Geotechnical assessment report

Fast-Track Submission - 77 Kapiti Road, Paraparaumu

New Central Park Limited



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Torlesse Ltd
Business Number: 9429050356317
Date: 22 October 2026
info@torlesseconsulting.co.nz

ACE MEMBER
Engineering New Zealand PROUD SUPPORTER

CONTENTS

EXECUTIVE SUMMARY 1
1. INTRODUCTION 2
1.1. Project Background 2
1.2. Scope and purpose of this GAR 3
1.3. Proposed Development, Relevant to Geotechnical Considerations 3
1.4. Information Received – Engineering and Architecture 5
1.5. Statutory Compliance Framework 5
1.5.1. National Policy Statement for Natural Hazards 2025 5
1.5.2. KCDC District Plan Requirements 5
1.5.3. KCDC District Wide Subdivision Matters - Liquefaction Risk 6
1.5.4. Regulatory Themes from previous KCDC and GWRC RFIs 6
2. SITE DESCRIPTION 7
3. DESKTOP STUDY 8
4. REVIEW OF GEOTECHNICAL AND HYDROLOGICAL REPORTS 9
4.1. Summary of the Previous Reports 9
4.2. Torlesse 2026 Ground Investigations 10
4.2.1. Trial Trench Excavations 10
4.2.2. Trial Trench Bulk Samples and Laboratory Testing 11
4.2.3. Supplementary Ground Investigations 14
5. GROUND MODEL 15
5.1. Soil Profile 15
5.2. Geological Sections 15
5.3. Groundwater 16
5.3.1. WWLA Assessments 16
5.3.2. Recent Groundwater Readings 16
5.3.3. Recent Trial Trench Investigations 16
5.4. Soil Parameters 18
6. GEOTECHNICAL HAZARDS 19
6.1. MBIE Guidance, Compliance with SUB-DW-R9 19
6.2. RMA Section 106 Hazard Assessment 19
6.3. Liquefaction and Lateral Spreading 20
6.3.1. Ground Motion Parameters 20
6.3.2. Liquefaction Analyses 20

6.3.3. Lateral Spreading 24
6.4. Slope Stability 25
6.4.1. Swale adjacent to the Spine Road 25
6.4.2. Temporary Cuts, Adjacent to M2PP Expressway 25
6.4.3. Lookout Recreation Area 26
6.4.4. Spine Road Causeway 26
6.5. Ground Settlement 26
6.5.1. Secondary Creep 26
6.5.2. Temporary Groundwater Lowering 27
6.5.3. Ground Heave 27
6.6. Natural Hazards Assessment, NPS-NH (2025) 28
7. GEOTECHNICAL ASSESSMENTS AND RECOMMENDATIONS 30
7.1. Building Foundations 30
7.1.1. Single and Two+ Storey Dwellings 31
7.1.2. Multi-Storey Residential Buildings 32
7.1.3. Large Format Retail 32
7.2. Roading 33
7.3. Culverts and Pipe Network 34
7.4. Bulk Earthworks 35
7.4.1. Treatment of Each Material Type 35
7.4.2. Bulk Earthworks, General Considerations 35
7.4.3. Suitability of Materials for Re-Use 36
7.5. Pre-Construction Earthworks Trials 36
7.5.1. Trial Compaction Pad 36
7.5.2. Trial Settlement Platform 36
8. CONCLUSIONS AND RECOMMENDATIONS 38
8.1. Soil Profile and Groundwater 38
8.2. Site Geotechnical Hazards 38
8.3. Building Foundations 38
8.4. Roading and Infrastructure 38
8.5. Bulk Earthworks 38
9. APPLICABILITY 39

Figure 1: Site boundaries, supplied by Scope Planning Ltd 3
Figure 2: Photo taken atop the central spine of sand dunes, looking to the north-east towards the Tararua's 4
Figure 3: Entrance to the site off Kapiti Rd, looking south with the sand dunes in the background 7
Figure 4: Wharemauku Stream looking upstream towards the KCDC town centre 7

Figure 5: Example grading curve for the fibrous peat (Sample C, TT5 1m begl) 13
Figure 6: Example grading curve for the organic sand (Sample E, TT4 0.5m begl) 13
Figure 7: Seepage at the base of the fibrous peat, taken from TT09 (Region 1) 17
Figure 8: Collapsing sands at the base of the trial trench (TT04, Region 1), indicative of the regional groundwater 17
Figure 9: Table 5.1 from MBIE Earthquake Geotechnical Engineering Practice Module 3 (2021) showing performance level categories. 22
Figure 10: Schematic sketch showing the arrangement of lateral spreading 24
Figure 11: Extract from NPS-NH (2025), Figure 1: Risk matrix 29
Figure 14: Extract from the HMO Architectural Drawing Set, 03 September 2026 31
Figure 13: Dwellings within the bright green polygon will require SED, likely deep piled foundations. 32
Figure 14: Extract from the HMO Architectural Drawing Set, 03 September 2026 32
Figure 15: Extract from the HMO Architectural Drawing Set, 07 September 2026 32
Figure 16: Causeway tying into Ihakara St, extract taken form Envelope roading drawing set. 33
Figure 17: Termination of wastewater line 'WW Line E', showing 4.74m depth to invert level. 34
Figure 18: Example settlement monitoring plate arrangement (note, monitoring plate at top not shown) 37

Table 1: Geotechnical Considerations 4
Table 2: Mapping RFI themes to relevant sections of this report 6
Table 3: Geotechnical desktop study 8
Table 4: Summary of historical data 9
Table 5: Key findings from the site works 10
Table 6: Laboratory testing schedule 11
Table 7: Laboratory testing results summary, water content and organic matter 12
Table 8: Supplementary ground investigations 14
Table 9: Region names and characteristics 15
Table 10: Groundwater monitoring completed by Torlesse 16
Table 11: Geotechnical material parameters 18
Table 12: Evaluation against the MBIE Guidance 2017 19
Table 13: Geotechnical Hazards 19
Table 14: Ground motion parameters 20
Table 15: Liquefaction under ULS seismic conditions, pre development 21
Table 15: Liquefaction under ULS seismic conditions, post development 22
Table 16: Load cases and target factors of safety 25
Table 17: Risk Assessment Against NPS-NH (2025) 28
Table 18: Building types 30
Table 19: Treatment of each material type 35

APPENDIX A: ARCHITECTURAL PLANS
APPENDIX B: GI LOCATION PLANS
APPENDIX C: 2026 GI DATA
APPENDIX D: GEOLOGICAL SECTIONS
APPENDIX E: CLIQ OUTPUTS
APPENDIX F: SLOPE STABILITY ASSESSMENT
APPENDIX G: WWLA PLANS

EXECUTIVE SUMMARY

New Central Park Limited (NCPL) has engaged Torlesse to provide geotechnical engineering services for the staged subdivision and enabling works at 77 and 109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu. This report assesses the geotechnical hazards and presents design parameters and recommendations to support the fast-track application.

The assessment draws on the existing investigations by Total Ground Engineering, ENGEO and Jacobs, 20 trial trenches excavated by Torlesse in June 2026, and 15 CPTs, 7 test pits and insitu permeability tests completed in 2026.

The site generally comprises 0.5 to 1.5m of fibrous peat over organic sands and clean dune sands to around 5 to 10m depth. These are underlain by dense sands and gravels. A central sand dune up to 15m high will be cut to provide fill. Perched groundwater is present at the base of the peat, with heavy inflows adjacent to the M2PP Expressway. A design level of 1mbegl has been adopted as part of our geotechnical assessments.

Under ULS earthquake conditions, liquefaction is predicted in discrete layers rather than through the full soil column. Post development free-field settlements are estimated at 10 to 35mm, corresponding to performance levels of L1 under MBIE Module 3 (2021). Liquefaction effects under SLS conditions are expected to be minimal. The risk of lateral spreading is assessed as low.

Slope stability analyses of the stormwater swale, temporary cuts adjacent to the M2PP Expressway and the proposed 'Lookout' indicate that target factors of safety are achieved. With the exception of ULS seismic, where moderate movements may occur but are not expected to damage buildings or infrastructure, nor coincide with a major storm event (central swale). And therefore, satisfying the requirements of MBIE Module 4 'Earthquake Resistant Foundation design', November 2021.

Fibrous peat will be removed beneath building platforms and road corridors and reused only as landscape fill. Consolidation settlement of the remaining granular soils organicxpected to be negligible. Creep settlement of the organic sands is estimated at 3mm to 5mm over the 50-year design life, to be confirmed by trial settlement platforms. Settlement of neighbouring assets due to temporary dewatering is expected to be negligible.

One and two storey dwellings are likely to be founded on shallow slabs on engineered fill, with geogrid reinforced earth rafts where finished levels are near existing ground. Multi-storey and large-span commercial buildings are likely to require piles into the dense sands and gravels. All foundations will require specific engineering design.

Dune sand is expected to provide the bulk of the engineered fill, and between 50% to 100% (depending on lime and/or cement treatment) of the organic sands are expected to be reusable. Trial compaction pads and settlement platforms are recommended to confirm blend proportions and a maximum organic content.

In our opinion, subject to the recommendations in this report being implemented, the geotechnical hazards identified present a low risk to the land, proposed structures and infrastructure, and are unlikely to be accelerated or worsened by the proposed works. On this basis, the proposal is supported from a geotechnical perspective, subject to the recommendations in this report.

Building-specific investigation and design will be required at building consent stage.

1. INTRODUCTION

1.1. Project Background

New Central Park Limited (NCPL) has engaged Torlesse to provide geotechnical engineering services for the staged subdivision and enabling works at 77 and 109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu. Torlesse's scope of service and important clarifications is set out in the short form agreement titled 'Offer of Geotechnical Engineering Services for Fast-Track Resource Consent' dated 13 March 2026.

New Central Park Limited (NCPL) is proposing the comprehensive development of land at 77 and 109 Kāpiti Road and 1 Brett Ambler Way, Paraparaumu, together with associated works on adjoining land. The Project is a comprehensive, masterplanned mixed-use development providing for the expansion of the Paraparaumu Metropolitan Centre.

The Project comprises:

- Approximately 604 residential dwellings, including apartments, townhouses, duplexes, courtyard housing and standalone dwellings;
- Approximately 20,000m^2 GFA of Large Format Retail (LFR);
- Approximately 3,800m^2 of other retail and commercial activities, including specialty retail and drive-through activities;
- Subdivision to create residential, commercial, LFR and other development allotments, together with roads, reserves and infrastructure;
- A new internal transport network, including the Town Centre Link Road, local roads and JOALs, together with pedestrian and cycling connections and provision for public transport;
- Three waters infrastructure required to service the development;
- An extensive network of open space, landscaping and blue-green infrastructure; and
- Wetland reclamation and creation and ecological restoration and enhancement, including a constructed indigenous wetland primarily providing ecological offsetting and compensation, together with complementary flood-storage functions.

The development has been comprehensively masterplanned to integrate the residential, commercial, transport, infrastructure, ecological, landscape and open space components of the Project. It is intended to proceed progressively in stages as an integrated extension to the existing Paraparaumu town centre.

The Project has been referred for consideration under the Fast-track Approvals Act 2024. This report forms part of the technical documentation supporting the substantive application for the Project.



Figure 1: Site boundaries, supplied by Scope Planning Ltd

1.2. Scope and purpose of this GAR

In recent months Torlesse has prepared several reports in support of the investigation and design for the project, as summarised below.

- Torlesse, 'Trial Trench Excavations – groundwater control and organic silts, 8 June 2026.
- Torlesse, 'Trial Trench Excavations', dated 10 August 2026.
- Torlesse, 'Stage 1 - Geotechnical Desk Study Report', dated 10 September 2026.

This report presents the findings from Stage 2 and Stage 3 of Torlesse geotechnical services. The scope and content of this report is comprehensive, in the sense it pulls all pertinent information from our previous reports, covering geotechnical hazards, parameters and recommendations sufficient for the fast-track application.

Stage 2 – Targeted Supplementary Ground Investigation

Following confirmation of the master planning framework and building typologies, Torlesse will undertake targeted supplementary deep ground investigations to close identified residual uncertainties.

This stage will include:

- *Additional deep CPTs in locations of non-NZS 3604 structures and critical infrastructure corridors.*
- *Boreholes within or adjacent to nominated building envelopes and deformation-sensitive assets.*
- *Targeted recovery of high-quality peat and sand samples for laboratory testing.*
- *Installation of supplementary groundwater monitoring points where required.*

Stage 3 – Fast-track Resource Consent Geotechnical Assessment Report

Stage 3 comprises preparation of the subdivision-stage geotechnical assessment report for Fast-track Resource Consent. This will include:

- *Site-wide liquefaction triggering assessment.*
- *Post-liquefaction settlement and lateral deformation modelling.*
- *Peat consolidation settlement assessment.*
- *Engineered landform stability assessment.*
- *Off-site deformation and boundary effects evaluation.*
- *Definition of platform performance criteria.*
- *Section 106 (as recently amended by the 2025 Amendment Act) suitability statement.*
- *Explicit risk evaluation aligned with NPS-NH 2025.*

1.3. Proposed Development, Relevant to Geotechnical Considerations

The following are extracts from Section 1 of the fast-track application of May 2026 (refer above):

'The Project proposes a comprehensive, masterplanned mixed-use development that will deliver a significant extension to the Paraparaumu town centre, including residential, large format retail, commercial and supporting infrastructure.'

'The Project will deliver approximately 520-620 residential units across a range of typologies, alongside large format retail, retail and commercial activities. It also includes significant infrastructure works, including a new east-west link road, three waters servicing, and an integrated network of open space, wetland and flood management areas. Importantly, the development has been designed as a coherent and integrated urban environment that responds to the Metropolitan Centre Zone Structure Plan and supports the role of Paraparaumu as the district's primary centre.'

In terms of master planning and overall arrangement, the project comprises the following:

- Residential allotments.
- Commercial, retail and mixed use activities.

- Restoration and enhancement of the Wharemauku Stream and wetland offset development.



Figure 2: Photo taken atop the central spine of sand dunes, looking to the north-east towards the Tararua's

The key geotechnical considerations are set out in Table 1 below.

Table 1: Geotechnical Considerations

Element of the Project	Geotechnical Considerations	Refer to Section of this GAR
Third Party Assets	• M2PP Expressway Road - temporary slope stability and settlement • M2PP Expressway Stormwater Detention Pond – slope stability • KCDC Swimming Pool and Childcare Centre – settlement due to temporary dewatering	• Section 6.4, 7.2 and 7.3
Local Roads	• Extent of undercutting to remove peat. • Slopes forming the causeway across the wetland	• Section 7.2
Surface Water Drainage	• Swale slope stability – static and seismic • Long term consolidation settlements	• Section 6.3 and Section 7.3
Single and Two+ Storey Dwellings	• Peat undercut Specific Engineering Design (SED) for all structures – allocate foundation types	• Section 7.1.1
3 to 10 storey Residential Buildings	• Peat undercut • Mitigate liquefaction • Consideration of pad, raft and piled foundations to support loads from large portal frames	• Section 7.1.2
Large Format Retail		• Section 7.1.3

1.4. Information Received – Engineering and Architecture

The information's received since completion of our Stage 1 Geotechnical Desk Study Report is as follows.

Planning Services:

- Scope Planning Ltd, 'Application For Referral to the Expert Consenting Panel, Under the Fast-Track Approvals Act 2024', dated May 2026.

Architectural Drawings:

- Refer to the substantive application by Scope Planning Ltd (SPL).

Civil Engineering Drawings:

- Refer to the substantive application prepared by SPL.

Geotechnical assessments and site investigation data:

- Total Ground Engineering, 'Geotechnical report for subdivision and development consent – 77 Kapiti Road', dated April 2019.
- ENGEO, 'Geotechnical Investigations – Bunnings Limited', Project no: 19325.000.001, dated September 2021.
- Jacobs, 'East West Connection Single Stage Business Case – Geotechnical Factual Report', dated March 2022.
- ENGEO, 'Geotechnical Investigation – 77 Kapiti Road, Paraparaumu', Project number 22313.000.001, dated September 2023.
- Williamson Water & Land Advisory, 'Kapiti Road Development – Hydrological Effects Expert Assessment', dated 11 June 2025.
- Williamson Water & Land Advisory, '77 Kāpiti Road, Paraparaumu – Hydrogeological Effects Assessment: Progress Update and Modelling Scenarios', dated 22 May 2026.
- Torlesse Ltd, 'Trial Trenches Geotechnical Memo', ref T0793/02, dated 10 August 2026.

Other disciplines:

- Subsurface Ltd, Archaeological Services, 'Kapiti Road Ihakara Street Connection – Prepared for Kapiti Coast District Council', dated 07 September 2022.

1.5. Statutory Compliance Framework

1.5.1. National Policy Statement for Natural Hazards 2025

The National Policy Statement for Natural Hazards (NPS-NH) 2025 establishes a risk-based framework requiring that natural hazard risk is identified, assessed and managed through land use decisions. It requires consideration of both hazard likelihood and consequence and does not support deferral of fundamental risk to later development stages.

For this site, the relevant hazards include liquefaction, post-liquefaction settlement and lateral deformation, and peat consolidation behaviour. The subdivision must therefore demonstrate, at this stage, that these hazards are understood and that resulting risks can be reduced to an acceptable level.

The geotechnical assessment is structured to provide a consequence-based evaluation of ground performance, supported by appropriate investigation and modelling, so that site suitability can be demonstrated under the NPS-NH framework Section 6 and 7 of this report summarise our assessments of the geotechnical hazards, and present engineering mitigation measures for each. Section 6.6 below provides a summary of the post construction hazard profile for the development, measured against the NPS-NH framework.

1.5.2. KCDC District Plan Requirements

The subdivision is subject to KCDC Rule SUB-DW-R9, which applies to subdivision of land containing peat or sandy soils and requires geotechnical information to be provided to a building consent level in respect of liquefaction risk.

In practical terms, it requires:

- A site-wide liquefaction assessment consistent with MBIE (2017) Guidance.
- Explicit assessment of settlement and lateral deformation consequences.
- Confirmation that risks to health, safety and property can be avoided or mitigated.
- Demonstration that platform design, earthworks and servicing layouts are consistent with geotechnical constraints.

The geotechnical deliverable at subdivision stage must therefore withstand scrutiny equivalent to building consent-level hazard assessment, rather than relying on deferral to future building-specific investigations.

1.5.3. KCDC District Wide Subdivision Matters - Liquefaction Risk

KCDC's District Wide Subdivision Matters, SUB-DW-R9 (Controlled Activity) requires a 'suitably qualified and experienced person' to undertake a site-specific liquefaction risk assessment. Further, the Clause requires the level of detail to be equivalent to the 'building consent stage'.

The scope of investigations (quality and quantity of data) and methodology for assessing and quantifying the effects of liquefaction is set out in MBIE (2017) Guidance (Planning and Engineering Guidance for Potentially Liquefaction-prone Land).

As part of Torlesse's desktop review of the site, we reviewed the quality and quantity of the available geotechnical data and undertook preliminary liquefactions assessments. Our review indicated the site categorisation of Level C (detailed area-wide assessment, refer MBIE 2017, Table 3.717), based on the following:

- Liquefaction vulnerability category - Liquefaction damage is possible, 'medium'
- Development scenario – 'commercial development' and 'urban residential development'

Level C requires average investigation density of 0.1 to 4 locations per hectare, and an average spacing between 50 to 320m.

1.5.4. Regulatory Themes from previous KCDC and GWRC RFIs

Prior to this project, earthworks and subdivision consents were lodged with KCDC and GWRC for earthworks and subdivision associated with a previous masterplan design.

A review of the KCDC and GWRC RFIs confirms that the focus is not on the absence of investigation data, but on confidence in the ground model, interpretation and consequence assessment. We have reviewed the RFI's and mapped them to each section of this report. Refer to the summary table below.

Table 2: Mapping RFI themes to relevant sections of this report.

RFI theme	Addressed in Section:
Liquefaction triggering and consequence	6.2.1, 6.2.2, Table 12
Post-liquefaction settlement and lateral deformation	6.2.2, 6.2.3
Peat compressibility and groundwater interaction	6.4, 7.4
Stability of engineered landforms, including the causeway	6.3 and 6.4
Off-site effects and boundary deformation	6.3.2, 6.4.2
Construction staging and temporary stability	6.3.2, 7.4, 7.5

2. SITE DESCRIPTION

The property is currently used as farmland with low lying and slightly undulating topography with a distinct sand dune in the central portion of the site. The height of the sand dune ranges from 5m to 15m, and the slopes are generally around 20 to 25 degrees.

The site has been altered in the past with drainage channels and localised earthworks. There are very few buildings or structures on the site, a shed structure exists in the centre of the site.

The Wharemauku Stream is fully channelised and extends along the southern boundary of the site. SH1 extends along the western boundary, and Kapiti Road extends along the northern boundary. The Kapiti Swimming Pool and Kapiti town centre are located to the east of the site.



Figure 3: Entrance to the site off Kapiti Rd, looking south with the sand dunes in the background



Figure 4: Wharemauku Stream looking upstream towards the KCDC town centre

3. DESKTOP STUDY

The 2023 ENGEO report (refer Section 1.4 above) includes a summary of publicly available information. Torlesse has reviewed the relevant public sources to confirm the key information and identify any additional matters relevant to the current development, presented below.

Table 3: Geotechnical desktop study

Source	Source Description	Data Description	Notes
GNS	NZ Geological Webmap (1:250,000)	OIS1 (Holocene) stable dune deposits	Holocene windblown deposits
	NZ Active Fault Database	~1.8km east - Ohariu Fault ~3.5km km east – Gibbs Fault	Dextral, RI II (>2,000 to <=3,500 years), slip rate is 1 – 2mm/yr Dextral, RI III (>3,500 to <=5,000 years), slip rate is unknown
GWRC	Mapped Hazard	Combined Hazard Ground Shaking Liquefaction Slope Tsunami	Moderate - High Moderate High Low None
	Selected Land Use Register (SLUR)	Not registered	-
KCDC	Historical Aerial Images	1942 – Entirely farmland 1987 – Structures present in middle of the plot	-
	KCDC Tsunami Maps	Paraparaumu and Raumati Map, October 2023	Site located in excess of 1km beyond the Tsunami evacuation zones.
Retrolens, and Google Earth	Historical Aerial Images	Refer to Section 4.4 of the Engeo 2023 report. Of note: • Between 2005 and 2007 material was stockpiled on top of the sand dune. Numerous stockpiles were formed, coloured grey, yellow and orange – indicating they were stockpiles of firewood, likely sourced from the large Macrocarpa tress felled at around the same time the local farm buildings were demolished. • In 2019 there is an area of worked ground near the north-east corner of the site. It is not clear whether the site was stripped and levelled or organic material brought in to level the site. We understand these works were associated with KCDC widening Kapiti Rd.	
NZGD	Records within 300m of the property	• ~30m & west & 105m north - 7 x Boreholes. • ~180m east - 3 x Window Samplers. • ~180m east - 4 x Cone Penetration Tests.	• Boreholes completed for NZTA (M2PP Expressway). • Window samplers generally comprise of sand underlain by a thin layer of peat and organic silt and underlain by well graded sand. • 159 Rimu Rd, CPT profiles show silty sands to 5m then clean sands to 15m depth.

4. REVIEW OF GEOTECHNICAL AND HYDROLOGICAL REPORTS

The investigation location plan (refer Appendix B) captures all site-specific investigations works, up to and including the recently completed Stage 2 test pits and CPT's.

4.1. Summary of the Previous Reports

The table below provides a summary of the testing completed onsite.

Table 4: Summary of historical data

Report Title	Report Date	Purpose of the report	Cone Penetration Tests	Machine Boreholes	Test Pits	Test Pits (for groundwater)	Hand Augers
Total Engineering, 'Geotechnical report for subdivision and development consent – 77 Kapiti Road'.	April 2019	To support the Resource Consent and Building Consent applications to the Kapiti Coast District Council.	22 no.	-	61 no.	-	-
ENGEO, 'Geotechnical Investigations – Bunnings Limited'. Project no: 19325.000.001	September 2021	Torlesse did not receive a copy of the geotechnical report, we received the logs only. To support detailed design of a large footprint retail building. The project did not proceed.	24 no.	5 no.	-	-	19 no.
Jacobs, 'East West Connection Single Stage Business Case – Geotechnical Factual Report'.	March 2022	To support East – West Connection Road linking Kapiti Road at the Arawhata Road intersection to Ihakara Street, including several connector roads.	6 no.	2 no.	-	-	-
ENGEO, 'Geotechnical Investigation – 77 Kapiti Road, Paraparaumu'. Project number 22313.000.001.	September 2023	Undertake geotechnical investigation and analyses to a level suitable for resource consent for the previous development.	10 no.	2 no.	3 no.	8no.	-
ENGEO, 'Preliminary Hydrological Assessment (Groundwater)' (Groundwater). Project number 22313.000.001	January 2025	Development of hydrographs comparing groundwater to rainfall, and a hydrogeological conceptual site model (CSM).	Installation and monitoring of 11 standpipe piezometers and two water level monitoring points in the Wharemauku Stream.				

4.2. Torlesse 2026 Ground Investigations

4.2.1. Trial Trench Excavations

The trial trenches were performed prior to preparing the Stage 1 Geotechnical Desk Study Report. The works were undertaken 10 to 12 June 2026. The purpose of these investigations was twofold, as follows:

- Primarily, to assist in evaluating the earthworks balance and methodology for the site;
- Secondarily, supplement existing site geotechnical data in developing a ground model, to inform response to KCDC's submission in response to the application.

The works comprised excavating 20 trial trenches, carefully recording the soil profile, groundwater inflows and trench wall stability. A copy of the trial trench logs is provided in Appendix C.

Table 5 below provides a summary of the key findings of the trial trenching works, particularly as they relate to the project mass balance, pre-construction activities and earthworks methodology.

Table 5: Key findings from the site works

Theme	Description	Geotechnical impact on the project
Classification of each soil unit	Primary units: • Topsoil • Fibrous peat • Organic sands • Clean sands Secondary units, encountered locally: Sandy silts with trace gravels Highly plastic clays (TT14 only)	Undertake laboratory testing, refer to Section 5.1 below. Evaluate what proportion of each unit can be re-used on site, either as engineered fill or landscape fill. Develop blends and then undertake trials for compaction and settlement.
Perched groundwater	Encountered consistently at the base of the fibrous peat. Heavy inflows encountered along the boundary of the M2PP expressway (Region 1). Relatively low inflows in the southern region (Region 4 and 5, and very limited perched groundwater in the north-east region (Region 2)). Refer to Figure 9 below.	Construction phase controls of groundwater ingress to the excavation will be required, it is envisaged these can be readily managed with traditional sump/pump arrangements and discharged to the local swale. Adopt a mobile treatment device where turbidity exceeds consented thresholds. Refer to the WWLA October 2026 report for further commentary.
Regional groundwater	Encountered consistently at around 2m to 2.5m below ground level. Ground appears moist, within seconds the soils collapse, losing all strength and structure. WWLA report estimates inflows ranging from 7L/s to 10L/s, although this does not reflect the staged earthworks methodology, opening up defined regions and backfilling prior to moving to the adjacent region.	Perimeter dewatering including a network of open drains and a central sump, working occasionally in order to keep groundwater below the base of the subgrade. Particularly important in the location of the 'Lookout', where the intention is to maximise yield of clean sands. Compounded in Region 1 where localised relatively heavy perched groundwater inflows are also expected, refer above. We expect only slight fluctuations in the regional groundwater levels between winter and summer seasons. Further commentary is provided in the WWLA October 2026 report, refer above.

Theme	Description	Geotechnical impact on the project
Trench wall stability	Typically side walls were stable, and the stability typically lasted overnight. Instability occurred where the regional groundwater was encountered, coupled with heavy perched groundwater inflows. Trial trenches TT04, TT08, TT17 and TT20 recorded collapsed side walls. Notably TT04 and TT08 are located in the same problematic region (Region 1, where heavy perched groundwater encountered near the M2PP expressway.	Slope stability analyses and groundwater drawdown assessment will be required to be undertaken during the detailed design to assess effects on third parties, in particular: • M2PP expressway embankments (western boundary of the site). • M2PP expressway stormwater detention pond (north-west corner of the site). • Utilities extending along Kapiti Rd. • Swimming pool to the east of the site. • Day care centre to the south of the site, on the opposite wide of Wharemauku Stream.
Hydraulic conductivity to Wharemauku Stream	Trial trenches TT10 to TT14, TT16 and TT18 were all undertaken in the order of 10m to 20m from the true right-hand side of the Wharemauku Stream (within Region 5). There were no signs of elevated groundwater inflows or wall instability in these locations.	A large flood management area and wetland is proposed near the Wharemauku Stream. The stream lies entirely within the site property boundary and provides popular amenity to the local community. • During the bulk excavation it is critical that the works do not cause instability in the banks of the stream or drawdown of stream surface water levels. • Potential drawdown effects associated with construction dewatering are being assessed separately by WWLA.
Presence of relic tree trunks and stumps	In excess of 200mm diameter.	Will require to be carefully separated during bulk cuts and material selection.

4.2.2. Trial Trench Bulk Samples and Laboratory Testing

Following completion of the recent trial trench excavations, a set of bulk samples and laboratory classification tests were scheduled. The testing was undertaken by WSP Laboratories, Petone.

Table 6: Laboratory testing schedule

Sample ID	Source	Sample Depth (m begl)	Lab. Description	Date Collected	Testing Required
E	TT4	~0.5	SAND	12-Jun-26	Sieve analysis, Loss on Ignition
G	TT4	~1	SILT	12-Jun-26	Sieve analysis, Hydrometer test, Atterberg Limits, Loss on Ignition
A	TT4	~2	SAND	12-Jun-26	Sieve analysis, Loss on Ignition

Sample ID	Source	Sample Depth (m begl)	Lab. Description	Date Collected	Testing Required
C	TT5	~1	PEAT	12-Jun-26	Sieve analysis, Loss on Ignition
D	TT13	~0.5	SILT	12-Jun-26	Sieve analysis, Hydrometer test, Atterberg Limits, Loss on Ignition
B	TT13	~1.2	SAND	12-Jun-26	Sieve analysis, Loss on Ignition
F	TT13	~1.5	SAND	12-Jun-26	Sieve analysis, Loss on Ignition
H	TT13	~1.8	SAND	12-Jun-26	Sieve analysis, Loss on Ignition

Laboratory test results are provided in Appendix C.

Table 7: Laboratory testing results summary, water content and organic matter

Sample ID	Source	Sample Depth (m begl)	Unit ID	Water Content (%)	Organic Matter (%)	PI	LL
E	TT4	~0.5	OS	94	10	~	~
G	TT4	~1	FP	624	80	182	356
A	TT4	~2	CS	59	5	~	~
C	TT5	~1	FP	355	95	~	~
D	TT13	~0.5	OS	159	15	46	115
B	TT13	~1.2	CS	49	1	~	~
F	TT13	~1.5	CS	33	0	~	~
H	TT13	~1.8	CS	29	0	~	~

- The fibrous peat was uniformly graded, from fine sands to fine gravels, refer example grading curve below, Figure 5.
- The organic sands and clean sands have very similar grading (poorly graded), and comprise around 70% fine sands (0.1 to 0.2 mm size) and less than 10% medium sands, refer to example grading curve below, Figure 6.
- Very high liquid limits (resulting in classification as extremely high plasticity) indicate peat fibres may have remained present in the silt fractions, and so the samples may not be representative.

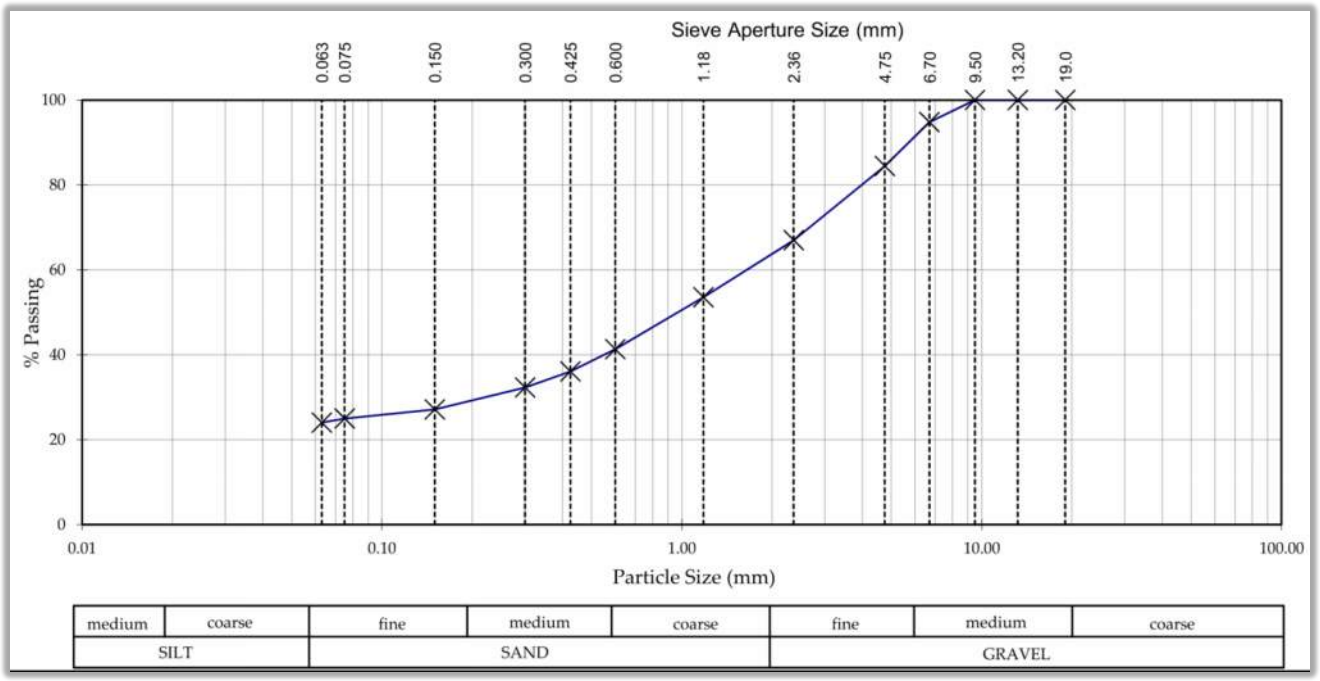


Figure 5: Example grading curve for the fibrous peat (Sample C, TT5 1m begl)



Figure 6: Example grading curve for the organic sand (Sample E, TT4 0.5m begl)

4.2.3. Supplementary Ground Investigations

Reflecting on the quality and quantity of data across the site, the known ground conditions and form of the proposed development; the site can be separated into several regions as shown in Sketch 1, Appendix B.

With reference to KCDC Rule SUB-DW-R9, the investigations presented in Table 8 below were scoped in order to address the following:

- CPTs to refine liquefaction triggering and lateral-spreading profiles.
- Test pits to assess undocumented fill and reusable dune material.
- Permeability testing to inform temporary groundwater management.
- Laboratory testing to confirm classification, organic content and compaction behaviour.

Table 8: Supplementary ground investigations

Geotechnical Region	Name	Geotechnical Considerations	Scope of Investigations
Region 1	North-west	Relatively thick peat Heavy groundwater inflows	CPT's and insitu permeability tests.
Region 2	North-east	Relatively thin peat	None required, because there are several CPT's and the peat is relatively thin in this region.
Region 3	Central dune	Potential for historic localised rubbish tips at base of slopes	Test pits along the base of the dune (north and south). Obtain bulk samples for further laboratory testing.
Region 4	Central south	Relatively thick peat	None required, because there are several CPT's in this region.
Region 5	Wharemauku	Close proximity to Wharemauku Stream Relatively shallow groundwater	CPT's and insitu permeability tests.
Region 6	Southern bite		CPT's and insitu permeability tests.

The CPT data, insitu permeability testing and test pit logs are provided in Appendix C.

5. GROUND MODEL

5.1. Soil Profile

Across the site the ground conditions are typical of the Kapiti Region, with low-lying areas generally comprised by a surficial layer of peat/organic soil varying from around 0.5m to 2m thickness underlain by Holocene age fine to medium clean dune sands up to 5m to 10m depth, underlain by Pleistocene age alluvium deposits comprised of alternating layers of sand and gravel.

The recent trial trench excavations (refer above) confirmed the site comprises a number of primary and secondary units, which in turn form the basis of our geotechnical hazard assessments (refer Section 6 below).

Primary soil units, encountered across most of the site:

- Fibrous peat.
- Organic sands.
- Clean sands.

Secondary units soil, encountered locally:

- Sandy silts with trace gravels.
- Highly plastic clays (TT14 only).

Several distinct regions are highlighted in Sketch 1, Appendix B. Each region is summarised below.

Table 9: Region names and characteristics

Geotechnical Region	Name	Important characteristics
Region 1	North-west	Relatively thick peat Heavy perched groundwater inflows Pit wall instability
Region 2	North-east	Relatively thin peat Limited perched groundwater
Region 3	Central dune	Good source of clean sands
Region 4	Central south	Relatively thick peat Moderate perched groundwater inflows Pit wall instability
Region 5	Wharemauku deposits	Thin surface layer of silts/sands/gravels Underlain by fibrous peat
Region 6	Southern bite	Relatively thin peat Very close to the Wharemauku Stream

5.2. Geological Sections

Six geological sections have been prepared (GS 01 to GS 06). Refer to Appendix D. The alignment of each section is shown on Sketch 1, Appendix B.

The section alignments were chosen in order to highlight key features of the site including the peat mound, central swale, spine road, wetland area and important buildings and infrastructure beyond the site boundaries (such as the KCDC aquatic centre and the M2PP Expressway.

5.3. Groundwater

5.3.1. WWLA Assessments

WWLA are providing hydrogeological services for the project, covering assessment of effects on groundwater and wetlands under construction and post development conditions. WWLA prepared a preliminary report in May 2026, and subsequent to this prepared hydrogeological assessment report, for inclusion in the substantive application. The latter report was prepared in coordination with this GAR. Full reference to the reports is provided below:

- WWLA, report titled '77 Kāpiti Road, Paraparaumu – Hydrogeological Effects Assessment: Progress Update and Modelling Scenarios', dated 22 May 2026.
- WWLA, report titled 'Hydrological Effects Assessment Report, Kapiti Road Development', dated 22 October 2026.

Where observations or effects differ between the WWLA report and this GAR, the WWLA shall take precedence.

5.3.2. Recent Groundwater Readings

Torlesse undertook a supplementary round of monitoring as part of the trial trench excavations, readings taken shown in the table below.

Table 10: Groundwater monitoring completed by Torlesse

ID	Depth below ground level	Date reading taken
MW01	0.6	10.06.26
MW02	0.5	11.06.26
MW03	1.4	11.06.26
MW04	1.2	11.06.26
MW09	0.5	12.06.26
MW11	0.8	12.06.26
Note: 1) Engeo Report 2025 stated MW 08 had been destroyed. 2) MW 05, 06, 07 and 10 – either could not be found due to heavy vegetation, or had been destroyed.		

5.3.3. Recent Trial Trench Investigations

The recent trial trench investigations also provided clarity around the ground water regime. Having read through the WWLA hydrogeological assessment reports of 2025 and 2026 (refer Section 1.4.4) and following discussions with the team at WWLA the groundwater regime can be separated into two fairly distinct groundwater features.

Perched groundwater, typically lying in the top 0.2m to 1.5m of the site:

- Encountered consistently at the base of the fibrous peat. Heavy inflows encountered along the boundary of the M2PP expressway (Region 1). Refer to Figure 9 below. Relatively low inflows in the southern region (Region 4 and 5), and very limited perched groundwater in the north-east region (Region 2).



Figure 7: Seepage at the base of the fibrous peat, taken from TT09 (Region 1)

Regional groundwater, encountered consistently at around 2 to 2.5m below ground level (early winter) equivalent to around 2 to 3.5m RL.

- When exposed within a bulk excavation the ground initially appears moist, and within seconds the soils become saturated and collapse, losing all strength and structure. Refer to Figure 10 below. Generally, this results in minor inflows to the excavation.



Figure 8: Collapsing sands at the base of the trial trench (TT04, Region 1), indicative of the regional groundwater

5.4. Soil Parameters

Soil parameters were derived form a combination of correlations, published information and CPeT-IT analyses. In order generate a strong correlation between soil types and data form the CPT's we paired selected locations, as summarised below.

- Jacobs CPT002 and BH002
- Jacobs CPT006 and Engeo BH03
- Engeo (Bunnings) CPT10 and Total Engineering S15
- Engeo (Bunnings) CPT1 and Total Engineering U11
- Engeo (Bunnings) CPT8 and Total Engineering S12

Table 11: Geotechnical material parameters

Unit	Typical Description	Typical Strength	Parameters						
			γ (kN/m³)	φ' (°)	c' (kPa)	s_u (kPa)	E' (MPa)	k_S (m/s)	Organic Content (%)
Site Won Fill (SWF)	Fine to coarse SAND	Dense	17	36	-	-	80	10^{-4}	~0
Fibrous Peat (FP)	PEAT	Very soft to soft	12	26	1	20	<5	4×10^{-6} to 10^{-7}	> 80
Organic Sand (OS)	Fine to medium SAND	Medium dense becoming dense	17	32 to 36	0	-	20 to 30	5×10^{-5} to 10^{-3}	5 to 15
Clean Sand (CS)	Fine to coarse SAND	Medium dense to very dense	20	36 to 40	0 to 2	-	80 to 120	5×10^{-5} to 10^{-3}	<3
Sandy Gravel (SG)	Sandy Gravel; fine to coarse	Dense to very dense	21	38 to 40	0 to 5	-	100 to 120	5×10^{-4}	~0
Notes	γ bulk unit weight; φ' effective friction angle; c' effective cohesion; s_u undrained shear strength; E' modulus of elasticity; k_S permeability.								

6. GEOTECHNICAL HAZARDS

6.1. MBIE Guidance, Compliance with SUB-DW-R9

The table below sets out how through supplementary ground investigations and assessments we have complied with 'Level C' under Controlled Activity, SUB-DW-R9

Table 12: Evaluation against the MBIE Guidance 2017

Item	Description	Assessment
Spatial variability	• Adequate spatial characterisation of liquefiable strata.	We have CPT's and test pits in all six regions (refer to Sketch 1 appendix B)
Groundwater records	• Robust groundwater assumptions.	Engeo installed 11 standpipe piezometers across the site, and many of those
Triggering and Consequences	• Assessment of liquefaction effects under ULS conditions	Refer to Section 6.3.2 below.
Residual Uncertainties	• Explicit management of residual uncertainty.	Section 7 below provides a number of recommendations and scope analyses to be undertaken as part of the detailed design of the project. Much of this work will be undertaken in coordination with the architects, civil and structural engineers.

6.2. RMA Section 106 Hazard Assessment

Torlesse has undertaken a qualitative assessment of the site geotechnical hazards. For simplicity, we have adopted a four-tiered system (none/low/moderate/high) to characterise the significance of the risk specific to the development. The risk allocation may differ for any subsequent or additional developments at the site.

Typically, risks with a low rating are not assessed further, while those with moderate or high ratings are assessed in more detail. Geotechnical hazards are summarised in Table 13 below.

Table 13: Geotechnical Hazards

Geohazard	Risk Category	Notes
Weak or variable soils	Moderate	Peat extends across much of the site, with the exception of the central dune Peat if left in place and untreated will adversely affect the performance of shallow foundations due to creep settlement. moderate. The recent round of test pits (refer Appendix C) were positioned at the toe of the sand dunes, and did not encounter any rubbish, offal pits or landfill material associated with an operational farm.
Shallow groundwater	Moderate	Perched lenses of groundwater encountered near surface across much of the site. Particularly heavy inflows adjacent to the M2PP Expressway.
Slope instability – static and seismic	Low	The overall site currently is flat, with the exception of the central dune, which will be removed as a source of fill material. Refer to Section 6.4 below.
Liquefaction	Moderate	Refer to Section 6.2.2 below.
Lateral spreading	Low	Refer to Section 6.2.3 below.

Geohazard	Risk Category	Notes
Fault rupture	Low	The site is not within the proximity of the Ohariu Fault avoidance zone, located approximately 1.8km to the east of the site; therefore the risk of fault rupture (abrupt surface movements and very strong directivity) at the site is low.

Section 6.6 below provides a summary of the post development geotechnical hazard risk assessment, measured against the NPS-NH, 2025.

6.3. Liquefaction and Lateral Spreading

6.3.1. Ground Motion Parameters

The ground motion parameters for geotechnical analysis are estimated using the MBIE and NZGS Earthquake Engineering Practice Module 1 (2021). Two design cases have been considered, both adopting a 50-year design life, with design peak ground accelerations (PGA) presented in Table 14 below.

- Module 1 - Site subsoil classification D (deep soil) is recommended for the site.
- TS NZS170.5 – Site Class IV to VII (pending site specific Vs_{30} testing).

Table 14: Ground motion parameters

Design Case	Source	Return Period	M_w	PGA (g)
SLS1	Module 1	25 years	6.5	0.13
ULS	Module 1	500 years	7.7	0.68
SLS1	TS NZS1170.5	25 years	6.9	0.15 to 0.16
ULS	TS NZS 1170.5	500 years	7.8	0.61 to 0.72

TS:1170.5:2025 is based on the NSHM:2022 and represents current knowledge of seismic hazard. For the purposes of assessing geotechnical hazards, TS:1170.5:2025 and Module 1 are classified as 'Alternative Solution' pathways. Refer to 'NZGS advice on geotechnical seismic hazard', released by NZGS, 17 June 2026.

When compared to Module 1, adoption of TS NZS1170.5:2025 results in:

- Much higher ground motions, in the order of 20% higher for deep soil sites like Kapiti.
- Adopting the Vs30 method for assessing site subsoil classification (site class), which requires more sophisticated and costly site testing in order to reliably assess the site class.

And so, the method for deriving the ground motion parameters is at the discretion of the Client, following consultation with the project geotechnical and structural engineer. For the purposes of this report, we recommend the following:

- Adopt ground motions derived from MBIE Module 1 (2021).
- Undertake a parallel-analyses to assess the impacts of adoption TS:1170.5:2025.
- At the outset of the detailed design (post fast-track consent approval) meet with the Client and structural engineer to discuss the relative merits of both methods and agree the preferred approach.

The method for deriving ground motion parameters does not materially alter our risk assessments at this stage of the project. Therefore, the preferred method will be confirmed in consultation with the Client as part of the detailed design.

6.3.2. Liquefaction Analyses

Torlesse has undertaken a comprehensive set of liquefaction analyses, utilising the software CLiq V.3.5.4.6. The analyses ran CPT profiles from all CPTs available, including the various data sets obtained by Engeo, Jacobs, Total Ground Engineering and the recent round of supplementary CPT's (FT_CPT01 to FT-CPT15).

Our liquefaction analyses adopted the following inputs, to reflect post development site conditions:

- Undercutting the peat and selected organic sands; and replacement with non-liquefiable engineered fill.
- Apply a surcharge at the base of the undercut to reflect the proposed fill material (thicknesses taken form Envelope cut and fill plans, unit weight of 17kN/m^3).

Our analyses have adopted the following sensitivity checks and input parameters:

- Sensitivity check – we ran separate liquefaction analyses for 1m and 2m thickness of fill, to reflect the variability of the fill thickness across the wider site. Our analyses indicated the effects of liquefaction (loss of strength and settlement) were not sensitive to fill thickness, and so for the purposes of our outputs we adopted 1m fill thickness.
- A fines correction value (CFC) is set as 0%.
- A groundwater table at 1m begl,.
- Threshold probability of liquefaction (PL) of 16%.

Our analyses indicate the following effects under SLS and ULS load cases:

- Under SLS earthquake conditions, minor liquefaction may occur. Localised lenses of soil may liquefy (triggering, causing less than 10mm surface settlement), but the surface expression (settlement, sand boils and crust break up) is expected to be minimal.
- Note the Kaikoura 2016 earthquake event (0.09g/M_w 7.8) generated similar levels of shaking as SLS loading and we are not aware of any reports of liquefaction in the Kapiti area.
- Under ULS earthquake conditions, certain layers of the soil profile may liquefy, liquefaction of the full soil column is not expected.
- To further explore the extent and effects of liquefaction we completed specific assessments for each of the six geotechnical regions presented in Table 8 and 9 above.
- Example outputs from each region are presented in Appendix E.

Table 15: Liquefaction under ULS seismic conditions, pre development

Geotechnical Region	Name	Soil Column Descriptor	LSN	LPI (ISH)	FFS* (mm)	Performance Level
			(averaged for all CPT's located in the Region)			
Region 1**	North-west	Liquefaction from around 1m to 3m begl, and localised lenses from 5m to 10m begl.	12	10	36	L1
Region 2	North-east	Similar to Region 1	14	11	27	L2
Region 3	Central dune	None, due to high overburden stresses from the existing dune	N/A			L0
Region 4	Central south	Liquefaction from around 1m to 3m begl, and then localised lenses to 8m begl.	10	7	21	L1
Region 5	Wharemauku ***	Localised lenses from 1m to 9m begl.	11	9	29	L1
Region 6	Southern bite	Liquefaction from around 1m to 1.5m begl, and then localised lenses to 10m begl.	8	6	12	L1

* Free-Field Settlement - This is only volumetric settlement (refer to Bray and Macedo, 2017). Total building settlement = volumetric settlement (Dv) + shear induced settlement (Ds) + Ejecta settlement (De). Ds and De depend on building loads and foundation arrangements, which are not defined at subdivision stage. These components will be assessed as part of the building-specific design.

Geotechnical Region	Name	Soil Column Descriptor	LSN	LPI (ISH)	FFS* (mm)	Performance Level
			(averaged for all CPT's located in the Region)			
** Region 1 - The footprint of the 'lookout' will be undercut and backfilled with peat. The peat itself is highly organic and has a high proportion of fines and organics, as such is not liquefiable. *** Region 5 - Includes the causeway section of the spine road, where the near surface peat and loose sands will be undercut and replaced with engineered fill. The localised lenses below the undercut present a low risk of significant damage to the road surface and services during a major earthquake. Some localised short-term repairs may be required.						

	EFFECTS FROM EXCESS PORE WATER PRESSURE AND LIQUEFACTION	CHARACTERISTICS OF LIQUEFACTION AND ITS CONSEQUENCES	CHARACTERISTIC F_L, LPI, LSN
L0	Insignificant	No significant excess pore water pressures (no liquefaction).	$F_L > 1.4$ LPI=0 LSN <10
L1	Mild	Limited excess pore water pressures; negligible deformation of the ground and small settlements.	$F_L > 1.2$ LPI = 0 LSN = 5 – 15
L2	Moderate	Liquefaction occurs in layers of limited thickness (small proportion of the deposit, say 10 percent or less) and lateral extent; ground deformation results in relatively small differential settlements.	$F_L \approx 1.0$ LPI < 5 LSN 10 – 25
L3	High	Liquefaction occurs in significant portion of the deposit (say 30 percent to 50 percent) resulting in transient lateral displacements, moderate-to-large differential movements, and settlement of the ground in the order of 100 mm to 200 mm.	$F_L < 1.0$ LPI = 5 – 15 LSN = 15 – 35
L4	Severe	Complete liquefaction develops in most of the deposit resulting in large lateral displacements of the ground, excessive differential settlements and total settlement of over 200 mm.	$F_L << 1.0$ LPI > 15 LSN > 30
L5	Very severe	Liquefaction resulting in lateral spreading (flow), large permanent lateral ground displacements and/or significant ground distortion (lateral strains/stretch, vertical offsets and angular distortion).	

Figure 9: Table 5.1 from MBIE Earthquake Geotechnical Engineering Practice Module 3 (2021) showing performance level categories.

Table 16: Liquefaction under ULS seismic conditions, post development

Geotechnical Region	Name	Soil Column Descriptor	LSN*	LPI (ISH)*	FFS (mm)	Inferred Performance Level**
			(averaged for all CPT's located in the Region)			
Region 1	North-west	Liquefaction immediately below the groundwater table, and localised liquefaction at depth.	n/a	n/a	33	L1
Region 2	North-east	Similar to Region 1	n/a	n/a	25	L1

Geotechnical Region	Name	Soil Column Descriptor	LSN*	LPI (ISH)*	FFS (mm)	Inferred Performance Level**
			(averaged for all CPT's located in the Region)			
Region 3	Central dune	None, due to high overburden stresses from the existing dune	N/A			L0
Region 4	Central south	Similar to Region 1	n/a	n/a	18	L1
Region 5	Wharemauku	Similar to Region 1	n/a	n/a	25	L1
Region 6	Southern bite	Similar to Region 1	n/a	n/a	9	L1

* LSN and LPI (ISH) not reported because of limitations in the CLiq software. The software treaded the base of the undercut as the 'finished ground surface' for reporting LSN and LPI (ISH), and so did not take account of the proposed engineered fill, forming a thick uniform crust of non-liquefiable soil.

** Inferred by qualitative assessment, on the basis of the FFS reported by CLiq coupled with the proposed engineered fill (refer to * above).

6.3.3. Lateral Spreading

Lateral spreading occurs where a free face (typically a slope or stream bank) lies adjacent to a region of liquefied soils, causing potentially very large and differential lateral movements. We have undertaken a qualitative assessment of lateral spreading risk across the site, considering a number of free faces within the property and beyond, including Wharemauku Stream and the M2PP Expressway stormwater detention pond. Our assessments indicate the risk is low, the basis for this is set out below.

The architectural drawings (refer Appendix A) indicate the development will form two free faces, as summarised below.

- Southern Region – the stream channels forming the northern extents of the Wharemauku wetland area. Expected to be in the order of 1m to 3m high and comprising gentle slopes.
- Central Region – the large swale running adjacent to the spine road. Refer extract from the architectural drawings below.

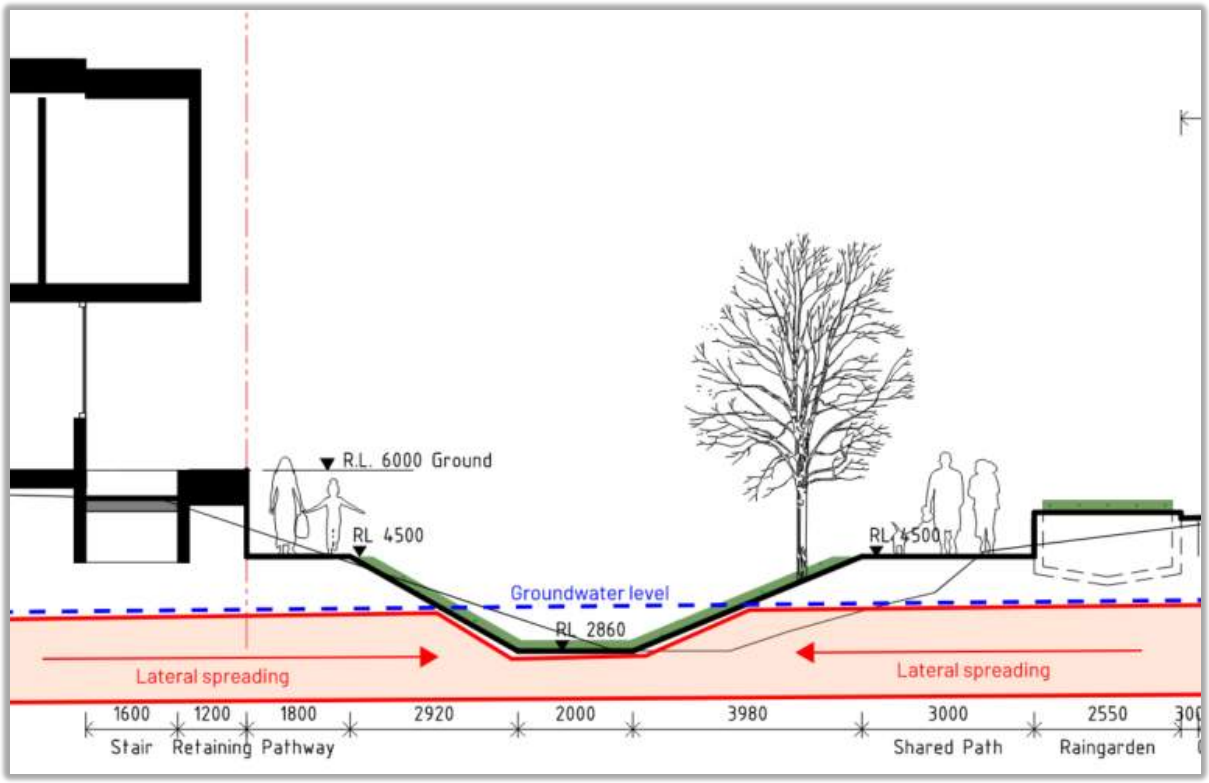


Figure 10: Schematic sketch showing the arrangement of lateral spreading

Several common and relatively economic methods are available to mitigate the effects of lateral spreading, where dwellings or commercial buildings are positioned near the free face:

- Single and two storey dwellings – geogrid reinforced earth raft to in part de-couple the slab from the lateral movement from the slab. The slab has adequate tensile capacity to resist lateral stetch across the building footprint. Commonly lateral spreading also generates abrupt differential vertical settlements caused by tension cracks in the surface crust. The geogrid raft will help to limit and redistribute the vertical settlements across the building footprint.
- Multi-storey residential and large footprint commercial buildings - form a shear key behind the free face to limit lateral movement (comprising driven sheet piles, soil densification or undercut/replacement).
- The stormwater, sewer and water supply networks will be positioned within the road corridor where the potentially liquefiable organic sands will be undercut and replaced with engineered fill. Reducing the likelihood of large lateral movements caused by a ULS event. Movement tolerant connections will be adopted as part of the design, and so loss of service following a major earthquake is expected to be low. Therefore, the overall risk of lateral spreading is low.

6.4. Slope Stability

Torlesse has undertaken a set of slope stability analyses, with the use of RocScience Slide™ software, adopting the method of 'GLE/Morgenstern and Price'. The analyses have been undertaken following the guidance set out in the following:

- NZGS, 'Slope Stability Geotechnical Guidance Series, Unit 1 – General Guidance', October 2024.

Load cases and target factors of safety are set out in the table below. Outputs from our analyses is provided in Appendix F.

Table 17: Load cases and target factors of safety

Load Case	Groundwater	Surcharges	PGA	Target FoS
Temporary (construction phase)	GWL @ 3.4m RL	None	0	1.3
Static Long Term		5kPa dwellings, 12kPa roads	0	1.5
Short Term High Groundwater	Ru = 0.2		0	1.3
Seismic SLS	GWL @ 3.4m RL	None	0.13	1.3
Seismic ULS (non-liquefied)		None	0.34 (pseudo-static)	1.0 (or limit displacements)

6.4.1. Swale adjacent to the Spine Road

The swale will be constructed in one continuous phase. The swale will be constructed by overfilling and then trimming back to the design profile, followed by planting and surface protection. As such there will be no temporary load case.

The swale batters vary from 2H:1V to 2.5H:1V and comprise engineered fill (locally sourced sands).

Our stability analyses has adopted Geological Section 2 (GS 02), refer to Sketch 1 in Appendix B. The geological section is presented in Appendix D.

With the exception of ULS Seismic, the analyses outputs indicate the target FoS in Table 16 above are achieved for all design cases. The FoS for Seismic ULS is 0.9 (1 significant figure) and as such lateral movements may occur. The lateral movements will be quantified during the detailed design, adopting the 'Newmarks sliding block method'. Irrespective, the resulting damage could be readily repaired after a major earthquake.

6.4.2. Temporary Cuts, Adjacent to M2PP Expressway

The fibrous peat and much of the organic sands will be undercut and backfilled with engineered fill. The finished ground level will be in the order of 1 to 1.5m above existing in this region of the site. We have undertaken temporary stability analyses to model the effects of forming a steep cutting adjacent to the property, approximately 5 to 15m offset from the stormwater swale adjacent to the southbound lanes of the M2PP Expressway.

Our stability analyses has adopted Geological Section 4 (GS 04), refer to Sketch 1 in Appendix B. The geological section is presented in Appendix D.

Analyses outputs indicate a FoS in excess of 2.0 for deep seated instability affecting the M2PP swale, as such we are satisfied the undercuts present a low risk of instability.

6.4.3. Lookout Recreation Area

Approximately 10 to 15m high fill batters (hereon referred to as the 'Lookout') will be formed along the boundary with the M2PP expressway. The fill will comprise fibrous peat and organic sand sourced from across the site. Batters will be formed at 3H:1V, allowing for near surface treatment (pins and fabric) to prevent localised shallow instability.

We have analysed deep seated instability that may affect either the core of the Lookout or the swale adjacent to the southbound lane of the M2PP Expressway.

Our stability analyses has adopted Geological Section 5 (GS 05), refer to Sketch 1 in Appendix B. The geological section is presented in Appendix D.

Analyses outputs indicate the target FoS in Table 16 are achieved.

6.4.4. Spine Road Causeway

An approximately 80m long causeway extends across the wetland area to the south of the site. Forming the spine road between Ihakara St and the residential area. The causeway will comprise engineered fill, a culvert midway and erosion protection measures on the upstream side.

Envelope earthworks plans indicate the overall height at road surface will be in the order of 3.6m from the base of the wetland area. The batters of the causeway are formed at 2H:1V.

All organic soils will be undercut prior to placement of the engineered fill. The fill will be permeable and so groundwater will lie near the base of the causeway batters. Quantitative slope stability analyses are not warranted for arrangements of this type. Our qualitative analyses indicate the batters will exhibit adequate stability under static load cases and much like the swale (refer Section 6.4.2 above), some movement may occur under a ULS seismic event. To be quantified during detailed design, and again much like the swale, the damage could be readily repaired after a major earthquake.

Following a major storm event high velocity flows are expected near the inlet and outlets to the culvert. Scour protection such as rip-rap or reno mattresses will be assessed as part of the detailed design.

6.5. Ground Settlement

The site soil profile generally comprises highly compressible fibrous peat underlain by organic sands and clean sands. There were some small pockets of silts and clays, but they were very localised. The clean sands are underlain by dense gravels sands of very low compressibility.

The fibrous peat will be stripped entirely prior to placement and compaction of the engineered fill to the building platforms and causeway

The organic sands are typically medium dense fine grained and generally drain well. There are typically three mechanisms for settlement, as follows:

- Immediate settlements – up to 30 to 50mm may occur in the organic sands, but will occur as the material is placed, and so will not affect buildings, roads or three waters network.
- Primary consolidation – occurs in silts and clays only, expected to be negligible as the material comprises fine sands.
- Secondary creep – occurs in soils with moderate to high organic content. Small and fairly uniform secondary settlements may occur over the 50-year design life of the site, refer to Section 6.4.1 below for further commentary.

6.5.1. Secondary Creep

We have completed a set of creep settlement calculations, following the methods of Tonni and Simonini, refer below:

- Geomechanics and Geoengineering: An International Journal,2013; 'Evaluation of secondary compression of sands and silts from CPTu', Tonni and Simonini.

$$C_{\alpha\varepsilon} = \frac{\Delta\varepsilon_z}{\Delta \mathrm{Log}\, t} = \frac{C_{\alpha e}}{1 + e_0}$$

- The paper recommend a $C_{\alpha E}$ range of 0.00058 to 0.00095.
- Adopting a 't' ratio of 50/1 (design life / time to end of primary consolidation ie: 50years/1year).
- Layer thickness of 3m (allows for typically 1m undercut and 2m of fill).

We estimate secondary settlements in the order of 3 to 5mm over the 50-year design life of the development. A sensitivity analyses of the range in settlements is not warranted given they are less than 10mm, and as such are compliant with the Building Code, which stipulates differential settlements over a typical span of 6m shall not exceed 25mm.

6.5.2. Temporary Groundwater Lowering

Several important assets are located near the site, as summarised below.

- M2PP Expressway, where the peat was undercut prior to placement of fill/ construction of the expressway.
- Kapiti Aquatic Centre, founded on deep piles.
- East-West Kapiti Rd and associated gas main and three waters network, per M2PP peat was undercut prior to construction of the road.

Temporary dewatering induced groundwater lowering has been modelled by WWLA, refer to WWLA report Section 6.4 'Construction Dewatering Effects' and Figure 18 (copy included in Appendix G of this GAR). As summarised below:

- A maximum of 2.2m near the boundaries of the site – where third party assets include the KCDC pool, M2PP Expressway and Kapiti Rd.
- Typically 1.4m to 0.6m in the order of 40 to 100m from the site boundaries – where third party assets include the residential dwellings to the north of Kapiti Rd and the Childcare Centre to the south of Wharemauku Stream.

Reductions in water level ranging from 0.6m to 2.2m are estimated to cause an increase in effective stress on the near surface soils of around 6 to 22kPa (unit weight of water 10kN/m^3). Considering the medium dense to dense state of the organic sands and underlying clean sands, the risk of settlement caused by dewatering is expected to be negligible.

6.5.3. Ground Heave

Civil layout plans indicate the toe of the peat bund is located approximately 20m from the swale adjacent to the southbound lanes of the M2PP expressway. The overall height of the peat bund ranges from 5m to 15m high, adopting a unit weight of 12kN/m^3 for the fibrous peat, results in a net pressure of at the base of the peat bund of around 60 to 180kPa.

The peat bund will be underlain by organic sands, with low compressibility, refer Section 6.5.1 above. We hold a design report from the M2PP expressway project (Beca, 2012), which confirms the peat below the footprint of the expressway was undercut and replaced with engineered fill. It is unlikely the peat below the swale was undercut. Irrespective, our qualitative assessments indicate the risk of basal heave below the swale is low.

6.6. Natural Hazards Assessment, NPS-NH (2025)

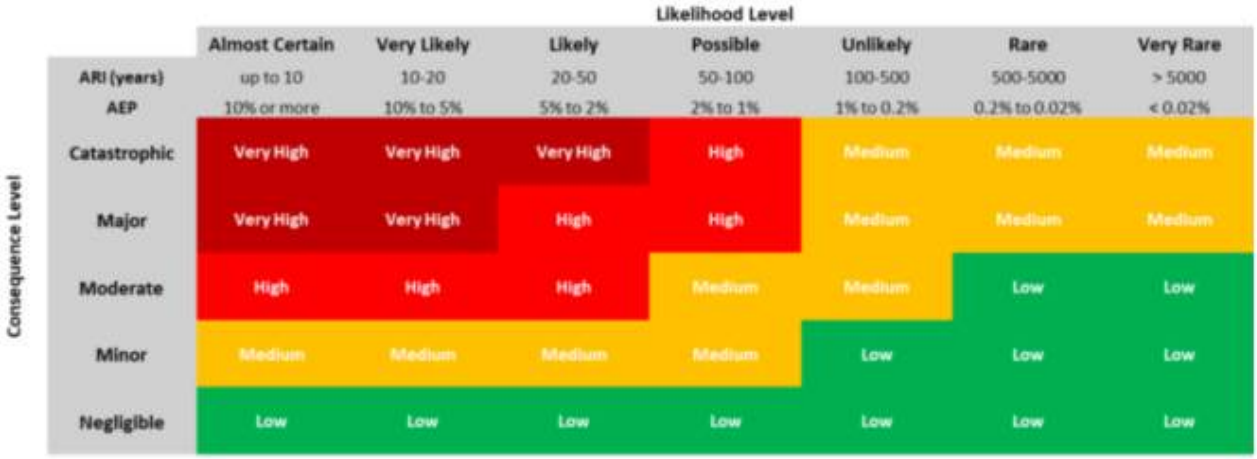
The National Policy Statement for Natural Hazards 2025 (NPS-NH) came into force on 15 January 2026. It applies to flooding, landslips, coastal erosion, coastal inundation, active faults, liquefaction and tsunami. It excludes infrastructure as defined in the RMA, which includes roads and drainage, sewerage and water supply systems. The assessment below therefore relates to the land and proposed buildings. Geotechnical considerations for roads and three waters are addressed in Sections 7.2 and 7.3.

Risk has been assessed using the NPS-NH likelihood and consequence tables and risk matrix, taking account of the mitigation measures recommended in this report and the residual risk where design events are exceeded. Where the property and life safety consequences differ, the higher level has been adopted. Under the NPS-NH, medium, high and very high risk is defined as significant.

Note – flooding, coastal erosion and coastal inundation assessments have been undertaken by Envelope with assistance from WWLA and are reported under separate cover.

Table 18: Risk Assessment Against NPS-NH (2025)

NPS-NH hazard	Likelihood	Consequence (with mitigation)	Risk level	Basis
Landslips	Unlikely (500-year ULS event)	Minor	Low	The site is generally flat, and the central dune will be removed. The swale, wetland batters and temporary cuts achieve the target factors of safety (Section 6.4). With the exception of Seismic ULS which returned a FoS of 0.9 (1 significant figure) and as such lateral movements may occur. Surface protection limits shallow instability. Residual risk beyond the design event is Rare, Moderate, Low.
Active faults	Rare (Ohariu Fault, RI 2,000 to 3,500 years)	Negligible	Low	The site is approximately 1.8km from the Ohariu Fault trace and outside the fault deformation zone. Ground shaking is addressed under liquefaction.
Liquefaction (including lateral spreading)	Unlikely (500-year ULS event)	Minor	Low	Liquefaction is predicted in discrete layers, approximately 10mm to 35mm free-field settlement post development. The risk is mitigated by peat removal, 1m to 2m of engineered fill, specifically designed foundations (Section 7.1) and setbacks or shear keys near free faces. Residual risk beyond the design event is Low.
Tsunami	Not applicable	Not applicable	Low	In excess of 1km beyond the mapped Tsunami zone (Table 3).



Consequence Level	Likelihood Level: Almost Certain	Very Likely	Likely	Possible	Unlikely	Rare	Very Rare
ARI (years)	up to 10	10-20	20-50	50-100	100-500	500-5000	> 5000
AEP	10% or more	10% to 5%	5% to 2%	2% to 1%	1% to 0.2%	0.2% to 0.02%	< 0.02%
Catastrophic	Very High	Very High	Very High	High	Medium	Medium	Medium
Major	Very High	Very High	High	High	Medium	Medium	Medium
Moderate	High	High	High	Medium	Medium	Low	Low
Minor	Medium	Medium	Medium	Medium	Low	Low	Low
Negligible	Low	Low	Low	Low	Low	Low	Low

Figure 11: Extract from NPS-NH (2025), Figure 1: Risk matrix

With the recommended mitigation, the risk from landslips, active faults and liquefaction (including lateral spreading) is assessed as low, which is not significant under the NPS-NH, and no very high risk has been identified. Flooding, coastal erosion and coastal inundation are outside the scope of this geotechnical assessment and have not been assessed in this report.

7. GEOTECHNICAL ASSESSMENTS AND RECOMMENDATIONS

Several important elements of the project will require geotechnical input as part of the detailed design and construction phase, as summarised below.

1. Building foundations – mitigating the minor effects of liquefaction and peat settlement.
2. Roading – undercuts throughout, so as compliant with KCDC roading standards.
3. Culverts and pipe network –protecting falls for gravity network and floatation checks.
4. Bulk Earthworks – dewatering and making best use of each material in order, to limit offsite disposal.
5. Pre-Construction Earthworks Trials – trial compaction and settlement monitoring pads.

7.1. Building Foundations

Architectural layouts (refer Appendix A) indicate the proposed development will comprise single and two storey NZS3604 type residential units, multi-storey residential units (retirement living etc) and commercial buildings.

Table 19: Building types

Type	Architectural Code	No. of Storeys	Superstructure arrangement
Apartments	A1, A3, A5, M2, M4, M8	3	Steel or concrete frame structure
	M7	4	
	A2, M3	6	
	A4	7	
	M1	10	
Large Format Retail	R	~	Large steel portal frames
Courtyard House	C	2	Timber frame or pre-cast panel
Duplex House	D	2	Timber frame
Single House	H	1 or 2	
Townhouse	T1, T5, T7, T8, T9, T30, T31, T34, T36, T37	3	Steel or concrete frame structure

7.1.1. Single and Two+ Storey Dwellings

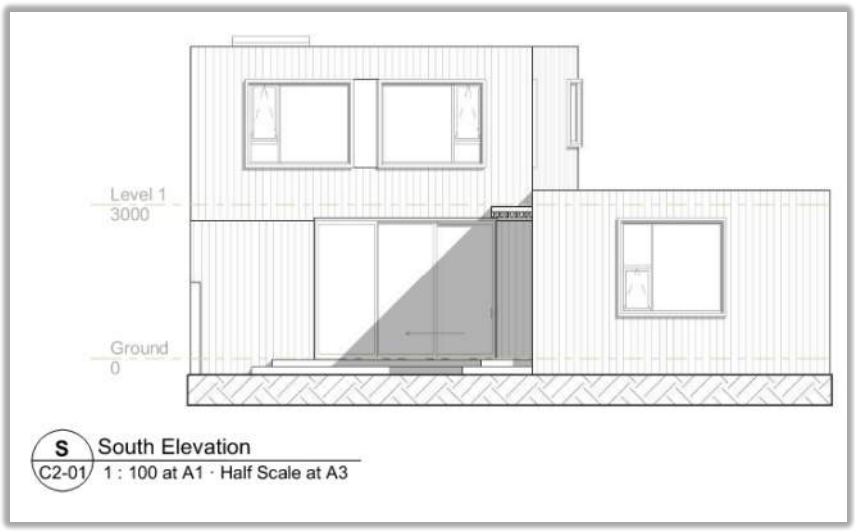


Figure 12: Extract from the HMO Architectural Drawing Set, 03 September 2026

Envelope cut and fill plans indicate finished platform levels to the residential areas will comprise approximately 1.5m to 2m of fill, which will act as a non-liquefiable crust, limiting large near surface differential settlements, irrespective the following will be adopted as part of the detailed design stage:

- MBIE's Canterbury Guidance Part A, December 2012 provides guidance on use of NZS 3604 foundations for liquefiable sites.
- Foundations for one and two storey dwellings will require specific engineering design to accommodate the estimated liquefaction settlements (Table 15). The superstructures are expected to be suitable for design in accordance with NZS 3604, with enhanced shallow foundations (for example, a Type 2B surface structure) on certified engineered fill.
- One and two storey dwellings – low bearing waffle slabs likely to be most economic, driven timber piles are also common for sites of this type in Kapiti.

Approximately 12no. of the two storey units will be positioned on the east facing batters of peat bund, refer to the figure below. The dwellings and underground service trenches will all require specific engineering design (SED), likely comprising piles socketed into the dense non-liquefiable 'sandy gravels' (SG).



Figure 13: Dwellings within the bright green polygon will require SED, likely deep piled foundations.

7.1.2. Multi-Storey Residential Buildings

- Founded on piles socketed into the dense sandy gravels.
- Piles could comprise traditional bored cast insitu (requiring casing), continuous flight auger or driven steel I-sections.
- Driven piles would require careful assessment and monitoring of vibration and noise.

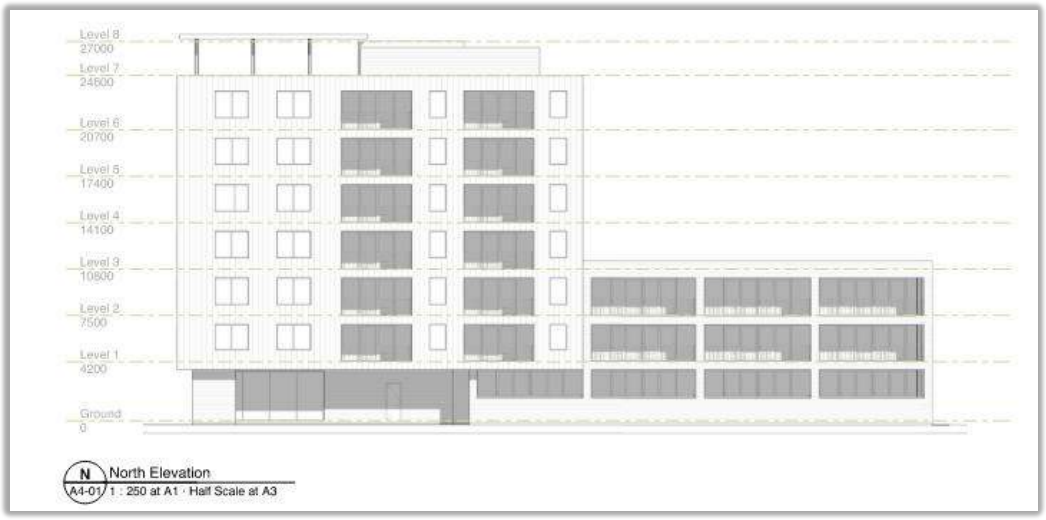


Figure 14: Extract from the HMO Architectural Drawing Set, 03 September 2026

7.1.3. Large Format Retail

- Commercial buildings – typically comprising large span portal frame structures founded on piles extending into the dense sandy gravels. Pile types similar to the multi-storey buildings (refer Section 7.1.2 above).
- Shallow foundations can also be considered, depending on loads and structural arrangement. Arranged in either pads tied with ground beams, or uniformly thick slabs with localised thickenings at columns.
- Consideration of thick well reinforced floor slabs tied into the columns, to allow trafficking of heavy vehicles.

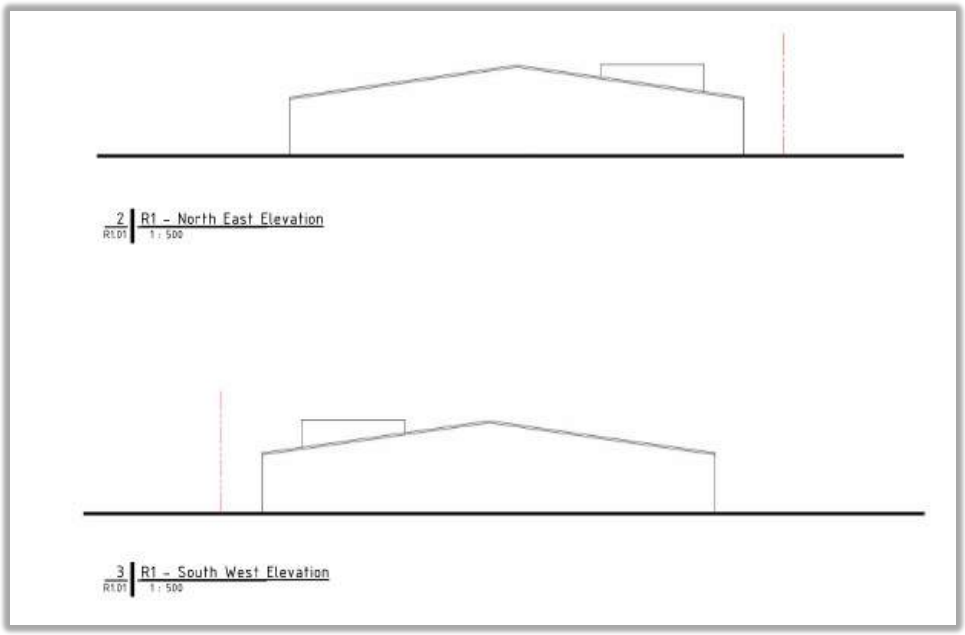


Figure 15: Extract from the HMO Architectural Drawing Set, 07 September 2026

7.2. Roading

The spine road and associated local roads will be designed and constructed by the Client, and then vested back to KCDC for operation and maintenance, or the private lanes held as jointly owned access lots.

The roads will be designed in accordance with the following:

- KCDC, Land Development Minimum Requirements, dated April 2022.
- KCDC, Altered requirements to Section 3 NZS 4404:2010 Roads, Schedule 3.
- KCDC, Roading Standard Drawings, RD-001 to RD0017, dated June 2026.

The key geotechnical inputs are as follows:

- Subgrade CBR's – adopt 6% for the engineered fill and clean sands and 3% for the organic sands (organic content less than 3%). Note – research by Clayton (2017), indicates the dune sands are difficult to compact to a high relative density, due to the fine rounded sand particles. Further investigation and assessment of CBR's will be undertaken as part of the detailed design. Pavement trials and investigation testing comprising falling weight deflectometers (FWD's) and Benklemen beam test (BB's) could be undertaken in order to verify the design CBR's.
- All fibrous peat below the causeway, roads and adjacent footpaths to be undercut and replaced with engineered fill.
- Subsoil drains will be required in order to control the shallow perched groundwater, discharging to the local stormwater network.
- Stability of the causeway batters is discussed in Section 6.4.4 above.

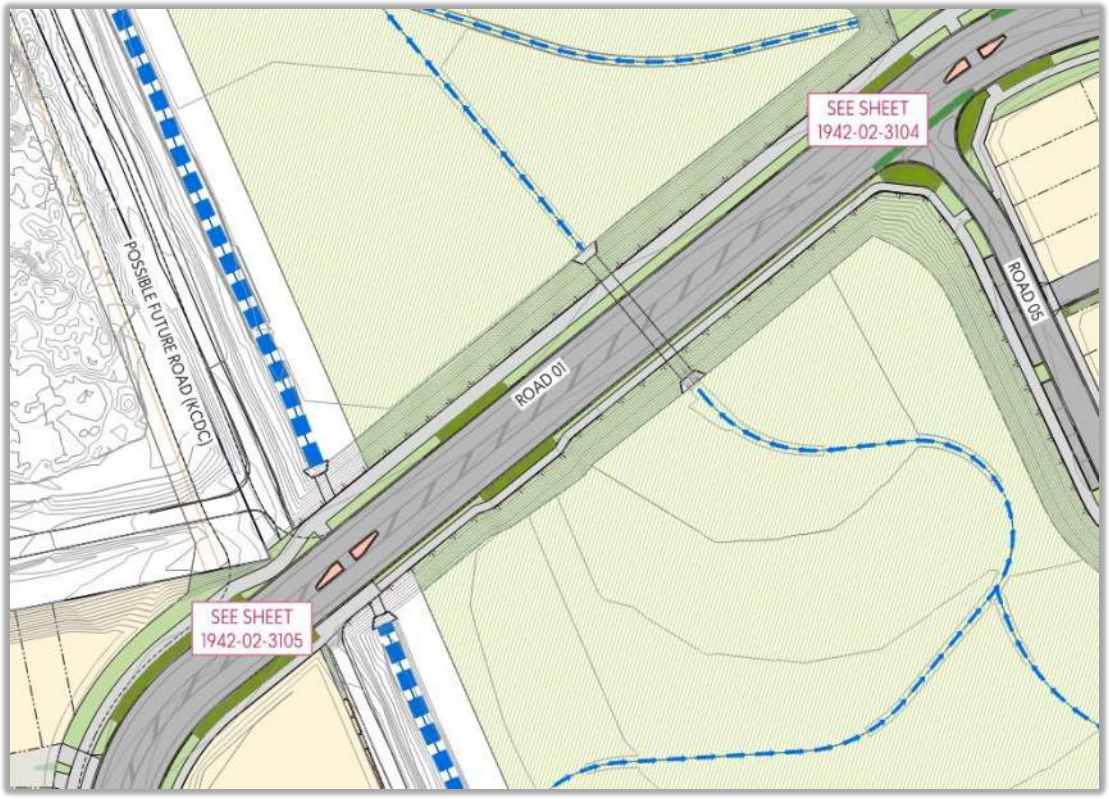


Figure 16: Causeway tying into Ihakara St, extract taken form Envelope roading drawing set.

7.3. Culverts and Pipe Network

Similar to the road network, the three waters network will be designed in accordance with KCDC Land Development Minimum Requirements, refer above.

The stormwater and wastewater network is presented in Envelope's 'proposed drainage layout plans' that accompany the substantive application

- Invert levels to the manholes and pipe network are generally at around 1 to 2m below finished ground level, and so are unlikely to require any specific geotechnical inputs.
- WW Line E calls up a wastewater pump station. Geotechnical inputs addressing buoyancy, liquefaction settlements and excavation supports will be provided during the detailed design. Such inputs are common for sites of this type in Kapiti, and from Torlesse's experience can be assessed and mitigated with commonly accepted methods as part of the detailed design.
- WW Lines E, F, K and L have tie-ins that lie below the finished ground level, requiring similar geotechnical inputs to the wastewater pump station.
- Water supply network is located typically 1m to 2m below the finished ground level.

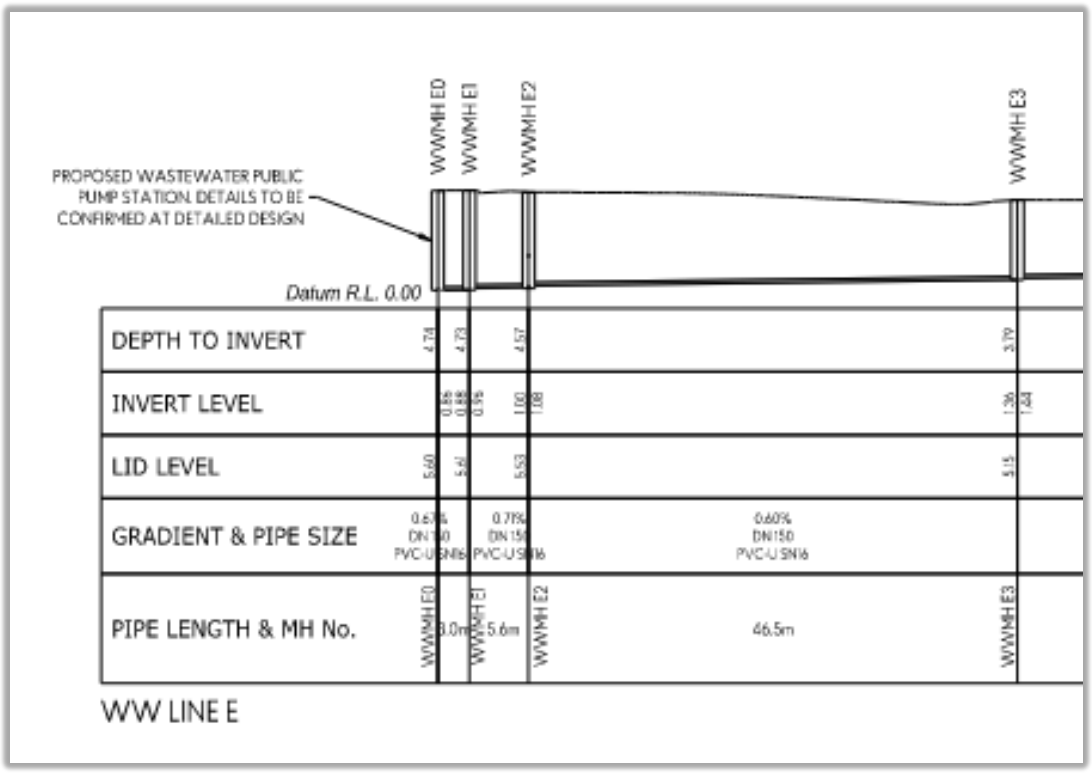


Figure 17: Termination of wastewater line 'WW Line E', showing 4.74m depth to invert level.

7.4. Bulk Earthworks

7.4.1. Treatment of Each Material Type

Material types, suitability for re-use and recommended proportions for earthworks mass balance are provided below.

Table 20: Treatment of each material type

Material Type	Description	Re-usability untreated	
		Untreated	Treated
Topsoil and fibrous peat	Will be stockpiled permanently as part of the Lookout along the western boundary of the site or used as landscape fill for the proposed wetland Any excess material will be disposed off-site.	0%	Not applicable
Organic sands	The material is friable and expected to be easily workable, the key consideration is the % by mass of organic material. High organic contents may cause large long term settlements affecting buildings and infrastructure.	50%	100%
Cean sands	Easily workable and can be re-used entirely as general fill. Not suitable for road pavements.	100%	Not required

Re-use of organic sands as general fill has a significant benefit to the overall earthworks mass balance. Following discussions with a local specialist contractor it was agreed that the organic sands could be blended with the clean sands in order maximise their re-use. It was also discussed that in order to meet programme within the earthworks season, and to avoid double handling the material, it would be advantageous to bulk cut the material and place in a single continuous operation. Where organic contents exceed a maximum threshold value the material would require to be disced prior to compaction.

This methodology comes with risks, and it becomes difficult to accurately control the organic content. To mitigate this risk, Torlesse will develop a set of rapid and repeatable tests in the field to control organic content. Predominantly relying on careful visual inspections, supplemented with continuous bulk sampling and laboratory testing for total organic content. Laboratory tests would become available several days after the material has been placed, and as such remedial works may be required on the occasions where maximum values are exceeded.

The target organic content will be developed by Torlesse as part of the detailed design, following receipt of the final batches of laboratory testing (refer Section 4.2.2 above). data set out in Section 5.1 above, and following completion of the trial earthworks set out in Section 7.5.1 and 7.5.2 below.

7.4.2. Bulk Earthworks, General Considerations

The following matters do not affect the assessed level of geotechnical risk or the suitability of the land for the proposed development, and can appropriately be addressed at detailed design following consent:

- Pavement subgrades and recommendations for design CBR's and drainage.
- Undercutting peat and organic sands below all roads vested to KCDC following completion of the works.
- Temporary cut batter profiles within the three primary units.
- Permanent cut and fill batter profiles.
- Control of groundwater as part of the temporary construction phase bulk excavations.
- Construction phase earthworks testing.

Our recommendations and construction phase support will be guided by the following:

- KCDC, 'Land Development Minimum Requirements', dated April 2022.

7.4.3. Suitability of Materials for Re-Use

It is expected that over 90% of material sourced from the existing dunes will be suitable for re-use. Beyond the sand dunes, for the purposes of preliminary mass balance assessments, we recommend the following:

- Average 0 to 1.0m of 'fibrous peat' to be removed, can be used as landscape fill.
- Average 1 to 2.5m of 'organic sands' that between 50% and 100% will be re-usable as engineered fill, depending on lime and/or cement treatment.
- 2.5m and below, comprises 'clean sands', 100% re-usable as engineered fill.

7.5. Pre-Construction Earthworks Trials

7.5.1. Trial Compaction Pad

The purpose of the trial compaction pad is to assess the response of the organic sands, clean sands and blends to compactive effort and control of water content to achieve optimum. Depending on the grain size distribution, particularly higher fractions of fine material, the dune sands can return unreliable (or highly variable) density readings and can dry out very quickly.

Several batches of progressively higher proportions of organic sands will be developed and compaction trials performed. Approximately 6 to 8 pads will be prepared comprising the following:

- Approximately 10m square and overall thickness of 1,000mm, comprising a minimum of four lifts.
- Nuclear densometer testing and DCP's to be performed on each lift.

The trial compaction pads may also form the base of the trial settlement platforms, refer to Section 7.5.2 below.

7.5.2. Trial Settlement Platform

The materials encountered on site are granular and as such primary settlements are expected to be immediate. Long term primary (consolidation) settlements are not expected. Long term secondary (creep) settlements may occur where the sands comprise high organic contents. Secondary settlements accumulate over the 50-year design life of the development, and if not carefully controlled can cause damage to buildings, underground services and pavements.

We recommend trial settlement monitoring is undertaken over a period of 18 months, in order to identify the onset of secondary settlement. Four platforms are recommended, each with progressively higher organic contents. Two platforms placed on top of the organic sand layer, and two platforms placed on top of the clean sands. The percentage by weight determined following completion of the trial blends, refer to Section 7.4.1 above.

Each platform to comprise the following:

- 25m metres square and an overall thickness of 2.5m, constructed in the same manner as the trial compaction pads (refer to Section 7.5.1 above).
- Install 3 rows of 3no. settlement monitoring plates (9no. total) at the base of the platform.
- Install a second batch of 9no. settlement monitoring plates at the top of the platform.
- Monitoring to be undertaken weekly for the first two months, then monthly for the remainder.

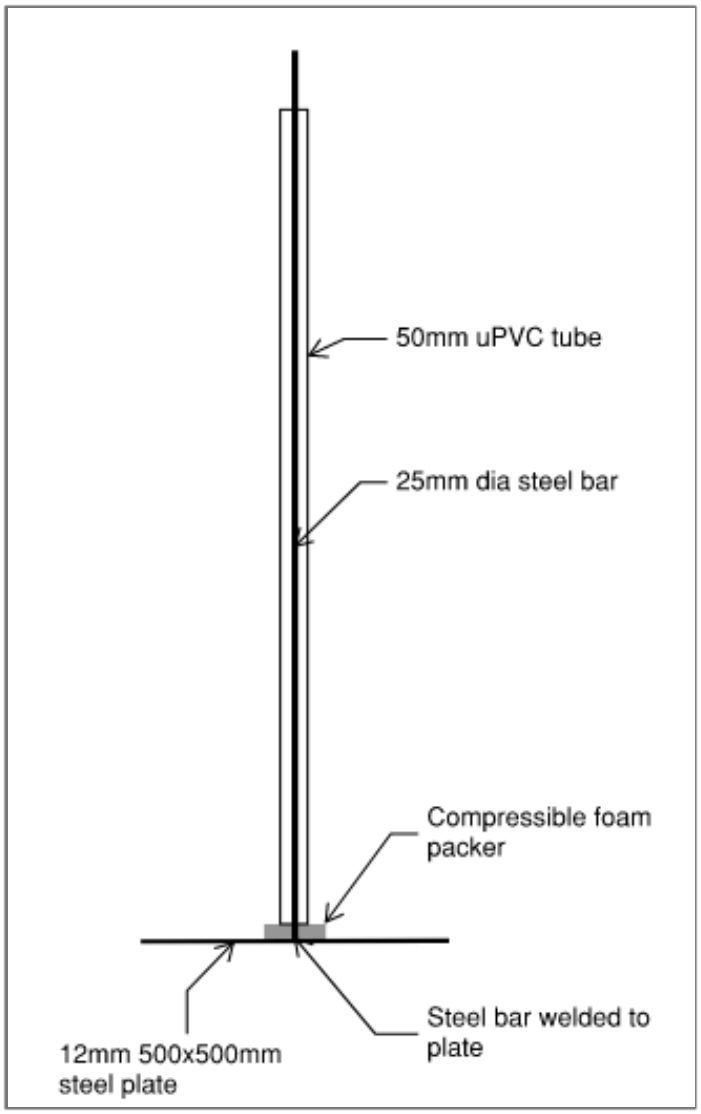


Figure 18: Example settlement monitoring plate arrangement (note, monitoring plate at top not shown)

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Soil Profile and Groundwater

- Ground conditions across the site are fairly consistent and typical of the Kapiti region, comprising stable dune sands and low-lying peat deposits.
- Perched groundwater lies near surface, and regional groundwater lies at around 2m to 2.5m below the existing ground level.
- The site can be separated into six regions, Regions 1 to 6. Of note Region 1 where high perched groundwater was encountered (likely associated with the M2PP Expressway), Region 3 providing a large source of clean sands for engineered fill, and Region 4 where relatively thick peats were encountered.
- The Regions are shown in Sketch 1, Appendix B.

8.2. Site Geotechnical Hazards

- RMA Section 106 Hazard Assessment – low to moderate. Refer to Table 13 for further commentary.
- Liquefaction and lateral spreading – low risk, provided the engineering measures and recommendations set out in this report are adopted in the detailed design.
- Slope stability – stability analyses indicate target factors of safety achieved. With the exception of ULS seismic event, where some movements may occur. Resulting in localised damage that can be readily repaired following a major earthquake.
- Long term creep settlement – expected to be minimal, provided the fibrous peat and highly organic sands are undercut and replaced with engineered fill. Trial compaction and settlement pads are recommended as part of the detailed design.
- Natural Hazards Assessment, NPS-NH (2025) – with mitigation measures set out in this report in place, risk levels all classified as low. Refer to Table 17 for further commentary.

8.3. Building Foundations

- Single and Two Storey Dwellings – suitable for NZS 3604, provided designs adopt the recommendations set out in MBIE's Canterbury Guidance Part A, refer to Section 7.1.1 for further commentary.
- Multi-Storey Residential Buildings – piles socketed into the dense sandy gravels.
- Large format retail – pad foundations, ground beams or piles; depending on the structural loads and tolerance of the building to settlement.

8.4. Roading and Infrastructure

- Subgrade CBR's – adopt 6% for the engineered fill and clean sands, 3% for the organic sands.
- All fibrous peat below the causeway, roads and adjacent footpaths to be undercut and replaced with engineered fill.
- Subsoil drains will be required in order to control the shallow perched groundwater, discharging to the local stormwater network.
- Invert levels to the manholes and pipe network are generally at around 1 to 2m below finished ground level, and so are unlikely to require any specific geotechnical inputs.

8.5. Bulk Earthworks

- Topsoil and fibrous peat- for use as landscape fill only.
- Organic sands – 50% to 100% re-usable, depending on treatment with lime and/or cement.
- Clean sands – 100% re-usable.
- Recommend trial compaction and settlements pads are undertaken as part of the detailed design, in order to develop the compaction methodology and verify long term settlements are negligible. Refer to Section 7.5 for further commentary.

9. APPLICABILITY

This report has been prepared on behalf of, and for the exclusive use of, the Client, and is subject to, and issued in accordance with, the provisions of the contract between Torlesse and the Client. Torlesse accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

In preparing this report, Torlesse has relied upon information provided by or on behalf of our Client. Torlesse accept no responsibility for the reliability or accuracy of this information.

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Interpretation of the ground conditions presented have been based on geotechnical data from point locations, between which ground conditions may differ. The actual underlying ground conditions may differ from those presented in this report.

If you have any questions relating to the scope or findings and recommendations within this report, please contact the author undersigned.

Authored by:



Jerry Spinks
Director, Geotechnical Engineer
CMEngNZ (CPEng)

Reviewed by:



Nathan Schumacher
Director, Geotechnical Engineer
CMEngNZ (CPEng)

APPENDIX A: ARCHITECTURAL PLANS

Refer to the substantive application by Scope Planning Ltd

APPENDIX B: GI LOCATION PLANS

Legend

- Trial Trenches
- Test Pit
- Cone Penetration Tests
- Cross Sections
- Property Boundary

Existing Test Locations

Total Engineering
- Test Pits
- Cone Penetration Tests

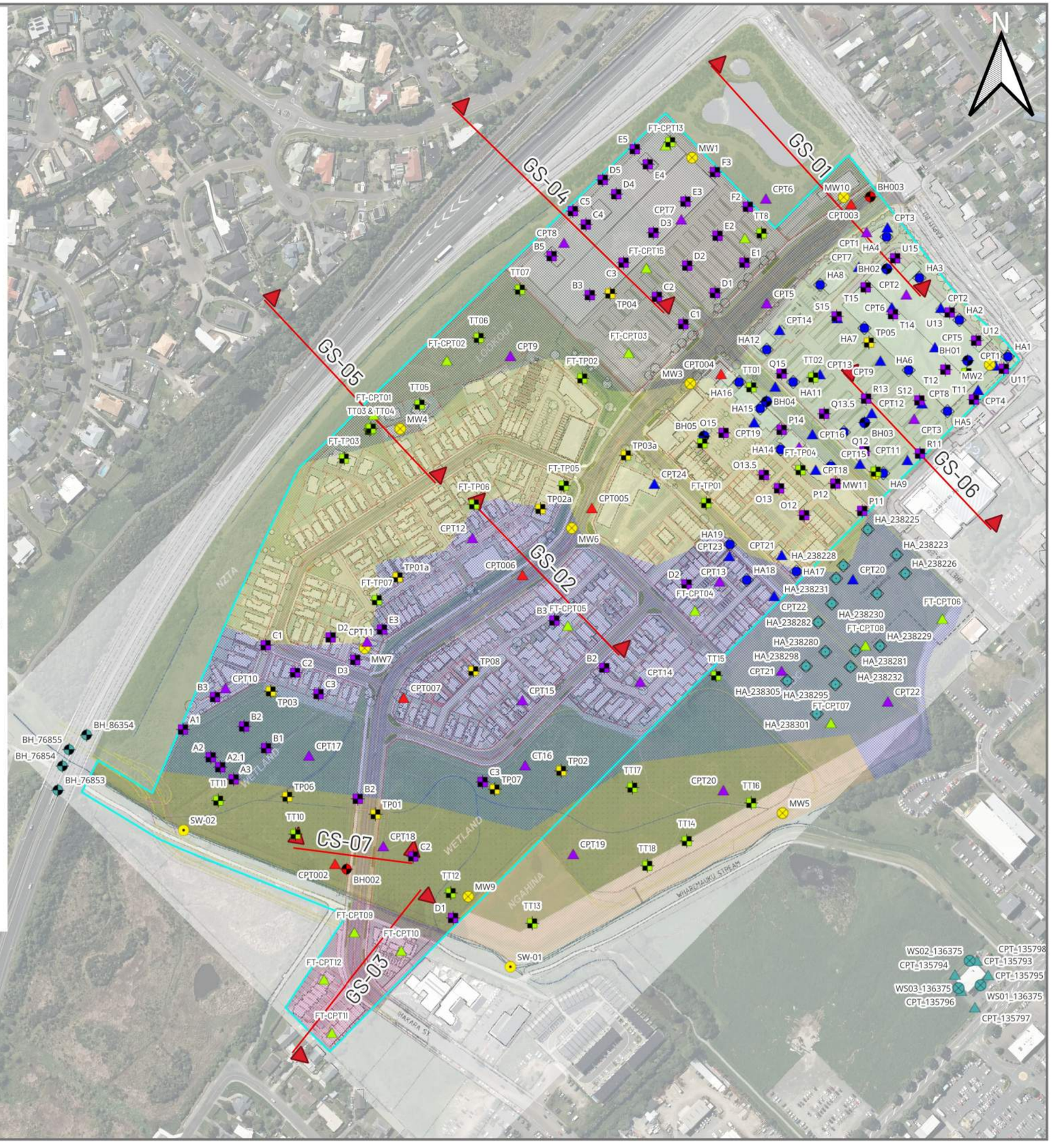
Engeo
- Test Pits
- Stilling Wells
- Water Monitoring Wells

Jacobs
- Boreholes
- Cone Penetration Tests

Engeo (Bunnings)
- Cone Penetration Tests
- Hand Augers
- Boreholes

New Zealand Geotechnical Database
- Hand Augers
- Window Samplers
- Cone Penetration Tests
- Boreholes

Geotechnical Zones
- Region 1 - North West
- Region 2 - Nort East
- Region 3 - Central Dune
- Region 4 - Central South
- Region 5 - Wharemaku Deposits
- Region 6 - Wharemaku South



Client:
New Central Park Limited (NCPL)

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Rd, Paraparaumu, Kapiti

Sketch Title:
Investigation Locations

Project/Report No:
T0793/04

Sketch ID:
1 of 2

Author:	Initials:
A Murali	AM
Checked By:	**Initials:**
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM
B	16/10/26	For Information	AM

Notes:

1. 5m contours obtained from LINZ LIDAR DEM 2024.
2. Existing test locations taken from Engeo, 'Geotechnical Investigation - 77 Kapiti Road, Paraparaumu', dated 6 September 2023 and New Zealand Geotechnical Database.
3. Masterplan overlay obtained from Herriott Melhuish O'Neill Architects, 'Development Plan - 77 and 109 Kapiti Road, Paraparaumu', dated 7 September 2026.

0 75 150 m

Scale 1:3,500 at A3

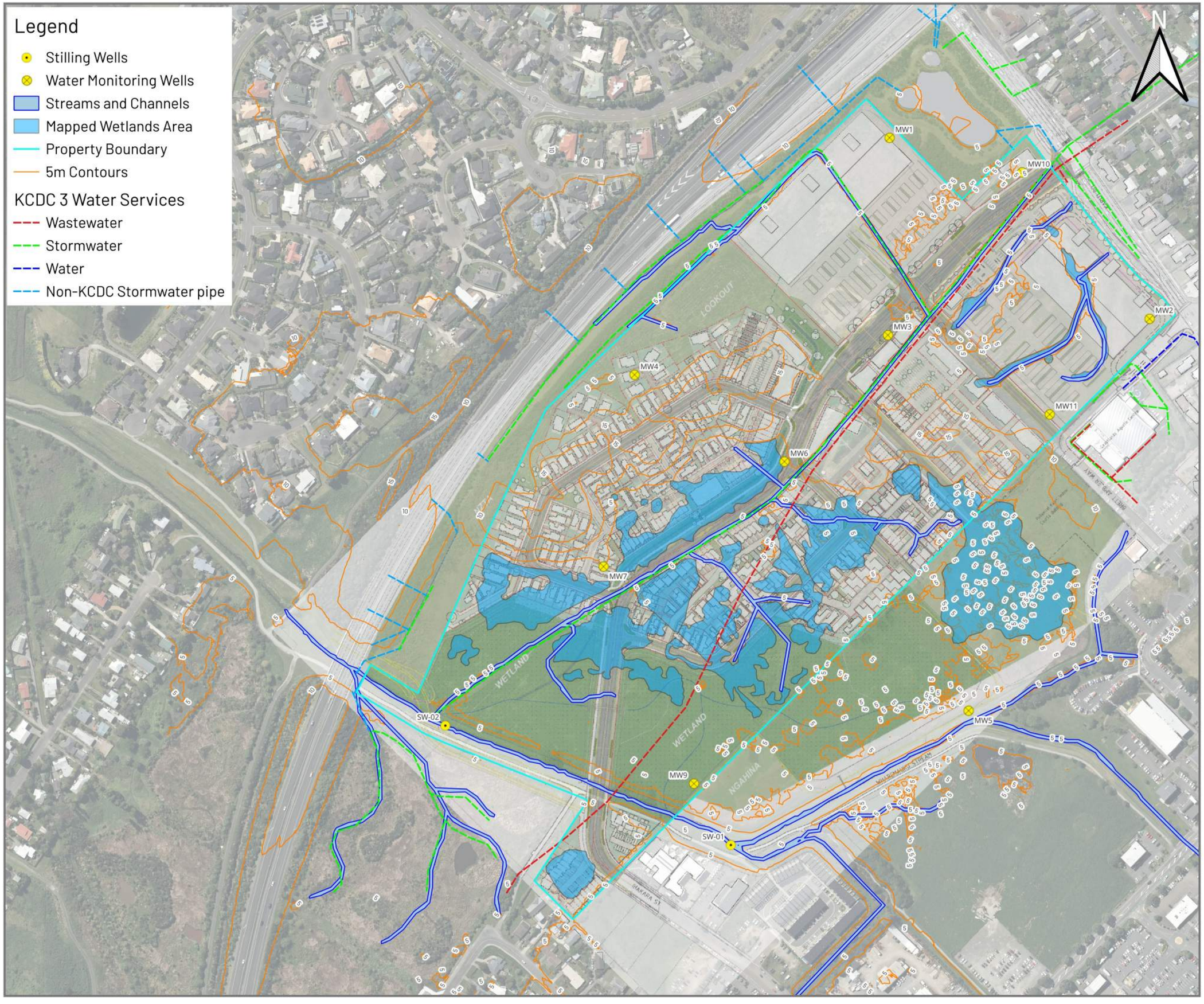
Data Courtesy:
LINZ, OPENMAPS

made with QGIS

Torlesse™

ACE MEMBER

ENGINEERING NEW ZEALAND OFFICIAL MEMBER



Client:
New Central Park Limited (NCPL)

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Rd, Paraparaumu, Kapiti

Sketch Title:
Drainage Channels

Project/Report No:
T0793/04

Sketch ID:
2 of 2

Author:	Initials:
A Murali	AM
Checked By:	**Initials:**
Reviewed By	ABC

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:

1. 5m contours obtained from LINZ LIDAR DEM 2024.
2. Wetlands map obtained from shapefile supplied by Envelope Engineering Ltd, via email on 8 June 2026.
3. Streams and channels obtained from shapefile supplied by Williamson Water and Land Advisory, via email on 4 August 2026.
4. Masterplan overlay obtained from Herriott Melhuish O'Neill Architects, 'Development Plan - 77 and 109 Kapiti Road, Paraparaumu', dated 7 September 2026.
5. Locations of monitoring wells taken from Engeo, 'Geotechnical Investigation - 77 Kapiti Road, Paraparaumu', dated 6 September 2023.

0 75 150 m

Scale 1:3,500 at A3

Data Courtesy:
LINZ, OPENMAPS

made with QGIS

Torlesse™

ACE MEMBER

ENGINEERING NEW ZEALAND OFFICIAL MEMBER

APPENDIX C: 2026 GI DATA

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

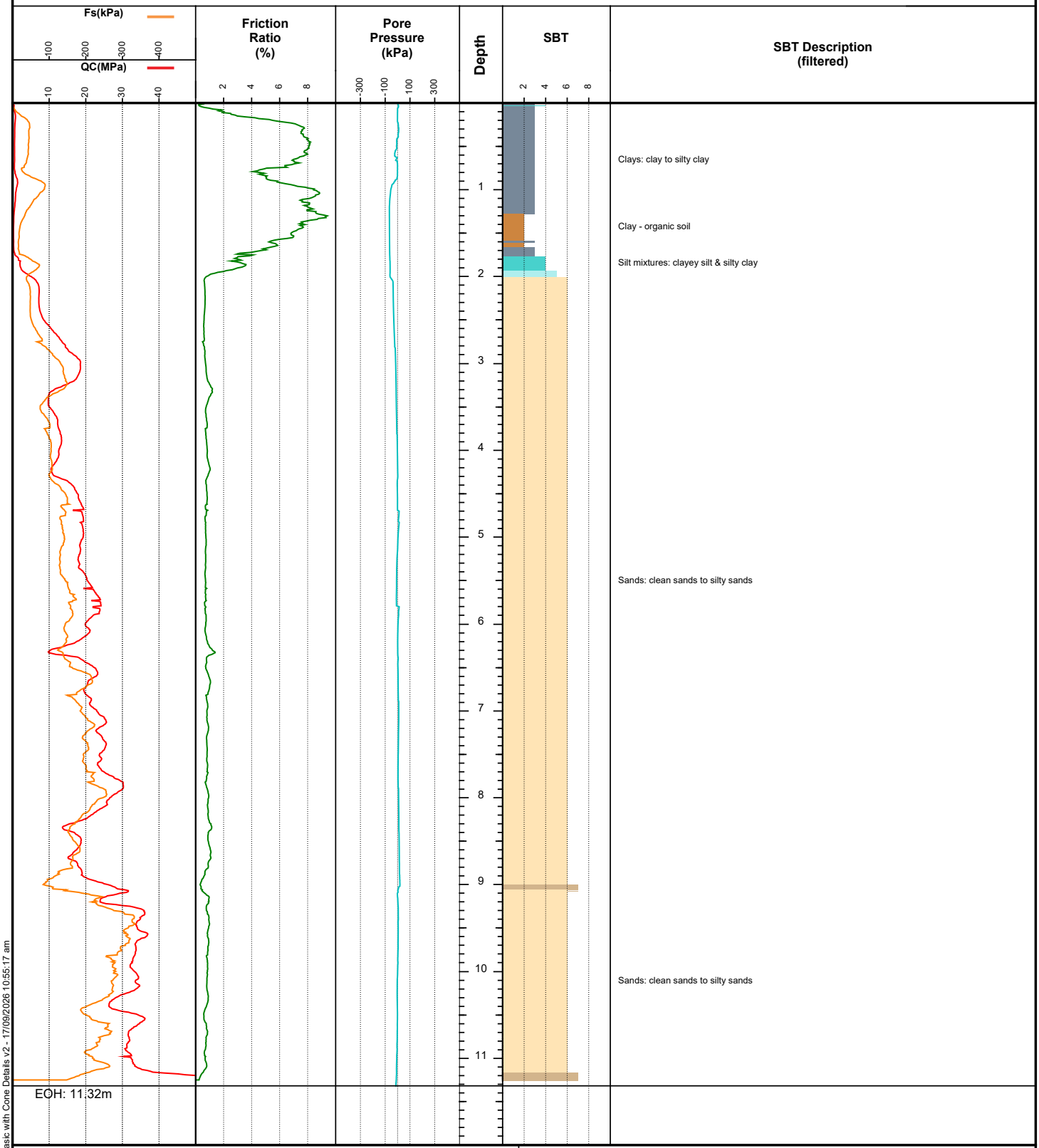
HOLE NO.: CPT01

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 15/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 15/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: -
Tip Resistance Initial: 0.022713816
Tip Resistance Final: 0.02266354
Local Friction Initial: 0.0002640915
Local Friction Final: 0.0002651748
Pore Pressure Initial: 0.0029223617
Pore Pressure Final: 0.0029140864

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-No water measured, hole collapse.

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:17 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT02

CLIENT: Torlesse Ltd

PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu

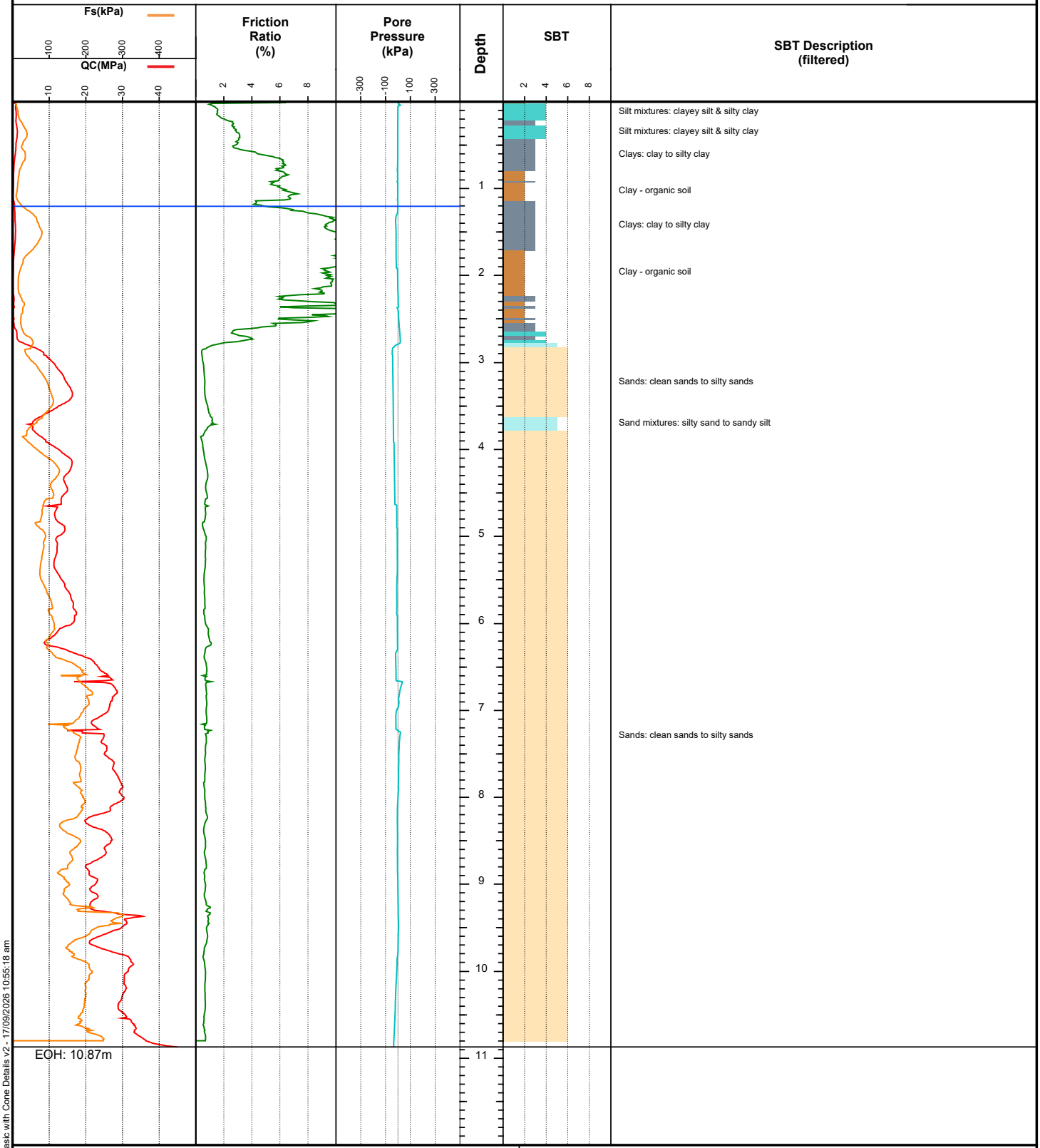
CONTRACTOR: Griffiths Drilling

START DATE: 14/09/2026

CO-ORDINATES:

ELEVATION: Ground

END DATE: 14/09/2026



Machine: Pagani TG63 - 150

Operator: Alex Parrott

Cone Reference: 000943

Cone Area Ratio: 0.00

Cone Type: 100 MPa PC

Predrill: 0.00

Water Level: 1.20

Tip Resistance Initial: 0.022758504

Tip Resistance Final: 0.022669125

Local Friction Initial: 0.0002644978

Local Friction Final: 0.0002653779

Pore Pressure Initial: 0.0029231985

Pore Pressure Final: 0.00292106

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:18 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

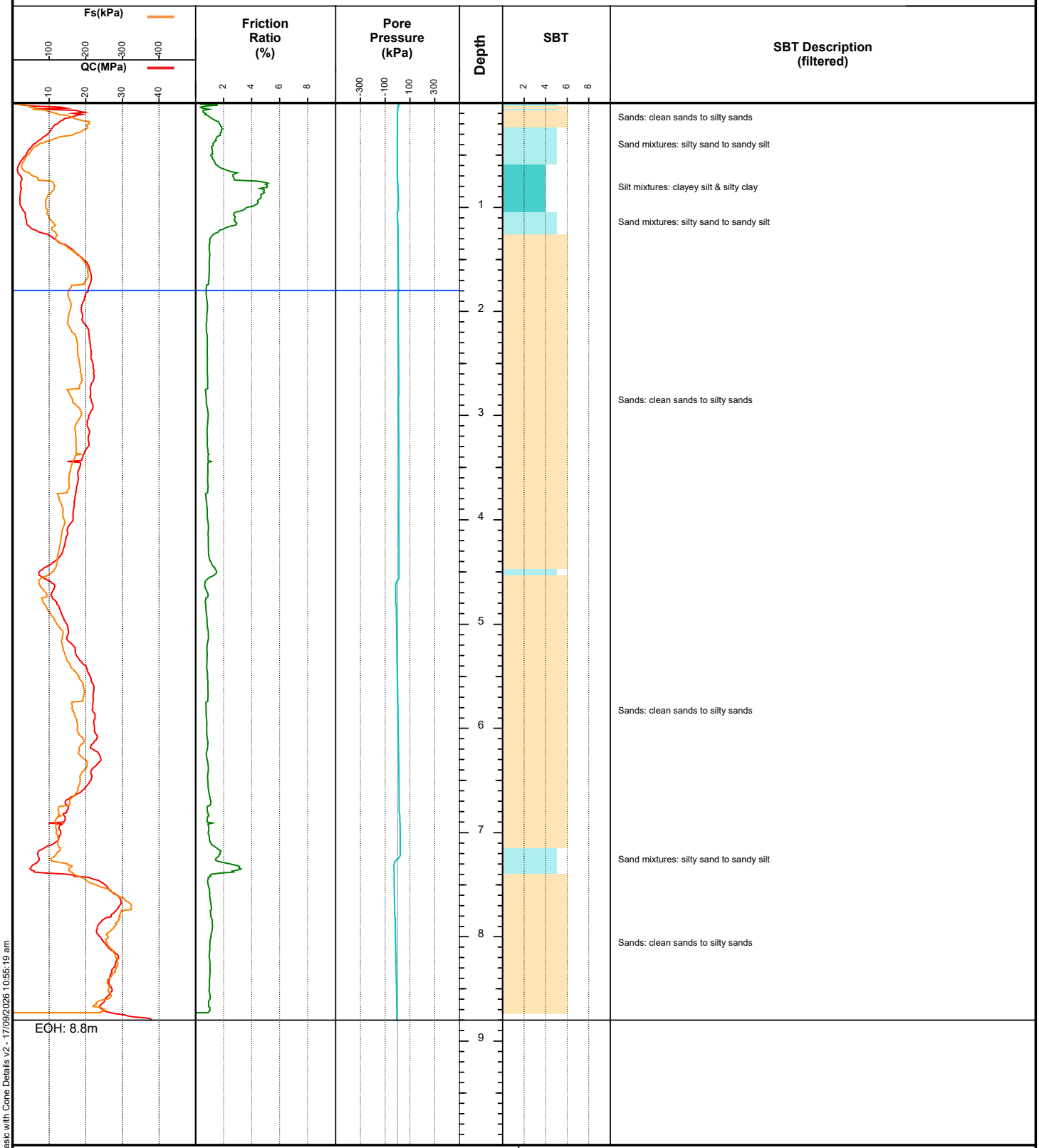
HOLE NO.: CPT03

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 14/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 14/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 1.80
Tip Resistance Initial: 0.022724988
Tip Resistance Final: -
Local Friction Initial: 0.0002637868
Local Friction Final: -
Pore Pressure Initial: 0.0029229196
Pore Pressure Final: -

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:19 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

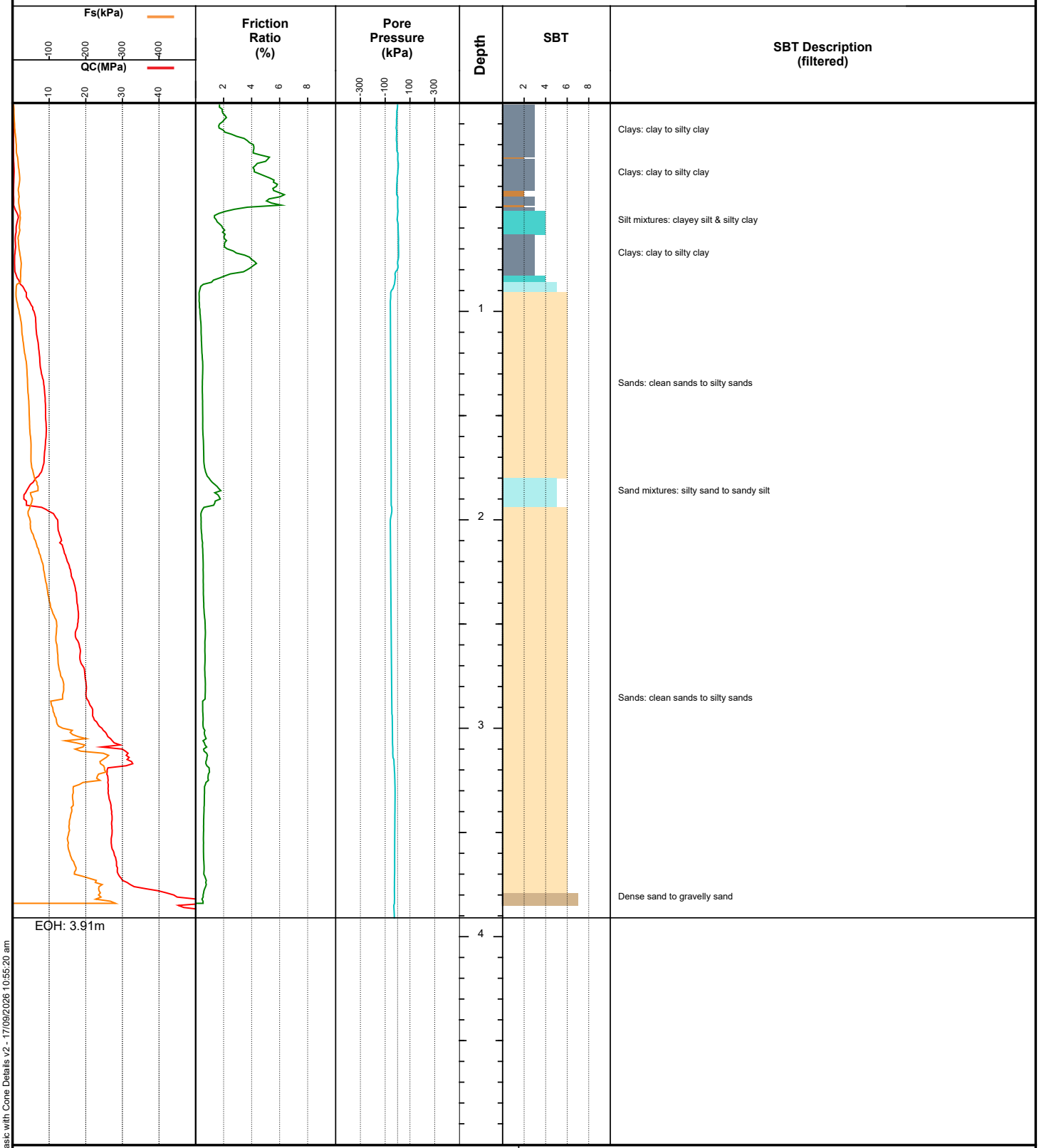
HOLE NO.: CPT04

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 15/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 15/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.00
Tip Resistance Initial: 0.022697056
Tip Resistance Final: 0.022652365
Local Friction Initial: 0.0002647347
Local Friction Final: 0.0002652425
Pore Pressure Initial: 0.0029218039
Pore Pressure Final: 0.0029128778

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-Water level at surface

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:20 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

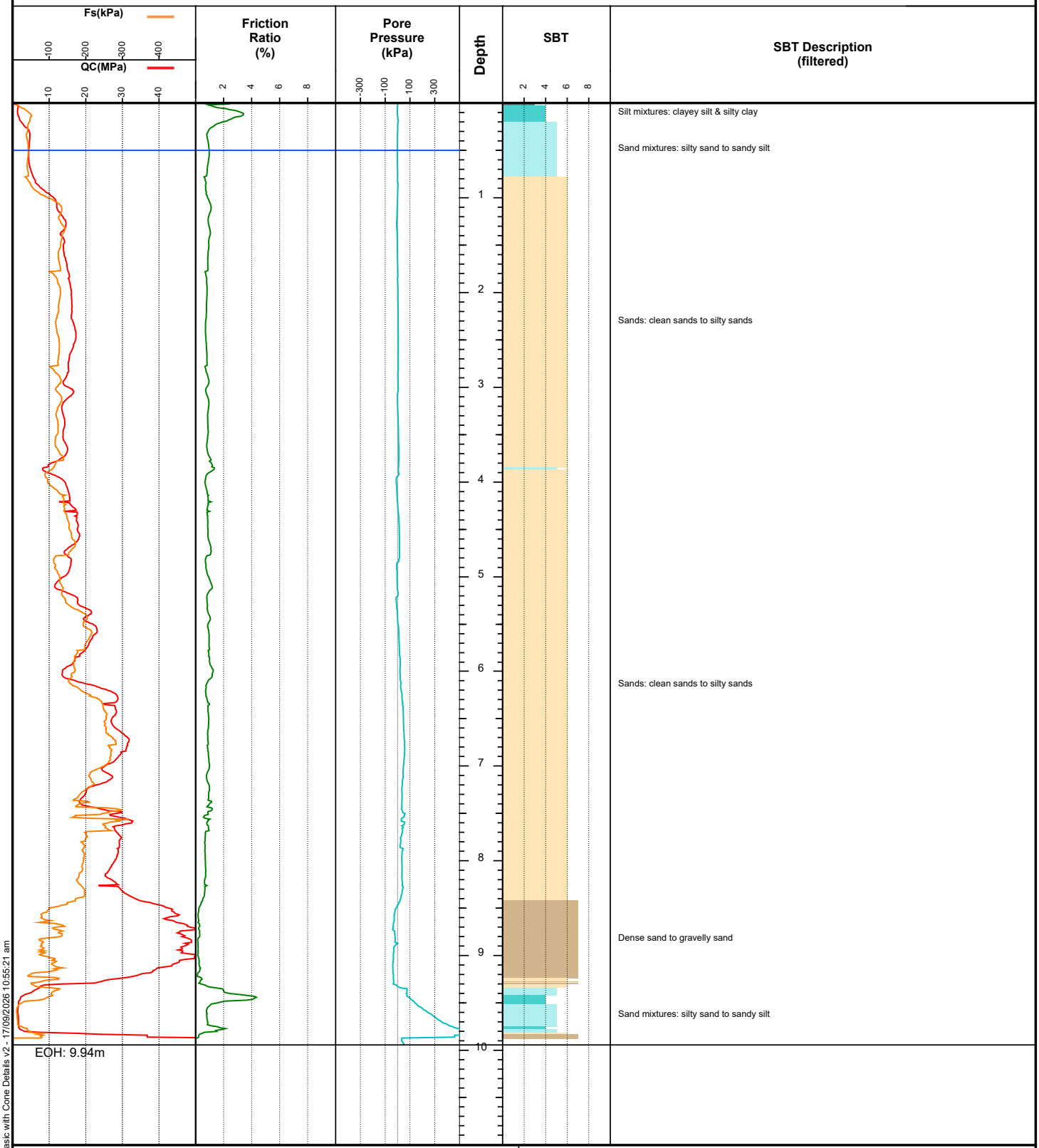
HOLE NO.: CPT05

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 16/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 16/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.50
Tip Resistance Initial: 0.022724988
Tip Resistance Final: 0.022652365
Local Friction Initial: 0.0002639222
Local Friction Final: 0.0002651071
Pore Pressure Initial: 0.0029221757
Pore Pressure Final: 0.0029185496

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:21 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

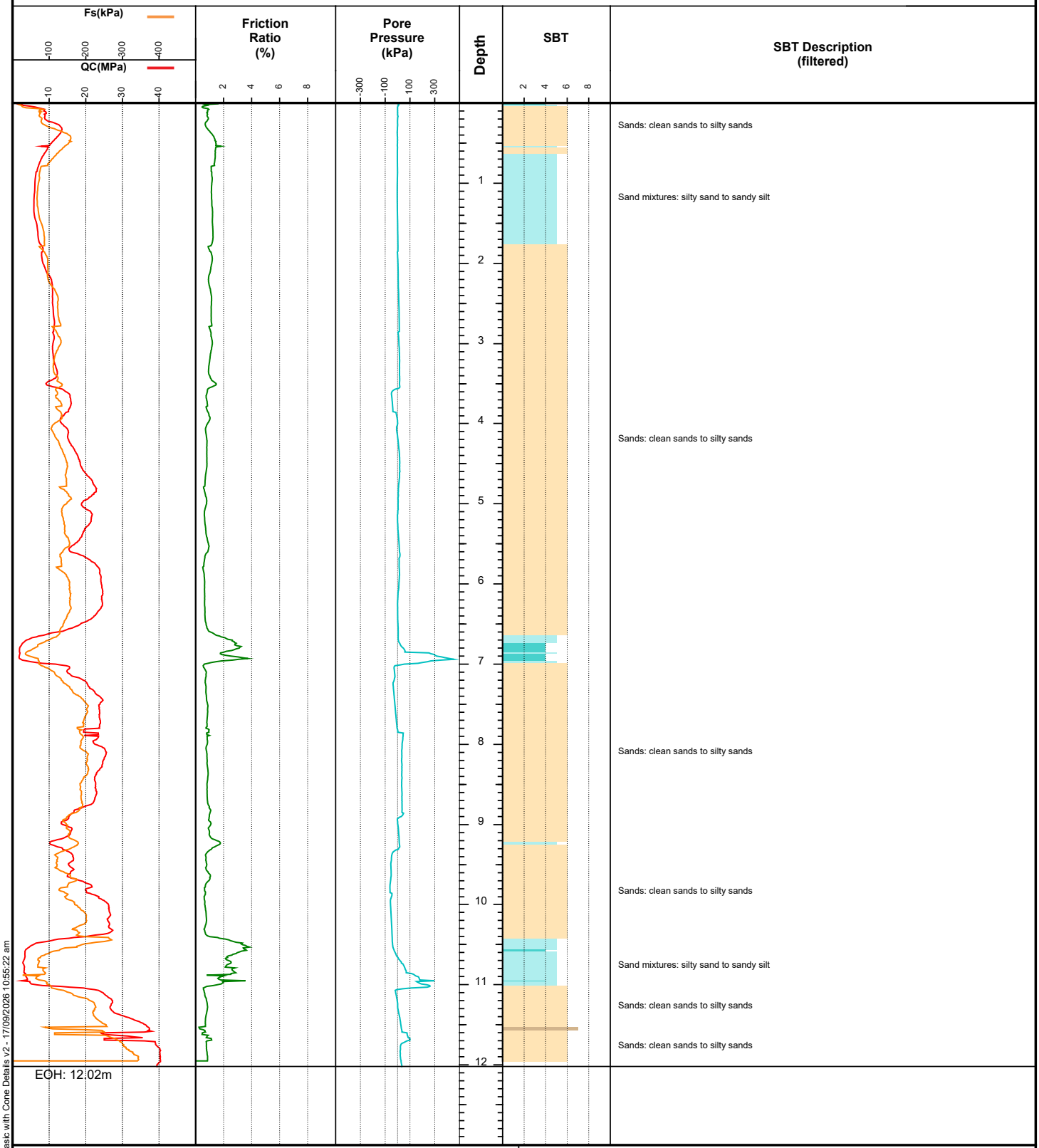
HOLE NO.: CPT06

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 16/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 16/09/2026



SBT Description (filtered)

- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sands: clean sands to silty sands
- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sands: clean sands to silty sands

Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: -
Tip Resistance Initial: 0.02280878
Tip Resistance Final: 0.022680297
Local Friction Initial: 0.0002648363
Local Friction Final: 0.0002649378
Pore Pressure Initial: 0.00292199
Pore Pressure Final: 0.0029177128

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-No water measured, hole collapse.

This test is operating under class 2 in accordance to TG6 standards

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GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

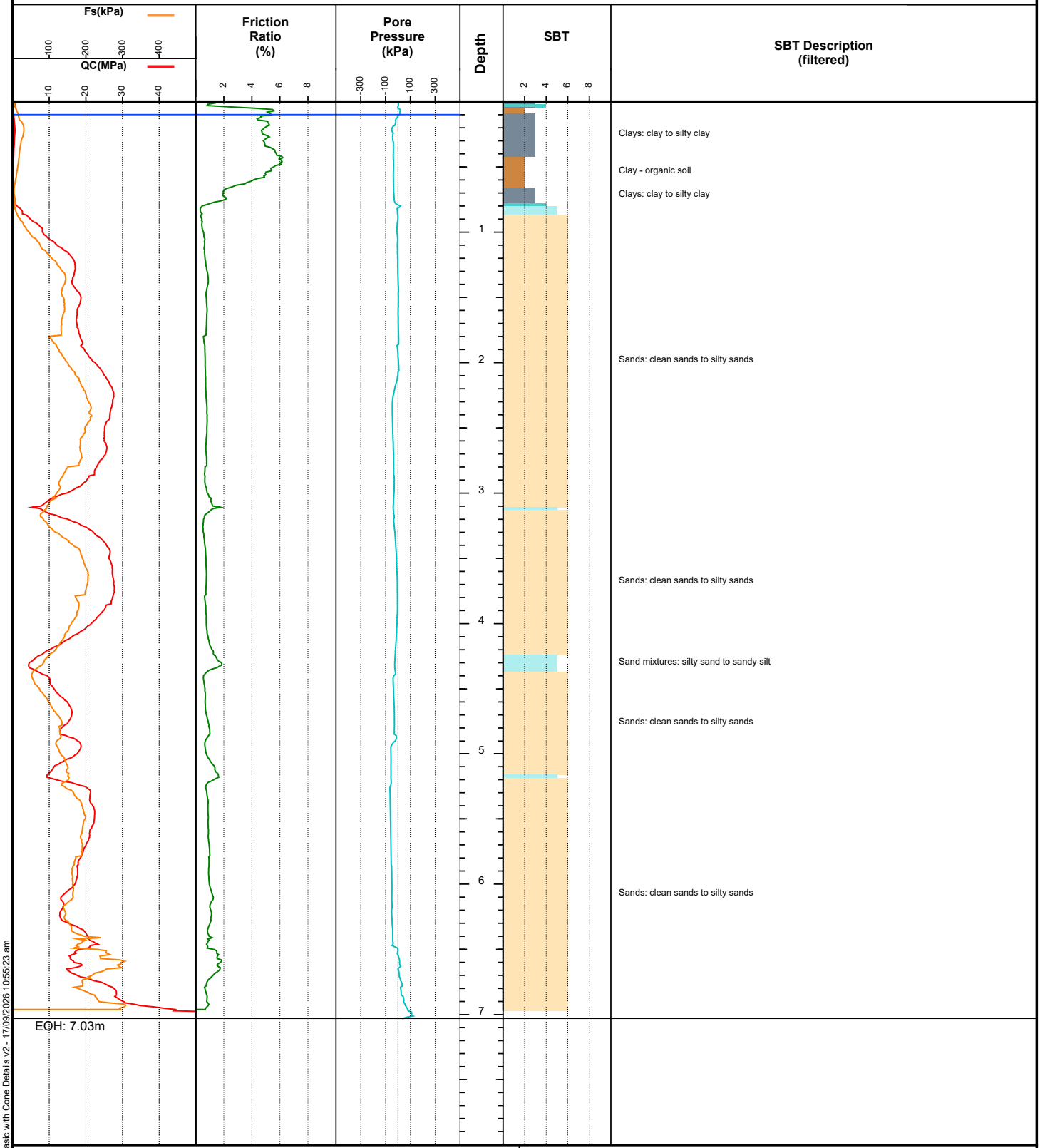
HOLE NO.: CPT07

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 16/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 16/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.10
Tip Resistance Initial: 0.022713816
Tip Resistance Final: -
Local Friction Initial: 0.000264734
Local Friction Final: -
Pore Pressure Initial: 0.002921525
Pore Pressure Final: -

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

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GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

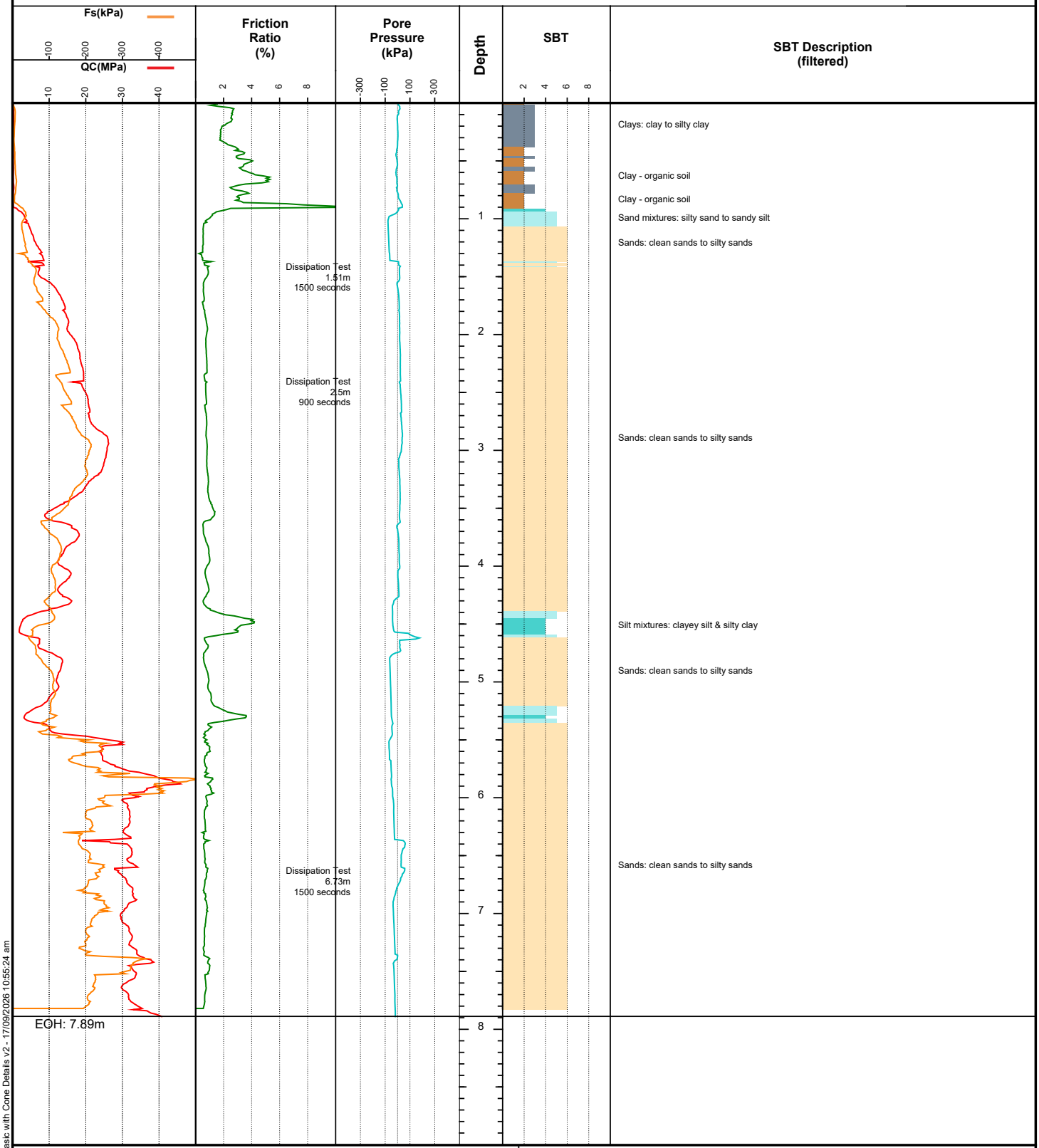
HOLE NO.: CPT08

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 16/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 16/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.00
Tip Resistance Initial: 0.022713816
Tip Resistance Final: 0.022613263
Local Friction Initial: 0.0002645316
Local Friction Final: 0.0002649378
Pore Pressure Initial: 0.00292106
Pore Pressure Final: 0.0029196653

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-Water level at surface.

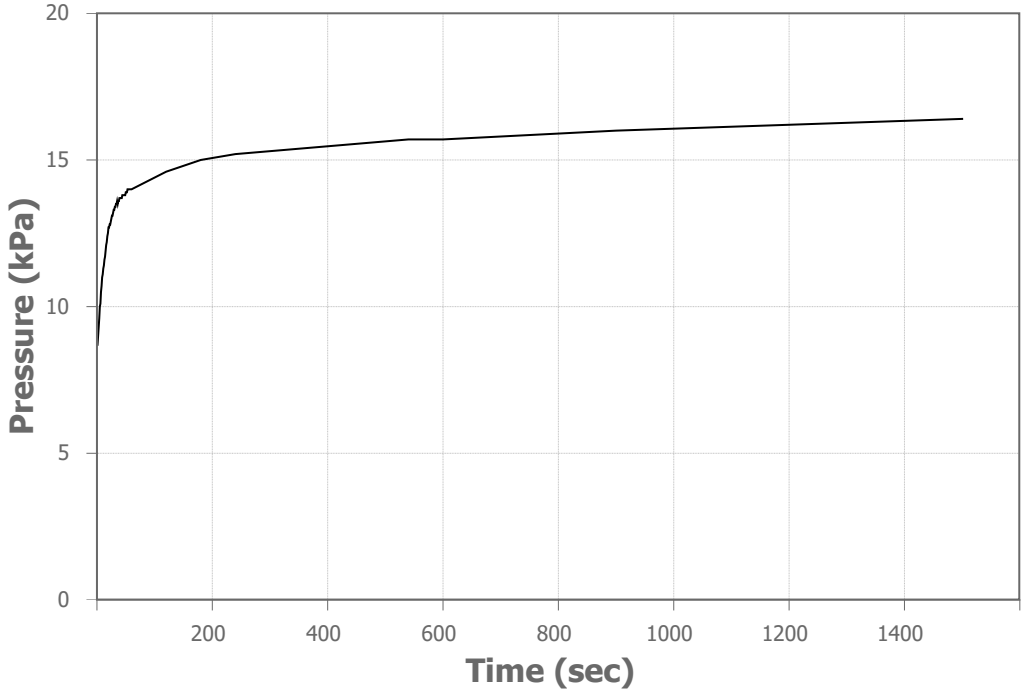
This test is operating under class 2 in accordance to TG6 standards

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DISSIPATION TESTS

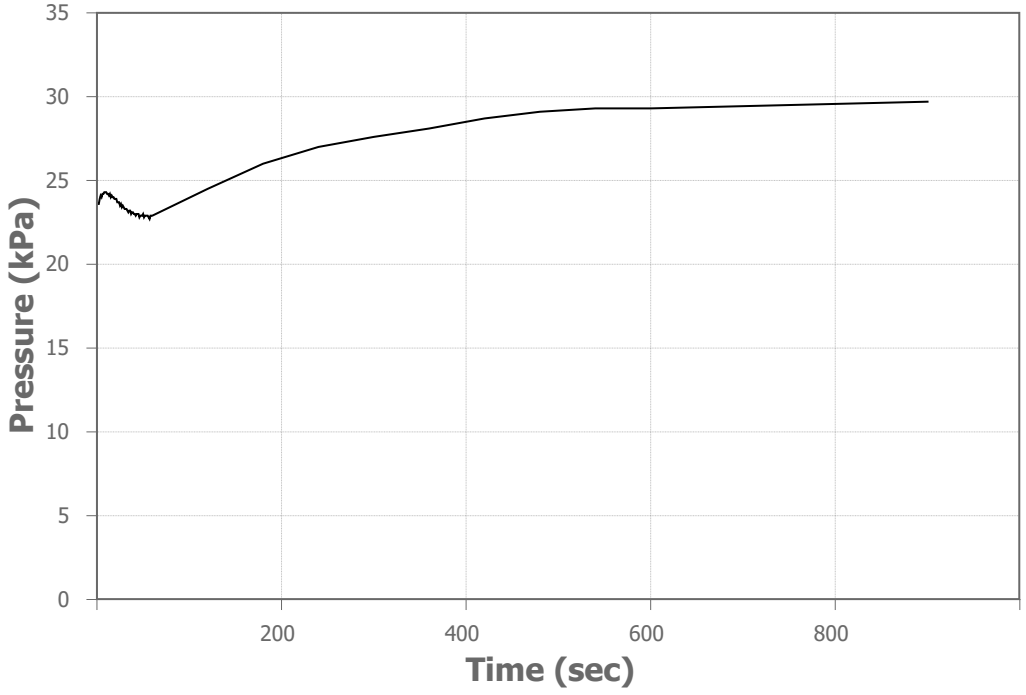
Test Depth: 1.51

1500



Test Depth: 2.5

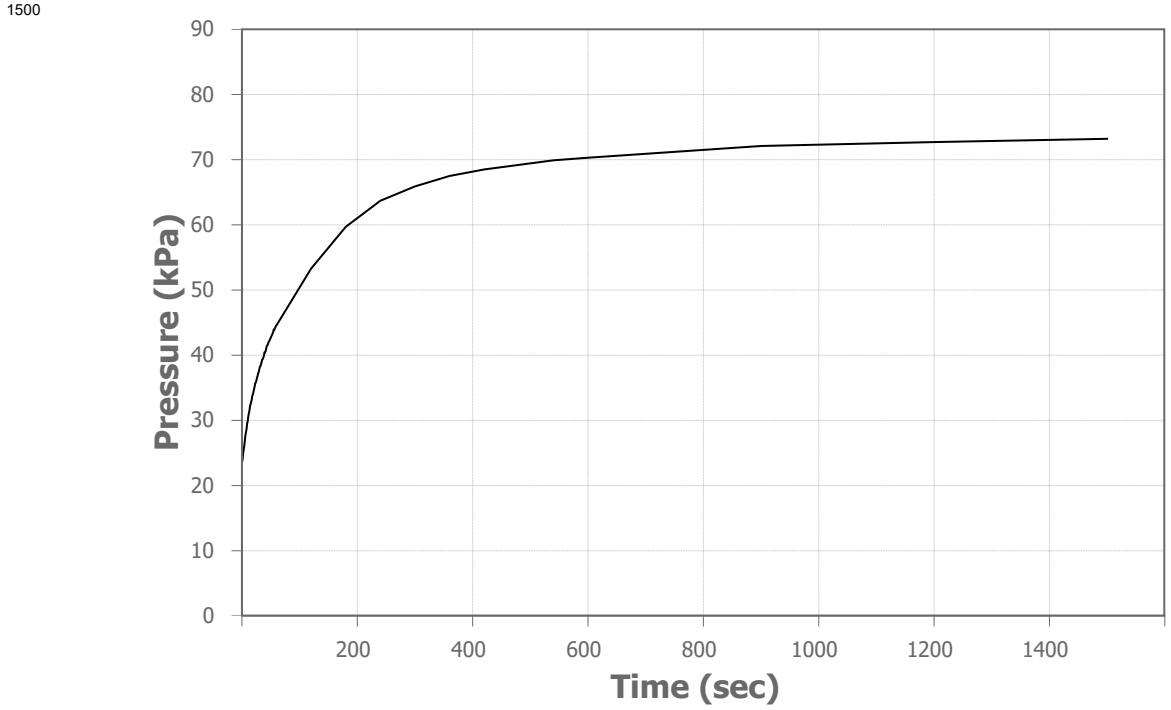
900



Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:25 ar

DISSIPATION TESTS

Test Depth: 6.73



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GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

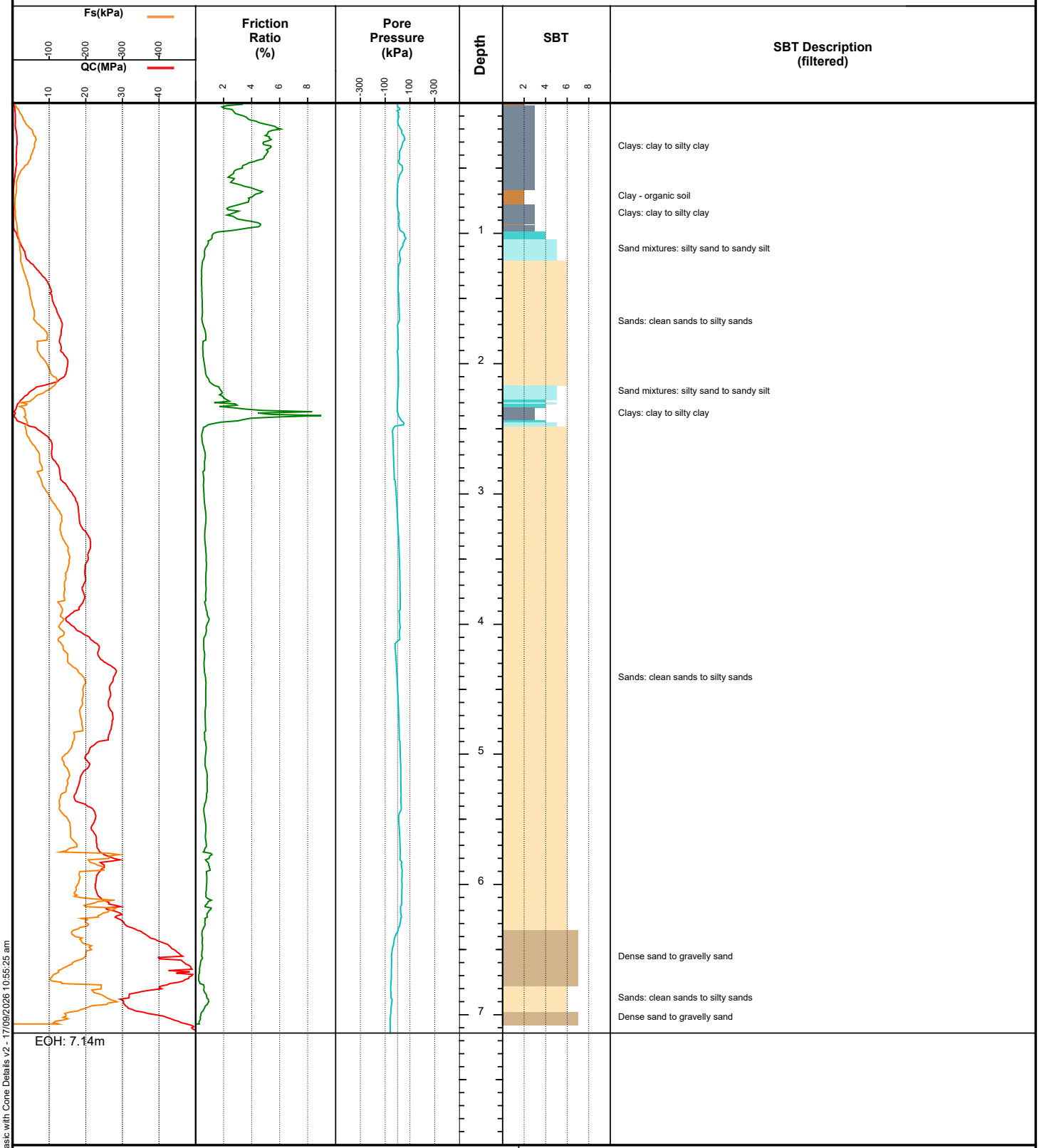
HOLE NO.: CPT09

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 15/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 15/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.00
Tip Resistance Initial: 0.022724988
Tip Resistance Final: 0.022680297
Local Friction Initial: 0.0002647686
Local Friction Final: 0.0002654456
Pore Pressure Initial: 0.0029225477
Pore Pressure Final: 0.0028906555

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-Positive head on potential artesian.

This test is operating under class 2 in accordance to TG6 standards

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GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

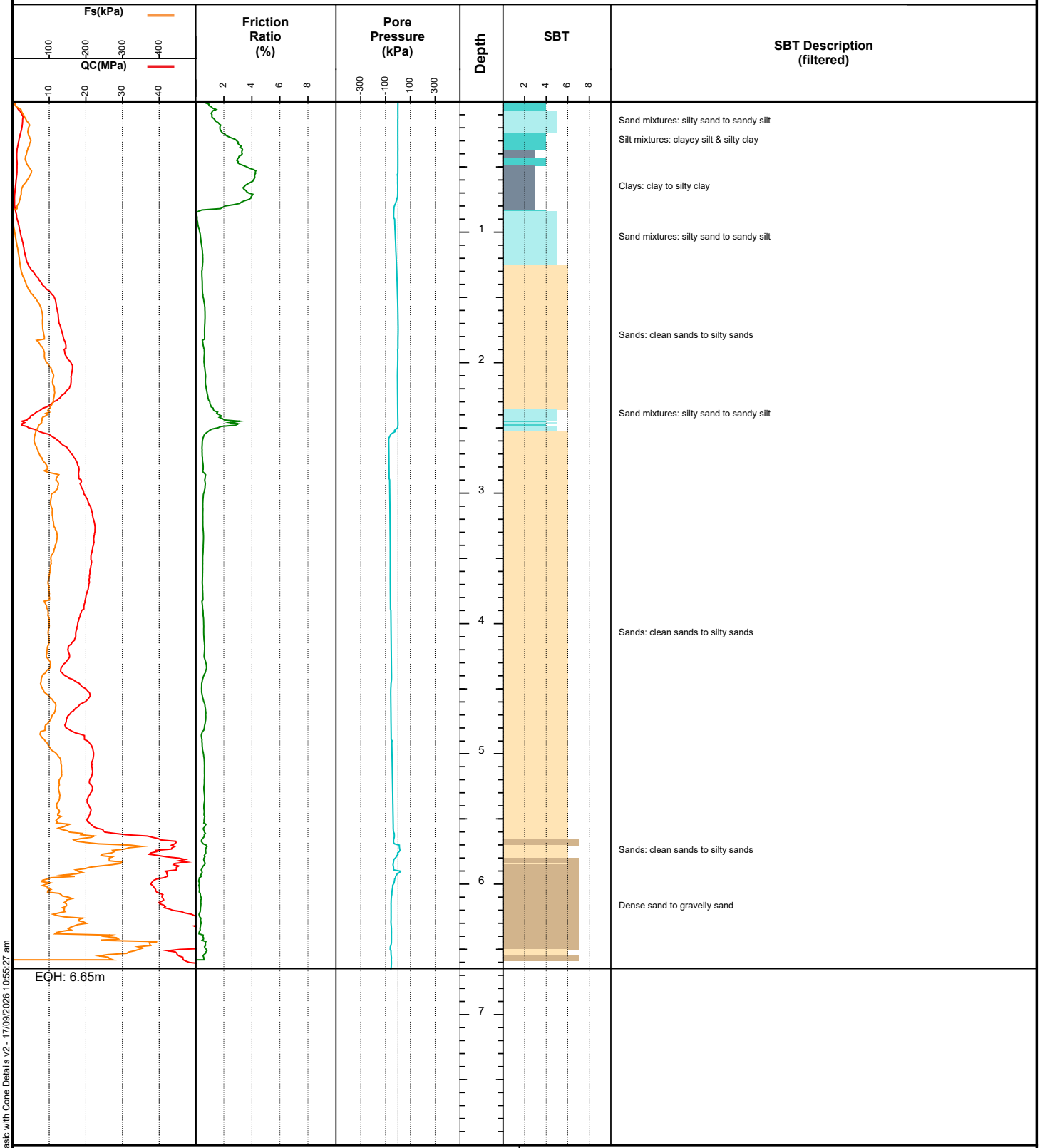
HOLE NO.: CPT10

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 15/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 15/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: -
Tip Resistance Initial: 0.022730574
Tip Resistance Final: 0.02269147
Local Friction Initial: 0.0002649040
Local Friction Final: 0.000265141
Pore Pressure Initial: 0.0029222688
Pore Pressure Final: 0.0029195724

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-No water measured, hole collapse.

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:27 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

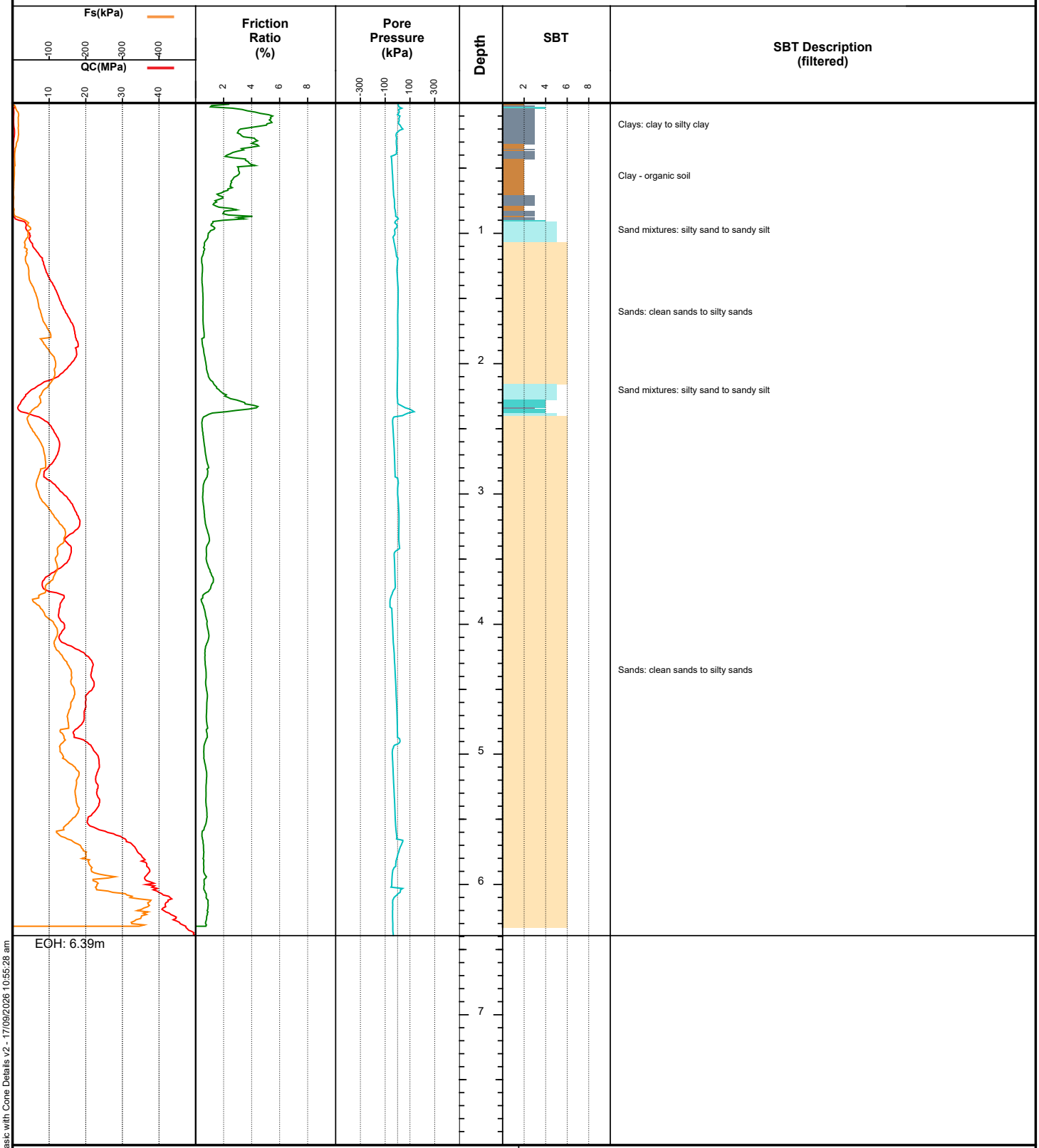
HOLE NO.: CPT11

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 15/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 15/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: -
Tip Resistance Initial: 0.022724988
Tip Resistance Final: 0.022674711
Local Friction Initial: 0.0002645316
Local Friction Final: 0.0002649717
Pore Pressure Initial: 0.0029224546
Pore Pressure Final: 0.002911111

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-No water measured, hole collapse.

This test is operating under class 2 in accordance to TG6 standards

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GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

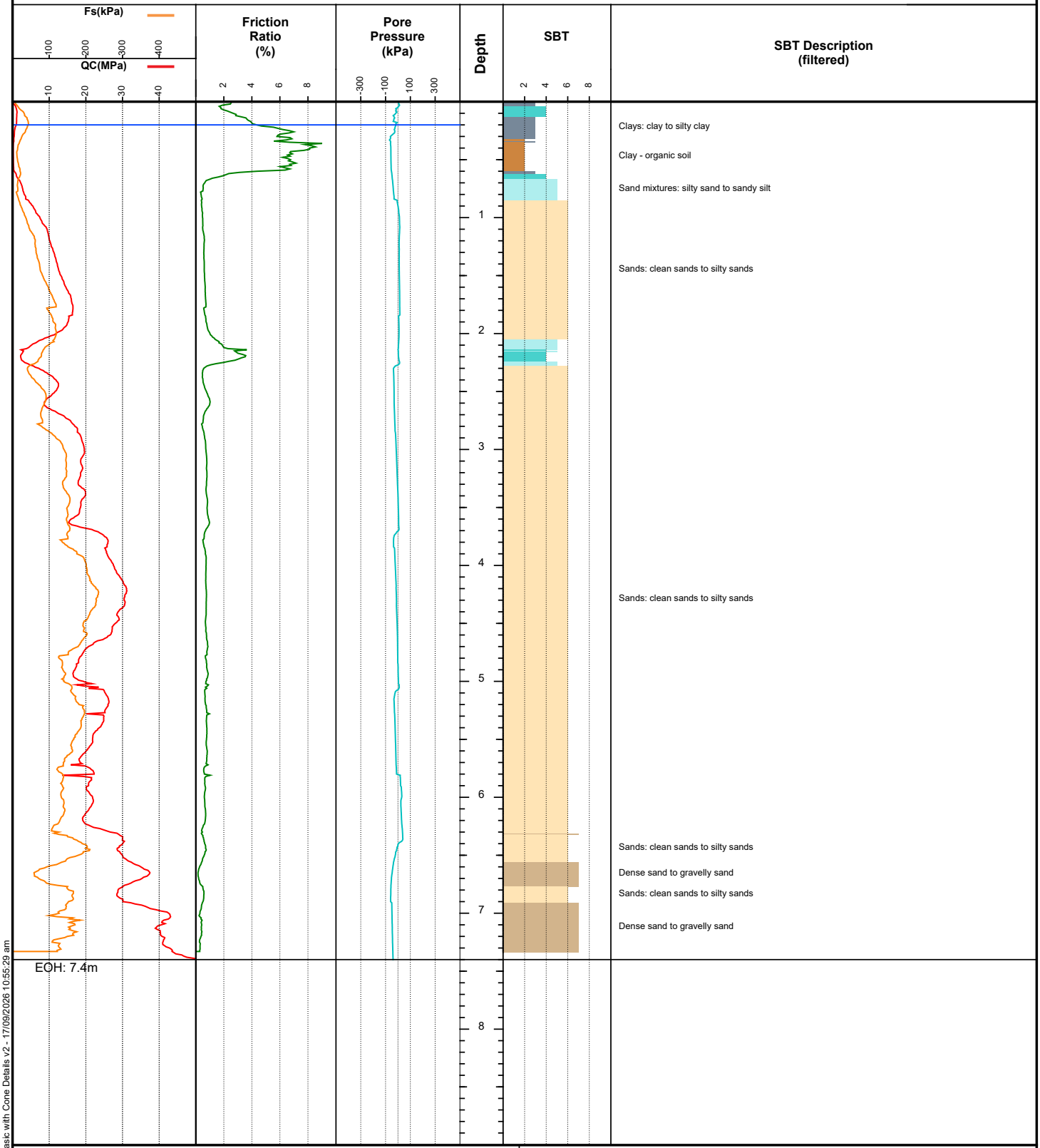
HOLE NO.: CPT12

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 15/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 15/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.20
Tip Resistance Initial: 0.022719402
Tip Resistance Final: 0.022708228
Local Friction Initial: 0.000264870
Local Friction Final: 0.000265174
Pore Pressure Initial: 0.002922268
Pore Pressure Final: 0.002895490

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:29 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

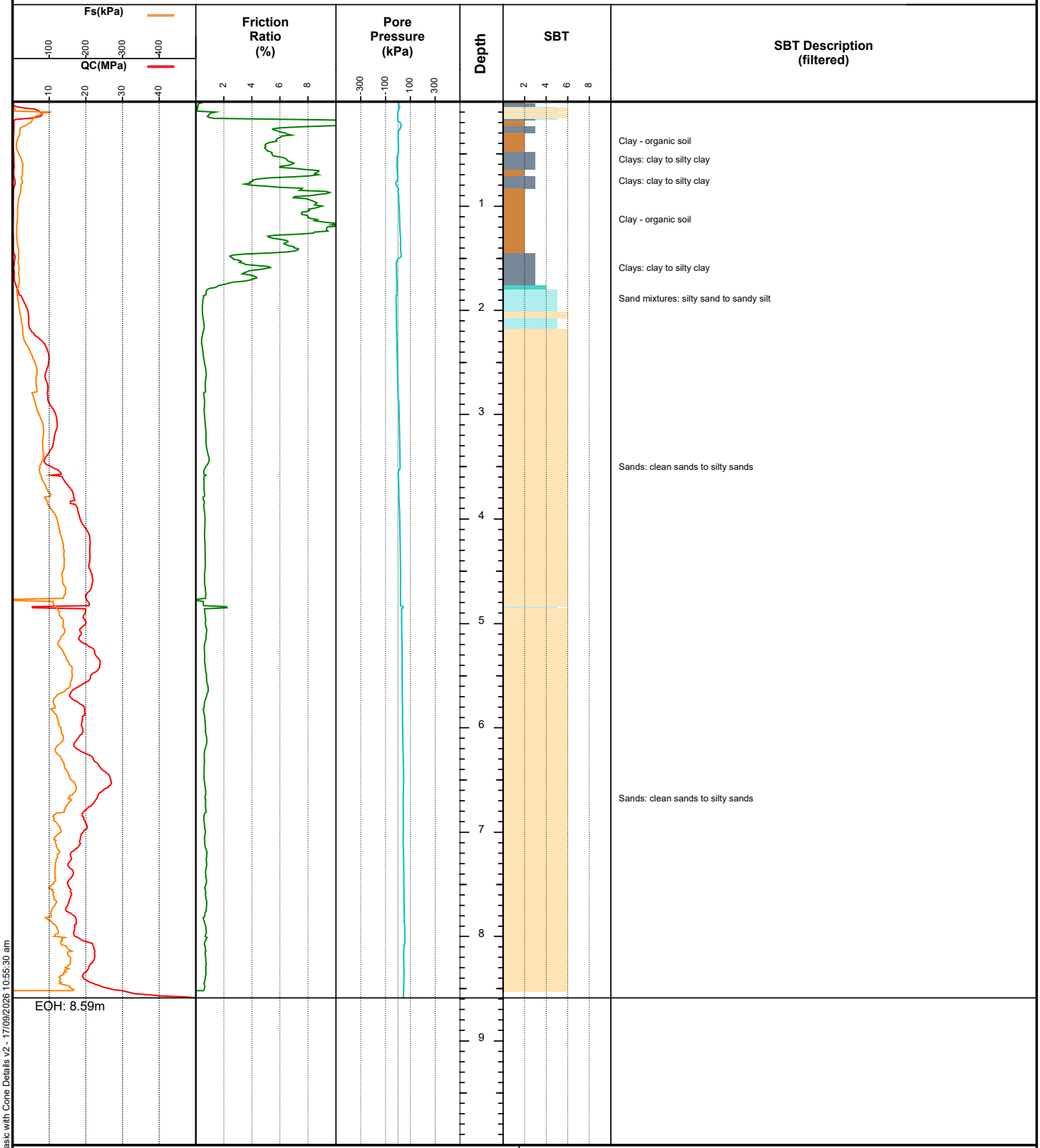
HOLE NO.: CPT13

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 14/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 14/09/2026



SBT Description (filtered)

- Clay - organic soil
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clay - organic soil
- Clays: clay to silty clay
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Sands: clean sands to silty sands

Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: -
Tip Resistance Initial: 0.022752918
Tip Resistance Final: 0.02269147
Local Friction Initial: 0.000264633
Local Friction Final: 0.000265242
Pore Pressure Initial: 0.002923849
Pore Pressure Final: 0.002919851

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:
-No water measured, hole collapse.

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:30 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

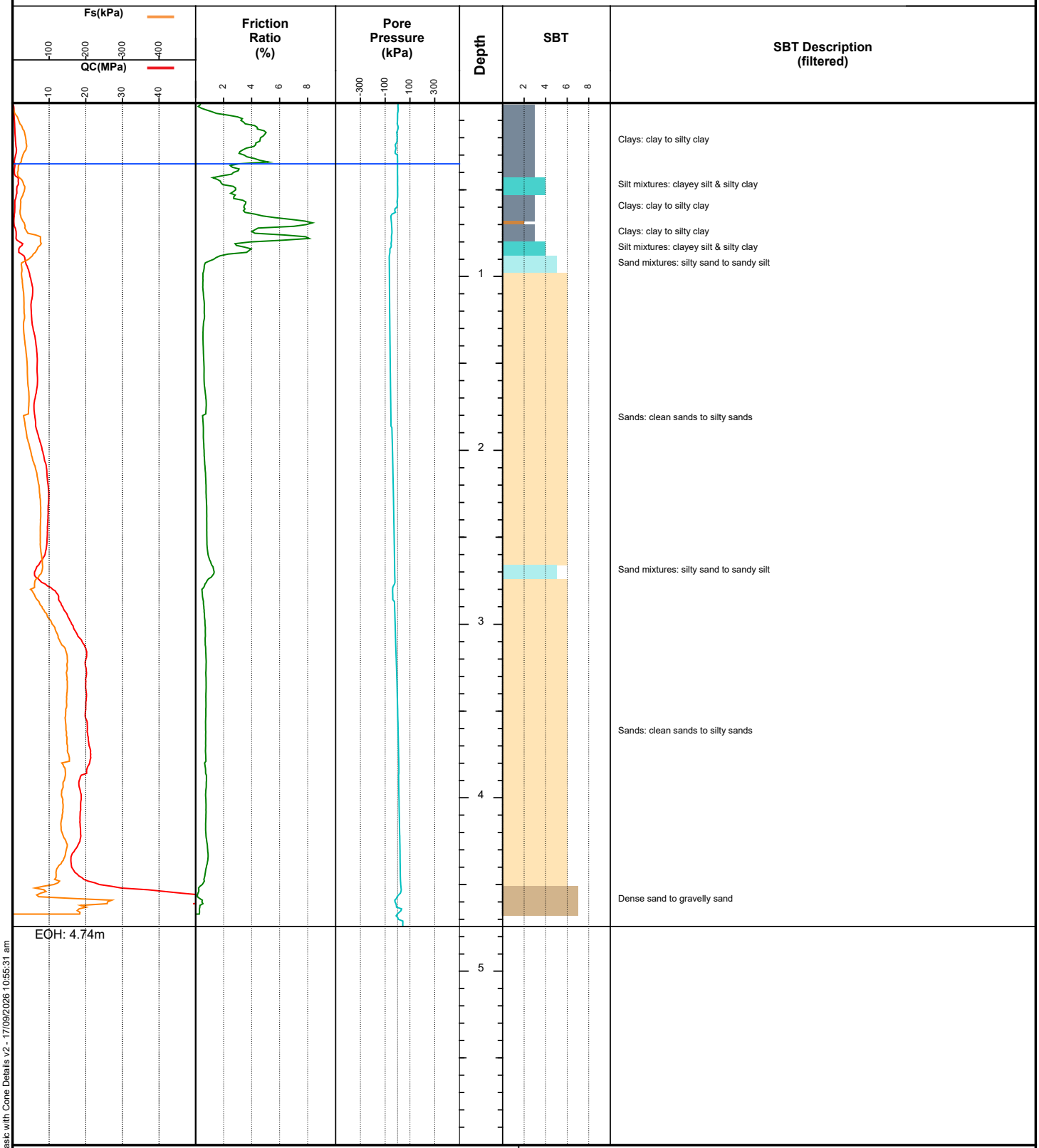
HOLE NO.: CPT14

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 14/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 14/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.35
Tip Resistance Initial: 0.022752918
Tip Resistance Final: 0.022685884
Local Friction Initial: 0.0002643285
Local Friction Final: 0.0002652425
Pore Pressure Initial: 0.0029224546
Pore Pressure Final: 0.0029172478

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:31 am

GRIFFITHS

CONE PENETRATION TEST (CPT) LOG

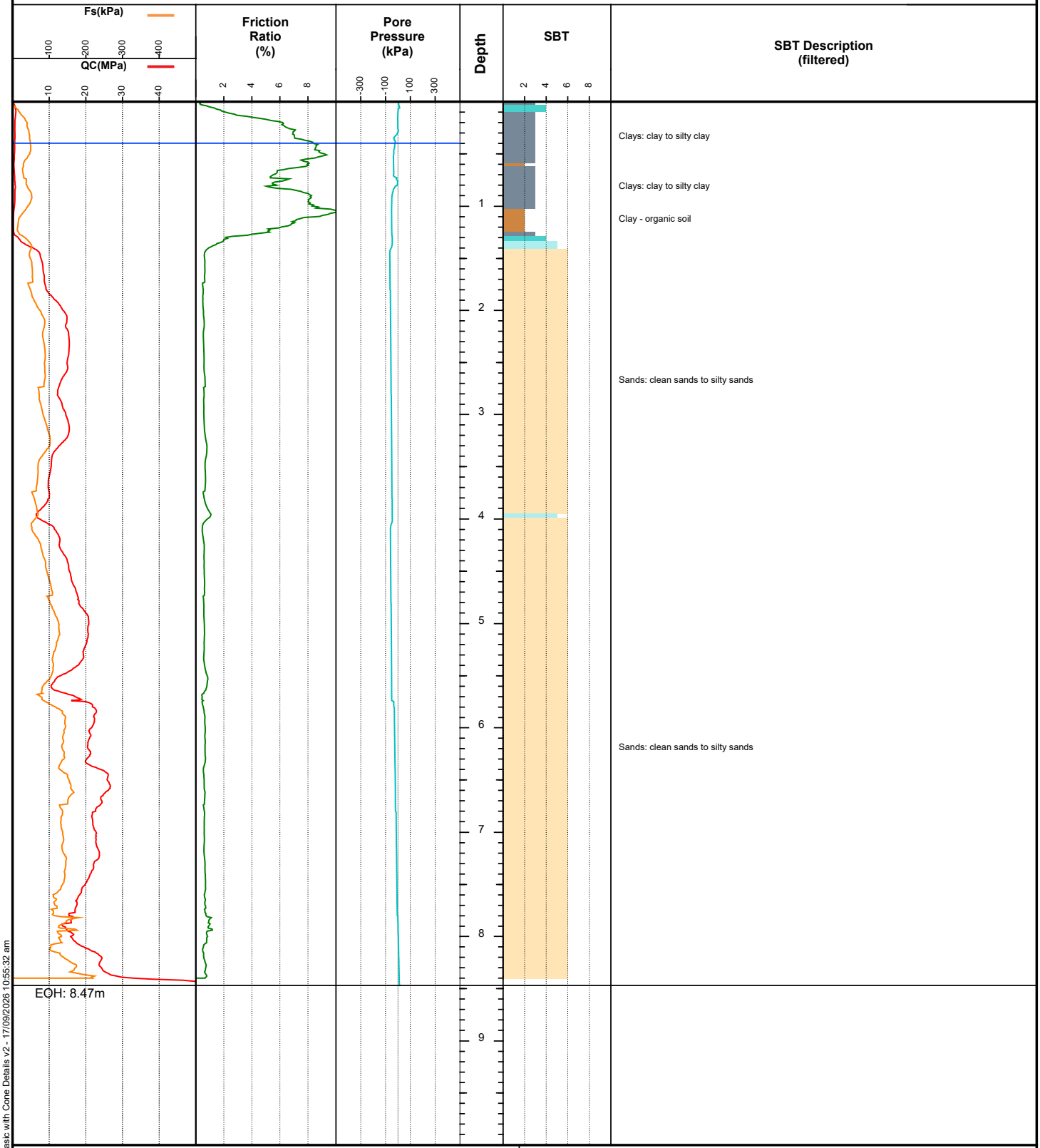
HOLE NO.: CPT15

CLIENT: Torlesse Ltd
PROJECT: 77 Kapiti Rd GI

JOB NO.: GS26-97

SITE LOCATION: 77 Kapiti Road, Paraparaumu
CONTRACTOR: Griffiths Drilling
START DATE: 14/09/2026

CO-ORDINATES:
ELEVATION: Ground
END DATE: 14/09/2026



Machine: Pagani TG63 - 150
Operator: Alex Parrott
Cone Reference: 000943
Cone Area Ratio: 0.00
Cone Type: 100 MPa PC
Predrill: 0.00

Water Level: 0.40
Tip Resistance Initial: 0.022741746
Tip Resistance Final: 0.022685884
Local Friction Initial: 0.0002643962
Local Friction Final: 0.000265141
Pore Pressure Initial: 0.0029227335
Pore Pressure Final: 0.0029198513

Soil Behaviour Type (SBT) - Robertson et al. 1986

0	Undefined	5	Sand mixtures: silty sand to sandy silt
1	Sensitive fine-grained	6	Sands: clean sands to silty sands
2	Clay - organic soil	7	Dense sand to gravelly sand
3	Clays: clay to silty clay	8	Stiff sand to clayey sand
4	Silt mixtures: clayey silt & silty clay	9	Stiff fine-grained

REMARKS:

This test is operating under class 2 in accordance to TG6 standards

Generated with CORE-GS by Geroc - CPT - Basic with Cone Details v2 - 17/09/2026 10:55:32 am

TEST PIT LOG: FT-TP01

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 13mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768389.11mE, 5469005.79mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic SAND; black-brown. Loose to medium dense; dry; sand, fine; (TOPSOIL).		0.2 / 13.0		1, 3, 3		Groundwater Not Encountered
SAND; light brown. Medium dense; moist; sand, fine; (DUNE SANDS).		0.4 / 12.5		3, 3, 3, 3, 3, 3, 3		
		0.6 / 12.0		4, 4, 5, 7, 5, 5, 6, 6, 5, 5, 5, 5, 6, 7, 7, 7, 8, 9, 10, 11, 15, 17		
2.3m: Dense.		0.8 / 11.5				
		1.0 / 11.0				
3.1m: Very dense.		1.2 / 10.5		Refusal 20		
End of Hole 3.20mbgl, target depth		1.4 / 10.0				
		1.6 / 9.5				
		1.8 / 9.0				
		2.0 / 8.5				
		2.2				
		2.4				
		2.6				
		2.8				
		3.0				
		3.2				
		3.4				
		3.6				
		3.8				
		4.0				
		4.2				
		4.4				
		4.6				
		4.8				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

Generated with CORE-GS by Geroc - Torlesse Test Pit & DCP Log V1.07 - 17/09/2026 2:48:38 pm



FT-TP01 Pit 0.0 – 3.2mbgl



FT-TP01 Stockpile

TEST PIT LOG: FT-TP02

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 9mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768281.50mE, 5469114.14mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic silty SAND; black-brown. Loose; dry to moist; sand, fine; (TOPSOIL).		0.2 / 0.4 / 8.5		1, 1, 1, 2		Groundwater Not Encountered
SAND, with some silt; dark brown. Loose to medium dense; dry to moist; sand, fine; (DUNE SANDS).		0.6 / 0.8		2, 3, 5, 5		
SAND, with some silt; brown. Dense to very dense; moist to wet; sand, fine; (DUNE SANDS).		1.0 / 8.0		8, 11, Refusal 20		
End of Hole 3.00mbgl, target depth		1.2 / 1.4 / 7.5 / 1.6 / 1.8 / 2.0 / 7.0 / 2.2 / 2.4 / 6.5 / 2.6 / 2.8 / 3.0 / 6.0 / 3.2 / 3.4 / 5.5 / 3.6 / 3.8 / 4.0 / 5.0 / 4.2 / 4.4 / 4.5 / 4.6 / 4.8				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

Generated with CORE-GS by Geroc - Torlesse Test Pit & DCP Log V1.07 - 17/09/2026 2:48:40 pm



FT-TP02 0.0 – 3.0mbgl



FT-TP02 Stockpile

TEST PIT LOG: FT-TP03

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 6mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768074.21mE, 5469044.50mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic silty SAND; black-brown. Very loose to loose; dry to moist; sand, fine; (TOPSOIL).		0.2 / 0.4		1, 1, 1		
SAND, with some silt and trace roots and branches; grey. Loose to medium dense; moist; sand, fine, strong organic odour; (BEACH DEPOSITS).		5.5 / 0.6 / 0.8 / 1.0 / 5.0 / 1.2		2, 5, 5, 6, 6, 11, 9		
1.3m: Very dense.		1.4 / 4.5 / 1.6 / 1.8		Refusal 20		
2.0m: Wet to saturated.		2.0 / 4.0				
2.2m: Water seepage; moderate infiltration.		2.2				▼ 2.2mbgl
2.5m: Saturated.		2.4 / 3.5 / 2.6 / 2.8				
End of Hole 3.00mbgl, target depth		3.0 / 3.0 / 3.2 / 3.4 / 2.5 / 3.6 / 3.8 / 4.0 / 2.0 / 4.2 / 4.4 / 1.5 / 4.6 / 4.8				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

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FT-TP03 Pit 0.0 – 3.0mbgl



FT-TP03 Stockpile

TEST PIT LOG: FT-TP04

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 7mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768471.16mE, 5469034.50mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic SAND; brown-black. Loose; dry to moist; sand, fine; (DUNE DEPOSITS).		0.2 / 0.4 / 0.6 / 6.5		1, 1, 1, 2, 1, 3		
Organic SAND; dark brown. Dense to very dense; dry to moist; sand, fine; (DUNE SANDS).		0.8 / 1.0 / 6.0		7, Refusal 20		
SAND; brown. Very dense; moist; sand, fine; (DUNE DEPOSITS).		1.2 / 1.4 / 5.5				
SAND; light brown. Very dense; moist to wet; sand, fine; (DUNE SANDS). 2.2m: Saturated.		1.6 / 1.8 / 2.0 / 5.0 / 2.2 / 2.4 / 4.5 / 2.6 / 2.8				▼ 2.2mbgl
End of Hole 3.00mbgl, target depth		3.0 / 4.0 / 3.2 / 3.4 / 3.5 / 3.6 / 3.8 / 4.0 / 3.0 / 4.2 / 4.4 / 2.5 / 4.6 / 4.8				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

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FT-TP04 Pit 0.0 – 3.0mbgl



FT-TP04 Stockpile

TEST PIT LOG: FT-TP05

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 8mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768265.50mE, 5469020.95mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic silty SAND; black-brown. Very loose to loose; dry to moist; sand, fine; (TOPSOIL).		0.2 / 0.4 / 7.5		1, 2, 2		Groundwater Not Encountered
SAND; light brown. Loose to medium dense; dry to moist; sand, fine; (DUNE SANDS).		0.6 / 0.8 / 7.0		1, 2, 1, 1, 1, 1, 2		
SAND, with minor silt; grey. Medium dense; moist; sand, fine; (BEACH DEPOSITS).		1.0 / 1.2 / 1.4 / 6.5		4, 4, 4, 3, 3		
2.2m: Dense.		1.6 / 1.8 / 2.0 / 6.0		2, 3, 2, 2, 4, 5, 7		
End of Hole 3.00mbgl, target depth		2.2 / 2.4 / 2.6 / 5.5		8, 7, 7, 6		
		2.8 / 3.0 / 5.0		4, 4, 6, 5		
		3.2 / 3.4 / 4.5		6, 7, 10, 13, 15		
		3.6 / 3.8 / 4.0		Refusal 20		
		4.2 / 4.4 / 3.5				
		4.6 / 4.8				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

Generated with CORE-GS by Geroc - Torlesse Test Pit & DCP Log V1.07 - 17/09/2026 2:48:46 pm



FT-TP05 Pit 0.0 3.0mbgl



FT-TP05 Stockpile

TEST PIT LOG: FT-TP06

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 5.8mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768187.50mE, 5469004.76mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Woody Peat; dark brown. Very soft; wet; (SWAMP DEPOSITS - Holocene).	B	0.2 / 5.5 0.4 0.6 0.8 / 5.0		1 1 1 1 2		
SAND, with some silt; blue-grey. Medium dense to dense; wet to saturated; sand, fine; (BEACH DEPOSITS). 1.1m: Dense. 1.4m: Very dense.		1.0 1.2 / 4.5 1.4 1.6 1.8 / 4.0 2.0 2.2 2.4 2.6 2.8 / 3.0 3.0 3.2 / 2.5 3.4 3.6 3.8 / 2.0 4.0 4.2 / 1.5 4.4 4.6 4.8 / 1.0		4 7 10 16 Refusal 20		0.9mbgl 1.6mbgl
End of Hole 3.00mbgl, target depth						

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

Generated with CORE-GS by Geroc - Torlesse Test Pit & DCP Log V1.07 - 17/09/2026 2:48:48 pm



FT-TP06 0.0 – 3.0mbgl



FT-TP06 Stockpile

TEST PIT LOG: FT-TP07

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 6mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768103.01mE, 5468921.50mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic silty SAND; black-brown. Loose; dry to moist; sand, fine; (TOPSOIL).		0.2 / 0.4 / 5.5		2, 2		
SAND, with some silt and trace roots and branches; grey. Loose to medium dense; moist; to wet sand, fine; (BEACH DEPOSITS). 0.8m: Dense.		0.6 / 0.8 / 1.0 / 5.0		2, 2, 3, 5, 9, 11, 17		
SAND, with some silt; blue-grey. Very dense; wet to saturated; sand, fine; (BEACH DEPOSITS). 1.6m: Saturated.		1.2 / 1.4 / 1.6 / 1.8 / 2.0 / 2.2 / 2.4 / 2.6 / 2.8 / 3.0 / 4.5 / 4.0 / 3.5 / 3.0		Refusal 20		▼ 1.6mbgl
End of Hole 3.00mbgl, target depth		3.2 / 3.4 / 3.6 / 3.8 / 4.0 / 4.2 / 4.4 / 4.6 / 4.8 / 2.5 / 2.0 / 1.5				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

Generated with CORE-GS by Geroc - Torlesse Test Pit & DCP Log V1.07 - 17/09/2026 2:48:50 pm



FT-TP07 Pit 0.0 – 3.0mbgl



FT-TP07 Stockpile

TEST PIT LOG: FT-TP08

Torlesse™

CLIENT:	New Central Park Ltd		**LOGGED BY:** HM
PROJECT:	Fast Track Consent	**PAGE:** 1 of 1	**CHECKED BY:**
PROJECT NO.:	T0793	**ELEVATION:** 8mRL (NZVD2016)	**START DATE:** 16/09/2026
SITE LOCATION:	77 Kapiti Road, Paraparaumu, Wellington	**CO-ORDINATES:** 1768385.85mE, 5469057.78mN (NZTM2000)	**END DATE:** 16/09/2026

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH / RL (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	SHEAR VANE/ POCKET PENETROMETER (kPa)	GROUND WATER
Organic SAND; black-brown. Loose to medium dense; dry to moist; sand, fine; (DUNE SANDS).		0.2 / 0.4 / 7.5		1, 2, 1, 2, 1		
SAND; brown. Loose to medium dense; moist; sand, fine; (DUNE SANDS). 0.8m: Dense. 1.0m: Very dense.		0.6 / 0.8 / 1.0 / 7.0		1, 3, 7, 10, Refusal 20		Groundwater Not Encountered
SAND; light brown. Very dense; moist; sand, fine; (DUNE SANDS).		1.2 / 1.4 / 6.5 / 1.6 / 1.8 / 2.0 / 6.0 / 2.2 / 2.4 / 5.5 / 2.6 / 2.8 / 3.0 / 5.0				
End of Hole 3.00mbgl, target depth		3.2 / 3.4 / 4.5 / 3.6 / 3.8 / 4.0 / 4.0 / 4.2 / 4.4 / 3.5 / 4.6 / 4.8				

Terminology:

UTP = Unable to Penetrate
PP = Pocket Penetrometer
SV = Shear Vane (Peak/ Residual)

Scala Penetrometer (DCP) completed in general accordance with NZS 4402.6.5.2:1988.
Logging completed in general accordance with NZGS 2005 Guidelines.

CONTRACTOR: Griffiths Drilling
MACHINE: 5T Excavator

Notes:

Coordinates gathered using Avensa Maps & QGIS.
Elevation estimated using 2021 LINZ LiDAR 1m DEM contours.

Generated with CORE-GS by Geroc - Torlesse Test Pit & DCP Log V1.07 - 17/09/2026 2:48:52 pm



FT-TP08 Pit 0.0 – 3.0mbgl



FT-TP08 Stockpile

Trial Trench (logged by)	Termination Depth/Dimensions	Soil Description	Groundwater Observations
TT01 (JS)	0.3m	100mm fibrous peat (Peat) Brown slightly organic fine to medium sands (Organic Sand)	Moist to wet at ground surface. Perched or regional groundwater not encountered.



Commentary:

- Very little peat observed, straight onto the slightly organic sands, and so elected to terminate the trench at shallow depth.

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT02 (JS)	0.6m	300 to 400mm Peat Orangish brown, fine to medium sands, trace rootlets. Non plastic. Compact.	Surface water only.



Commentary:

- Very little peat observed

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT03 (JS)	0.4m	Peat 0.5m thick, underlain by Organic Sand. Heavy groundwater inflows, not able to log. Abandoned and moved onto TT04 located immediately adjacent.	Heavy ground water inflows through base of peat. Appears to be associated with the surface water run off from M2PP expressway.



Heavy flows from perched water at base of peat.



Photo taken approximately 15m to 20minutes after pit first opened.



Pit full with water at end of day, water level at around 100mm below ground surface.



Organic Sand

Commentary:

Water flow calcs as follows:

- 11:52am
- 2.5x4.5x (30 to 50mm)
- 11:58
- 6 minutes
- 0.5625 m3
- 562l/360s
- 2l/s
- 7.2m3/hr

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT04 (JS)	2.6m	300mm Peat 300mm Organic Sand Then fine to medium clean sands ('Clean Sand') to base of trench.	Groundwater 1.9m from ground level. Causing sand to collapse at base.



Regional groundwater at base, causing bases of the walls to slump and collapse, sands loose all strength and structure.



Refer commentary below.

Commentary:

- On the following day, Thursday 12 June the groundwater was approximately 600mm below ground level, not clear as to whether this is perched groundwater or regional groundwater (or likely a combination of both).

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT05 (JS)	3.2m	Peat to 1.5m Organic Sand to 2.9m Clean Sand to base of trench	Perched groundwater at interface of Peat and f to m sands, high flows into pit. Refer to top left corner of pit in photo below, water can be seen pouring in. Regional groundwater not encountered.



Surface scrape, exposing the top of the fibrous peat.



Base of pit dry.

Commentary:

- Pit walls stable

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT06 (JS)		Similar to TT 05	Perched groundwater at interface of Peat and Organic Sand, flows less when compared to TT05.



Perched groundwater accumulating at the base of the pit.



Stockpile predominantly fibrous peat, with the light brown organic sands shown in the foreground

Commentary:

- Pit walls stable

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT07 (JS)	2.5	Peat to 1.1m Organic Sand to 2.1m Clean Sand to base of pit.	Perched groundwater at base of Peat.



Perched groundwater accumulating at base of trench.
Looking to the west.



Photo taken at 4pm at end of day, more perched water at base of trench.
Looking to the east.

Commentary:

- Overall pit length 10m

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT08 (JS)	3m	Peat to 0.6m Organic Sand to 1.2m Clean Sand to base of pit.	Perched groundwater inflows after about 5minutes of opening the trench, possibly associated with the M2PP expressway stormwater ;pond immediately to the north. Regional groundwater at base of pit.



Pit walls collapsed, on the northern side, adjacent to the M2PP pond.



Commentary:

- Pit walls collapsing in the Clean Sands

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT09 (JS)	3.5	Peat to 1.5m Organic Sand to 2m Clean Sand to base of pit.	Heavy perched groundwater inflows at around 0.6 to 1m depth. No signs of regional groundwater.



Heavy seepage at the base of the fibrous peat, the brown coloured water then stains the side of the pit walls



Relic tree roots fallen to the base of the pit.

Commentary:

- ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT10 (AM)	1.5	0.0–0.3mbgl: Topsoil 0.3–0.8mbgl: SILT, minor sand, trace gravel 0.8–1.2mbgl: PEAT 1.2–1.5mbgl: Fine SAND, some silt, minor rootlets	Perched groundwater inflow at ~1mbgl. Regional Groundwater not encountered.



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT11 (AM)	2.0	0.0–0.3mbgl: Topsoil 0.3–0.6mbgl: SILT, minor sand, trace gravel 0.6–1.2mbgl: PEAT 1.2–1.5mbgl: Fine SAND, some silt, minor rootlets 1.5–2.0mbgl: Fine-medium grey SAND	Minor perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench.



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT12 (AM)	1.8	0.0–0.3mbgl: Topsoil 0.3–0.6mbgl: SILT, minor sand, trace gravel 0.6–1.2mbgl: PEAT 1.2–1.5mbgl: Fine SAND, some silt, minor rootlets 1.5–1.8mbgl: Fine-medium grey SAND	Minor perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench.



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT13 (AM)	2.0	0.0–0.3mbgl: Topsoil 0.3–0.6mbgl: SILT, minor sand, trace gravel 0.6–1.2mbgl: PEAT 1.2–1.5mbgl: Fine SAND, some silt, minor rootlets 1.5–2.0mbgl: Fine-medium grey SAND	Minor perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench. Water level rose to 0.7mbgl overnight



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT14 (AM)	2.5	0.0–0.2mbgl: Topsoil 0.2–0.6mbgl: SILT, minor sand, trace gravel 0.6–1.5mbgl: PEAT 1.5–2.0mbgl: highly plastic CLAY, minor silt, no strength recorded	Perched groundwater above CLAY layer



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT15 (AM)	2.0	0.0–0.2mbgl: Topsoil 0.2–1.0mbgl: PEAT 1.0–2.0mbgl: Fine-medium grey SAND	Minor perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench.



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT16 (AM)	2.5	0.0–0.3mbgl: Topsoil 0.3–0.6mbgl: SILT, minor sand, trace gravel 0.6–1.2mbgl: PEAT 1.2–1.5mbgl: Fine SAND, some silt, minor rootlets 1.5–2.5mbgl: Fine-medium grey SAND	Some perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench.



Commentary:

- Relic tree root encountered, fell to base of pit

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT17 (AM)	3.0	0.0–0.3mbgl: Topsoil 0.3–0.6mbgl: SILT, minor sand, trace gravel 0.6–1.2mbgl: PEAT 1.2–1.5mbgl: Fine SAND, some silt, minor rootlets 1.5–3.0mbgl: Fine-medium grey SAND	Some perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench. Wall collapsed.



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT18 (AM)	3.5	0.0–0.3mbgl: Topsoil 0.3–1.0mbgl: SILT, minor sand, trace gravel 1.0-1.6mbgl: PEAT 1.6-2.5mbgl: Fine SAND, some silt, minor rootlets 2.5-3.5mbgl: Fine-medium grey SAND	Minor perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench.



Commentary: ~

Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT19 (AM)	2.0	0.0–0.3mbgl: Topsoil 0.3–1.5mbgl: Fine-medium dark brown SAND, high organic content 1.5-2.0mbgl: Fine-medium dark brown SAND	Minor perched groundwater inflow observed at base of peat. Regional groundwater table encountered at base of trench.



Commentary: ~

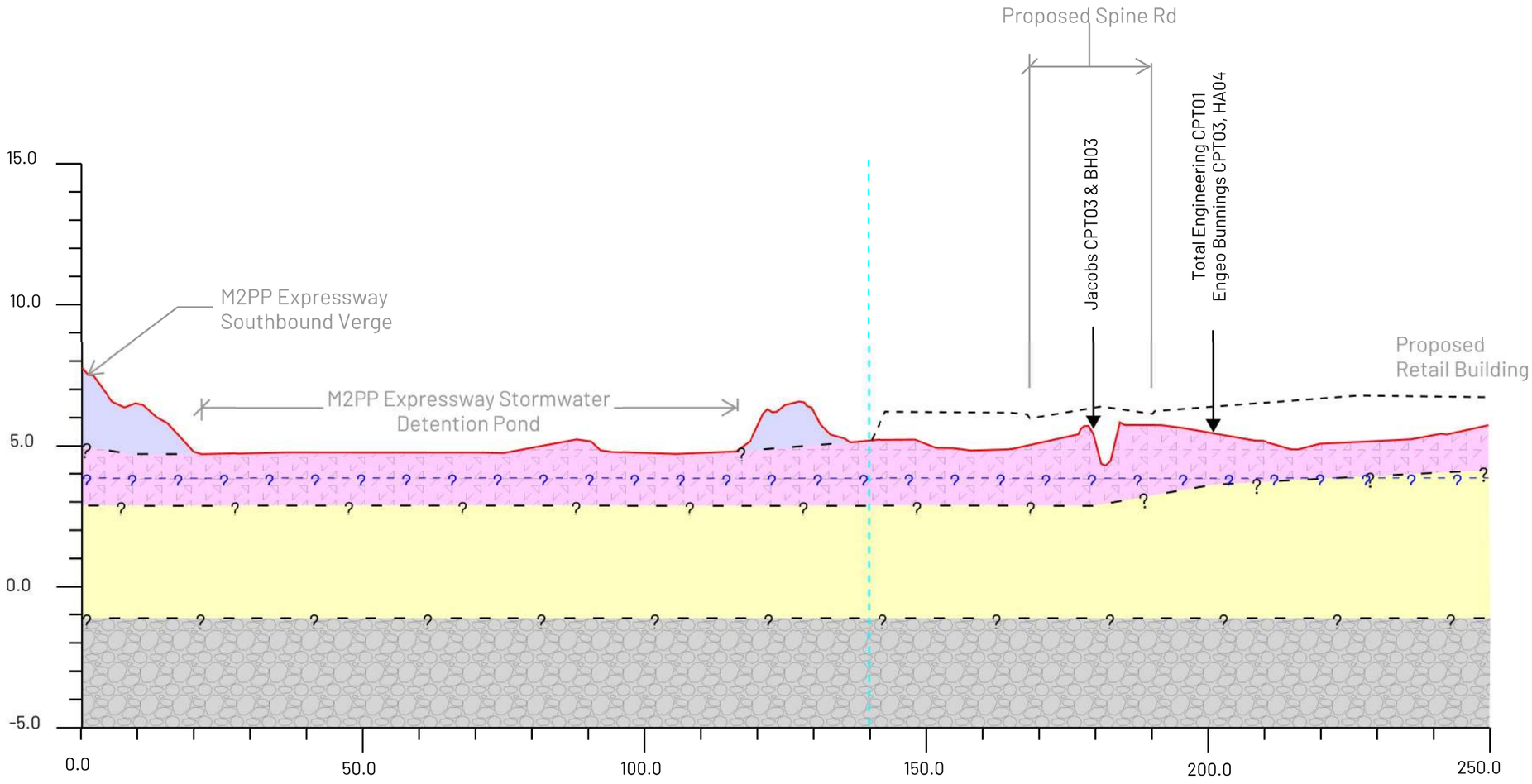
Trial Trench (logged by)	Termination Depth (mbgl)	Soil Description	Groundwater Observations
TT20 (AM)	2.0	0.0–0.3mbgl: Topsoil 0.3–1.5mbgl: Fine-medium dark brown SAND, high organic content 1.5-2.0mbgl: Fine-medium grey SAND	Regional groundwater table encountered at base of trench. Wall collapse observed.



Commentary: ~

APPENDIX D: GEOLOGICAL SECTIONS

Geological Section 01



Y Scale: 1:180
0m
5m

X Scale: 1:900
0m
45m

Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 01

Project/Report No.:
T0793/04

Sketch ID:
GS1 of 6

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

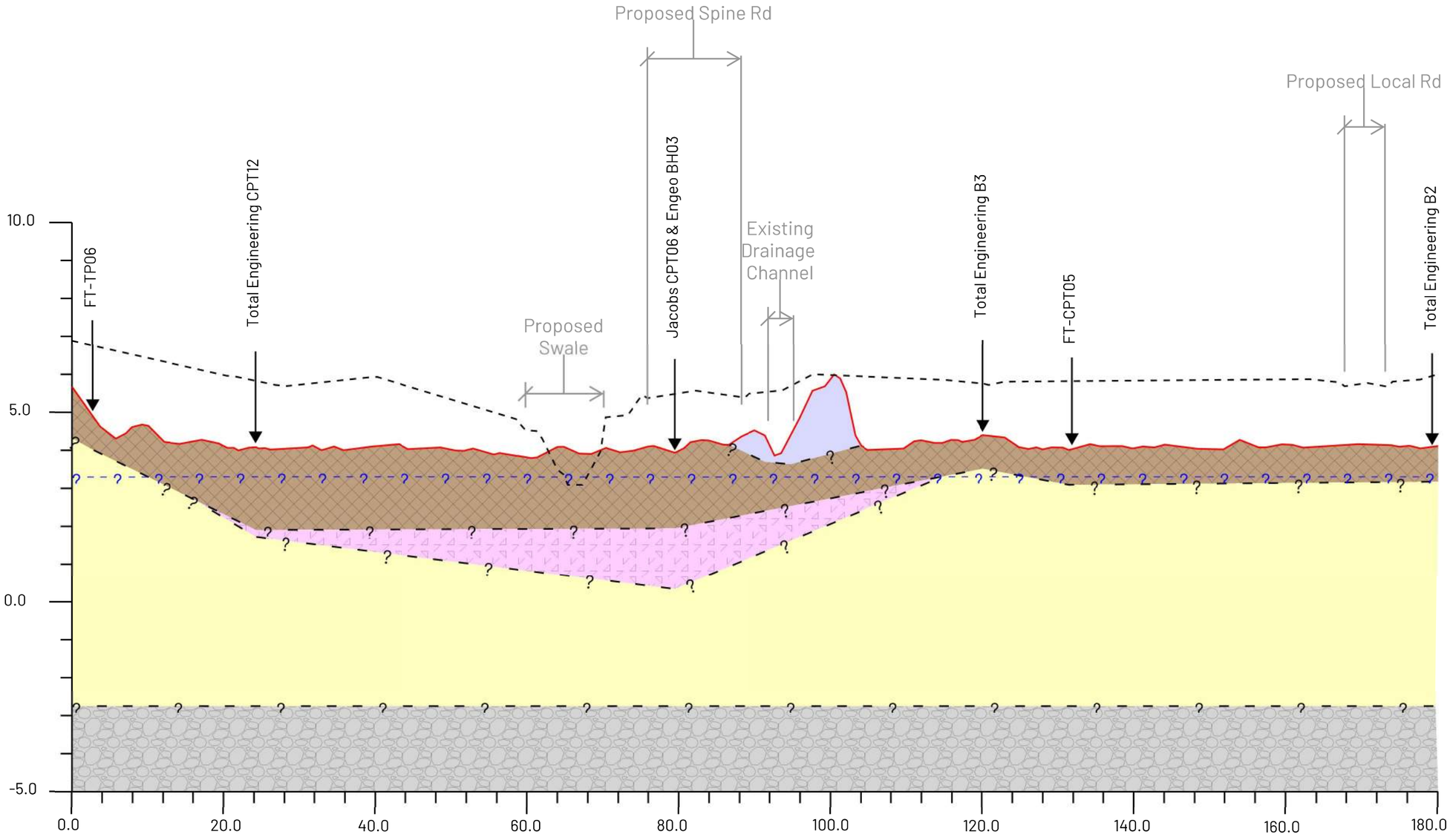
LEGEND

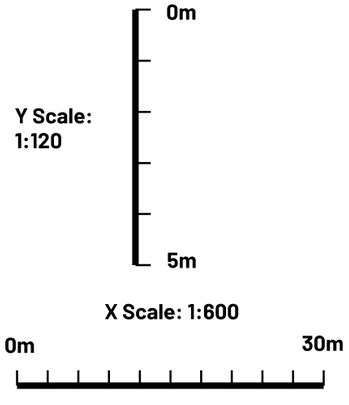
- Fibrous Peat
- Existing Fill
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

Torlesse™

ACE MEMBER
ENGINEERING NEW ZEALAND OFFICIAL MEMBER

Geological Section 02





Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 02

Project/Report No.:
T0793/04

Sketch ID:
GS2 of 6

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

LEGEND

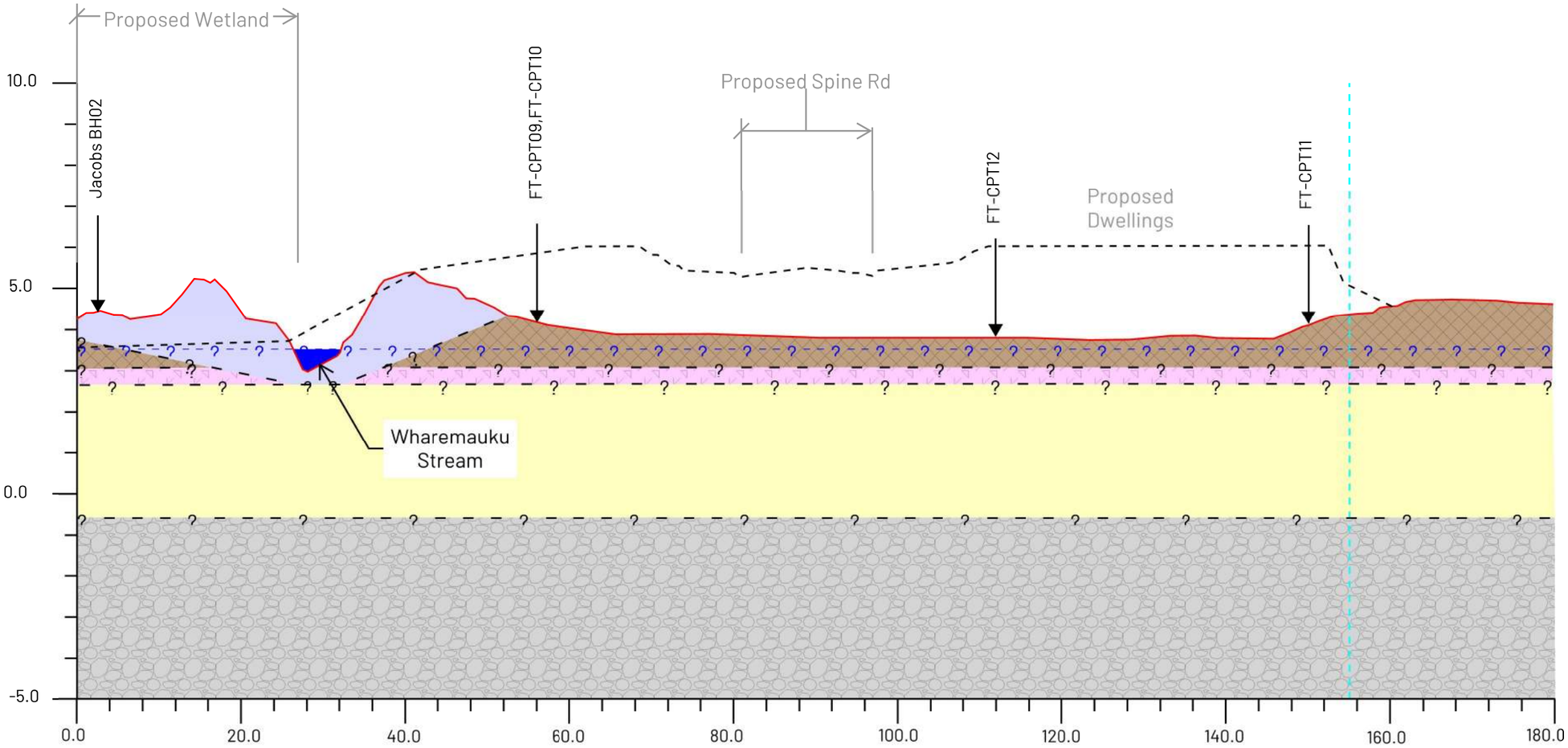
- Fibrous Peat
- Existing Fill
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

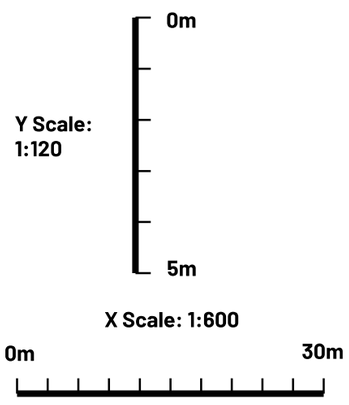
Torlesse™

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ENGINEERING NEW ZEALAND OFFICIAL MEMBER

Geological Section 03





Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 03

Project/Report No.:
T0793/04

Sketch ID:
GS3 of 6

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

LEGEND

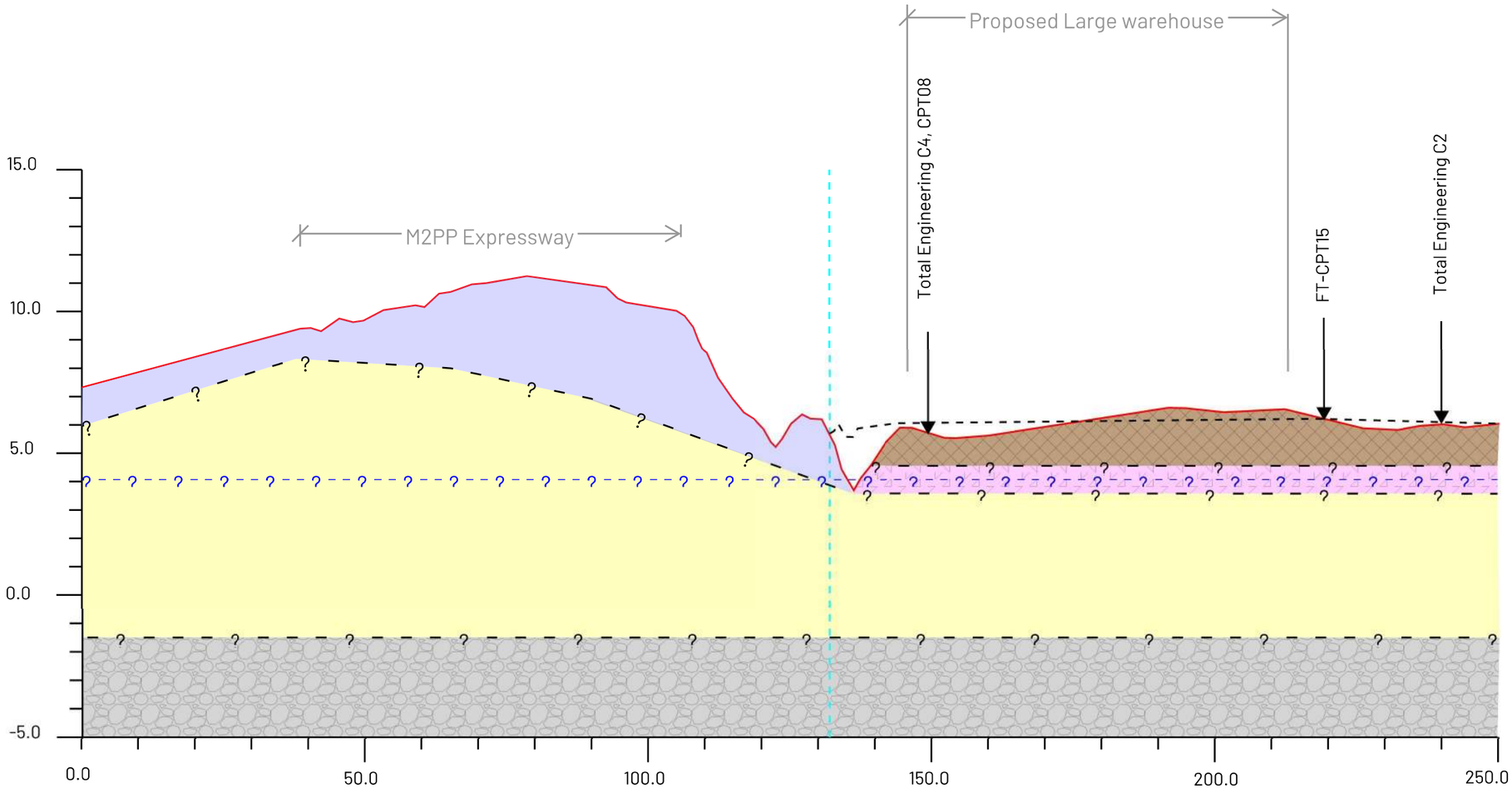
- Fibrous Peat
- Existing Fill
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

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ACE MEMBER

ENGINEERING NEW ZEALAND OFFICIAL MEMBER

Geological Section 04



Y Scale: 1:180

0m

5m

X Scale: 1:900

0m

45m

Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 04

Project/Report No.:
T0793/04

Sketch ID:
GS4 of 6

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

LEGEND

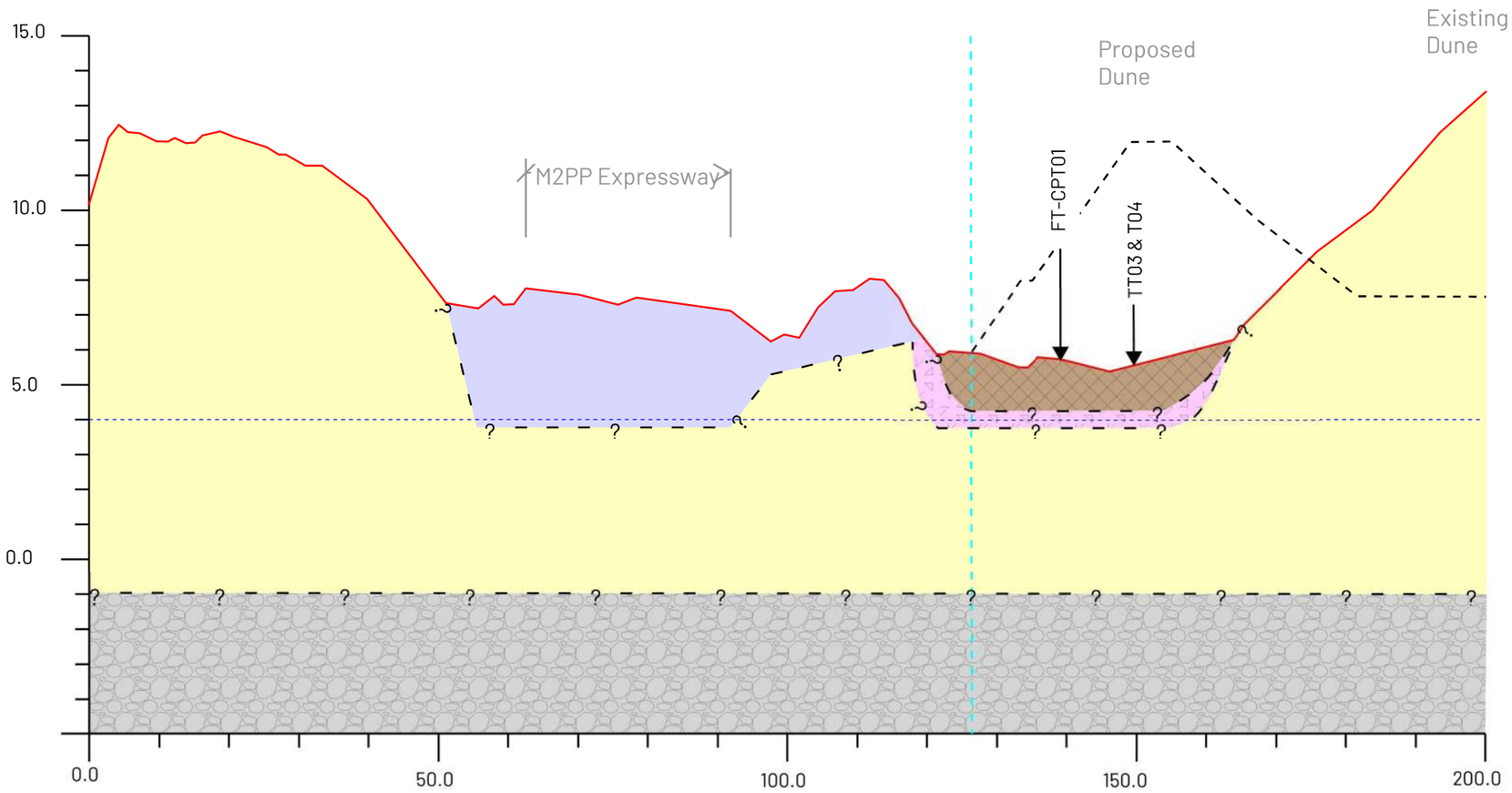
- Fibrous Peat
- Existing Fill
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

Torlesse™

ACE MEMBER

ENGINEERING NEW ZEALAND OFFICIAL MEMBER

Geological Section 05



Y Scale: 1:160

0m

5m

X Scale: 1:800

0m

40m

Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 05

Project/Report No.:
T0793/04

Sketch ID:
GS5 of 6

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

LEGEND

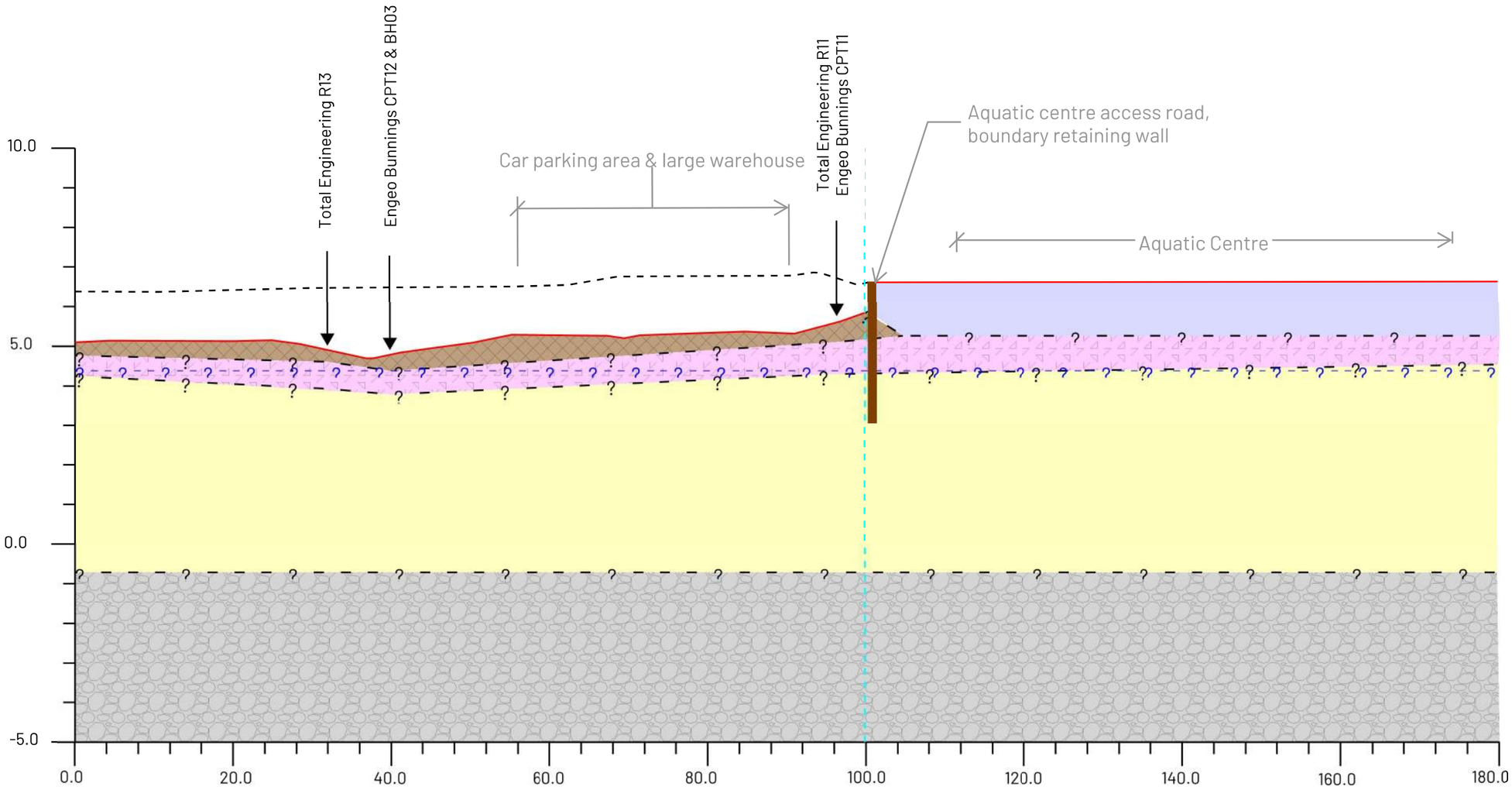
- Fibrous Peat
- Existing Fill
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

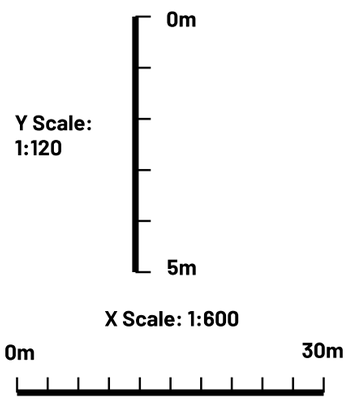
Torlesse™

ACE MEMBER

ENGINEERING NEW ZEALAND OFFICIAL MEMBER

Geological Section 06





Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 06

Project/Report No.:
T0793/04

Sketch ID:
GS6 of 6

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	23/09/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

LEGEND

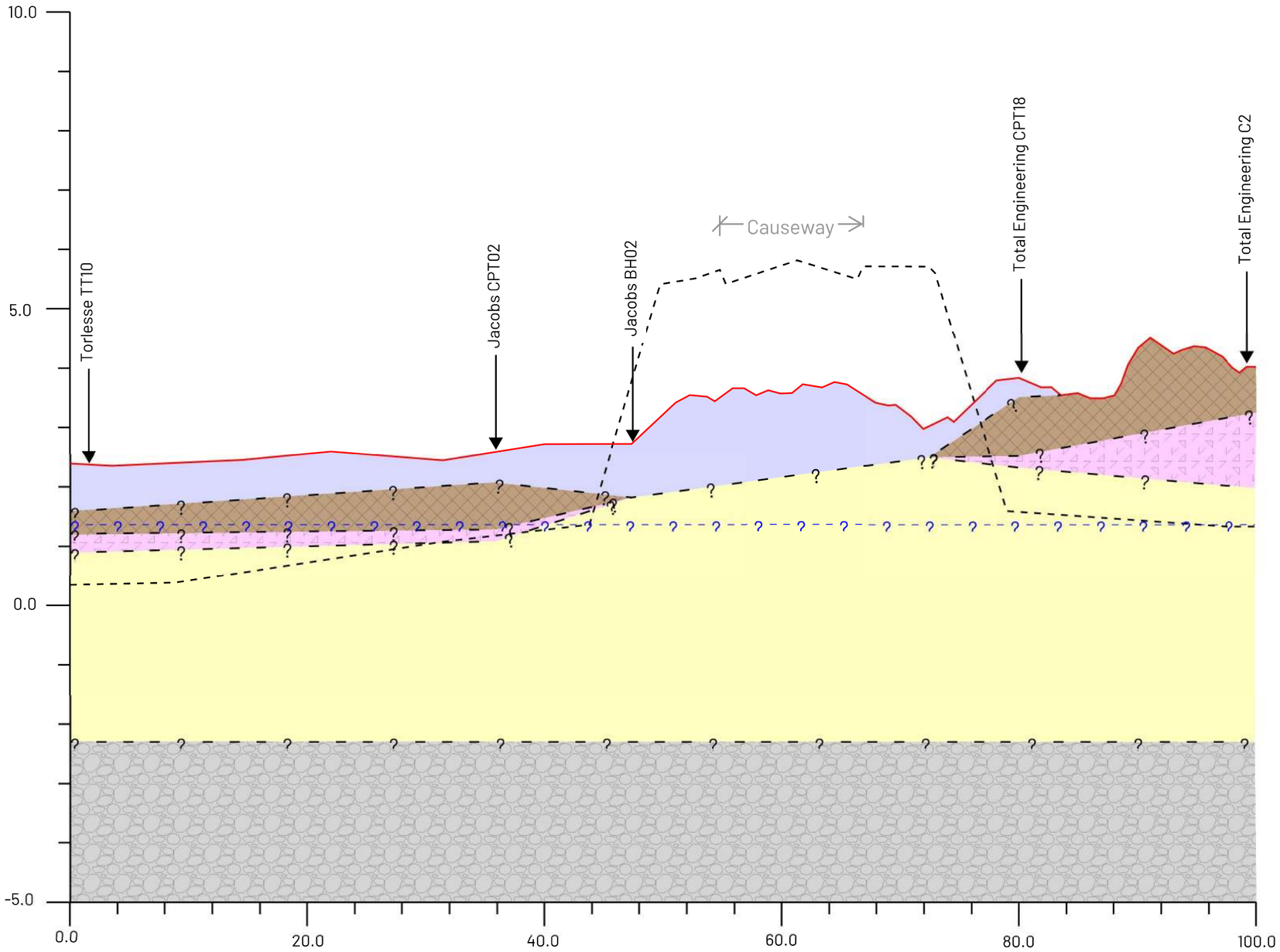
- Fibrous Peat
- Existing Fill
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

Torlesse™

ACE MEMBER

ENGINEERING NEW ZEALAND OFFICIAL MEMBER

Geological Section 07



Y Scale: 1:80

0m

3m

X Scale: 1:400

0m 20m

Client:
New Central Park Limited

Project Name:
Fast Track Submission Geotechnical Assessment Report

Site Location:
77 Kapiti Road, Paraparaumu, Kapiti

Sketch Title:
Geological Section 07

Project/Report No.:
T0793/04

Sketch ID:
GS7 of 7

Author:	Initials:
A Murali	AM

Checked By:	Initials:
J Spinks	JS

Ver.	Date	Status	Initials
A	16/10/26	For Information	AM

Notes:
1. Existing and proposed ground level obtained from DEM provided by Envelope on 17 September 2026.

LEGEND

- Fibrous Peat
- Silt
- Organic Sand
- Clean Sand
- Sandy Gravel
- Property Boundary
- Groundwater
- Existing Ground Level
- Proposed Ground Level

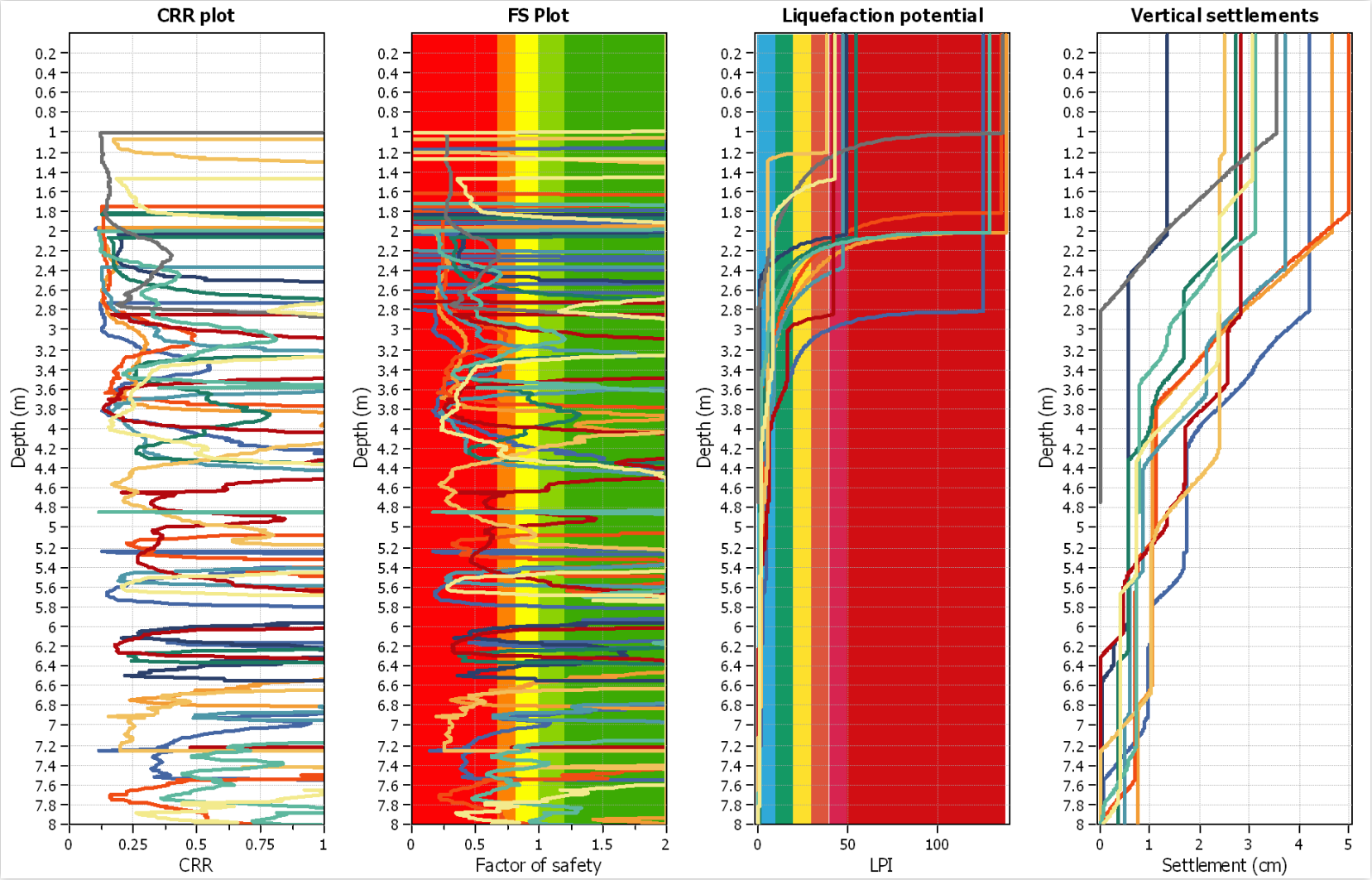
Torlesse™

ACE MEMBER

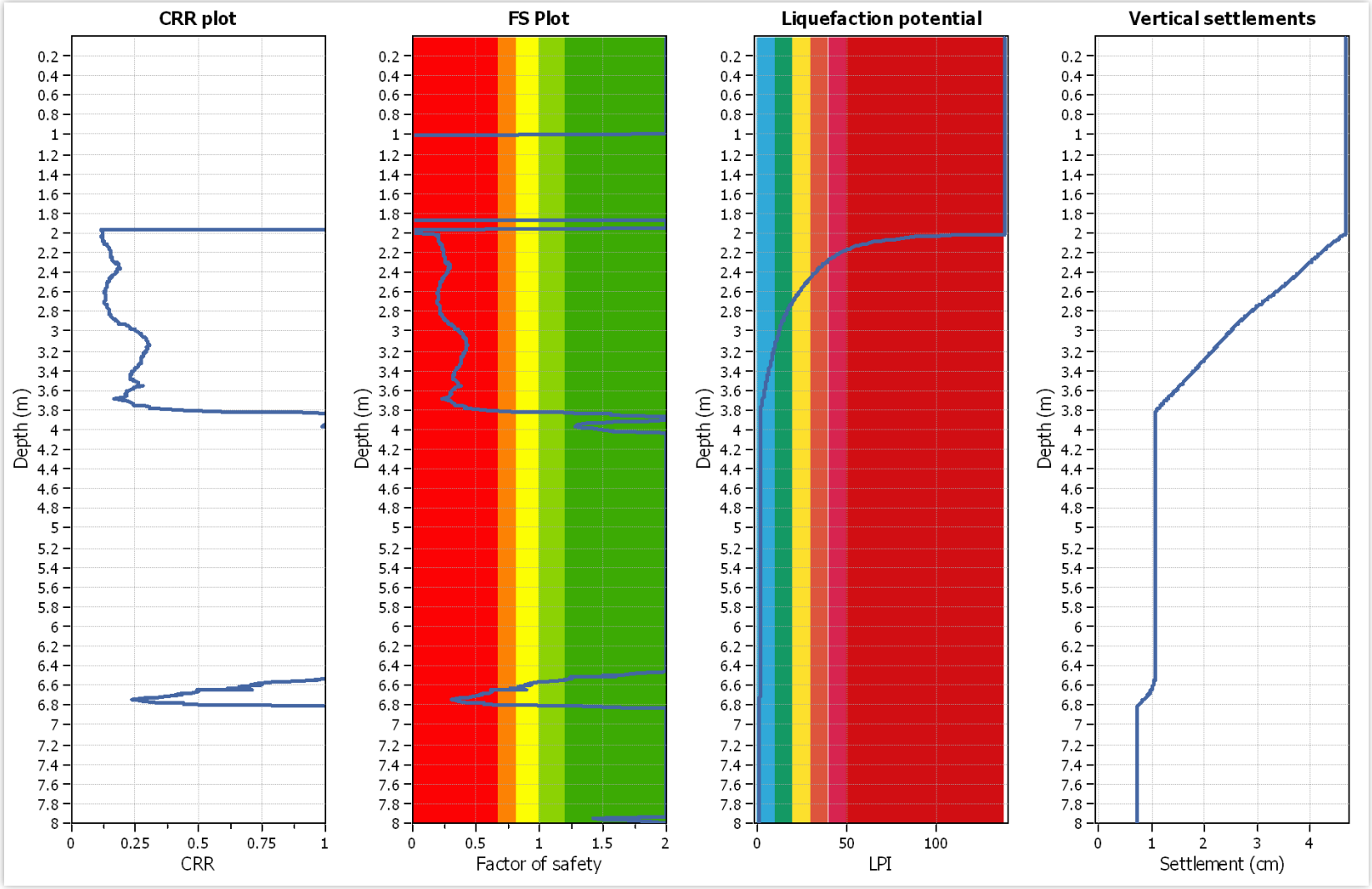
ENGINEERING NEW ZEALAND OFFICIAL MEMBER

APPENDIX E: CLIQ OUTPUTS

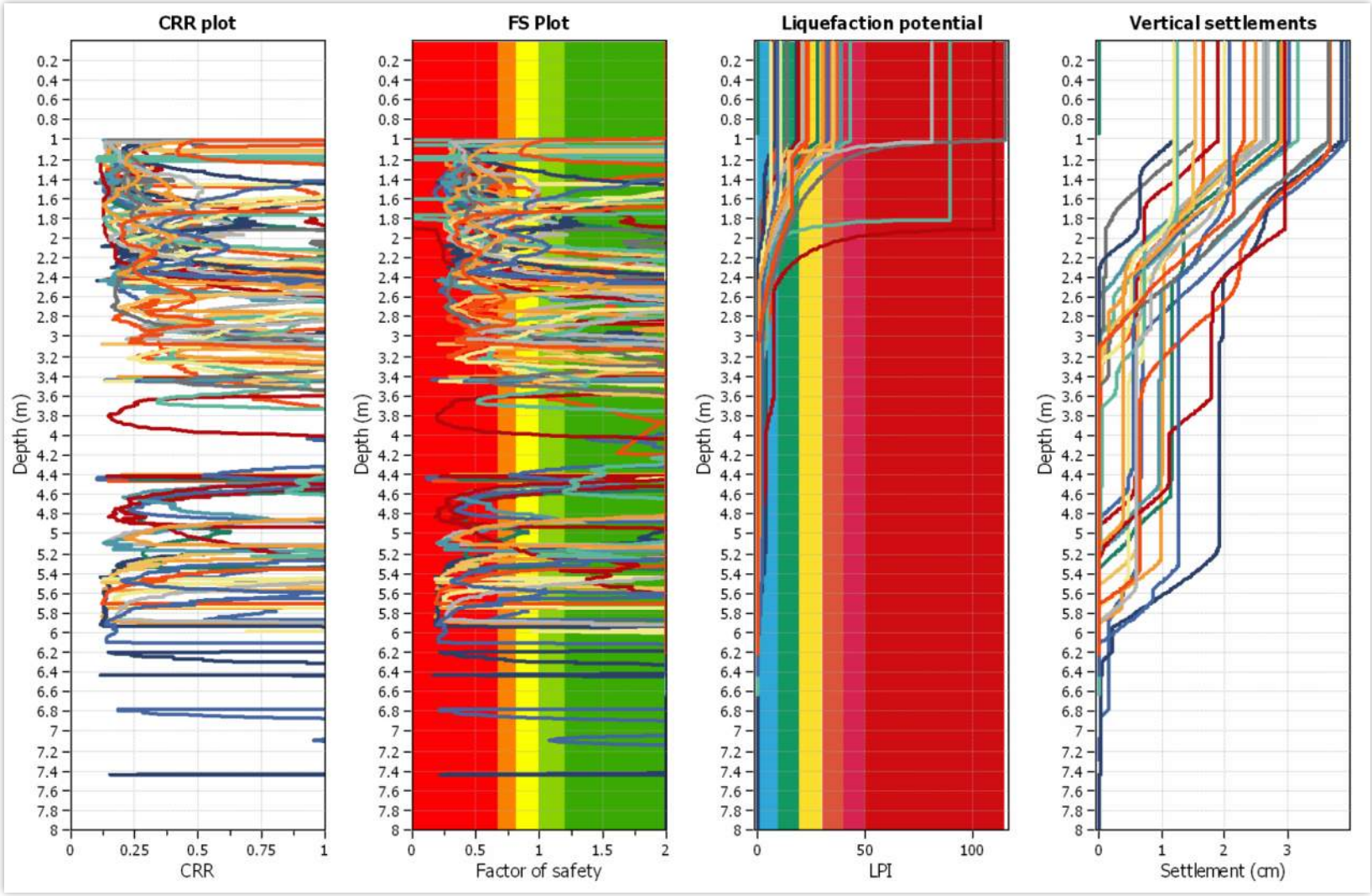
Region 1 Post Development – Liquefaction Outputs, ULS Seismic



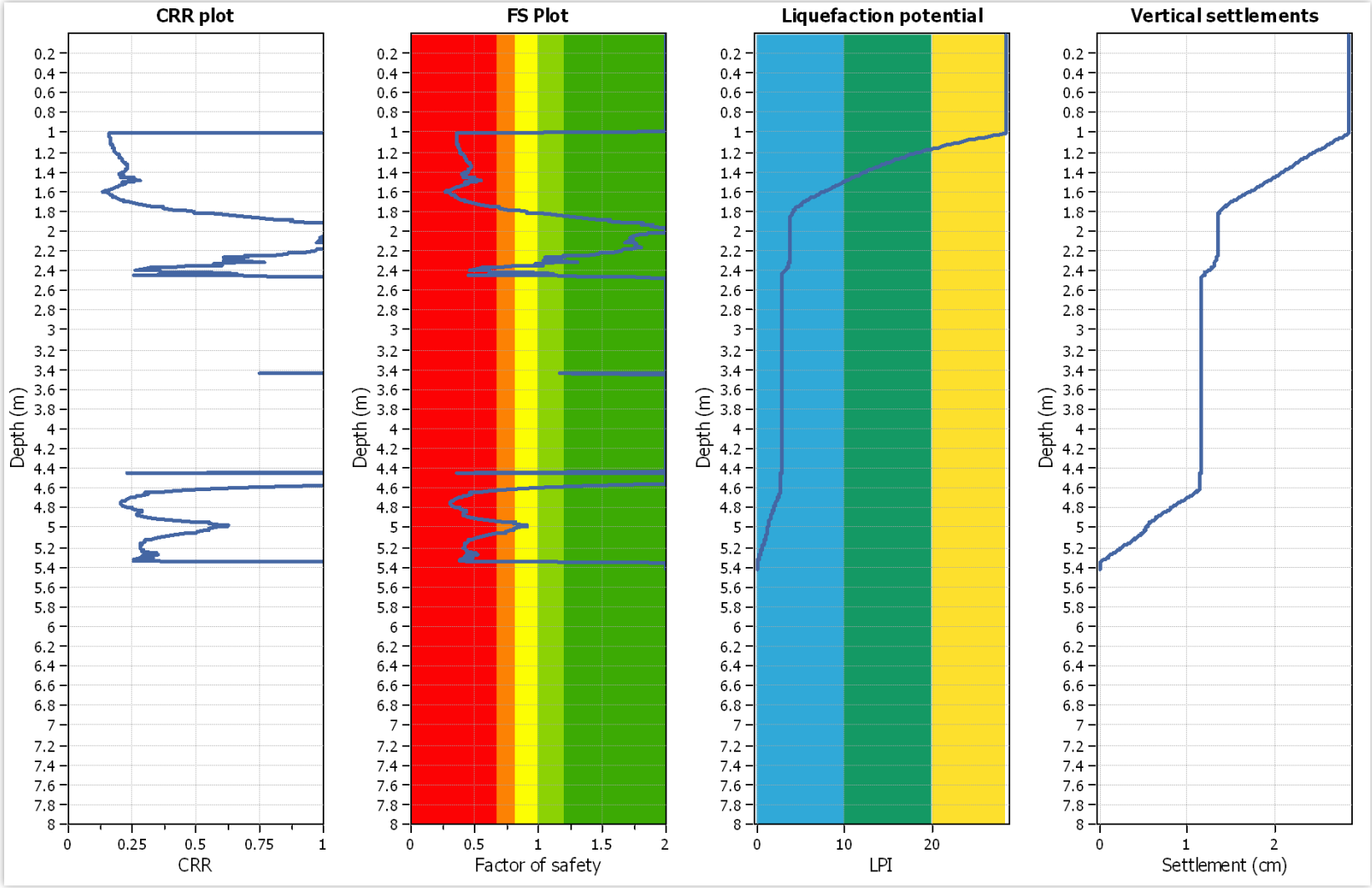
Typical more onerous example: TE-CPT06



Region 2 Post Development – Liquefaction Outputs, ULS Seismic



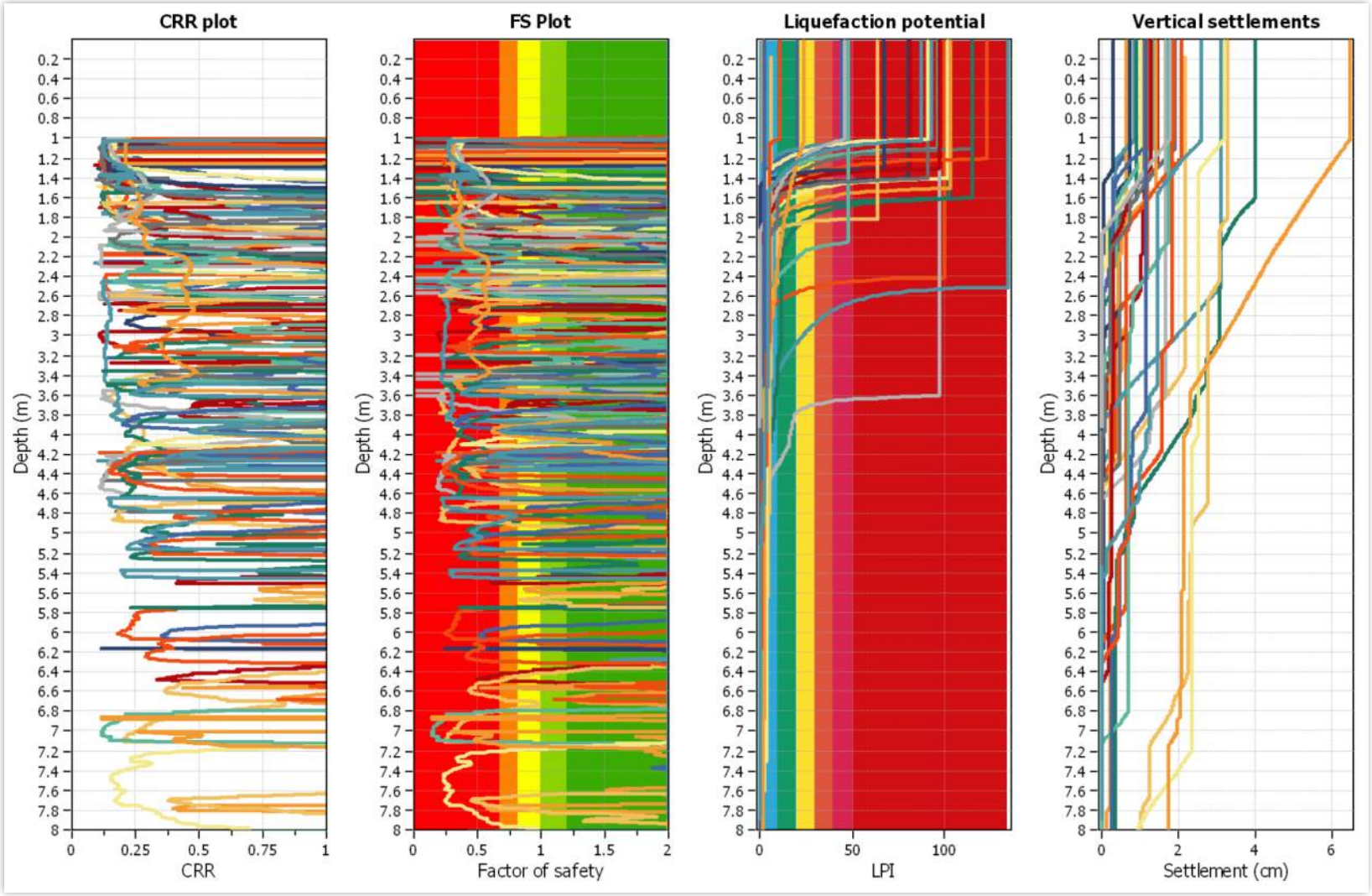
Typical more onerous example: Bunnings_CPT06



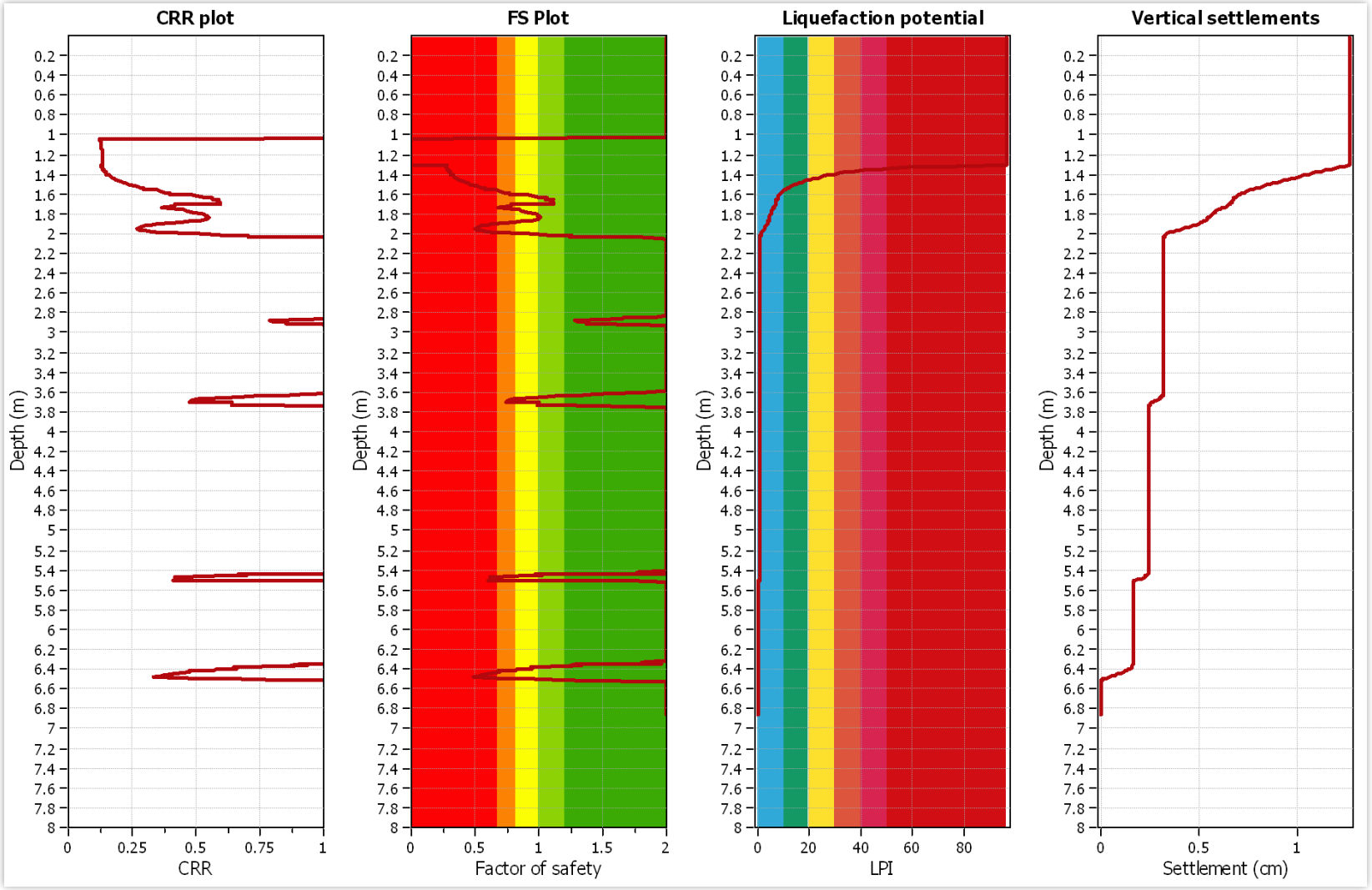
Region 3 Post Development – Liquefaction Outputs, ULS Seismic

Liquefaction risk is low.

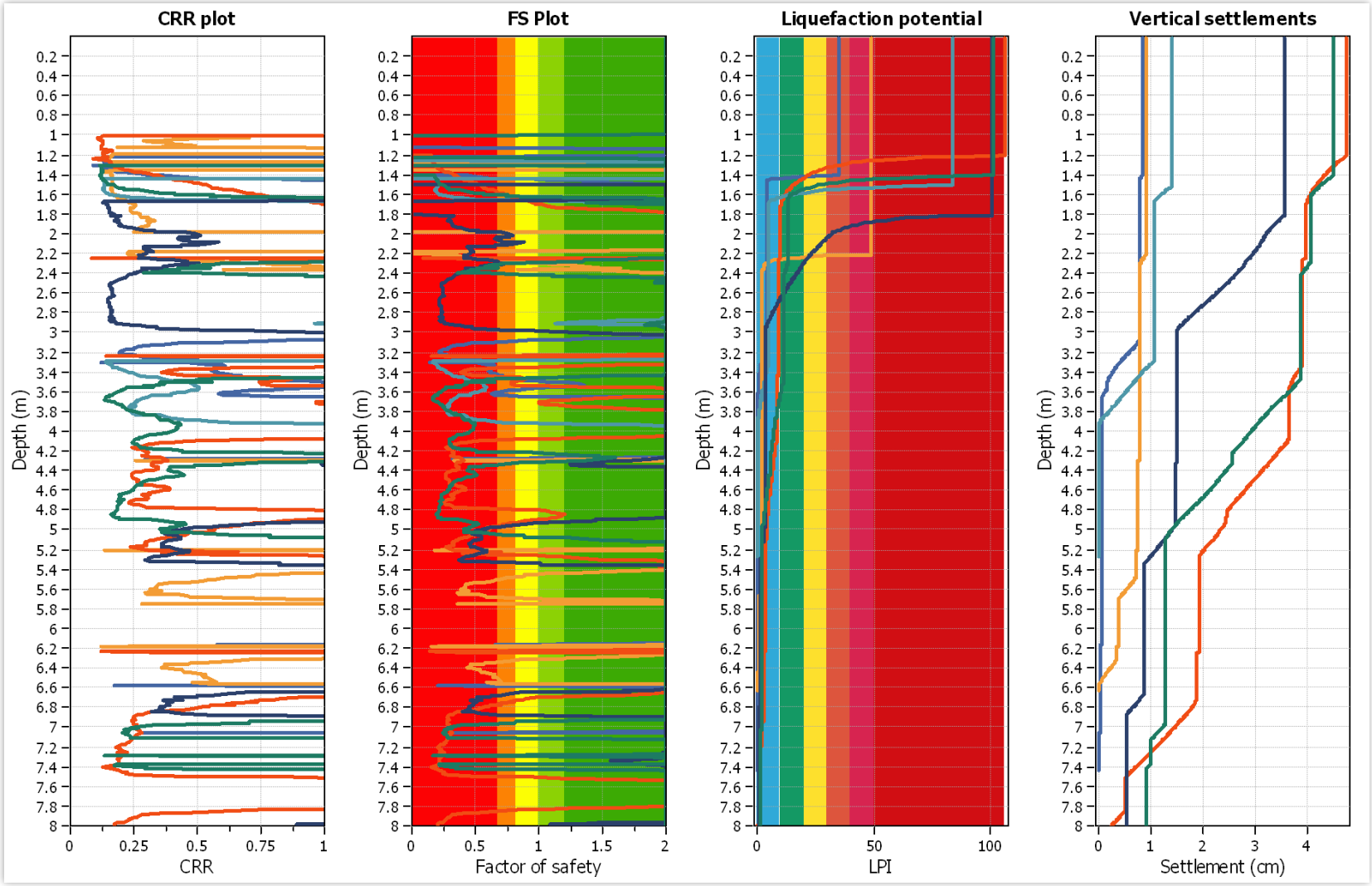
Region 4 Post Development– Liquefaction Outputs, ULS Seismic



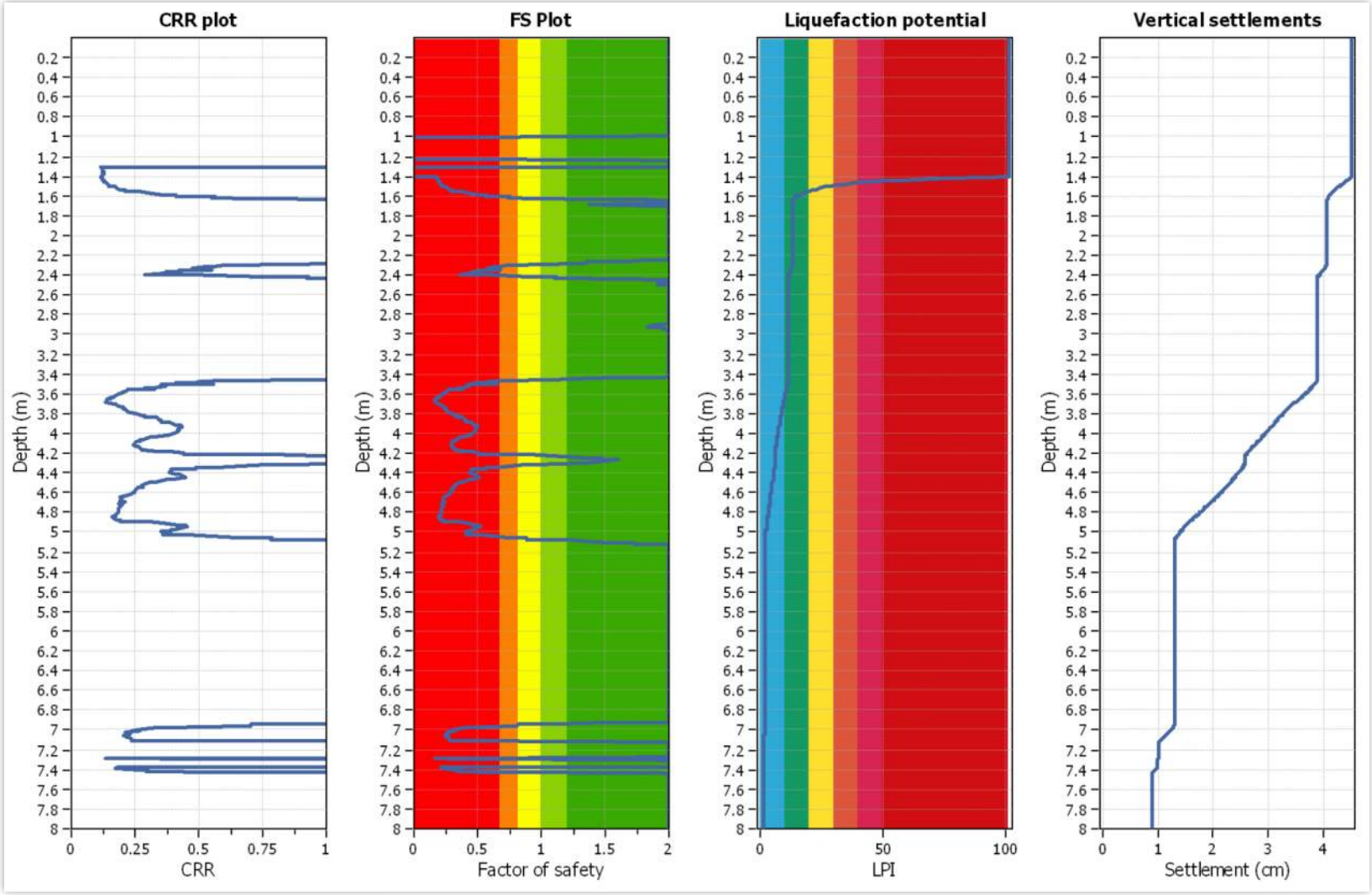
Typical more onerous example: TE_CPT15



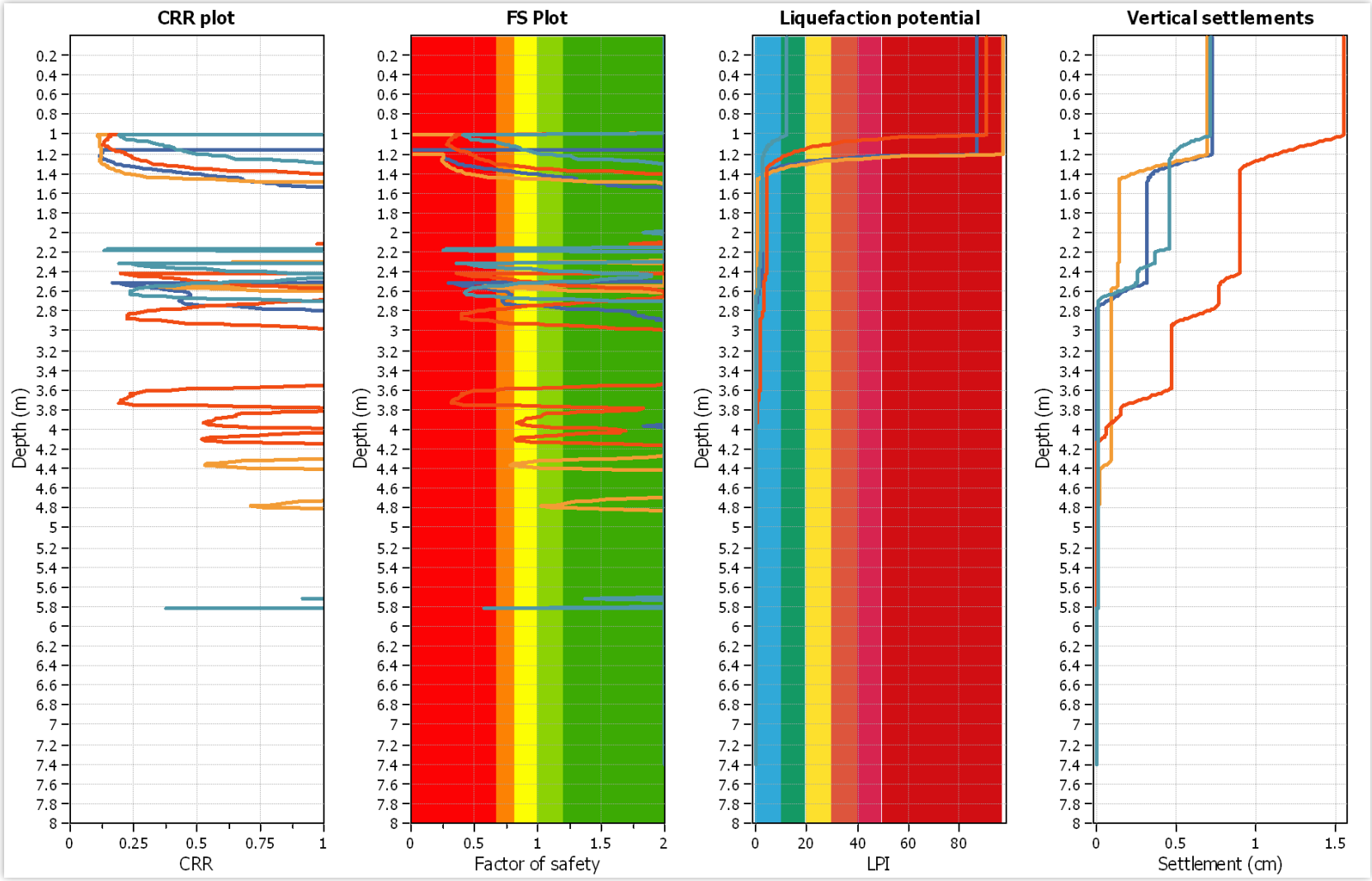
Region 5 Post Development – Liquefaction Outputs, ULS Seismic



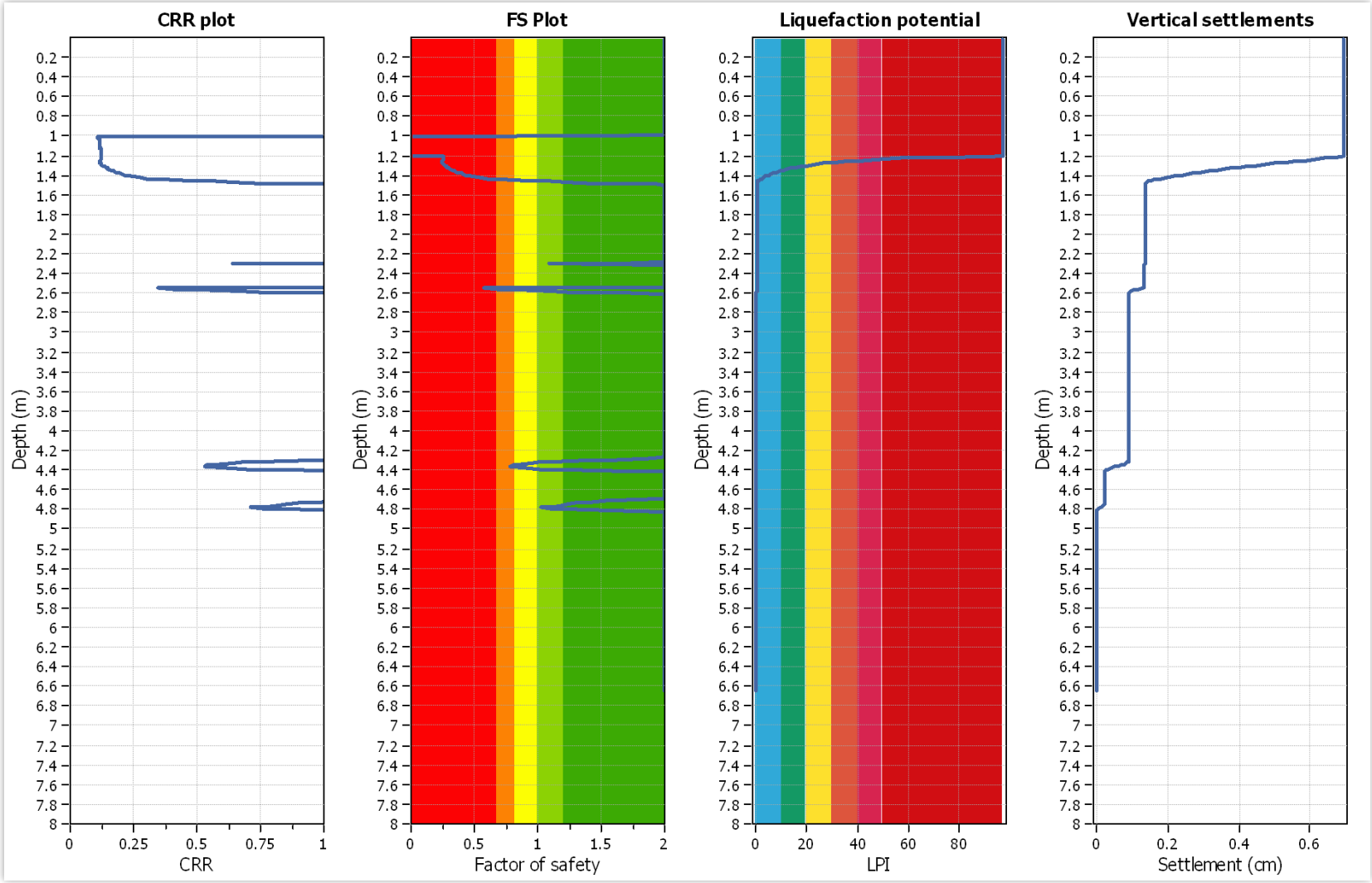
Typical more onerous example: TE_CPT20



Region 6 – Liquefaction Outputs, ULS Seismic



Typical more onerous example: FT-CPT10



APPENDIX F: SLOPE STABILITY ASSESSMENT

Soil parameters as follows:

Swale (GS 02)

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Clean Sand		20	Mohr-Coulomb	2	36
Sandy Gravel		21	Mohr-Coulomb	5	38
Site Won Fill		17	Mohr-Coulomb	0	34

Temporary Cut Adjacent to M2PP Expressway (GS 04)

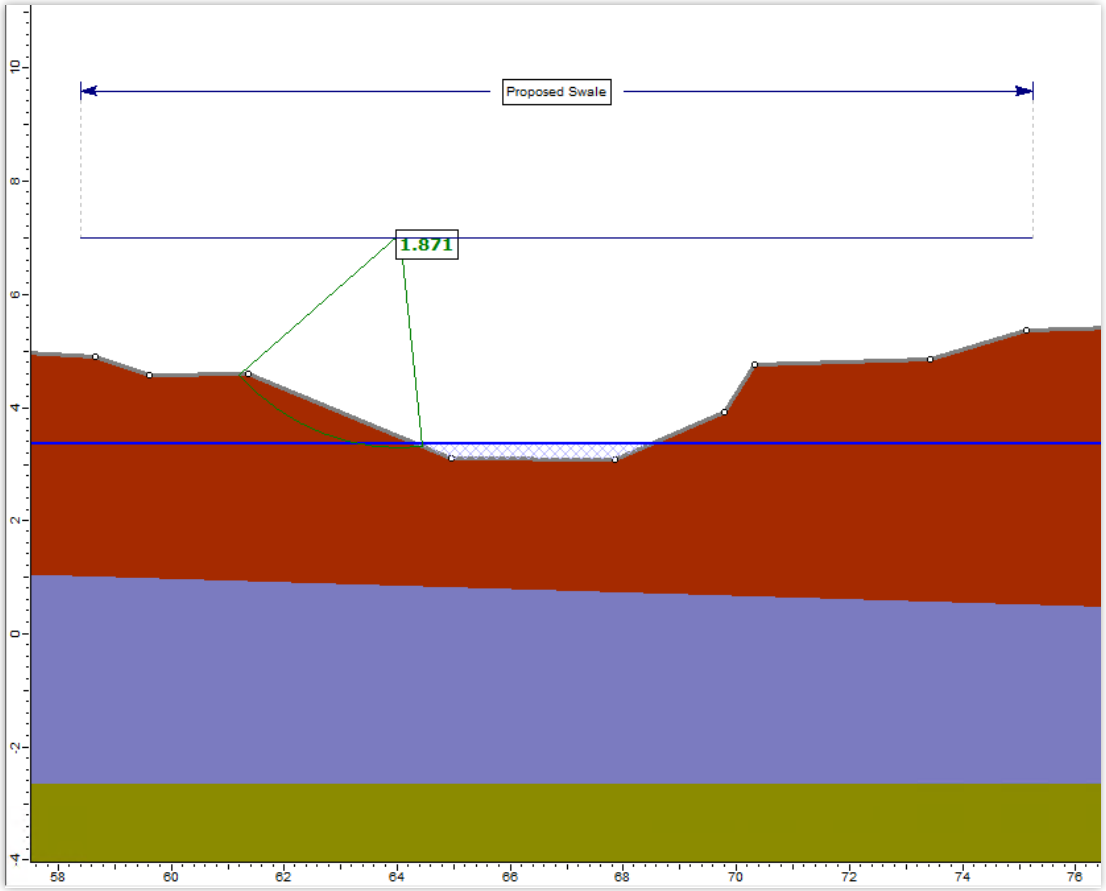
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Existing Fill		20	Mohr-Coulomb	5	30
Clean Sand		20	Mohr-Coulomb	2	36
Sandy Gravel		21	Mohr-Coulomb	5	36

Peat Bund (GS 05)

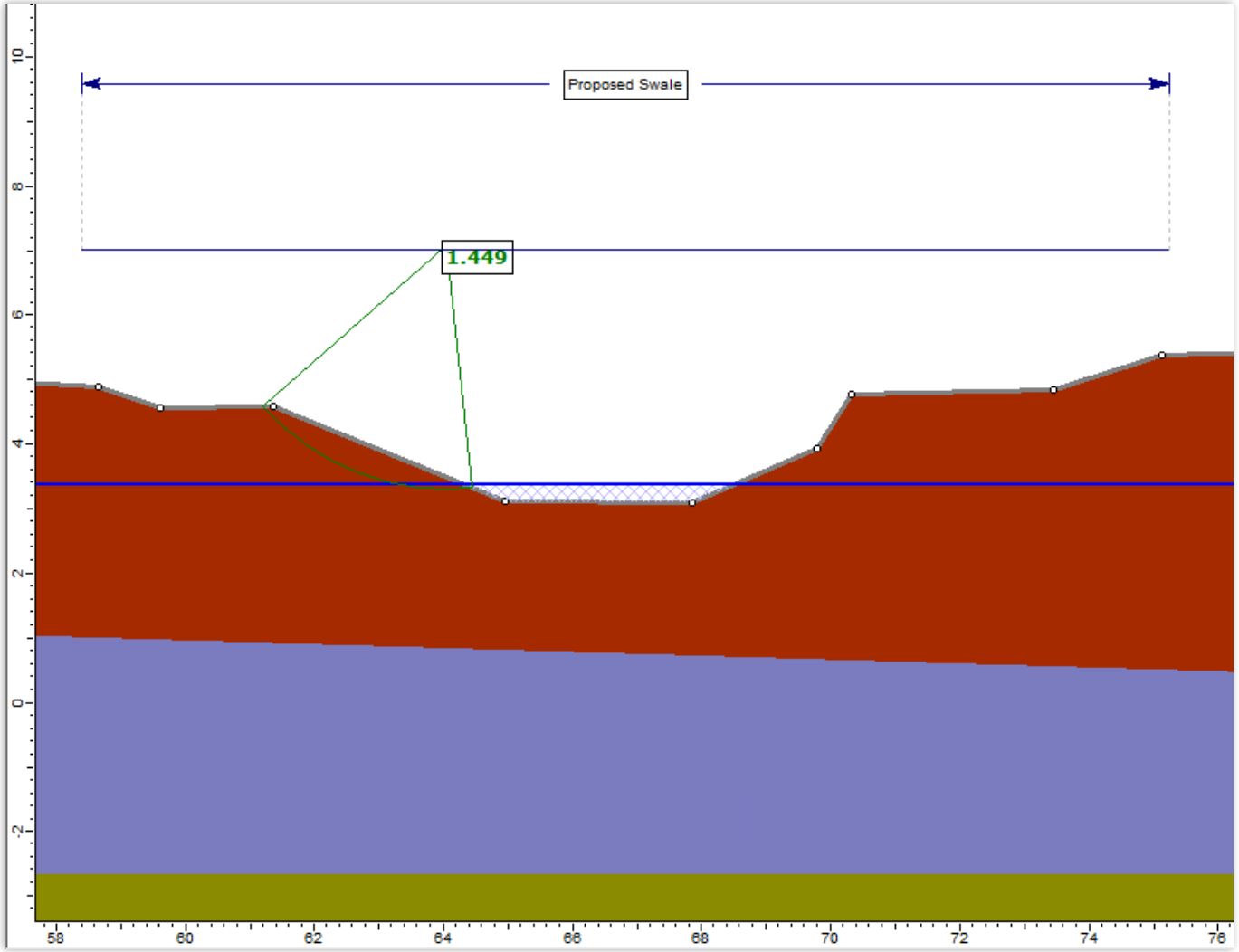
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Fibrous Peat		12	Mohr-Coulomb	1	26
Existing Fill		20	Mohr-Coulomb	5	30
Clean Sand		20	Mohr-Coulomb	2	36
Sandy Gravel		21	Mohr-Coulomb	5	38

Swale (GS 02)

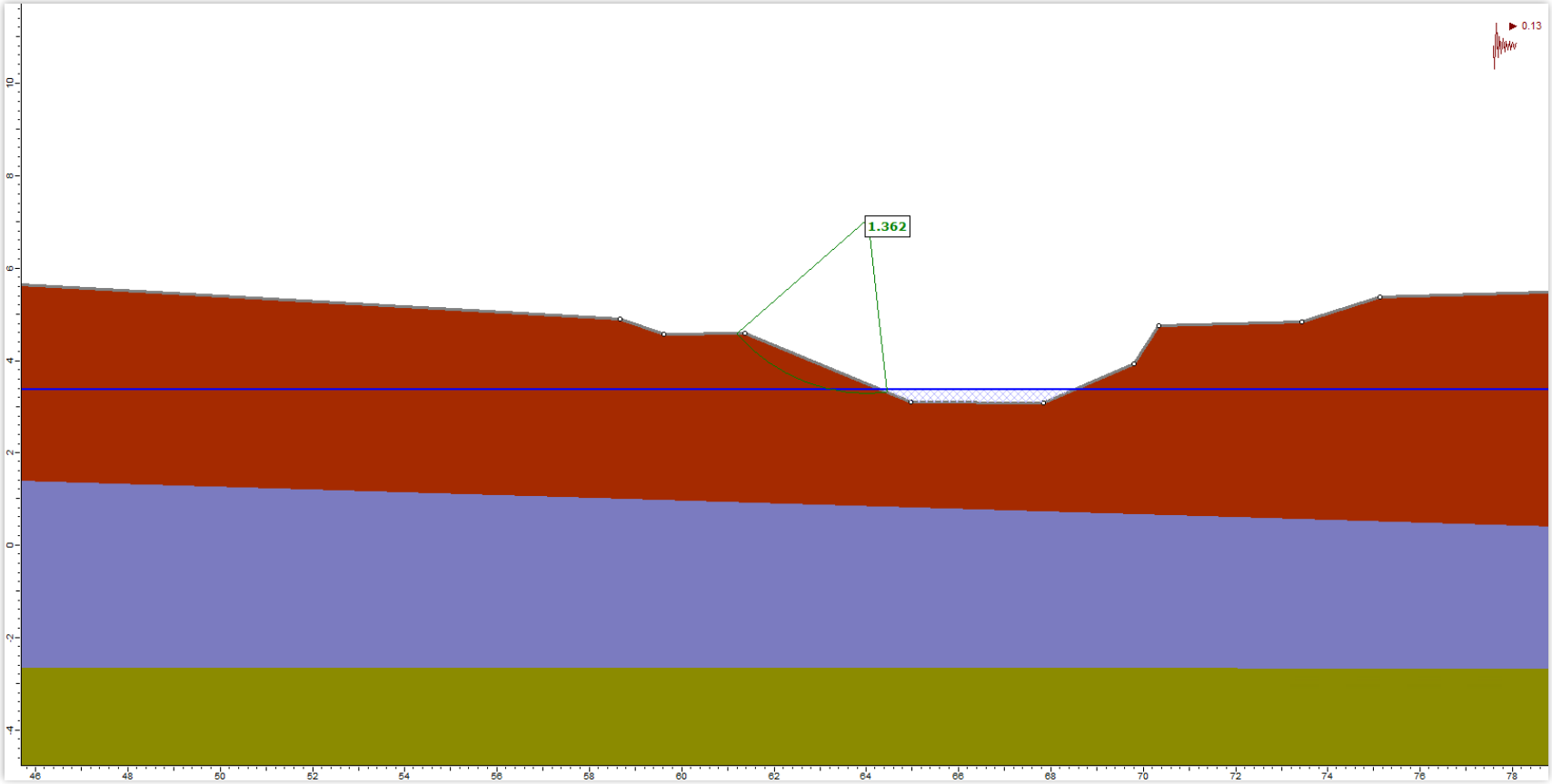
Static Long Term



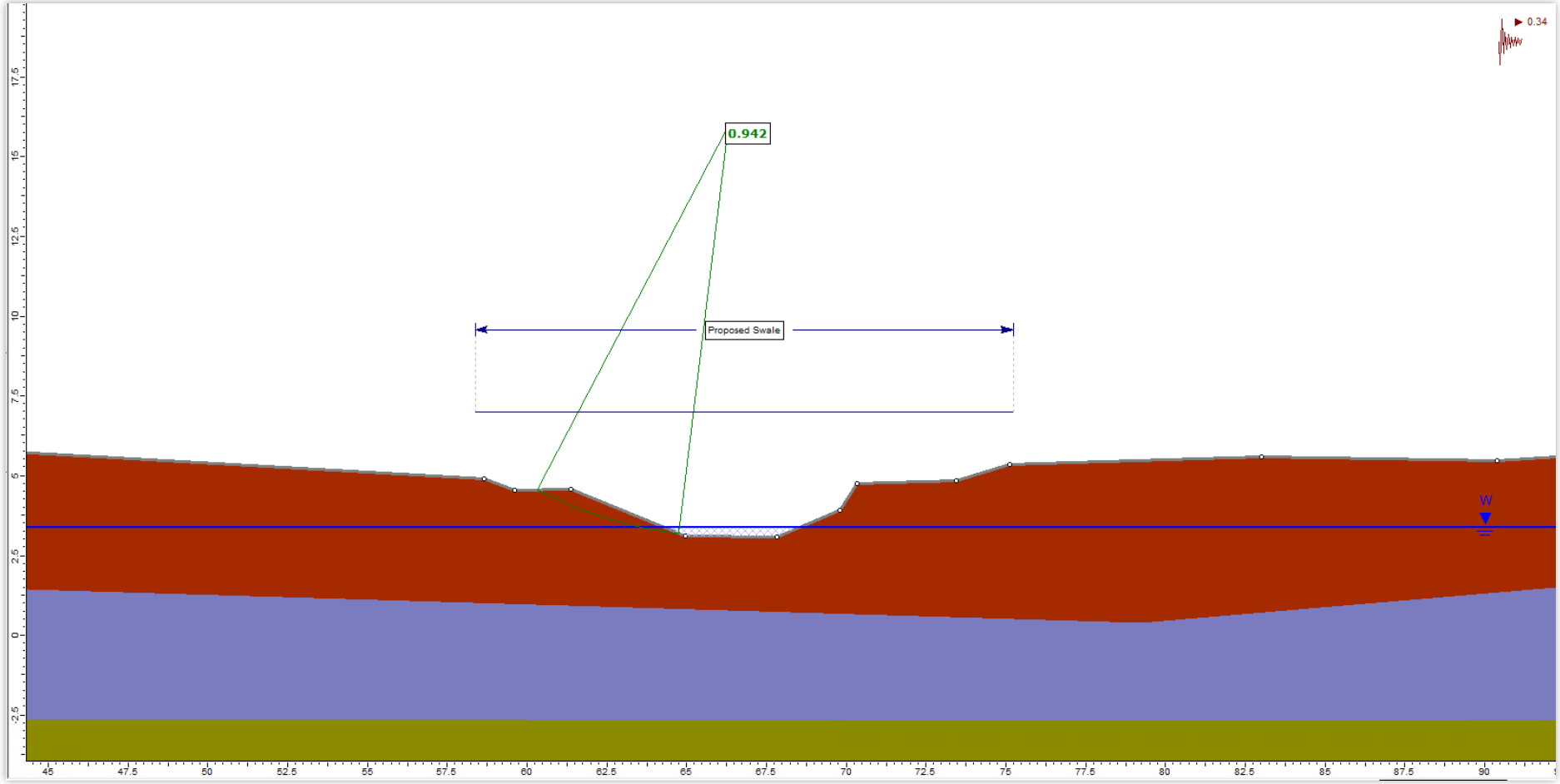
Short Term High Groundwater



Seismic SLS

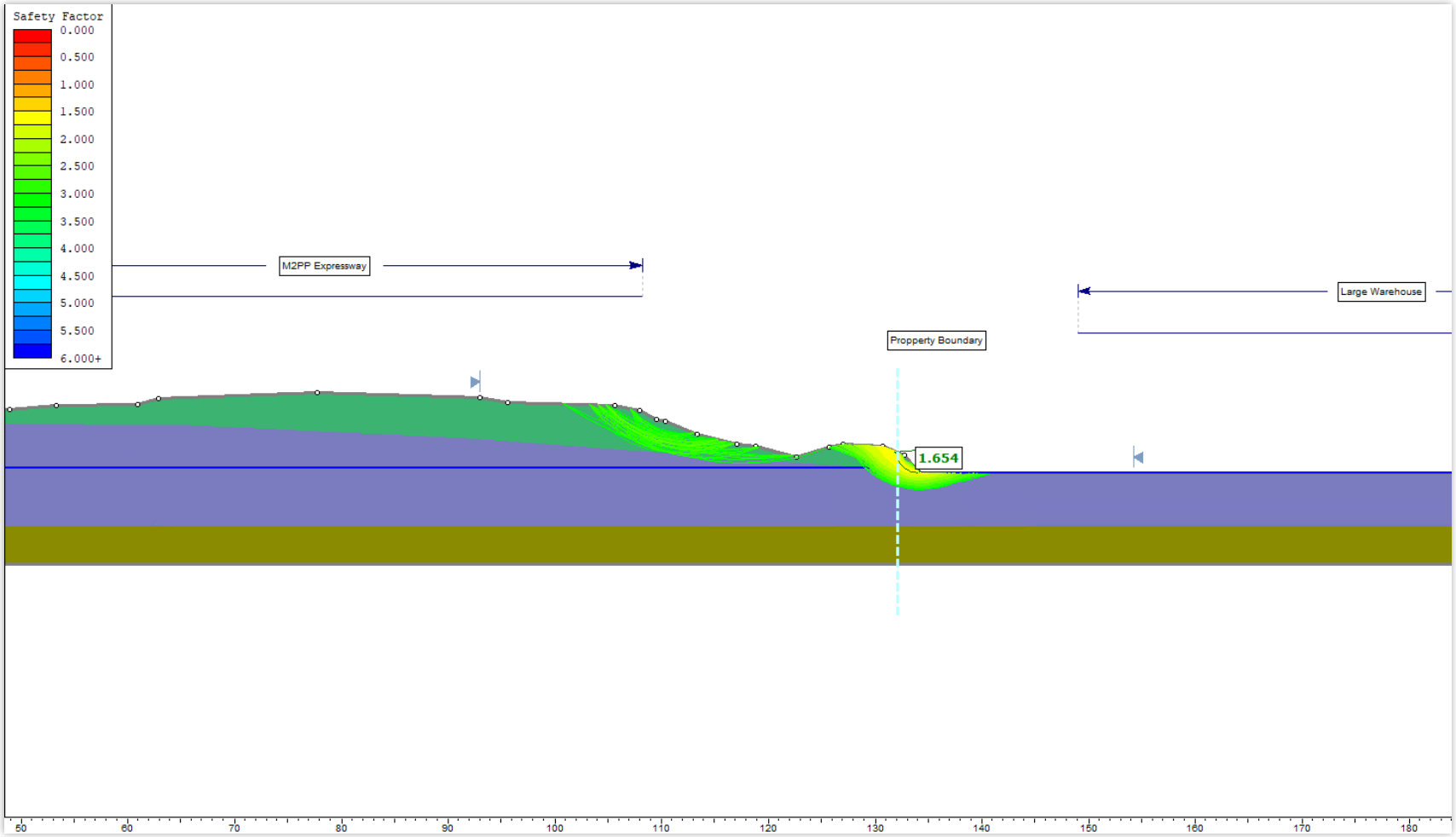


Seismic ULS


0.34
0.942
Proposed Swale
W
17.5
15
12.5
10
7.5
5
2.5
0
-2.5
45
47.5
50
52.5
55
57.5
60
62.5
65
67.5
70
72.5
75
77.5
80
82.5
85
87.5
90

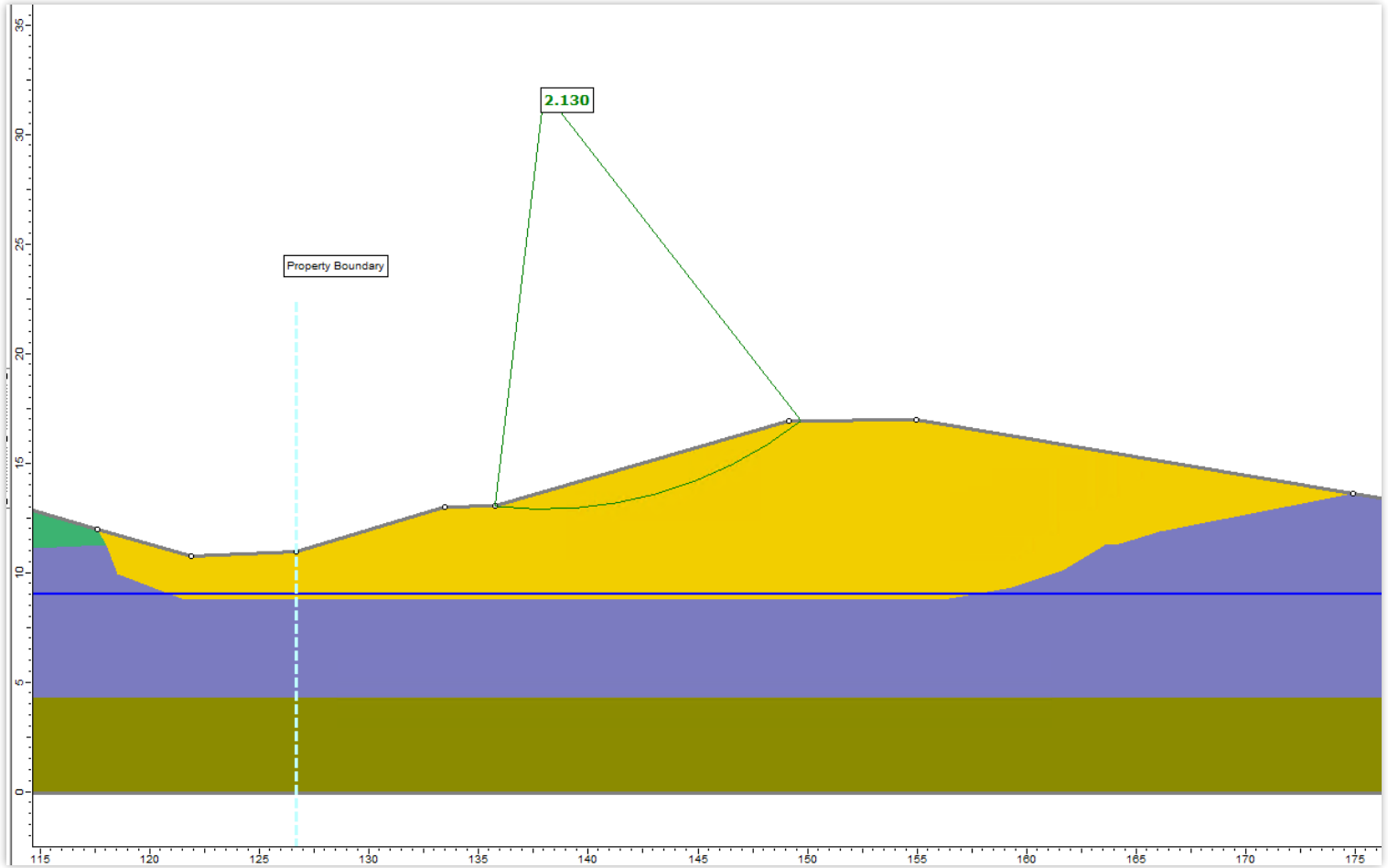
Temporary Cut Adjacent to M2PP Expressway (GS 04)

Temporary Conditions_Construction Phase

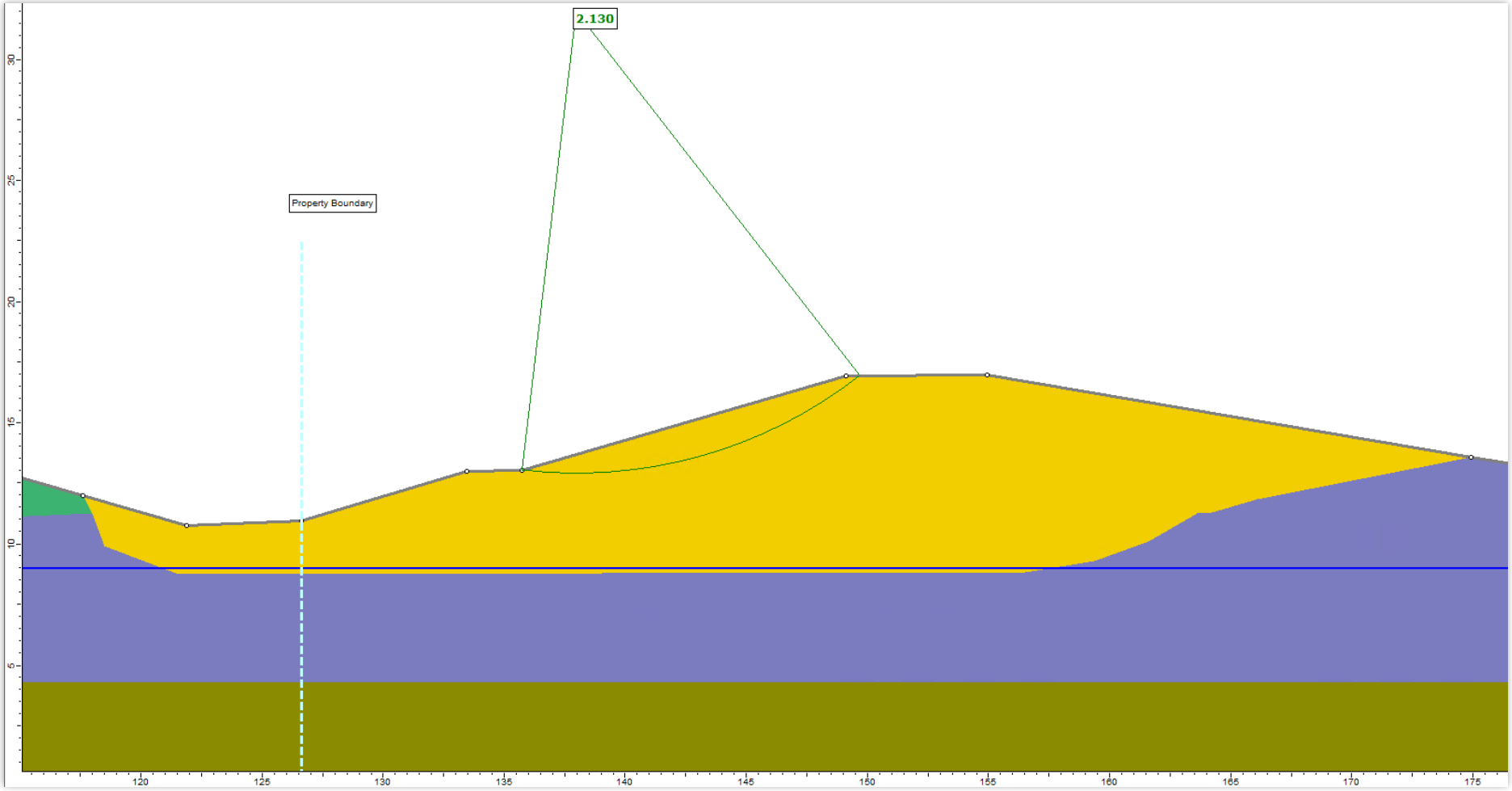


Peat Bund (GS 05)

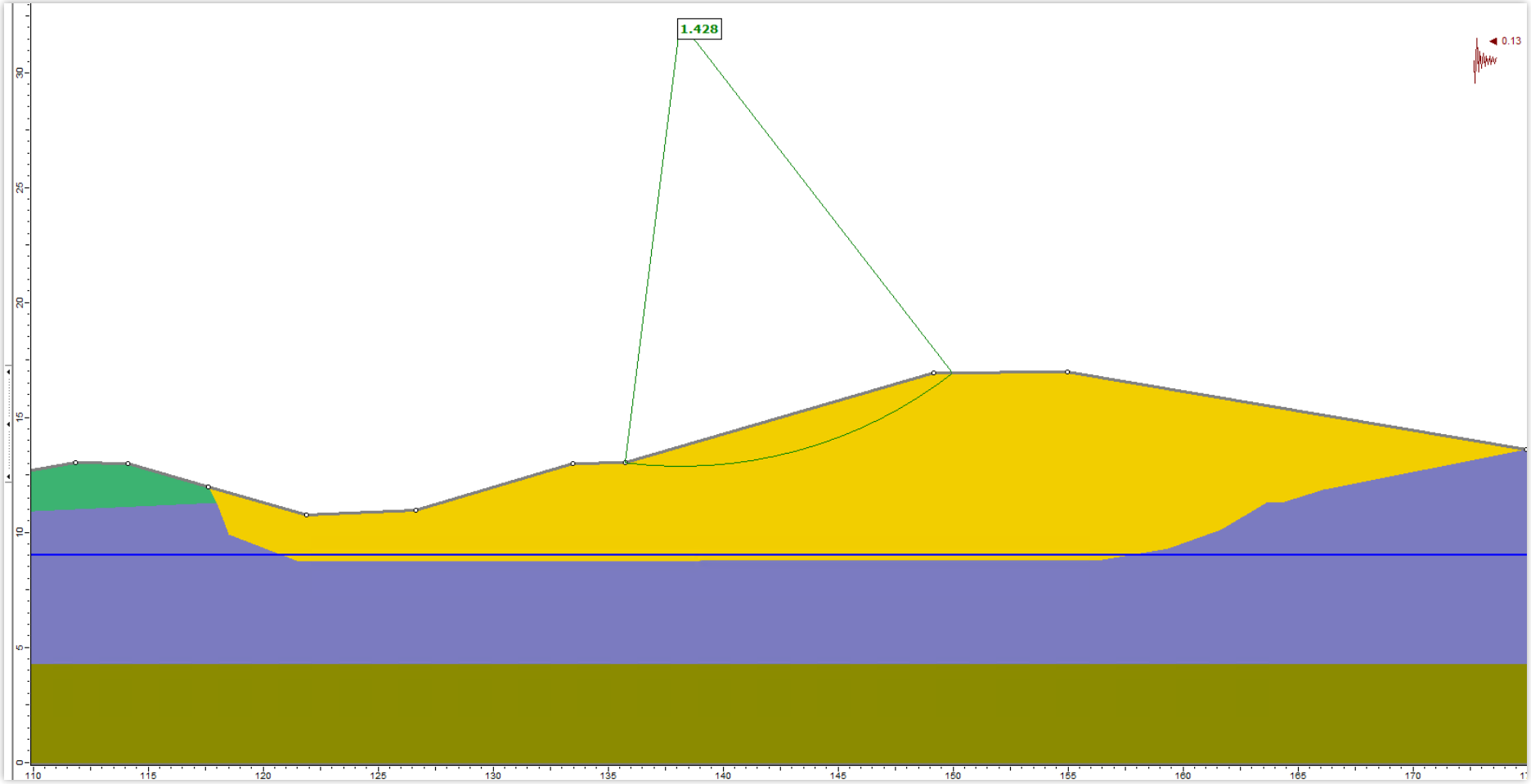
Static Long Term



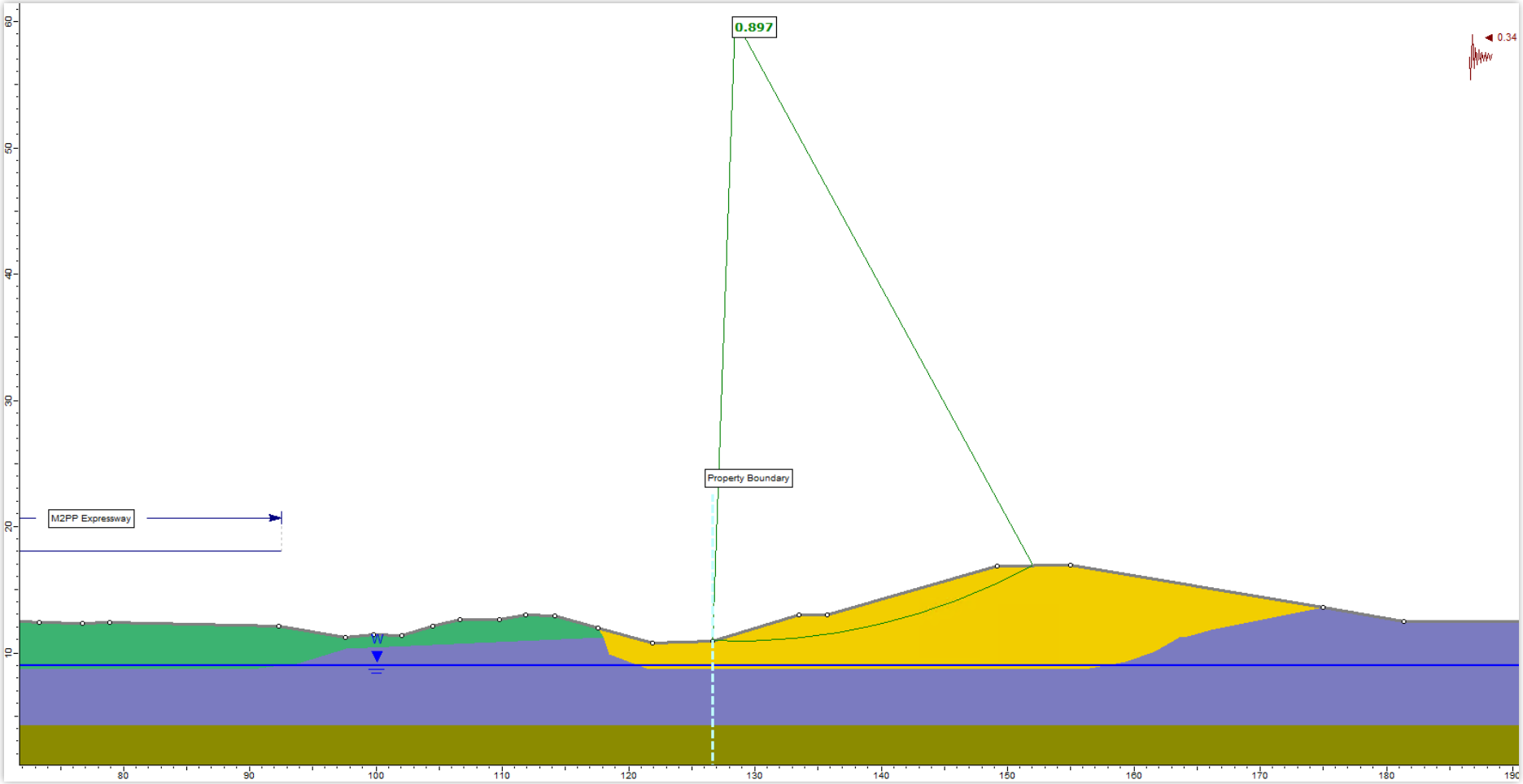
Short Term High Groundwater



Seismic SLS


1.428
0.13
0
5
10
15
20
25
30
110
115
120
125
130
135
140
145
150
155
160
165
170

Seismic ULS


0.897
0.34
Property Boundary
M2PP Expressway
60
50
40
30
20
10
80
90
100
110
120
130
140
150
160
170
180
190

APPENDIX G: WWLA PLANS

Refer to the WWLA report dated 22 October 2026.