-C40: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10					
Aliphatic C5-C44: EH_CU+HS_1D_AL	DETSC 3072*	10	mg/kg	< 10					
Aromatic C5-C7: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01					
Aromatic C7-C8: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01					
Aromatic C8-C10: HS_1D_AR	DETSC 3321*	0.01	mg/kg	< 0.01					
Aromatic C10-C12: EH_CU_1D_AR	DETSC 3072#	0.9	mg/kg	< 0.9					
Aromatic C12-C16: EH_CU_1D_AR	DETSC 3072#	0.5	mg/kg	< 0.5					
Aromatic C16-C21: EH_CU_1D_AR	DETSC 3072#	0.6	mg/kg	< 0.6					
Aromatic C21-C35: EH_CU_1D_AR	DETSC 3072#	1.4	mg/kg	< 1.4					
Aromatic C35-C40: EH_CU_1D_AR	DETSC 3072*	1.4	mg/kg	< 1.4					
Aromatic C10-C44: EH_CU_1D_AR	DETSC 3072*	10	mg/kg	< 10					
Aromatic C5-C40: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10					

Summary of Chemical Analysis

Soil Samples

Our Ref 25-27757

Client Ref ~ LKC251564

Contract Title ~ Heywood Old Road, Middleton

Lab No	2606700	2606701	2606702	2606703	2606704	2606705
Sample ID ~	TP102	TP110	TP107	TP105	SD102	TP112
Depth ~	0.00-0.40	0.00-0.50	0.00-0.30	0.00-0.40	0.00-0.40	0.00-0.30
Other ID ~						
Sample Type ~	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date ~	26/11/2025	26/11/2025	26/11/2025	26/11/2025	26/11/2025	26/11/2025
Sampling Time ~	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Aromatic C5-C44: EH_CU+HS_1D_AR	DETSC 3072*	10	mg/kg	< 10					
TPH Ali/Aro C5-C40: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10					
TPH Ali/Aro C5-C44: EH_CU+HS_1D_Total	DETSC 3072*	10	mg/kg	< 10					
Ali/Aro C10-C44: EH_CU_1D_Total	DETSC 3072*	10	mg/kg	< 10					
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.10	0.41	0.45	< 0.10	< 0.10	< 0.10
Fluorene	DETSC 3301	0.1	mg/kg	0.14	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	DETSC 3301	0.1	mg/kg	0.54	0.47	1.5	0.14	1.0	0.33
Anthracene	DETSC 3301	0.1	mg/kg	0.84	2.8	2.2	0.54	1.1	0.47
Fluoranthene	DETSC 3301	0.1	mg/kg	0.99	< 0.10	2.8	< 0.10	1.9	0.58
Pyrene	DETSC 3301	0.1	mg/kg	1.3	2.9	1.8	< 0.10	2.3	0.97
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	0.47	0.31	0.92	0.18	0.91	0.32
Chrysene	DETSC 3301	0.1	mg/kg	0.33	1.6	0.84	0.13	0.78	0.29
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	0.30	0.55	0.89	< 0.10	0.59	0.22
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.16	0.42	0.39	< 0.10	0.36	0.20
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	0.48	1.6	< 0.10	< 0.10	0.79	0.41
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.66	1.1	< 0.10	< 0.10	< 0.10	0.48
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.22	1.3	< 0.10	< 0.10	< 0.10	0.12
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.31	0.38	< 0.10	< 0.10	< 0.10	0.26
PAH 16 Total	DETSC 3301	1.6	mg/kg	6.7	14	12	< 1.6	9.8	4.5

WASTE ACCEPTANCE CRITERIA TESTING v20.25.02.03

Our Ref 25-27757

Client Ref LKC251564

Contract Title Heywood Old Road, Middleton

Sample Id TP102 0.00-0.40

Sample Numbers 2606700 2606706

Date Analysed 08/12/2025

Test Results On Waste			WAC Limit Values		
Determinand and Method Reference	Units	Result	Inert Waste	SNRHW	Hazardous Waste
DETSC 2084# Total Organic Carbon	%	4.8	3	5	6
DETSC 2003# Loss On Ignition	%	9.3	n/a	n/a	10
DETSC 3321# BTEX	mg/kg	< 0.04	6	n/a	n/a
DETSC 3401# PCBs (7 congeners)	mg/kg	< 0.01	1	n/a	n/a
DETSC 3311* Mineral Oil (C10 - C40)	mg/kg	< 10	500	n/a	n/a
DETSC 3301 PAHs	mg/kg	6.7	100	n/a	n/a
DETSC 2008# pH	pH Units	7.6	n/a	>6	n/a
DETSC 2073* Acid Neutralisation Capacity (pH4)	mol/kg	< 1.0	n/a	TBE	TBE
DETSC 2073* Acid Neutralisation Capacity (pH7)	mol/kg	< 1.0	n/a	TBE	TBE

Test Results On Leachate			WAC Limit Values		
Determinand and Method Reference	Conc in Eluate ug/l	Amount Leached mg/kg	Limit values for LS10 Leachate		
	10:1	LS10	Inert Waste	SNRHW	Hazardous Waste
DETSC 2306 Arsenic as As	1.2	0.01	0.5	2	25
DETSC 2306 Barium as Ba	2.9	< 0.1	20	100	300
DETSC 2306 Cadmium as Cd	0.032	< 0.02	0.04	1	5
DETSC 2306 Chromium as Cr	< 0.25	< 0.1	0.5	10	70
DETSC 2306 Copper as Cu	6.2	0.06	2	50	100
DETSC 2306 Mercury as Hg	< 0.010	< 0.002	0.01	0.2	2
DETSC 2306 Molybdenum as Mo	< 1.1	< 0.1	0.5	10	30
DETSC 2306 Nickel as Ni	1.1	< 0.1	0.4	10	40
DETSC 2306 Lead as Pb	0.62	< 0.05	0.5	10	50
DETSC 2306 Antimony as Sb	0.4	< 0.05	0.06	0.7	5
DETSC 2306 Selenium as Se	0.36	< 0.03	0.1	0.5	7
DETSC 2306 Zinc as Zn	4.2	0.04	4	50	200
DETSC 2055 Chloride as Cl	900	< 100	800	15,000	25,000
DETSC 2055* Fluoride as F	140	1.4	10	150	500
DETSC 2055 Sulphate as SO4	1300	< 100	1000	20,000	50,000
DETSC 2009* Total Dissolved Solids	17000	170	4000	60,000	100,000
DETSC 2130 Phenol Index	< 100	< 1	1	n/a	n/a
DETSC 2033* Dissolved Organic Carbon	12000	120	500	800	1000

Additional Information	
DETSC 2008 pH	7.0
DETSC 2009 Conductivity uS/cm	24.2
* Temperature*	18.0
Mass of Sample Kg	0.117
Mass of dry Sample Kg	0.090
Stage 1	
Volume of Leachant L2	0.872
Volume of Eluate VE1	0

TBE - To Be Evaluated
SNRHW - Stable Non-Reactive
Hazardous Waste

Disclaimer: The WAC limit values are provided for guidance only. Normec DETS does not accept responsibility for errors or omissions. Values are correct at time of issue.

Summary of Asbestos Analysis

Soil Samples

Our Ref 25-27757

Client Ref ~ LKC251564

Contract Title ~ Heywood Old Road, Middleton

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
2606700	TP102 0.00-0.40	SOIL	NAD	none	Michael Kay
2606701	TP110 0.00-0.50	SOIL	NAD	none	Michael Kay
2606702	TP107 0.00-0.30	SOIL	NAD	none	Michael Kay
2606703	TP105 0.00-0.40	SOIL	NAD	none	Michael Kay
2606704	SD102 0.00-0.40	SOIL	NAD	none	Michael Kay
2606705	TP112 0.00-0.30	SOIL	NAD	none	Michael Kay

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * -not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 25-27757
 Client Ref ~ LKC251564
 Contract ~ Heywood Old Road, Middleton

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Incorrect container for tests
2606700	TP102 0.00-0.40 SOIL	26/11/25	GJ 250ml, GJ 30ml, PT 1L		
2606701	TP110 0.00-0.50 SOIL	26/11/25	GJ 250ml, GJ 30ml, PT 1L		
2606702	TP107 0.00-0.30 SOIL	26/11/25	GJ 250ml, GJ 30ml, PT 1L		
2606703	TP105 0.00-0.40 SOIL	26/11/25	GJ 250ml, GJ 30ml, PT 1L		
2606704	SD102 0.00-0.40 SOIL	26/11/25	GJ 250ml, GJ 30ml, PT 1L		
2606705	TP112 0.00-0.30 SOIL	26/11/25	GJ 250ml, GJ 30ml, PT 1L		
2606706	TP102 0.00-0.40 LEACHATE	26/11/25	GJ 250ml, GJ 30ml, PT 1L		

Lab No	Sample ID	Comments
2606706	TP102 0.00-0.40	Insufficient sample 1070g (<2kg) Sample received
Key: G-Glass P-Plastic J-Jar T-Tub Normec DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.		

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 250µm sieve
 Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
 The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
 Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Information in Support of the Analytical Results

List of HWOL Acronyms and Operators

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det	Acronym
Aliphatic C5-C6	HS_1D_AL
Aliphatic C6-C8	HS_1D_AL
Aliphatic C8-C10	HS_1D_AL
Aliphatic C10-C12	EH_CU_1D_AL
Aliphatic C12-C16	EH_CU_1D_AL
Aliphatic C16-C21	EH_CU_1D_AL
Aliphatic C21-C35	EH_CU_1D_AL
Aliphatic C35-C40	EH_CU_1D_AL
Aliphatic C10-C44	EH_CU_1D_AL
Aliphatic C5-C40	EH_CU+HS_1D_AL
Aliphatic C5-C44	EH_CU+HS_1D_AL
Aromatic C5-C7	HS_1D_AR
Aromatic C7-C8	HS_1D_AR
Aromatic C8-C10	HS_1D_AR
Aromatic C10-C12	EH_CU_1D_AR
Aromatic C12-C16	EH_CU_1D_AR
Aromatic C16-C21	EH_CU_1D_AR
Aromatic C21-C35	EH_CU_1D_AR
Aromatic C35-C40	EH_CU_1D_AR
Aromatic C10-C44	EH_CU_1D_AR
Aromatic C5-C40	EH_CU+HS_1D_AR
Aromatic C5-C44	EH_CU+HS_1D_AR
TPH Ali/Aro C5-C40	EH_CU+HS_1D_Total
TPH Ali/Aro C5-C44	EH_CU+HS_1D_Total
Ali/Aro C10-C44	EH_CU_1D_Total
Mineral Oil (C10-C40) + Clean Up	EH_CU_1D_Total

Key:

~ Sample details are provided by the client and can affect the validity of the results

* -not accredited.

-MCERTS (accreditation only applies if report carries the MCERTS logo).

\$ -subcontracted.

n/s -not supplied.

I/S -insufficient sample.

U/S -unsuitable sample.

t/f -to follow.

nd -not detected.

End of Report Ver 25.10.03

Appendix F – Certificates of Analysis (Geotechnical)

Certificate of Analysis

Certificate Number 25-28928

Issued: 18-Dec-25

Client LK Consult Limited
Unit 29
Eton Business Park
Eton Hill Road
Radcliffe
Manchester
M26 2ZS

Our Reference 25-28928

Client Reference ~ LKC251564

Order No ~ PO-C002180

Contract Title ~ Heywood Old Road, Middleton

Description 3 Soil samples.

Date Received 10-Dec-25

Date Started 10-Dec-25

Date Completed 18-Dec-25

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. 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 except in full, without the prior written approval of the laboratory.

Approved By

A handwritten signature in black ink, appearing to read "Louise Cook".

Louise Cook
Contracts Manager



Sample Deviations present. See Deviation Table Section for details.

Normec DETS Limited

Unit 2, Park Road Industrial Estate South, Consett, Co Durham, DH8 5PY
Tel: 01207 582333 • email: info-dets@normecgroup.com • normecdets.com

Summary of Chemical Analysis Soil Samples

Our Ref 25-28928

Client Ref ~ LKC251564

Contract Title ~ Heywood Old Road, Middleton

Lab No	2613260	2613261	2613262
Sample ID ~	CP101	CP101	CP101
Depth ~	1.20-1.65	3.30-3.75	4.60-4.95
Other ID ~			
Sample Type ~	SOIL	SOIL	SOIL
Sampling Date ~	n/s	n/s	n/s
Sampling Time ~	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Magnesium Aqueous Extract (2:1)	DETSC 2076*	10	mg/l	< 10	< 10	< 10
Inorganics						
pH	DETSC 2008#		pH	8.2	8.2	7.6
Chloride Aqueous Extract (2:1)	DETSC 2055	1	mg/l	6.7	6.5	6.8
Nitrate Aqueous Extract as NO3 (2:1)	DETSC 2055	1	mg/l	< 1.0	< 1.0	< 1.0
Sulphate Aqueous Extract as SO4 (2:1)	DETSC 2076#	10	mg/l	< 10	14	14

Information in Support of the Analytical Results

Our Ref 25-28928
 Client Ref ~ LKC251564
 Contract ~ Heywood Old Road, Middleton

Containers Received & Deviating Samples

Lab No	Sample ID ~	Date Sampled ~	Containers Received	Holding time exceeded for tests	Incorrect container for tests
2613260	CP101 1.20-1.65 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2613261	CP101 3.30-3.75 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	
2613262	CP101 4.60-4.95 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (30 days), pH + Conductivity (7 days)	

Key: P-Plastic T-Tub

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Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 250µm sieve
 Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.
 The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-
 Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

Key:

~ Sample details are provided by the client and can affect the validity of the results
 * -not accredited.
 # -MCERTS (accreditation only applies if report carries the MCERTS logo).
 \$ -subcontracted.
 n/s -not supplied.
 I/S -insufficient sample.
 U/S -unsuitable sample.
 t/f -to follow.
 nd -not detected.

End of Report Ver 25.10.03

TEST REPORT

Client LK Consult Ltd

Address Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Greater Manchester
M26 2ZS

Contract LKR 25 1564 -
Heywood Old Lane, Middleton

Job Number MRN 26004/1
Date of Issue 06 January 2026
Page 1 of 4

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
- 6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.



Andrew House, Hadfield Street, Dukinfield, Cheshire SK16 4QX Tel: 0161 475 0870
Email: enquiries@murrayrix.com Website: www.murrayrix.com

Also at: London: 020 8523 1999

Murray Rix is the trading name of Murray Rix (Northern) Limited. Registered in England 2878361

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

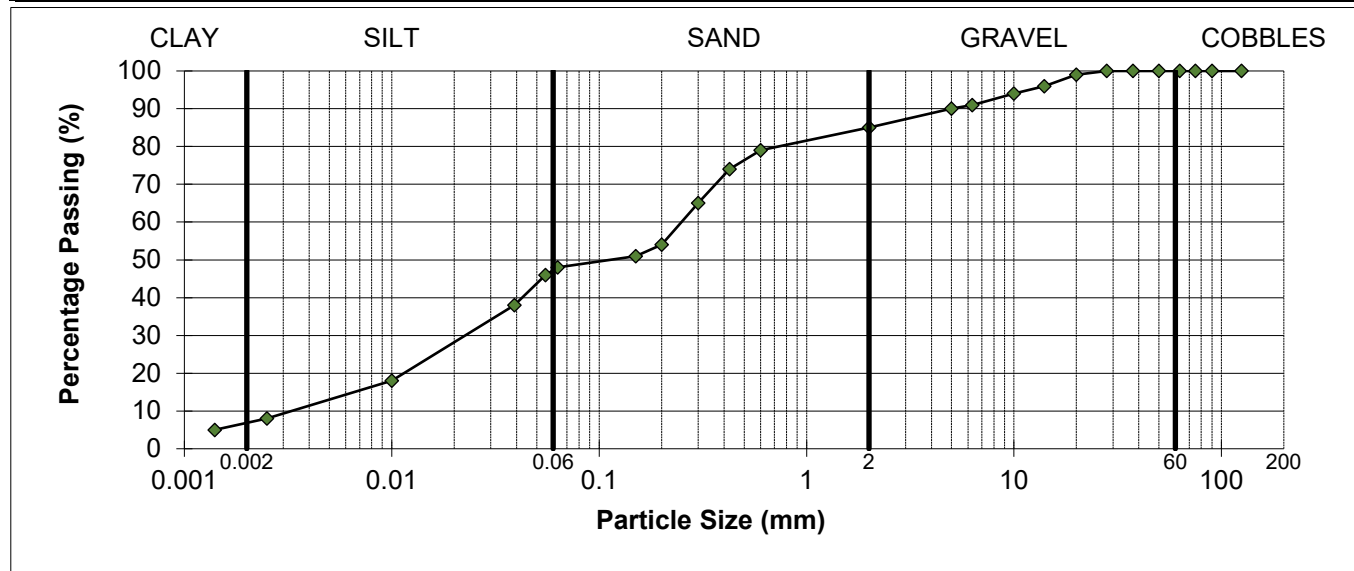
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/1

SAMPLE LABEL	CP101 0.7-1.0m B	DATE SAMPLED	28-Nov-25
LAB SAMPLE No	5243501	DATE RECEIVED	10-Dec-25
DATE TESTED	15-Dec-25	SAMPLED BY	Client

MATERIAL	Brown clayey gravelly SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	85	
90	100		0.6	79	
75	100		0.425	74	
63	100		0.3	65	
50	100		0.2	54	
37.5	100		0.15	51	
28	100		0.063	48	
20	99		0.055	46	
14	96		0.039	38	
10	94		0.01	18	
6.3	91		0.0025	8	
5	90		0.0014	5	



SOIL FRACTIONS			
GRAVEL	15%	SILT	41%
SAND	37%	CLAY	7%

As received water content =	18.3%
-----------------------------	-------

REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

06-Jan-26

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
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PARTICLE SIZE DISTRIBUTION

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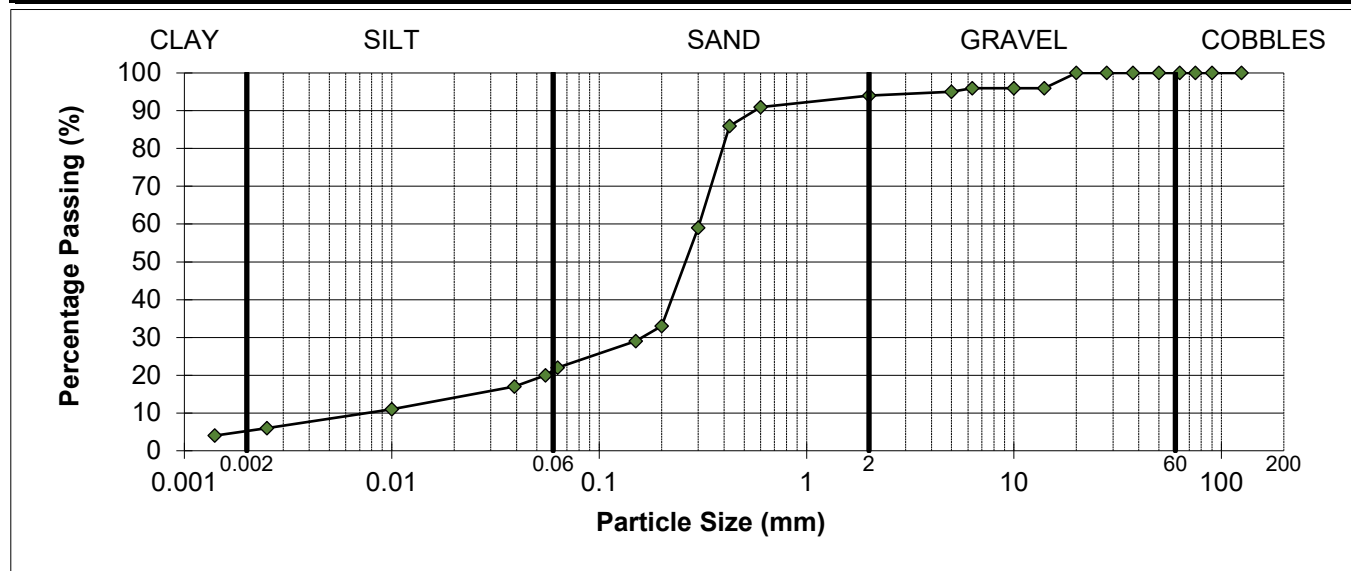
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/1

SAMPLE LABEL	CP101 2.7-3.0m B	DATE SAMPLED	28-Nov-25
LAB SAMPLE No	5243502	DATE RECEIVED	10-Dec-25
DATE TESTED	15-Dec-25	SAMPLED BY	Client

MATERIAL	Brown clayey gravelly SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	94	
90	100		0.6	91	
75	100		0.425	86	
63	100		0.3	59	
50	100		0.2	33	
37.5	100		0.15	29	
28	100		0.063	22	
20	100		0.055	20	
14	96		0.039	17	
10	96		0.01	11	
6.3	96		0.0025	6	
5	95		0.0014	4	



SOIL FRACTIONS			
GRAVEL	6%	SILT	17%
SAND	72%	CLAY	5%
As received water content =		19.2%	

REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

06-Jan-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

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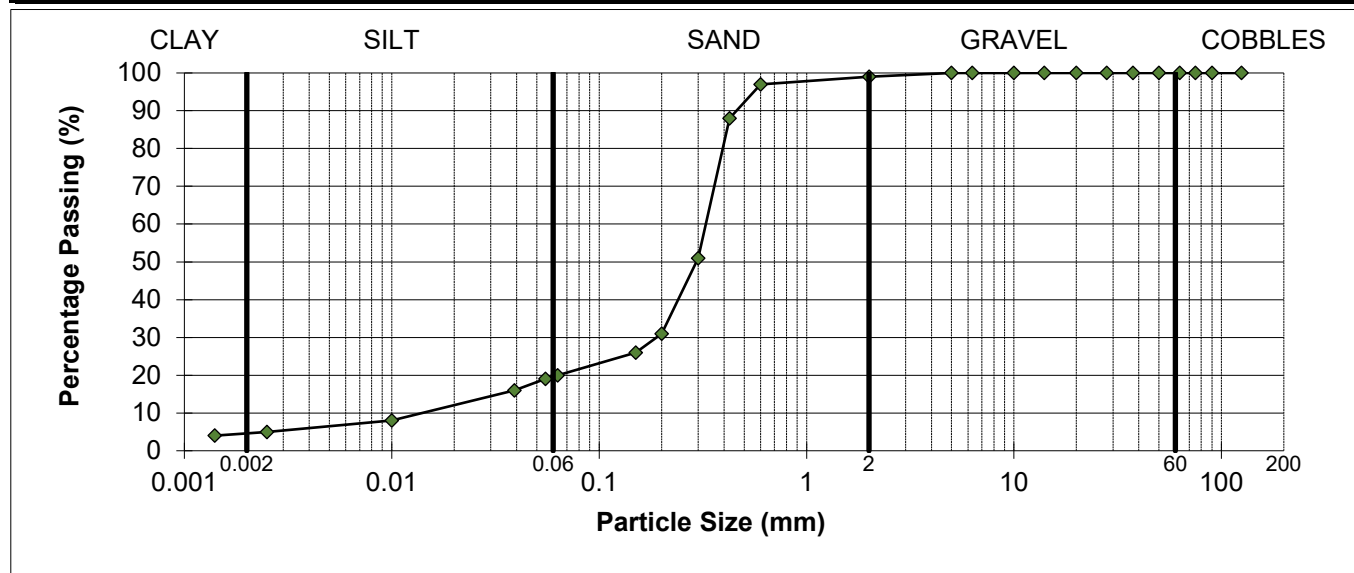
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/1

SAMPLE LABEL	CP101 5.0-5.3m B	DATE SAMPLED	28-Nov-25
LAB SAMPLE No	5243503	DATE RECEIVED	10-Dec-25
DATE TESTED	15-Dec-25	SAMPLED BY	Client

MATERIAL	Brown clayey slightly gravelly SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	99	
90	100		0.6	97	
75	100		0.425	88	
63	100		0.3	51	
50	100		0.2	31	
37.5	100		0.15	26	
28	100		0.063	20	
20	100		0.055	19	
14	100		0.039	16	
10	100		0.01	8	
6.3	100		0.0025	5	
5	100		0.0014	4	



SOIL FRACTIONS			
GRAVEL	1%	SILT	15%
SAND	79%	CLAY	5%
As received water content =		16.6%	

REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

06-Jan-26

TEST REPORT

Client LK Consult Ltd

Address Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Greater Manchester
M26 2ZS

Contract LKR 25 1564 -
Heywood Old Lane, Middleton

Job Number MRN 26004/2

Date of Issue 07 January 2026

Page 1 of 10

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
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- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
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Also at: London: 020 8523 1999

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PARTICLE SIZE DISTRIBUTION

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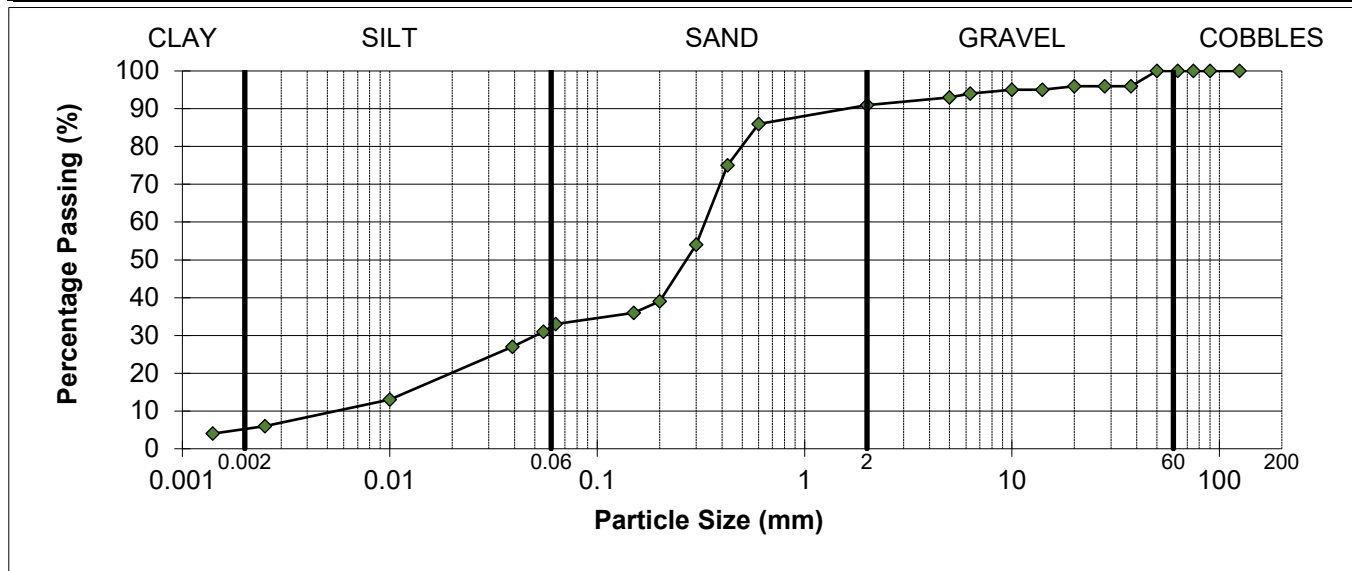
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP107 1.5-2.0m	DATE SAMPLED	26-Nov-25
LAB SAMPLE No	5238501	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown clayey gravelly SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	91	
90	100		0.6	86	
75	100		0.425	75	
63	100		0.3	54	
50	100		0.2	39	
37.5	96		0.15	36	
28	96		0.063	33	
20	96		0.055	31	
14	95		0.039	27	
10	95		0.01	13	
6.3	94		0.0025	6	
5	93		0.0014	4	



SOIL FRACTIONS			
GRAVEL	9%	SILT	28%
SAND	58%	CLAY	5%
As received water content =		15.7%	

REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

07-Jan-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

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PARTICLE SIZE DISTRIBUTION

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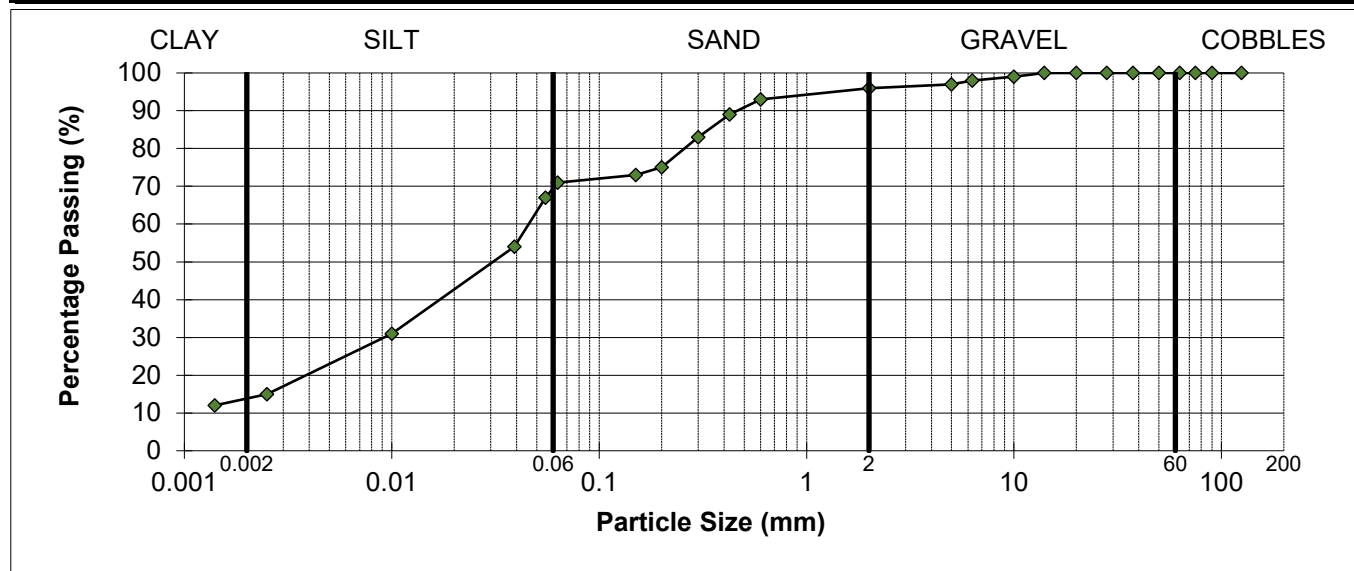
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP108 0.5-1.0m	DATE SAMPLED	26-Nov-25
LAB SAMPLE No	5238502	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	96	
90	100		0.6	93	
75	100		0.425	89	
63	100		0.3	83	
50	100		0.2	75	
37.5	100		0.15	73	
28	100		0.063	71	
20	100		0.055	67	
14	100		0.039	54	
10	99		0.01	31	
6.3	98		0.0025	15	
5	97		0.0014	12	



SOIL FRACTIONS			
GRAVEL	4%	SILT	57%
SAND	25%	CLAY	14%
As received water content =		28.4%	

REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

07-Jan-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

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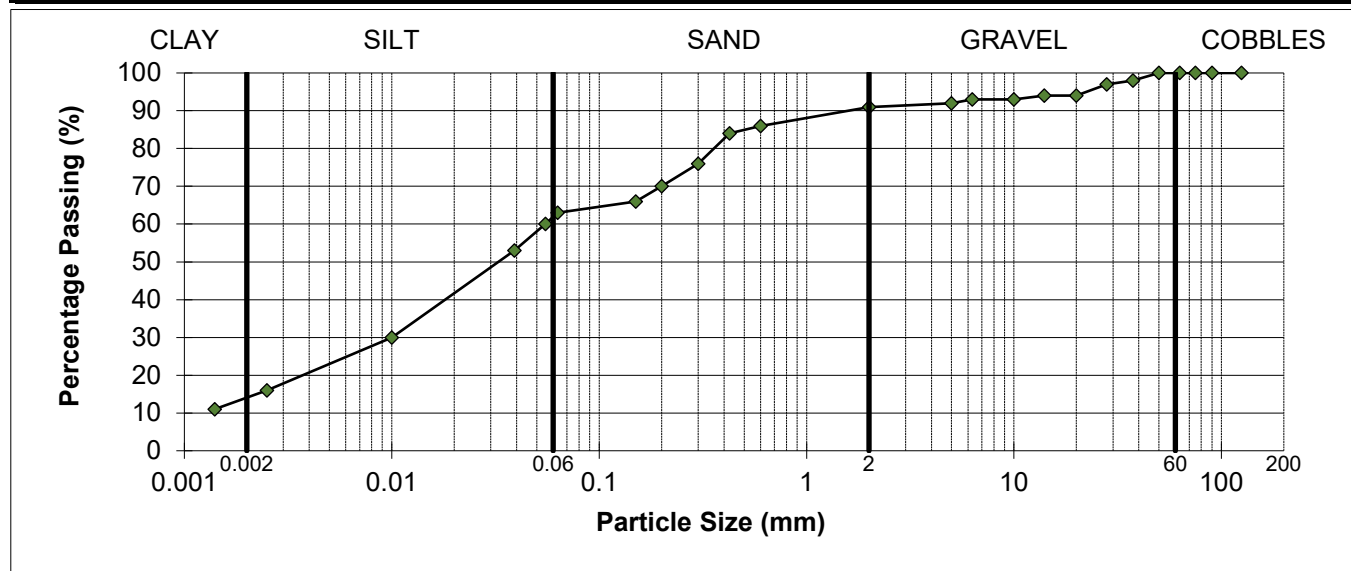
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP109 1.0-2.0m	DATE SAMPLED	26-Nov-25
LAB SAMPLE No	5238504	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		2	91	
90	100		0.6	86	
75	100		0.425	84	
63	100		0.3	76	
50	100		0.2	70	
37.5	98		0.15	66	
28	97		0.063	63	
20	94		0.055	60	
14	94		0.039	53	
10	93		0.01	30	
6.3	93		0.0025	16	
5	92		0.0014	11	



SOIL FRACTIONS			
GRAVEL	9%	SILT	49%
SAND	28%	CLAY	14%

As received water content =	14.8%
-----------------------------	-------

REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

07-Jan-26

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

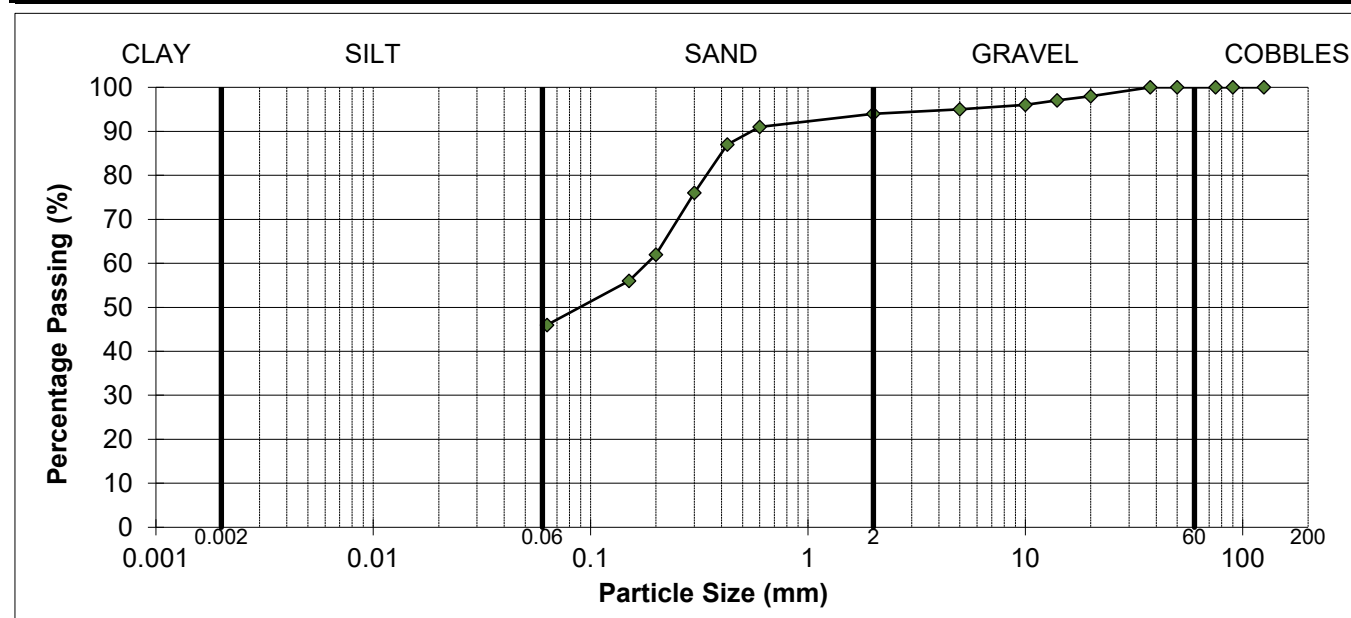
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP111 0.5-1.5m	DATE SAMPLED	26-Nov-25
LAB SAMPLE No	5238505	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		5	95	
90	100		2	94	
75	100		0.6	91	
50	100		0.425	87	
37.5	100		0.3	76	
20	98		0.2	62	
14	97		0.15	56	
10	96		0.063	46	



SOIL FRACTIONS			
COBBLES	0%	SAND	48%
GRAVEL	6%	SILT / CLAY	46%

As received water content	20.3%
---------------------------	-------

REMARKS

SIGNED



NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

07-Jan-26

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION
BS EN ISO 17892-4:2016

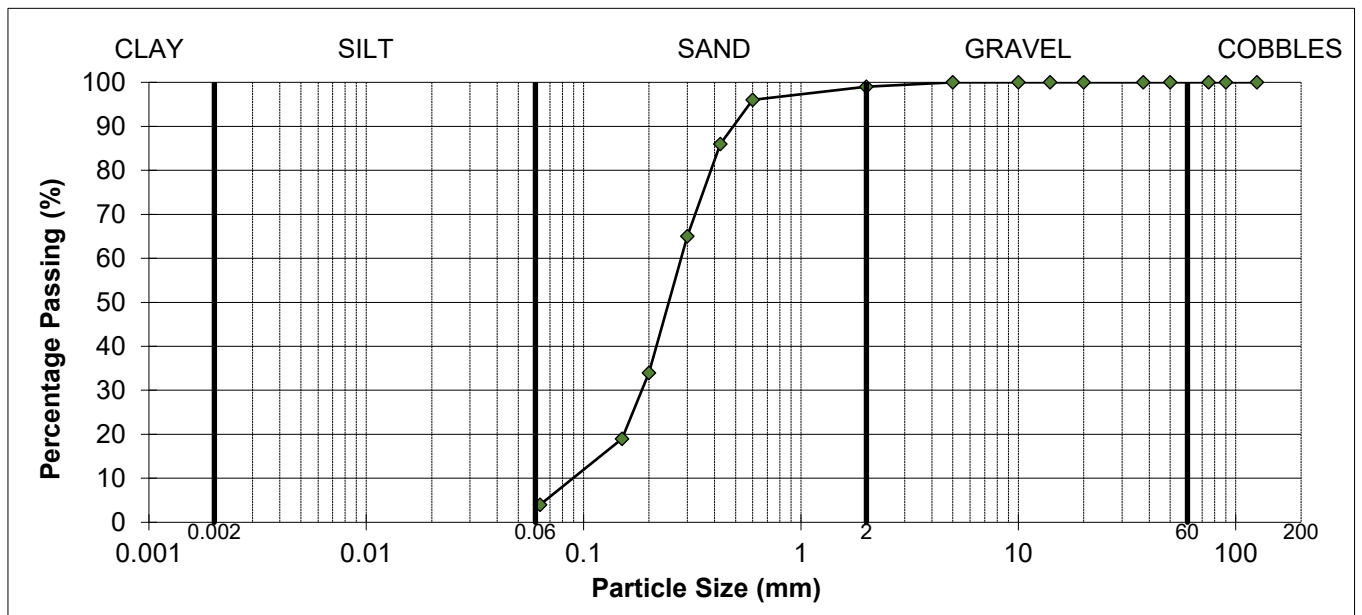
Determination of Water Content in accordance with BS EN ISO 17892-1:2014+A1:2022 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP112 1.0-2.0m	DATE SAMPLED	26-Nov-25
LAB SAMPLE No	5238506	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly gravelly SAND
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		5	100	
90	100		2	99	
75	100		0.6	96	
50	100		0.425	86	
37.5	100		0.3	65	
20	100		0.2	34	
14	100		0.15	19	
10	100		0.063	4	



SOIL FRACTIONS			
COBBLES	0%	SAND	95%
GRAVEL	1%	SILT / CLAY	4%
As received water content		20.7%	

REMARKS

SIGNED



NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

07-Jan-26

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

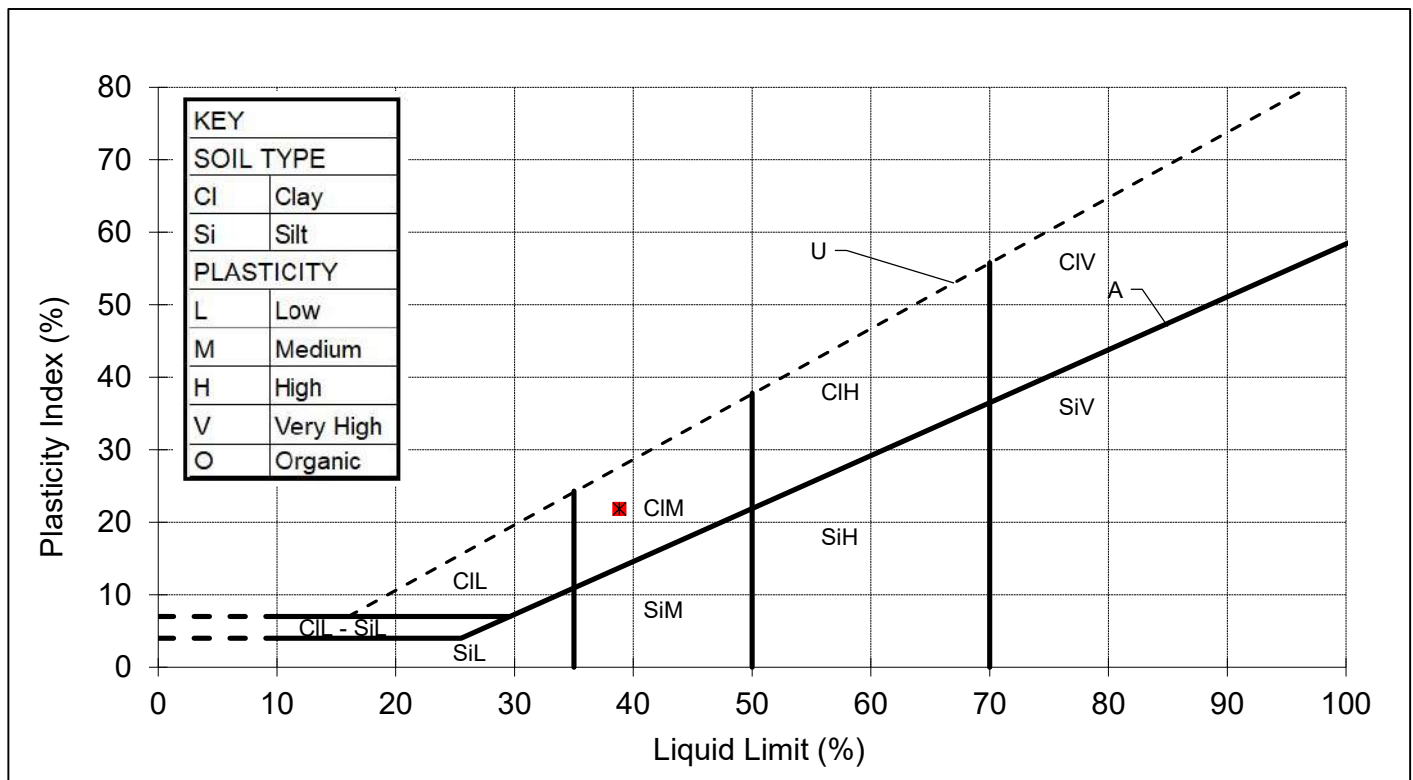
CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP108 0.5-1.0m	DATE SAMPLED	26-Nov-25
SAMPLE No.	5238502	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.5	38.5	1.010	
Determination 2 (avg)	19.5	38.4		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
28.4	39	17	22	89



REMARKS

SIGNED

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O.P. Davies BA (Hons)
(Director / Head of Laboratory)

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PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

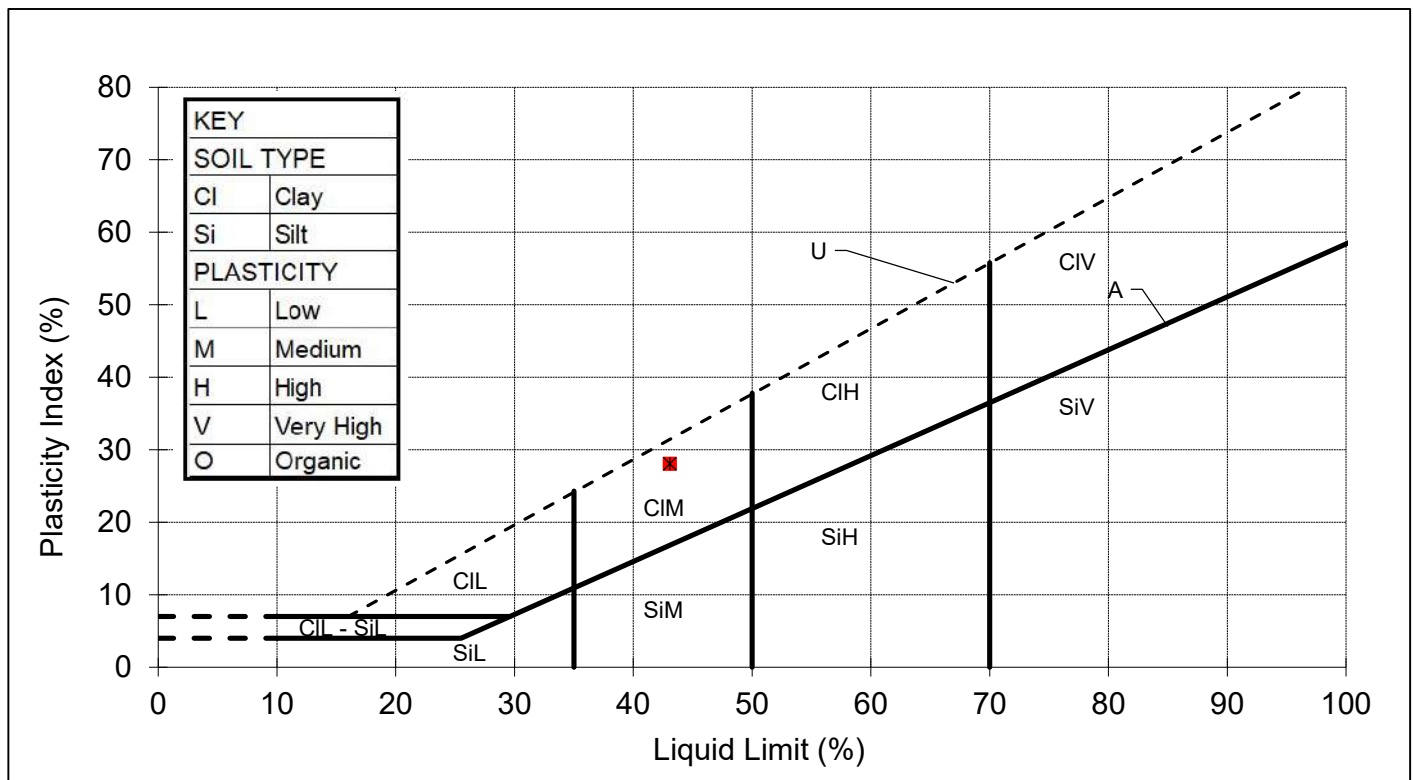
CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP109 1.0-2.0m	DATE SAMPLED	26-Nov-25
SAMPLE No.	5238504	DATE RECEIVED	04-Dec-25
DATE TESTED	08-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Water Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	19.7	42.8	1.006	
Determination 2 (avg)	19.7	42.8		

Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14.8	43	15	28	84



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Director / Head of Laboratory)

DATE

07-Jan-26

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 2.5kg RAMMER

BS 1377-2:2022 Cl.11

PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

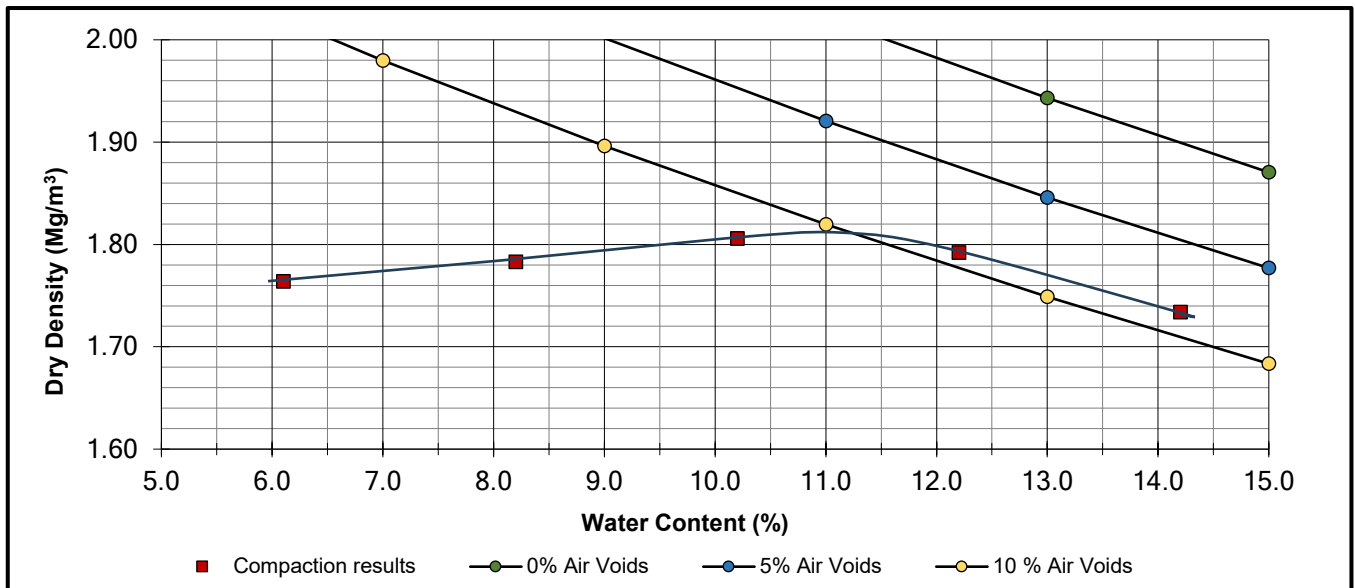
CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP108 1.8-2.1m	DATE SAMPLED	26-Nov-25
SAMPLE NUMBER	5238503	DATE RECEIVED	04-Dec-25
DATE TESTED	10-Dec-25	SAMPLED BY	Client

MATERIAL	Grey brown silty slightly gravelly SAND
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	2 %	GRADING ZONE	Zone 4
RETAINED 20mm	3 %	PARTICLE DENSITY	2.60 Mg/m ³ (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m ³)
1	6.1	1.764
2	8.2	1.783
3	10.2	1.806
4	12.2	1.792
5	14.2	1.734



OPTIMUM WATER CONTENT	11	(%)
MAXIMUM DRY DENSITY	1.81	(Mg/m ³)

REMARKS

NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

SIGNED

DATE 07-Jan-26

MURRAY RIX

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DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

DRY DENSITY/WATER CONTENT RELATIONSHIP 2.5kg RAMMER

BS 1377-2:2022 Cl.11

PARTICLE DENSITY METHOD BS 1377-2:2022 Cl.9.2

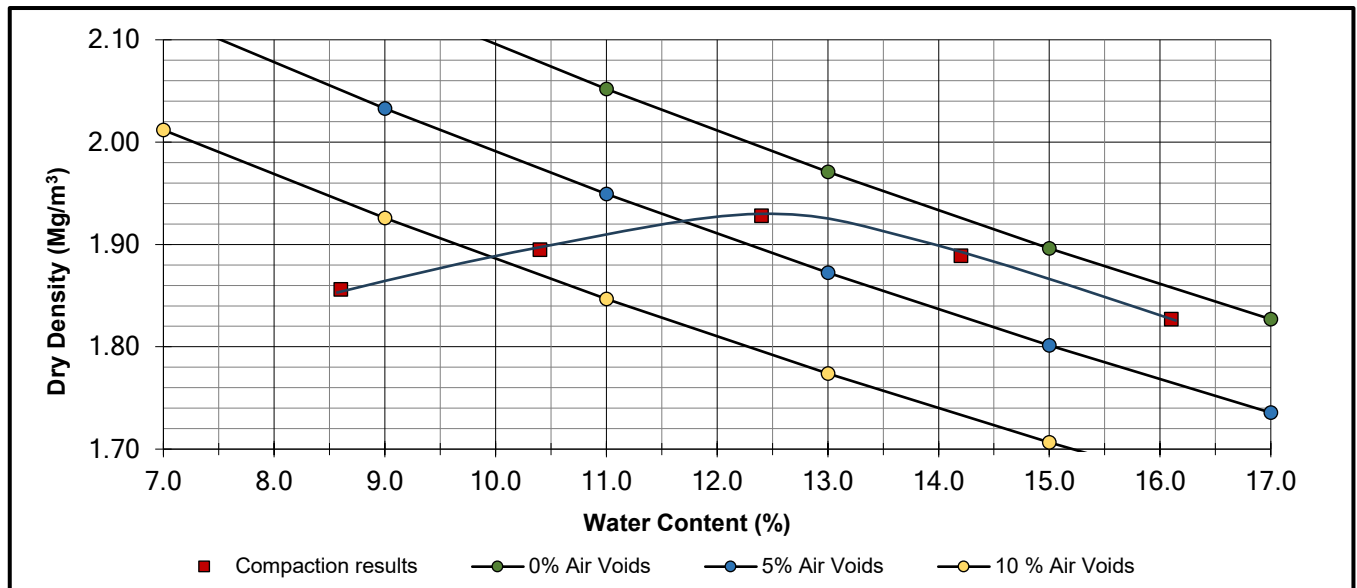
CLIENT	LK Consult Ltd
SITE	LKR 25 1564 - Heywood Old Lane, Middleton
JOB NUMBER	MRN 26004/2

SAMPLE LABEL	TP109 1.0-2.0m	DATE SAMPLED	26-Nov-25
SAMPLE NUMBER	5238504	DATE RECEIVED	04-Dec-25
DATE TESTED	10-Dec-25	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample
PRE TREATMENT	Air Dried / Separate Batches

RETAINED 37.5mm	2 %	GRADING ZONE	Zone 4
RETAINED 20mm	6 %	PARTICLE DENSITY	2.65 Mg/m ³ (Assumed)

POINT NUMBER	WATER CONTENT (%)	DRY DENSITY (Mg/m ³)
1	8.6	1.856
2	10.4	1.895
3	12.4	1.928
4	14.2	1.889
5	16.1	1.827



OPTIMUM WATER CONTENT	12 (%)
MAXIMUM DRY DENSITY	1.93 (Mg/m ³)

REMARKS

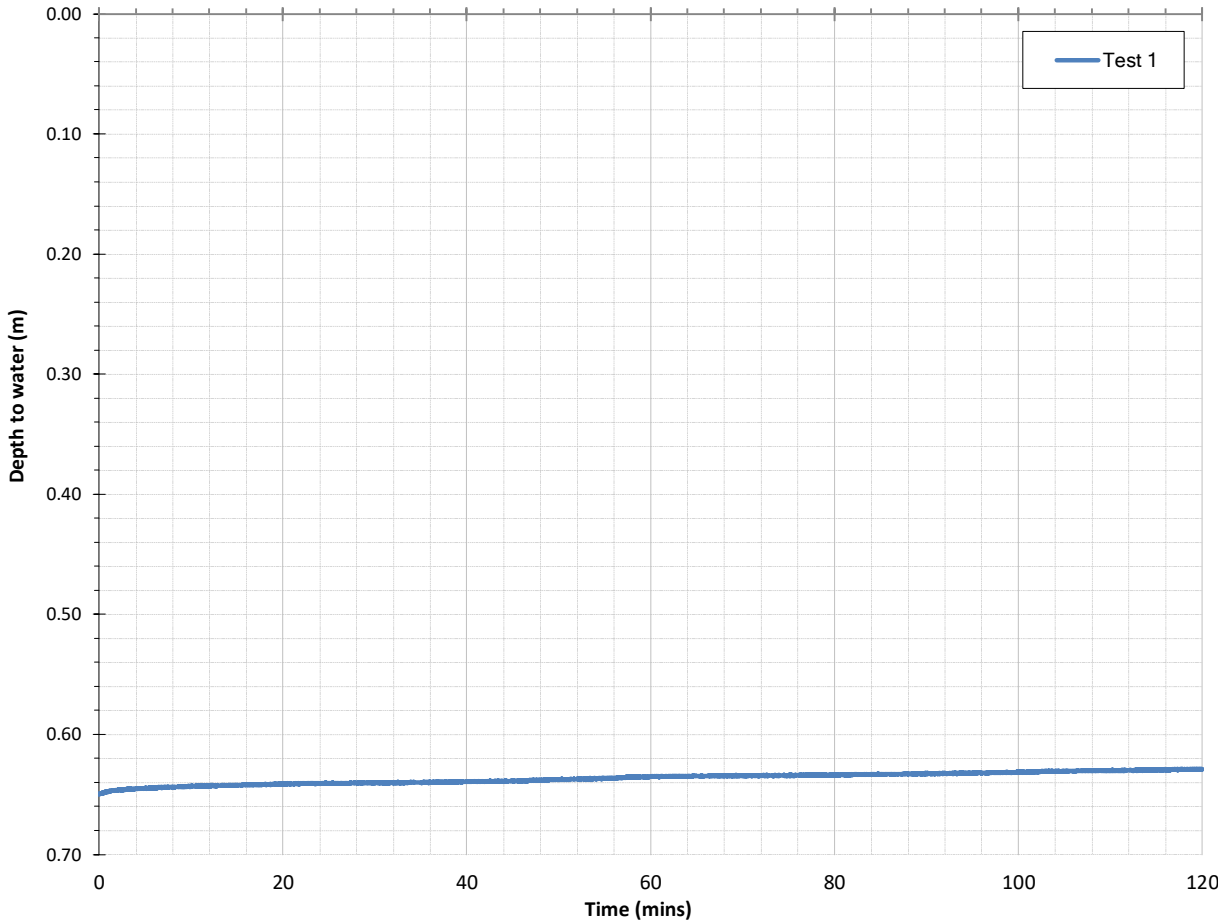
NAME O.P. Davies BA (Hons)
(Director / Head of Laboratory)

SIGNED

DATE 07-Jan-26

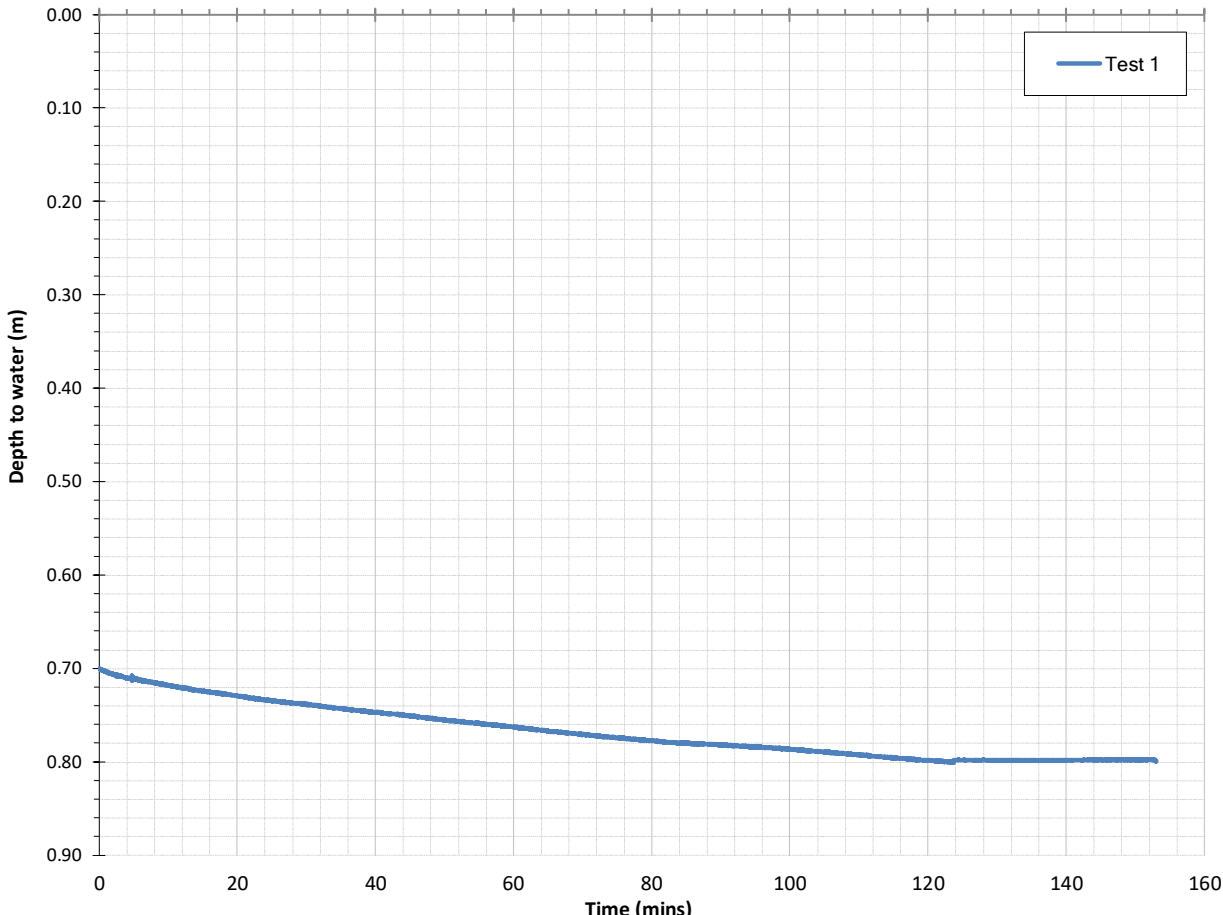
Appendix G – Soakaway Tests

Site Name Heywood Old Road, Middleton		Gravel Used No		
Job Number LKC251564		Length 1.20 m		
Date of Test 25/11/2025		Width 0.60 m		
Pit Number SA101		Depth 1.20 m		
Strata Within Test Area Clay / Silt		Groundwater Level Dry		



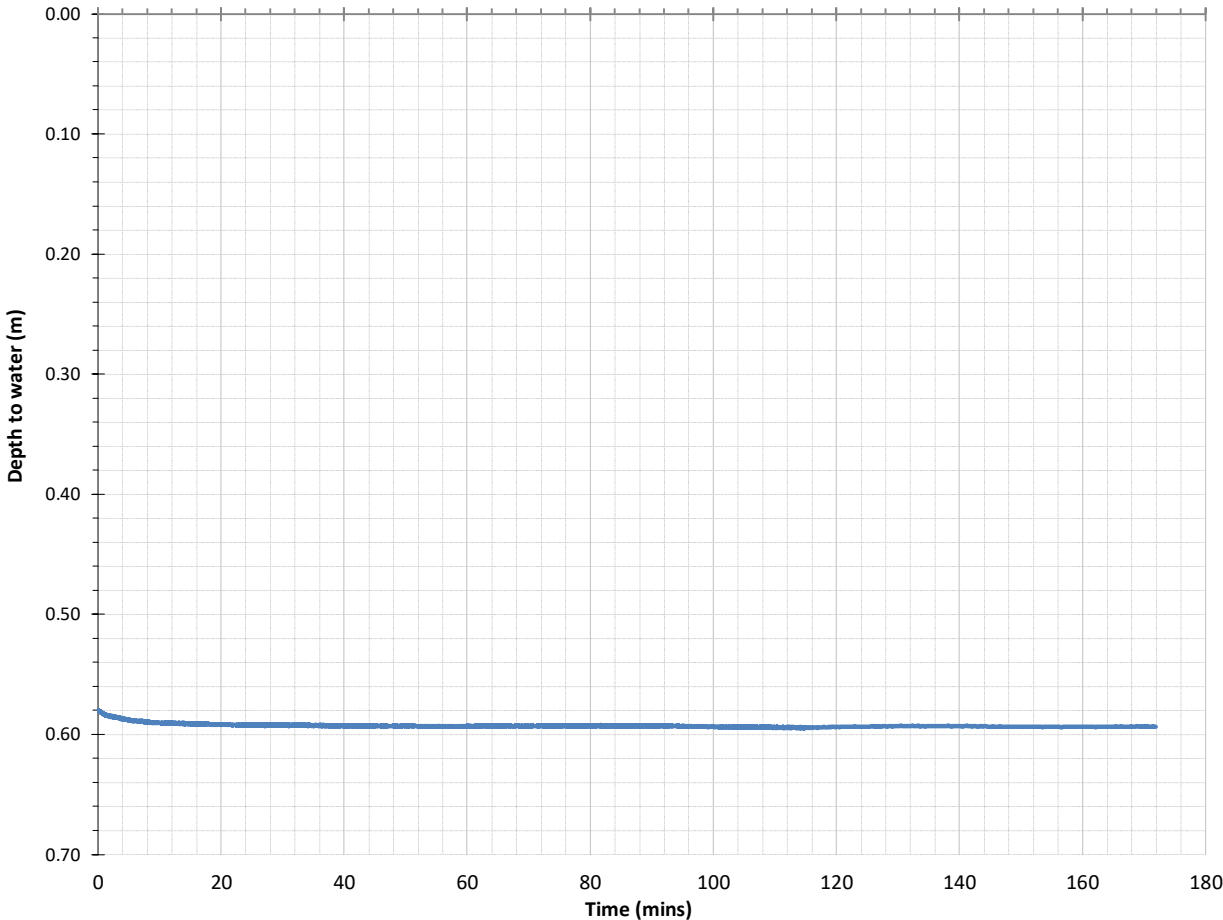
		Test 1		
Starting Water Depth	m	0.64		
Effective Storage Depth	m	0.56		
75% Effective Storage Depth	m	0.42		
75% Effective depth below GL	m	0.78		
25% Effective Storage Depth	m	0.14		
25% Effective depth below GL	m	1.06		
Effective Storage Depth 75%-25%	m	0.28		
Time to fall to 75% effective depth	mins	Not Reached		
Time to fall to 25% effective depth	mins	Not Reached		
V (75%-25%)	m ³	0.20		
a (50%)	m ²	1.72		
t (75%-25%)	mins	N/R		
SOIL INFILTRATION RATE	m/s	N/R		
DESIGN SOIL INFILTRATION RATE (m/s)		N/R		
COMMENTS	N/R = Not Recorded. Due to very slow drainage, times for 75% effective depth and 25% effective depth not possible. Infiltration rate unable to be calculated. Only one test undertaken due to the slow rate of flow.			

Site Name Heywood Old Road, Middleton		Gravel Used No		
Job Number LKC251564		Length 1.40 m		
Date of Test 25/11/2025		Width 0.70 m		
Pit Number SA102		Depth 1.10 m		
Strata Within Test Area Sand		Groundwater Level Dry		



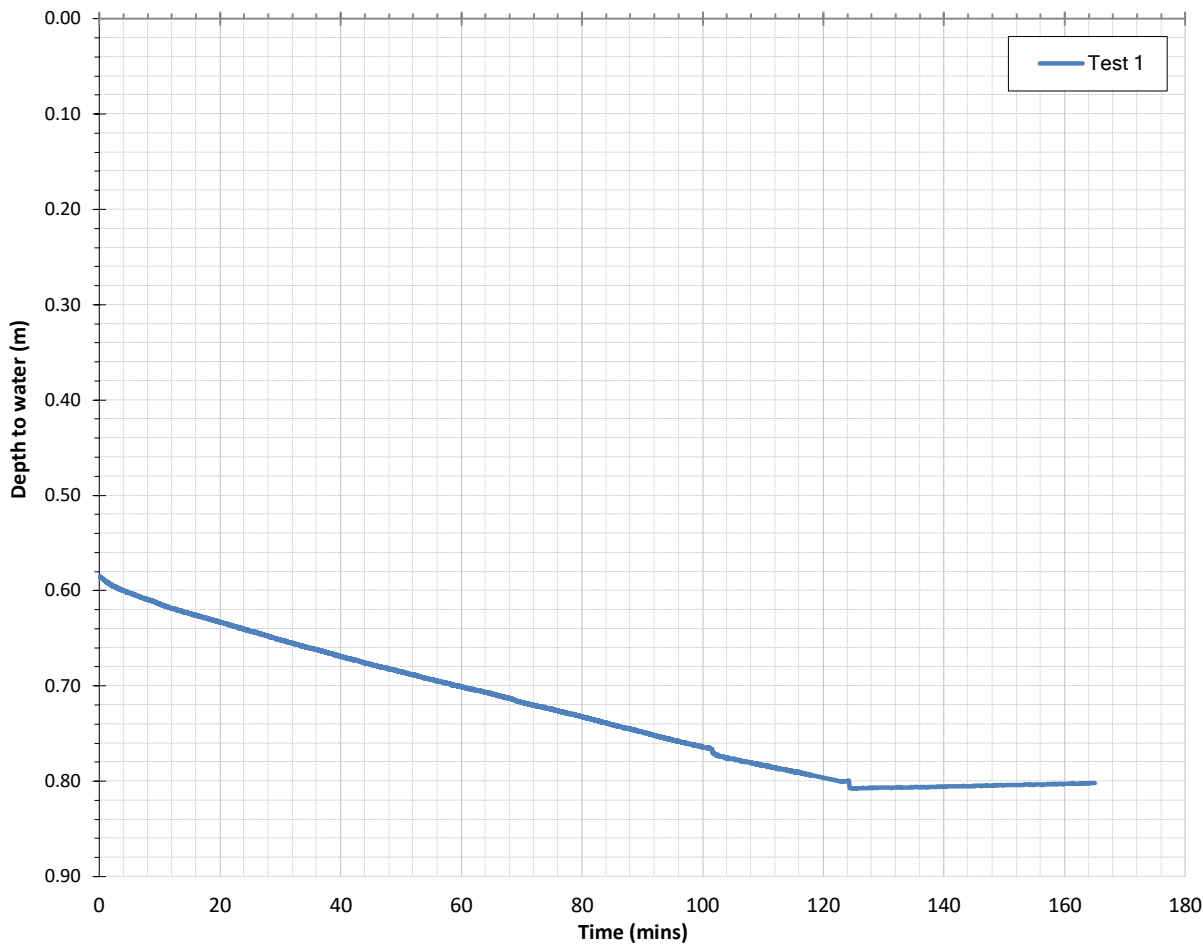
		Test 1		
Starting Water Depth	m	0.70		
Effective Storage Depth	m	0.40		
75% Effective Storage Depth	m	0.30		
75% Effective depth below GL	m	0.80		
25% Effective Storage Depth	m	0.10		
25% Effective depth below GL	m	1.00		
Effective Storage Depth 75%-25%	m	0.20		
Time to fall to 75% effective depth	mins	Not Reached		
Time to fall to 25% effective depth	mins	Not Reached		
V (75%-25%)	m ³	0.20		
a (50%)	m ²	1.82		
t (75%-25%)	mins	N/R		
SOIL INFILTRATION RATE	m/s	N/R		
DESIGN SOIL INFILTRATION RATE (m/s)		N/R		
COMMENTS	N/R = Not Recorded. Due to very slow drainage, times for 75% effective depth and 25% effective depth not possible. Infiltration rate unable to be calculated. Only one test undertaken due to the slow rate of flow.			

Site Name Heywood Old Road, Middleton		Gravel Used No		
Job Number LKC251564		Length 1.20 m		
Date of Test 25/11/2025		Width 0.60 m		
Pit Number SA103		Depth 1.10 m		
Strata Within Test Area Sand		Groundwater Level Dry		



		Test 1		
Starting Water Depth	m	0.58		
Effective Storage Depth	m	0.52		
75% Effective Storage Depth	m	0.39		
75% Effective depth below GL	m	0.71		
25% Effective Storage Depth	m	0.13		
25% Effective depth below GL	m	0.97		
Effective Storage Depth 75%-25%	m	0.26		
Time to fall to 75% effective depth	mins	Not Reached		
Time to fall to 25% effective depth	mins	Not Reached		
V (75%-25%)	m ³	0.19		
a (50%)	m ²	1.66		
t (75%-25%)	mins	N/R		
SOIL INFILTRATION RATE	m/s	N/R		
DESIGN SOIL INFILTRATION RATE (m/s)		N/R		
COMMENTS	N/R = Not Recorded. Due to very slow drainage, times for 75% effective depth and 25% effective depth not possible. Infiltration rate unable to be calculated. Only one test undertaken due to the slow rate of flow.			

Site Name Heywood Old Road, Middleton		Gravel Used No		
Job Number LKC251564		Length 1.20 m		
Date of Test 25/11/2025		Width 0.70 m		
Pit Number SA104		Depth 0.80 m		
Strata Within Test Area Sand		Groundwater Level Dry		



		Test 1		
Starting Water Depth	m	0.59		
Effective Storage Depth	m	0.21		
75% Effective Storage Depth	m	0.16		
75% Effective depth below GL	m	0.64		
25% Effective Storage Depth	m	0.05		
25% Effective depth below GL	m	0.75		
Effective Storage Depth 75%-25%	m	0.11		
Time to fall to 75% effective depth	mins	23.65		
Time to fall to 25% effective depth	mins	91		
V (75%-25%)	m ³	0.09		
a (50%)	m ²	1.25		
t (75%-25%)	mins	67.35		
SOIL INFILTRATION RATE	m/s	1.789E-05		
DESIGN SOIL INFILTRATION RATE (m/s)		1.79E-05		
COMMENTS	Base of test area recorded as 0.80mbgl as correlates with depth transducer placed in soakaway pit. Due to time constraints onsite, only one test was undertaken.			

Appendix H – Generic Assessment Criteria Values

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
Metals	Inorganic Arsenic	N/A	37	40	49	640	79	168	DEFRA C4SL
	Beryllium	N/A	1.7	1.7	35	12	2.2	63	LQM S4UL
	Boron	N/A	290	11,000	45	240,000	21,000	46,000	LQM S4UL
	Cadmium	N/A	26	149	4.9	410	220	880	DEFRA C4SL
	Chromium (III)	N/A	910	910	18,000	8,600	1,500	33,000	LQM S4UL
	Chromium (VI)	N/A	21.0	21.0	170.0	49	23.0	250	DEFRA C4SL
	Copper	N/A	2,400	7,100	520	68,000	12,000	44,000	LQM S4UL
	Lead	N/A	200	310	80	2,330	630	1,300	DEFRA C4SL
	Elemental Mercury	N/A	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}	LQM S4UL
	Inorganic Mercury	N/A	40	56	19	1,100	120	240	LQM S4UL
	Methylmercury	N/A	11	15	6.0	320	40	68	LQM S4UL
	Nickel	N/A	130	180	53	980	230	800	LQM S4UL
	Selenium	N/A	250	430	88	12,000	1,100	1,800	LQM S4UL
Polycyclic Aromatic Hydrocarbons (PAHs)	Vanadium	N/A	410	1,200	91	9,000	2,000	5,000	LQM S4UL
	Zinc	N/A	3,700	40,000	620	730,000	81,000	170,000	LQM S4UL
	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000	LQM S4UL
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000	LQM S4UL
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000	LQM S4UL
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000	LQM S4UL
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000	LQM S4UL
		2.5%	5,400	35,000	950	540,000	74,000	150,000	LQM S4UL
		6%	11,000	37,000	2,200	540,000	74,000	150,000	LQM S4UL
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49	LQM S4UL
		2.5%	11	14	6.5	170	29	56	LQM S4UL
		6%	13	15	13	180	29	62	LQM S4UL
	Benzo(a)pyrene (only)	1%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		2.5%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		6%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
	Benzo(a)pyrene (surrogate marker Coal Tar)	1%	0.8	1.2	0.32	15	2.2	4	LQM S4UL
		2.5%	1.0	1.2	0.67	15	2.2	5	LQM S4UL
		6%	1.1	1.2	1.20	15	2.2	5	LQM S4UL
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13	LQM S4UL
		2.5%	3.3	4.0	2.1	44	7.2	15	LQM S4UL
		6%	3.7	4.0	3.9	45	7.2	16	LQM S4UL
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400	LQM S4UL
		2.5%	340	360	470	4,000	640	1,500	LQM S4UL
		6%	350	360	640	4,000	640	1,600	LQM S4UL
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370	LQM S4UL
		2.5%	93	110	75	1,200	190	410	LQM S4UL
		6%	100	110	130	1,200	190	440	LQM S4UL
	Chrysene	1%	15	30	4.1	350	57	93	LQM S4UL
		2.5%	22	31	9.4	350	57	110	LQM S4UL
		6%	27	32	19	350	57	120	LQM S4UL
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1	LQM S4UL
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3	LQM S4UL
		6%	0.3	0.32	0.43	3.6	0.58	1.4	LQM S4UL
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300	LQM S4UL
		2.5%	560	1,600	130	23,000	3,100	6,300	LQM S4UL
		6%	890	1,600	290	23,000	3,100	6,400	LQM S4UL
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000	LQM S4UL
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000	LQM S4UL
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000	LQM S4UL
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150	LQM S4UL
		2.5%	36	46	21	510	82	170	LQM S4UL
		6%	41	46	39	510	82	180	LQM S4UL
	Naphthalene	1%	15	15	65	1600 f	11000 f	800 f	C4SL
		2.5%	36	36	130	3700 f	15000 f	1200 f	C4SL
		6%	85	85	200	8400 f	17000 f	1900 f	C4SL
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200	LQM S4UL
		2.5%	220	1,500	38	22,000	3,100	6,200	LQM S4UL
		6%	440	1,500	90	22,000	3,100	6,300	LQM S4UL
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000	LQM S4UL
		2.5%	1,200	3,800	270	54,000	7,400	15,000	LQM S4UL
		6%	2,000	3,800	620	54,000	7,400	15,000	LQM S4UL
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	LQM S4UL
		2.5%	0.98	1.2	0.67	15	2.2	4.7	LQM S4UL
		6%	1.1	1.2	1.2	15	2.2	4.8	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
BTEx Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90	LQM S4UL
		2.5%	0.17	0.70	0.034	47	72	100	LQM S4UL
		6%	0.37	1.4	0.075	90	73	110	LQM S4UL
		6%	0.87	3.3	0.180	98	140	230	C4SL
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}	LQM S4UL
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}	LQM S4UL
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}	LQM S4UL
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}	LQM S4UL
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}	LQM S4UL
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}	LQM S4UL
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}	LQM S4UL
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}	LQM S4UL
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}	LQM S4UL
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}	LQM S4UL
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}	LQM S4UL
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}	LQM S4UL
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}	LQM S4UL
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}	LQM S4UL
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}	LQM S4UL
Petroleum Hydrocarbons	Aliphatic								
	EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304) ^{sol}	95,000 (304) ^{sol}	LQM S4UL
	EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}	LQM S4UL
	EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}	LQM S4UL
	EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}	LQM S4UL
	EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}	LQM S4UL
	EC>16-35	1%	65,000 (8.48)	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f	LQM S4UL
	EC>35-44	1%	65,000 (8.48)	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f	LQM S4UL
	Aliphatic								
	EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}	LQM S4UL
	EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}	LQM S4UL
	EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}	LQM S4UL
	EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}	LQM S4UL
	EC>12-16	2.5%	2,400 (59) ^{sol}	2,400 (59) ^{sol}	13,000	82,000 (59) ^{sol}	13,000	25,000 (59) ^{sol}	LQM S4UL
	EC>16-35	2.5%	92,000 (21)	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f	LQM S4UL
	EC>35-44	2.5%	92,000 (21)	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f	LQM S4UL
	Aliphatic								
	EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}	LQM S4UL
	EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}	LQM S4UL
	EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}	LQM S4UL
	EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}	LQM S4UL
	EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}	LQM S4UL
	EC>16-35	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f	LQM S4UL
	EC>35-44	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}	LQM S4UL
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}	LQM S4UL
	EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}	LQM S4UL
	EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}	LQM S4UL
	EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000	LQM S4UL
	EC>16-21	1%	260 ^f	1,900 ^f	46 ^f	28,000 ^f	3,800 ^f	7,600 ^f	LQM S4UL
	EC>21-35	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	EC>35-44	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}	LQM S4UL
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}	LQM S4UL
	EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}	LQM S4UL
	EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}	LQM S4UL
	EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000	LQM S4UL
	EC>16-21	2.5%	540 ^f	1,900 ^f	110 ^f	28,000 ^f	3,800 ^f	7,700 ^f	LQM S4UL
	EC>21-35	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	EC>35-44	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}	LQM S4UL
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}	LQM S4UL
	EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}	LQM S4UL
	EC>10-12	6%	380	1,200	4	34,000 (2,150) ^{sol}	5,000	10,000	LQM S4UL
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000	LQM S4UL
	EC>16-21	6%	930 ^f	1,900 ^f	260 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
	EC>21-35	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f	LQM S4UL
	EC>35-44	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f	LQM S4UL
	Aliphatic +Aromatic >EC44	1%	1,600 ^f	1,900 ^f	1,200 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
		2.5%	1,800 ^f	1,900 ^f	2,100 ^f	28,000 ^f	3,800 ^f	7,800 ^f	LQM S4UL
		6%	1,900 ^f	1,900 ^f	3,000 ^f	28,000 ^f	3,800 ^f	7,900 ^f	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	0.11	0.16	0.05	12.0	300	300	DEFRA C4SL
		2.5%	0.18	0.24	0.10	17.0	310	330	DEFRA C4SL
		6%	0.31	0.41	0.19	29.0	310	330	DEFRA C4SL
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) ^{vap}	LQM S4UL
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) ^{vap}	LQM S4UL
		6%	39	40	240	3,000	140,000	100,000 (6,392)	LQM S4UL
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800	LQM S4UL
		2.5%	3.4	8.0	0.89	550	1,400	2,100	LQM S4UL
		6%	7.5	17	2.0	1,100	1,400	2,300	LQM S4UL
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500	LQM S4UL
		2.5%	2.8	3.5	1.9	250	1,400	1,800	LQM S4UL
		6%	6.4	8.2	4.4	560	1,400	2,100	LQM S4UL
	Tetrachloroethene (PCE)	1%	0.31	0.32	2.00	24	3,200	1400	DEFRA C4SL
		2.5%	0.70	0.71	4.8	55	3,300	1900	DEFRA C4SL
		6%	1.60	1.60	11.0	130	3,400	2,500	DEFRA C4SL
	Tetrachloromethane (carbon tetrachloride)	1%	0.03	0.03	0.45	2.9	890	190	LQM S4UL
		2.5%	0.06	0.06	1.0	6.3	920	270	LQM S4UL
		6%	0.13	0.13	2.4	14	950	400	LQM S4UL
	Trichloroethene (TCE)	1%	0.009	0.010	0.032	0.7	76.0	41.0	DEFRA C4SL
		2.5%	0.020	0.020	0.072	1.5	78.0	51.0	DEFRA C4SL
		6%	0.043	0.045	0.160	3.4	79.0	69.0	DEFRA C4SL
	cis 1,2-dichloroethene	1%	0.46	0.50	0.890	38	3,800	2,000	DEFRA C4SL
		2.5%	0.78	0.84	1.70	64	3,800	2,400	DEFRA C4SL
		6%	1.50	1.60	3.60	120	3,900	3,100	DEFRA C4SL
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600	LQM S4UL
		2.5%	1.7	2.1	0.83	170	2,500	2,800	LQM S4UL
		6%	3.4	4.2	1.7	350	2,500	3,100	LQM S4UL
	Trans-1,2 Dichloroethene	1%	0.9	0.9	3.7	69	13,000	5,600	DEFRA C4SL
		2.5%	1.6	1.7	7.5	120	13,000	7,000	DEFRA C4SL
		6%	3.3	3.4	16.0	260	13,000	9,100	DEFRA C4SL
	Chloroethene (vinyl chloride)	1%	0.006	0.015	0.0017	1.1E+00	7.8	18.0	DEFRA C4SL
		2.5%	0.010	0.019	0.0031	1.4E+00	7.8	19.0	DEFRA C4SL
		6%	0.017	0.029	0.0058	2.20	7.8	19.0	DEFRA C4SL
	2,4,6-Trinitrotoluene (TNT)	1%	1.6	65	0.24	1,000	130	260	LQM S4UL
		2.5%	3.7	66	0.58	1,000	130	270	LQM S4UL
		6%	8.1	66	1.4	1,000	130	270	LQM S4UL
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) ^{sol}	LQM S4UL
		2.5%	250	13,000	38	210,000	26,000	51,000	LQM S4UL
		6%	540	13,000	85	210,000	27,000	53,000	LQM S4UL
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) ^{vap}	LQM S4UL
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) ^{vap}	LQM S4UL
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) ^{vap}	LQM S4UL
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30	LQM S4UL
		2.5%	6.6	7.4	6.1	170	18	31	LQM S4UL
		6%	7.1	7.5	9.8	170	18	31	LQM S4UL
	Dieldrin	1%	0.97	7.0	0.17	170	18	30	LQM S4UL
		2.5%	2.0	7.3	0.41	170	18	30	LQM S4UL
		6%	3.5	7.4	0.96	170	18	31	LQM S4UL
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300	LQM S4UL
		2.5%	7.8	620	1.2	9,400	1,200	2,400	LQM S4UL
		6%	17.4	620	2.7	9,400	1,200	2,400	LQM S4UL
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26	LQM S4UL
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26	LQM S4UL
		6%	0.14	6.6	2.2E-02	140	16	27	LQM S4UL
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) ^{vap}	1.2	5,600 (3.0E-03) ^{vap}	1,200	2,300	LQM S4UL
		2.5%	18	280 (7.0E-03) ^{vap}	2.9	7,400 (7.0E-03) ^{vap}	1,200	2,400	LQM S4UL
		6%	41	410 (1.6E-02) ^{vap}	6.8	8,400 (1.6E-02) ^{vap}	1,200	2,500	LQM S4UL
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15	LQM S4UL
		2.5%	0.2	3.8	3.2E-02	65	8.1	15	LQM S4UL
		6%	0.46	3.8	7.7E-02	65	8.1	16	LQM S4UL
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}	LQM S4UL
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}	LQM S4UL
		6%	2.4	2.4	32	290	14,000	2,900	LQM S4UL
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}	LQM S4UL
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}	LQM S4UL
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}	LQM S4UL
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}	LQM S4UL
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}	LQM S4UL
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}	LQM S4UL
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}	LQM S4UL
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120	LQM S4UL
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130	LQM S4UL
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190	LQM S4UL
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190	LQM S4UL
		6%	22	38	7.0	830	100	190	LQM S4UL
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30	LQM S4UL
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30	LQM S4UL
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30	LQM S4UL

Generic Assessment Criteria Values

Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}	Source
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^g	94	0.13 ^g	3,500	620	1,100	LQM S4UL
		2.5%	2.0	150	0.30	4,000	620	1,100	LQM S4UL
		6%	4.5	210	0.70	4,300	620	1,100	LQM S4UL
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110	LQM S4UL
		2.5%	0.52	29	8.0E-02	400	60	120	LQM S4UL
		6%	1.2	31	0.19	400	60	120	LQM S4UL
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300	LQM S4UL
		2.5%	0.29	0.29	10	22	11,000	1,900	LQM S4UL
		6%	0.62	0.62	23	47	11,000	2,700	LQM S4UL
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48	LQM S4UL
		2.5%	0.7	0.78	0.61	66	25	50	LQM S4UL
		6%	1.6	1.8	1.4	120	25	51	LQM S4UL
	Phenol	1%	120	440 (460)	23	440 ^{dir} (26,000)	440 ^{dir} (10,000)	440 ^{dir} (7,600)	LQM S4UL
		2.5%	200	690	42	690 ^{dir} (30,000)	690 ^{dir} (10,000)	690 ^{dir} (8,300)	LQM S4UL
		6%	380	1,200	83	1,300 ^{dir} (34,000)	1,300 ^{dir} (10,000)	1,300 ^{dir} (9,300)	LQM S4UL

sol/vap = solubility/vapour limit (potentially use if free product identified, although highly conservative)
f=naphthalene is based on comparison of inhalation exposure with TDI(inhal) for localised effect
f = oral, dermal and inhalation exposures compared to oral HCV
dir = S4ULs based on threshold protective of direct skin contact with phenol)brackets long term exposure for illustration purposes)
g = derived based on 2,3,4-tetrachlorophenol

Appendix I – HazWasteOnline™ Output Sheets

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



IBCOZ-JHYSQ-R06T4

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Report is invalid if pages are removed.

Job name

LKC251564

Description/Comments

Project

LKC251564

Site

Heywood Old Road / Redwood SEN

Classified by

Name: **Colin Crompton**
Date: **24 Dec 2025 15:24 GMT**
Telephone: **0161 763 7200**
Company: **LK Group**
Unit 29, Eton Business Park
Eton Hill Rd, Radcliffe
Greater Manchester
M26 2ZS

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

CERTIFIED

Course

Hazardous Waste Classification
Most recent 3 year Refresher

Date

08 Oct 2020
05 Dec 2023

Next 3 year Refresher due by Dec 2026

Purpose of classification

2 - Material Characterisation

Address of the waste

Heywood Old Road, Middleton

Post Code **OL10 2QN**

SIC for the process giving rise to the waste

85200 Primary education

Description of industry/producer giving rise to the waste

Redevelopment of greenfield site

Description of the specific process, sub-process and/or activity that created the waste

Waste created during enabling works

Description of the waste

Topsoil, limited made ground, natural sand and clay

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	TP102/0.00-0.40/2025-11-26		Non Hazardous		3
2	TP110/0.00-0.50/2025-11-26		Non Hazardous		5
3	TP107/0.00-0.30/2025-11-26		Non Hazardous		7
4	TP105/0.00-0.40/2025-11-26		Non Hazardous		9
5	SD102/0.00-0.40/2025-11-26		Non Hazardous		11
6	TP112/0.00-0.30/2025-11-26		Non Hazardous		13

Related documents

#	Name	Description
1	25-27757.hwol	DETS North .hwol file used to populate the Job

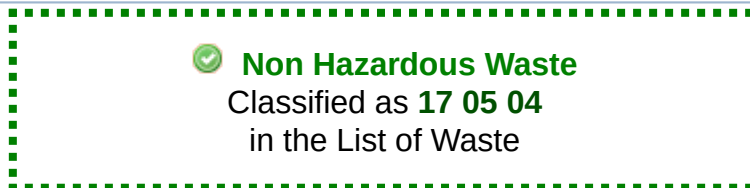
Report

Created by: Colin Crompton

Created date: 24 Dec 2025 15:24 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	15
Appendix B: Rationale for selection of metal species	16
Appendix C: Version	17

Classification of sample: TP102/0.00-0.40/2025-11-26



Sample details

Sample name:	LoW Code:
TP102/0.00-0.40/2025-11-26	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
23% (wet weight correction)	Entry:
	17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 23% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex }			1	16	mg/kg		12.32	mg/kg	0.00123 %	✓	
	033-002-00-5											
2	barium { barium oxide }				56	mg/kg	1.117	48.144	mg/kg	0.00481 %	✓	
		215-127-9	1304-28-5									
3	cadmium (non-pyrophoric); [1] cadmium oxide (non-pyrophoric) [2]				0.2	mg/kg		0.154	mg/kg	0.0000154 %	✓	
	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]									
4	copper { copper(II) oxide }				23	mg/kg	1.252	22.169	mg/kg	0.00222 %	✓	
	029-016-00-6	215-269-1	1317-38-0									
5	mercury { inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex }			1	0.12	mg/kg		0.0924	mg/kg	0.00000924 %	✓	
	080-002-00-6											
6	nickel { nickel(II) oxide (nickel monoxide) }				9.1	mg/kg	1.273	8.917	mg/kg	0.000892 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]									
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	46	mg/kg		35.42	mg/kg	0.00354 %	✓	
	082-001-00-6											
8	antimony { antimony compounds, with the exception of the tetroxide (Sb ₂ O ₄), pentoxide (Sb ₂ O ₅), trisulphide (Sb ₂ S ₃), pentasulphide (Sb ₂ S ₅) and those specified elsewhere in this Annex }			1	1.3	mg/kg		1.001	mg/kg	0.0001 %	✓	
	051-003-00-9											
9	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<0.5	mg/kg	1.405	<0.703	mg/kg	<0.0000703 %		<LOD
	034-002-00-8											
10	zinc { zinc oxide }				51	mg/kg	1.245	48.88	mg/kg	0.00489 %	✓	
	030-013-00-7	215-222-5	1314-13-2									
11	polychlorobiphenyls; PCB				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
	602-039-00-4	215-648-1	1336-36-3									
12	chromium in Cr(VI) compounds { chromium(VI) oxide }				<1	mg/kg	1.923	<1.923	mg/kg	<0.000192 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
13	●	TPH (C6 to C40) petroleum group				<10 mg/kg		<10 mg/kg	<0.001 %		<LOD
				TPH							
14	●	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9							
15	●	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
			205-917-1	208-96-8							
16	●	anthracene				0.84 mg/kg		0.647 mg/kg	0.0000647 %	✓	
			204-371-1	120-12-7							
17		benzo[a]pyrene; benzo[def]chrysene				0.48 mg/kg		0.37 mg/kg	0.000037 %	✓	
		601-032-00-3	200-028-5	50-32-8							
18		benzo[a]anthracene				0.47 mg/kg		0.362 mg/kg	0.0000362 %	✓	
		601-033-00-9	200-280-6	56-55-3							
19	●	benzo[bk]fluoranthene				0.3 mg/kg		0.231 mg/kg	0.0000231 %	✓	
			[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9							
20		benzo[k]fluoranthene				0.16 mg/kg		0.123 mg/kg	0.0000123 %	✓	
		601-036-00-5	205-916-6	207-08-9							
21	●	benzo[ghi]perylene				0.31 mg/kg		0.239 mg/kg	0.0000239 %	✓	
			205-883-8	191-24-2							
22		chrysene				0.33 mg/kg		0.254 mg/kg	0.0000254 %	✓	
		601-048-00-0	205-923-4	218-01-9							
23		dibenz[a,h]anthracene				0.22 mg/kg		0.169 mg/kg	0.0000169 %	✓	
		601-041-00-2	200-181-8	53-70-3							
24	●	fluoranthene				0.99 mg/kg		0.762 mg/kg	0.0000762 %	✓	
			205-912-4	206-44-0							
25	●	fluorene				0.14 mg/kg		0.108 mg/kg	0.0000108 %	✓	
			201-695-5	86-73-7							
26	●	indeno[123-cd]pyrene				0.66 mg/kg		0.508 mg/kg	0.0000508 %	✓	
			205-893-2	193-39-5							
27		naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		601-052-00-2	202-049-5	91-20-3							
28	●	phenanthrene				0.54 mg/kg		0.416 mg/kg	0.0000416 %	✓	
			201-581-5	85-01-8							
29	●	pyrene				1.3 mg/kg		1.001 mg/kg	0.0001 %	✓	
			204-927-3	129-00-0							
30		chromium in Cr(III) compounds { ● chromium(III) oxide }				11 mg/kg	1.462	12.379 mg/kg	0.00124 %	✓	
			215-160-9	1308-38-9							
Total:									0.0195 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP110/0.00-0.50/2025-11-26

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP110/0.00-0.50/2025-11-26	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
21%	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 21% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex }			1	22 mg/kg		17.38 mg/kg	0.00174 %	✓	
	033-002-00-5									
2	cadmium (non-pyrophoric); [1] cadmium oxide (non-pyrophoric) [2]				0.3 mg/kg		0.237 mg/kg	0.0000237 %	✓	
	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]							
3	copper { copper(II) oxide }				44 mg/kg	1.252	43.512 mg/kg	0.00435 %	✓	
	029-016-00-6	215-269-1	1317-38-0							
4	mercury { inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex }			1	0.21 mg/kg		0.166 mg/kg	0.0000166 %	✓	
	080-002-00-6									
5	nickel { nickel(II) oxide (nickel monoxide) }				19 mg/kg	1.273	19.102 mg/kg	0.00191 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]							
6	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	93 mg/kg		73.47 mg/kg	0.00735 %	✓	
	082-001-00-6									
7	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
	034-002-00-8									
8	zinc { zinc oxide }				90 mg/kg	1.245	88.499 mg/kg	0.00885 %	✓	
	030-013-00-7	215-222-5	1314-13-2							
9	chromium in Cr(VI) compounds { chromium(VI) oxide }				<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
10	acenaphthene				0.41 mg/kg		0.324 mg/kg	0.0000324 %	✓	
		201-469-6	83-32-9							
11	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8							
12	anthracene				2.8 mg/kg		2.212 mg/kg	0.000221 %	✓	
		204-371-1	120-12-7							
13	benzo[a]pyrene; benzo[def]chrysene				1.6 mg/kg		1.264 mg/kg	0.000126 %	✓	
	601-032-00-3	200-028-5	50-32-8							

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
14		benzo[a]anthracene 601-033-00-9 200-280-6 56-55-3				0.31	mg/kg		0.245	mg/kg	0.0000245 %	✓	
15	•	benzo[bk]fluoranthene [1] 205-911-9 [2] 205-916-6 [1] 205-99-2 [2] 207-08-9				0.55	mg/kg		0.435	mg/kg	0.0000435 %	✓	
16		benzo[k]fluoranthene 601-036-00-5 205-916-6 207-08-9				0.42	mg/kg		0.332	mg/kg	0.0000332 %	✓	
17	•	benzo[ghi]perylene 205-883-8 191-24-2				0.38	mg/kg		0.3	mg/kg	0.00003 %	✓	
18		chrysene 601-048-00-0 205-923-4 218-01-9				1.6	mg/kg		1.264	mg/kg	0.000126 %	✓	
19		dibenz[a,h]anthracene 601-041-00-2 200-181-8 53-70-3				1.3	mg/kg		1.027	mg/kg	0.000103 %	✓	
20	•	fluoranthene 205-912-4 206-44-0				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
21	•	fluorene 201-695-5 86-73-7				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
22	•	indeno[123-cd]pyrene 205-893-2 193-39-5				1.1	mg/kg		0.869	mg/kg	0.0000869 %	✓	
23		naphthalene 601-052-00-2 202-049-5 91-20-3				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
24	•	phenanthrene 201-581-5 85-01-8				0.47	mg/kg		0.371	mg/kg	0.0000371 %	✓	
25	•	pyrene 204-927-3 129-00-0				2.9	mg/kg		2.291	mg/kg	0.000229 %	✓	
26	🧪	vanadium { divanadium pentaoxide; vanadium pentoxide } 023-001-00-8 215-239-8 1314-62-1				37	mg/kg	1.785	52.181	mg/kg	0.00522 %	✓	
27	🧪	chromium in Cr(III) compounds { • chromium(III) oxide } 215-160-9 1308-38-9				27	mg/kg	1.462	31.175	mg/kg	0.00312 %	✓	
Total:												0.0337 %	

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP107/0.00-0.30/2025-11-26

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP107/0.00-0.30/2025-11-26	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
17%	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex }			1	19 mg/kg		15.77 mg/kg	0.00158 %	✓	
	033-002-00-5									
2	cadmium (non-pyrophoric); [1] cadmium oxide (non-pyrophoric) [2]				0.3 mg/kg		0.249 mg/kg	0.0000249 %	✓	
	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]							
3	copper { copper(II) oxide }				31 mg/kg	1.252	32.208 mg/kg	0.00322 %	✓	
	029-016-00-6	215-269-1	1317-38-0							
4	mercury { inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex }			1	0.16 mg/kg		0.133 mg/kg	0.0000133 %	✓	
	080-002-00-6									
5	nickel { nickel(II) oxide (nickel monoxide) }				14 mg/kg	1.273	14.788 mg/kg	0.00148 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]							
6	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	94 mg/kg		78.02 mg/kg	0.0078 %	✓	
	082-001-00-6									
7	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
	034-002-00-8									
8	zinc { zinc oxide }				60 mg/kg	1.245	61.987 mg/kg	0.0062 %	✓	
	030-013-00-7	215-222-5	1314-13-2							
9	chromium in Cr(VI) compounds { chromium(VI) oxide }				<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
10	acenaphthene				0.45 mg/kg		0.374 mg/kg	0.0000374 %	✓	
		201-469-6	83-32-9							
11	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8							
12	anthracene				2.2 mg/kg		1.826 mg/kg	0.000183 %	✓	
		204-371-1	120-12-7							
13	benzo[a]pyrene; benzo[def]chrysene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	601-032-00-3	200-028-5	50-32-8							

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
14		benzo[a]anthracene				0.92	mg/kg		0.764	mg/kg	0.0000764 %	✓	
		601-033-00-9	200-280-6	56-55-3									
15	■	benzo[bk]fluoranthene				0.89	mg/kg		0.739	mg/kg	0.0000739 %	✓	
			[1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9									
16		benzo[k]fluoranthene				0.39	mg/kg		0.324	mg/kg	0.0000324 %	✓	
		601-036-00-5	205-916-6	207-08-9									
17	■	benzo[ghi]perylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-883-8	191-24-2									
18		chrysene				0.84	mg/kg		0.697	mg/kg	0.0000697 %	✓	
		601-048-00-0	205-923-4	218-01-9									
19		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
20	■	fluoranthene				2.8	mg/kg		2.324	mg/kg	0.000232 %	✓	
			205-912-4	206-44-0									
21	■	fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
22	■	indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
23		naphthalene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
24	■	phenanthrene				1.5	mg/kg		1.245	mg/kg	0.000125 %	✓	
			201-581-5	85-01-8									
25	■	pyrene				1.8	mg/kg		1.494	mg/kg	0.000149 %	✓	
			204-927-3	129-00-0									
26	🧪	vanadium { divanadium pentaoxide; vanadium pentoxide }				26	mg/kg	1.785	38.524	mg/kg	0.00385 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
27	🧪	chromium in Cr(III) compounds { ■ chromium(III) oxide }				14	mg/kg	1.462	16.983	mg/kg	0.0017 %	✓	
			215-160-9	1308-38-9									
Total:											0.0268 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP105/0.00-0.40/2025-11-26

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP105/0.00-0.40/2025-11-26	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
23%	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 23% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex }			1	13 mg/kg		10.01 mg/kg	0.001 %	✓	
	033-002-00-5									
2	cadmium (non-pyrophoric); [1] cadmium oxide (non-pyrophoric) [2]				0.3 mg/kg		0.231 mg/kg	0.0000231 %	✓	
	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]							
3	copper { copper(II) oxide }				26 mg/kg	1.252	25.061 mg/kg	0.00251 %	✓	
	029-016-00-6	215-269-1	1317-38-0							
4	mercury { inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex }			1	0.1 mg/kg		0.077 mg/kg	0.0000077 %	✓	
	080-002-00-6									
5	nickel { nickel(II) oxide (nickel monoxide) }				12 mg/kg	1.273	11.759 mg/kg	0.00118 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]							
6	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	54 mg/kg		41.58 mg/kg	0.00416 %	✓	
	082-001-00-6									
7	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
	034-002-00-8									
8	zinc { zinc oxide }				61 mg/kg	1.245	58.464 mg/kg	0.00585 %	✓	
	030-013-00-7	215-222-5	1314-13-2							
9	chromium in Cr(VI) compounds { chromium(VI) oxide }				<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
10	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		201-469-6	83-32-9							
11	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8							
12	anthracene				0.54 mg/kg		0.416 mg/kg	0.0000416 %	✓	
		204-371-1	120-12-7							
13	benzo[a]pyrene; benzo[def]chrysene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	601-032-00-3	200-028-5	50-32-8							

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number							
14		benzo[a]anthracene 601-033-00-9 200-280-6 56-55-3				0.18 mg/kg		0.139 mg/kg	0.0000139 %	✓	
15	•	benzo[bk]fluoranthene [1] 205-911-9 [2] 205-916-6 [1] 205-99-2 [2] 207-08-9				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16		benzo[k]fluoranthene 601-036-00-5 205-916-6 207-08-9				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
17	•	benzo[ghi]perylene 205-883-8 191-24-2				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
18		chrysene 601-048-00-0 205-923-4 218-01-9				0.13 mg/kg		0.1 mg/kg	0.00001 %	✓	
19		dibenz[a,h]anthracene 601-041-00-2 200-181-8 53-70-3				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
20	•	fluoranthene 205-912-4 206-44-0				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
21	•	fluorene 201-695-5 86-73-7				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
22	•	indeno[123-cd]pyrene 205-893-2 193-39-5				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
23		naphthalene 601-052-00-2 202-049-5 91-20-3				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
24	•	phenanthrene 201-581-5 85-01-8				0.14 mg/kg		0.108 mg/kg	0.0000108 %	✓	
25	•	pyrene 204-927-3 129-00-0				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
26	🧪	vanadium { divanadium pentaoxide; vanadium pentoxide } 023-001-00-8 215-239-8 1314-62-1				23 mg/kg	1.785	31.616 mg/kg	0.00316 %	✓	
27	🧪	chromium in Cr(III) compounds { • chromium(III) oxide } 215-160-9 1308-38-9				14 mg/kg	1.462	15.756 mg/kg	0.00158 %	✓	
Total:									0.0195 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: SD102/0.00-0.40/2025-11-26

 **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
SD102/0.00-0.40/2025-11-26	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
17%	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 17% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex }			1	18 mg/kg		14.94 mg/kg	0.00149 %	✓	
	033-002-00-5									
2	cadmium (non-pyrophoric); [1] cadmium oxide (non-pyrophoric) [2]				0.3 mg/kg		0.249 mg/kg	0.0000249 %	✓	
	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]							
3	copper { copper(II) oxide }				32 mg/kg	1.252	33.247 mg/kg	0.00332 %	✓	
	029-016-00-6	215-269-1	1317-38-0							
4	mercury { inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex }			1	0.11 mg/kg		0.0913 mg/kg	0.00000913 %	✓	
	080-002-00-6									
5	nickel { nickel(II) oxide (nickel monoxide) }				18 mg/kg	1.273	19.013 mg/kg	0.0019 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]							
6	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	72 mg/kg		59.76 mg/kg	0.00598 %	✓	
	082-001-00-6									
7	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
	034-002-00-8									
8	zinc { zinc oxide }				71 mg/kg	1.245	73.351 mg/kg	0.00734 %	✓	
	030-013-00-7	215-222-5	1314-13-2							
9	chromium in Cr(VI) compounds { chromium(VI) oxide }				<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
10	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		201-469-6	83-32-9							
11	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8							
12	anthracene				1.1 mg/kg		0.913 mg/kg	0.0000913 %	✓	
		204-371-1	120-12-7							
13	benzo[a]pyrene; benzo[def]chrysene				0.79 mg/kg		0.656 mg/kg	0.0000656 %	✓	
	601-032-00-3	200-028-5	50-32-8							

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		EU CLP index number	EC Number	CAS Number									
14		benzo[a]anthracene 601-033-00-9 200-280-6 56-55-3				0.91	mg/kg		0.755	mg/kg	0.0000755 %	✓	
15	•	benzo[bk]fluoranthene [1] 205-911-9 [2] 205-916-6 [1] 205-99-2 [2] 207-08-9				0.59	mg/kg		0.49	mg/kg	0.000049 %	✓	
16		benzo[k]fluoranthene 601-036-00-5 205-916-6 207-08-9				0.36	mg/kg		0.299	mg/kg	0.0000299 %	✓	
17	•	benzo[ghi]perylene 205-883-8 191-24-2				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
18		chrysene 601-048-00-0 205-923-4 218-01-9				0.78	mg/kg		0.647	mg/kg	0.0000647 %	✓	
19		dibenz[a,h]anthracene 601-041-00-2 200-181-8 53-70-3				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
20	•	fluoranthene 205-912-4 206-44-0				1.9	mg/kg		1.577	mg/kg	0.000158 %	✓	
21	•	fluorene 201-695-5 86-73-7				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
22	•	indeno[123-cd]pyrene 205-893-2 193-39-5				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
23		naphthalene 601-052-00-2 202-049-5 91-20-3				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
24	•	phenanthrene 201-581-5 85-01-8				1	mg/kg		0.83	mg/kg	0.000083 %	✓	
25	•	pyrene 204-927-3 129-00-0				2.3	mg/kg		1.909	mg/kg	0.000191 %	✓	
26	🧪	vanadium { divanadium pentaoxide; vanadium pentoxide } 023-001-00-8 215-239-8 1314-62-1				28	mg/kg	1.785	41.488	mg/kg	0.00415 %	✓	
27	🧪	chromium in Cr(III) compounds { • chromium(III) oxide } 215-160-9 1308-38-9				19	mg/kg	1.462	23.049	mg/kg	0.0023 %	✓	
Total:											0.0273 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP112/0.00-0.30/2025-11-26

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
TP112/0.00-0.30/2025-11-26	Chapter:
Moisture content:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
21%	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 21% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic compounds, with the exception of those specified elsewhere in this Annex }			1	19 mg/kg		15.01 mg/kg	0.0015 %	✓	
	033-002-00-5									
2	cadmium (non-pyrophoric); [1] cadmium oxide (non-pyrophoric) [2]				0.3 mg/kg		0.237 mg/kg	0.0000237 %	✓	
	048-002-00-0	231-152-8 [1] 215-146-2 [2]	7440-43-9 [1] 1306-19-0 [2]							
3	copper { copper(II) oxide }				35 mg/kg	1.252	34.612 mg/kg	0.00346 %	✓	
	029-016-00-6	215-269-1	1317-38-0							
4	mercury { inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex }			1	0.18 mg/kg		0.142 mg/kg	0.0000142 %	✓	
	080-002-00-6									
5	nickel { nickel(II) oxide (nickel monoxide) }				16 mg/kg	1.273	16.086 mg/kg	0.00161 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]							
6	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	79 mg/kg		62.41 mg/kg	0.00624 %	✓	
	082-001-00-6									
7	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<0.5 mg/kg	1.405	<0.703 mg/kg	<0.0000703 %		<LOD
	034-002-00-8									
8	zinc { zinc oxide }				70 mg/kg	1.245	68.833 mg/kg	0.00688 %	✓	
	030-013-00-7	215-222-5	1314-13-2							
9	chromium in Cr(VI) compounds { chromium(VI) oxide }				<1 mg/kg	1.923	<1.923 mg/kg	<0.000192 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
10	acenaphthene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		201-469-6	83-32-9							
11	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8							
12	anthracene				0.47 mg/kg		0.371 mg/kg	0.0000371 %	✓	
		204-371-1	120-12-7							
13	benzo[a]pyrene; benzo[def]chrysene				0.41 mg/kg		0.324 mg/kg	0.0000324 %	✓	
	601-032-00-3	200-028-5	50-32-8							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
14	benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.32 mg/kg		0.253 mg/kg	0.0000253 %	✓	
15	benzo[bk]fluoranthene [1] 205-911-9 [2] 205-916-6	[1] 205-99-2 [2] 207-08-9			0.22 mg/kg		0.174 mg/kg	0.0000174 %	✓	
16	benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.2 mg/kg		0.158 mg/kg	0.0000158 %	✓	
17	benzo[ghi]perylene 205-883-8	191-24-2			0.26 mg/kg		0.205 mg/kg	0.0000205 %	✓	
18	chrysene 601-048-00-0	205-923-4	218-01-9		0.29 mg/kg		0.229 mg/kg	0.0000229 %	✓	
19	dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		0.12 mg/kg		0.0948 mg/kg	0.00000948 %	✓	
20	fluoranthene 205-912-4	206-44-0			0.58 mg/kg		0.458 mg/kg	0.0000458 %	✓	
21	fluorene 201-695-5	86-73-7			<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
22	indeno[123-cd]pyrene 205-893-2	193-39-5			0.48 mg/kg		0.379 mg/kg	0.0000379 %	✓	
23	naphthalene 601-052-00-2	202-049-5	91-20-3		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
24	phenanthrene 201-581-5	85-01-8			0.33 mg/kg		0.261 mg/kg	0.0000261 %	✓	
25	pyrene 204-927-3	129-00-0			0.97 mg/kg		0.766 mg/kg	0.0000766 %	✓	
26	vanadium { divanadium pentaoxide; vanadium pentoxide } 023-001-00-8	215-239-8	1314-62-1		32 mg/kg	1.785	45.129 mg/kg	0.00451 %	✓	
27	chromium in Cr(III) compounds { chromium(III) oxide } 215-160-9	1308-38-9			17 mg/kg	1.462	19.629 mg/kg	0.00196 %	✓	
Total:								0.0266 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non GB MCL determinands

■ **arsenic compounds, with the exception of those specified elsewhere in this Annex**

GB MCL index number: 033-002-00-5

Description/Comments: Worst Case: IARC considers arsenic compounds Group 1; Carcinogenic to humans

Additional Hazard Statement(s): Carc. 1A; H350

Reason for additional Hazards Statement(s):

20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from:: IARC Group 1 (23, Sup 7, 100C) 2012

■ **barium oxide** (EC Number: 215-127-9, CAS Number: 1304-28-5)

Description/Comments: Data from ECHA's C&L Inventory Database, Sigma Aldrich SDS dated 6/2/20

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/88825>

Data source date: 02 Apr 2020

Hazard Statements: Acute Tox. 3; H301 , Skin Corr. 1B; H314 , Eye Dam. 1; H318 , Acute Tox. 1; H332

■ **lead compounds with the exception of those specified elsewhere in this Annex**

GB MCL index number: 082-001-00-6

Description/Comments: Least-worst case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following MCL protocols, considers many simple lead compounds to be Carcinogenic category 2

Additional Hazard Statement(s): Carc. 2; H351

Reason for additional Hazards Statement(s):

20 Nov 2021 - Carc. 2; H351 hazard statement sourced from:: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html. Review date 29/09/2015

■ **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

GB MCL index number: 602-039-00-4

Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans;

POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.

Additional Hazard Statement(s): Carc. 1A; H350

Reason for additional Hazards Statement(s):

20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from:: IARC Group 1 (23, Sup 7, 100C) 2012

■ **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Unknown Oil

Hazard statements taken from WM3 1st Edition 2015

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

■ **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

■ **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

■ **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **benzo[bk]fluoranthene** (EC Number: [1] 205-911-9 [2] 205-916-6, CAS Number: [1] 205-99-2 [2] 207-08-9)

Description/Comments: Combined data from harmonised entries in CLP for benzo[b] and benzo[k]fluoranthene; C&L Inventory Database

Data source: <https://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 02 Mar 2017

Hazard Statements: Carc. 1B; H350 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
 Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
 Data source date: 23 Jul 2015
 Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
 Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
 Data source date: 21 Aug 2015
 Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
 Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
 Data source date: 06 Aug 2015
 Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
 Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
 Data source date: 06 Aug 2015
 Hazard Statements: Carc. 2; H351

■ **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
 Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
 Data source date: 06 Aug 2015
 Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

■ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
 Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
 Data source date: 21 Aug 2015
 Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **chromium(III) oxide** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from ECHA's C&L inventory database
 Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>
 Data source date: 30 Apr 2020
 Hazard Statements: Acute Tox. 4; H302 , Skin Sens. 1; H317 , Eye Irrit. 2; H319

Appendix B: Rationale for selection of metal species

arsenic {arsenic compounds, with the exception of those specified elsewhere in this Annex}

Oxide most likely form of metal in soil environment

barium {barium oxide}

Based upon ground conditions

copper {copper(II) oxide}

Oxide most likely form of metal in soil environment

mercury {inorganic compounds of mercury with the exception of mercuric sulphide and those specified elsewhere in this Annex}

Oxide most likely form of metal in soil environment

nickel {nickel(II) oxide (nickel monoxide)}

Oxide most likely form of metal in soil environment

lead {lead compounds with the exception of those specified elsewhere in this Annex}

Oxide most likely form of metal in soil environment

antimony {antimony compounds, with the exception of the tetroxide (Sb₂O₄), pentoxide (Sb₂O₅), trisulphide (Sb₂S₃), pentasulphide (Sb₂S₅) and those specified elsewhere in this Annex}

Based upon ground conditions

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Oxide most likely form of metal in soil environment

zinc {zinc oxide}

Oxide most likely form of metal in soil environment

chromium in Cr(VI) compounds {chromium(VI) oxide}

Oxide most likely form of metal in soil environment

chromium in Cr(III) compounds {chromium(III) oxide}

Oxide most likely form of metal in soil environment

vanadium {divanadium pentaoxide; vanadium pentoxide}

Oxide most likely form of metal in soil environment

Appendix C: Version

HazWasteOnline Classification Engine: **WM3 1st Edition v1.2.GB - Oct 2021**

HazWasteOnline Classification Engine Version: 2025.345.6921.12504 (11 Dec 2025)

HazWasteOnline Database: 2025.345.6921.12504 (11 Dec 2025)

This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

GB MCL List v2.0 - version 2.0 of 20th October 2023

GB MCL List v3.0 - version 3.0 of 11th January 2024

GB MCL List v4.0 - version 4.0 of 2nd March 2024

GB MCL List v5.0 - version 5.0 of 26th June 2024

GB MCL List v6.0 - version 6.0 of 15th February 2025

GB MCL List v7.0 - version 7.0 of 23rd September 2025

Appendix J – References

- ¹ Environment Agency, October 2020, "Land contamination risk management (LCRM). How to assess and manage the risks from land contamination".
- ² CIRIA, January 2001, "Contaminated land risk assessment. A guide to good practice", C552.
- ³ The British Standards Institution (BSI Standards), December 2017, "Investigation of potentially contaminated sites - Code of practice", BS 10175:2011+A2:2017.
- ⁴ The British Standards Institution (BSI Standards), March 2018, "Geotechnical investigation and testing. Identification and classification of soil - Part 1: Identification and description", BS EN ISO 14688-1:2018.
- ⁵ The British Standards Institution (BSI Standards), May 2020, "Code of practice for ground investigations", BS 5930:2015+A1:2020.
- ⁶ Environment Agency, 2000, "Technical Aspects of Site Investigation", Technical Report P5-065/TR, Volumes I and II, Text Supplements.
- ⁷ CIRIA, December 2007, "Assessing risks posed by hazardous ground gases to buildings", C665.
- ⁸ Building Research Establishment (BRE), 2003, "Soakaway Design", Digest 365.
- ⁹ The British Standards Institution (BSI Standards), March 2018, "Geotechnical investigation and testing. Identification and classification of soil - Part 1: Identification and description", BS EN ISO 14688-1:2018.
- ¹⁰ Building Research Establishment (BRE), 2003, "Soakaway Design", Digest 365.
- ¹¹ European Commission, 2004 & 2007, "Eurocode 7: Geotechnical Design – Part 1 – General rules" & "Part 2: Ground investigation and testing", EN 1997-1:2004 & EN 1997-2:2007.
- ¹² Highways England, 1998, "Specification for Highway Works. Site clearance", Volume 1, Series 200.
- ¹³ Highways England, 2016, "Specification for Highway Works. Earthworks", Volume 1, Series 600.
- ¹⁴ CIRIA, 2001, "Trenching practice", REP R 97, 2nd Edition.
- ¹⁵ Highways England, 2016, "Specification for Highway Works. Earthworks", Volume 1, Series 600.
- ¹⁶ CIRIA, 2001, "Trenching practice", REP R 97, 2nd Edition.
- ¹⁷ Environment Agency, October 2020, "Land contamination risk management (LCRM). How to assess and manage the risks from land contamination".
- ¹⁸ DEFRA, December 2014, "Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination", SP1010, Policy Companion Document.
- ¹⁹ CL:AIRE, September 2014, "Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination", SP1010, Final Project Report (Revision 2).
- ²⁰ Environment Agency, January 2009, "Updated technical background to the CLEA model", Science Report SC050021/SR3.
- ²¹ Environment Agency, January 2009, "Human health toxicological assessment of contaminants in soil", Science Report - Final SC050021/SR2.
- ²² Environment Agency, January 2009, "A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA)", Project SC050021/Final Technical Review 1.
- ²³ Environment Agency, November 2008, "Compilation of data for priority organic pollutants for derivation of Soil Guideline Values", Science Report SC050021/SR7.
- ²⁴ Environment Agency, September 2009, "CLEA Software (Version 1.05) Handbook", Science Report SC050021/SR4.
- ²⁵ Environment Agency, April 2002, "Contaminants in soils: collation of toxicological data and intake values for humans. Benzo(a)pyrene", TOX2.
- ²⁶ U.S. Environmental Protection Agency, September 1984, "Health Effects Assessment for Polycyclic Aromatic Hydrocarbons (PAHs)", EPA/540/1-86/013.
- ²⁷ Environment Agency, September 2003, "Review of the Fate and Transport of Selected Contaminants in the Soil Environment", Draft Technical Report P5-079/TR1.
- ²⁸ CL:AIRE, September 2014, "Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination", SP1010, Final Project Report (Revision 2).
- ²⁹ Public Health England, September 2017, "Contaminated land information sheet: risk assessment approaches for polycyclic aromatic hydrocarbons (PAHs)".
- ³⁰ Culp S.J., Gaylor D.W., Sheldon W.G., Goldstein L.S., Beland F.A., January 1998, "A comparison of the tumors induced by coal tar and benzo[a]pyrene in a 2-year bioassay", Carcinogenesis, Volume 19, P117-124.
- ³¹ CL:AIRE, November 2012, "A Pragmatic approach to Ground Gas Risk Assessment", RB 17.
- ³² Building Research Establishment (BRE), June 2005, "Concrete in Aggressive Ground", SD1.
- ³³ CIRIA, 2001, "Trenching practice", REP R 97, 2nd Edition.
- ³⁴ Environment Agency, February 2016, "Register or renew waste exemptions".
- ³⁵ CL:AIRE, March 2011, "The Definition of Waste: Development Industry Code of Practice", Version 2.
- ³⁶ Health & Safety Executive, 1991, "Protection of Workers and the General Public during the Development of Contaminated Land".
- ³⁷ Yorkshire and Lincolnshire Pollution Advisory Group, June 2021, "Verification Requirements for Cover Systems: Technical Guidance for Developers, Landowners and Consultants", Version 4.1.
- ³⁸ The British Standards Institution (BSI Standards), April 2015, "Specification for topsoil", BS 3882:2015 - TC.
- ³⁹ CIRIA, January 2001, "Contaminated land risk assessment. A guide to good practice", C552.

Based across the UK with
offices in Manchester, Liverpool,
Swindon and Glasgow.

Manchester (Head Office)

**Unit 29
Eton Business Park
Eton Hill Rd, Radcliffe
M26 2ZS**

**0161 763 7200
info@thelkgroup.com**

Manchester (Ancoats Office)

**84 Silk Street
Ancoats
Manchester
M4 6BJ**

**0161 763 7200
info@thelkgroup.com**

Glasgow

**Wright Business Centre
1 Lonmay Road
Glasgow
G33 4EL**

**0141 773 6269
info@thelkgroup.com**

Swindon

**39 Bowman House Business Centre
Bowman Court
Whitehill Lane
Royal Wootton Bassett
Swindon
SN4 7DB**

**01793 987390
info@thelkgroup.com**



LK GROUP