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21 September 2026

Middle Road Residential Subdivision

Middle Road, Havelock North

GEOTECHNICAL INVESTIGATION REPORT

CDL Land New Zealand Ltd

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1.0 INTRODUCTION

CMW Geosciences (CMW) was engaged by CDL Land New Zealand Ltd (CDL) to carry out a geotechnical investigation and assessment for a proposed residential subdivision at 92, 108, 148 Middle Road and 139 Te Aute Road, Havelock North, known as the Middle Road Project. The subdivision will comprise 317 lots with associated roads, accessways, stormwater infrastructure, detention ponds and reserves. The total area of the site is approximately 30.6 hectares. CMW have previously completed a Preliminary Geotechnical Appraisal Report (PGAR) for the site[1].

The scope of work and associated terms and conditions of our engagement were detailed in our services proposal letter referenced NAP2025-0024AC, Rev 1 dated 6 May 2026.

The purpose of this report is to summarise the current and historic geotechnical investigations, ground conditions encountered and provide geotechnical recommendations for the proposed development, including foundation, road and stormwater pond and disposal recommendations to support CDL's submission of a Substantive Application for the Middle Road Project under the Fast-track Approvals Act 2024 (FTAA) to be lodged with the Environmental Protection Agency (EPA).

A statement of professional opinion is provided in ***Appendix B.***

2.0 STATEMENT OF QUALIFICATIONS AND EXPERIENCE

2.1 Izzy Atchley (Author)

I am a Senior Engineering Geologist at CMW Geosciences Ltd. (CMW). CMW is a specialised geotechnical consultancy specialising in geotechnical engineering, engineering geology, hydrogeology and geophysics throughout Australia and New Zealand. I have been employed at CMW since February 2022.

I hold the qualifications of Bachelor of Science in Geology, a Postgraduate Diploma in Engineering Geology and a Master of Engineering Management; all from the University of Canterbury, which I completed in 2016. I am a membership of the New Zealand Geotechnical Society and Engineering NZ.

I have 9 years of professional experience in geotechnical consulting, including working on a range of development projects. My experience includes planning, scoping, managing and undertaking a variety of ground investigations for medium to large scale developments, construction monitoring and quality assurance, geotechnical analysis and reporting.

I confirm that, in my capacity as author of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

2.2 Tom Bunny (Project Principal / Reviewer)

I am an Associate Geotechnical Engineer at CMW Geosciences Ltd. (CMW). CMW is a specialised geotechnical consultancy specialising in geotechnical engineering, engineering geology, hydrogeology and geophysics throughout Australia and New Zealand. I have been employed at CMW since June 2025.

I hold the qualifications of Bachelor of Science in Geology, a Postgraduate Diploma in Engineering Geology, both from the University of Canterbury which I completed in 2002. I am a Chartered Professional Engineer (CPEng) and Chartered Member of Engineering New Zealand (CMEngNZ).

I have 23 years of professional experience in geotechnical consulting, including 10 years in Hawkes Bay. My experience includes project management, site investigation, assessment, geotechnical design and

[1] CMW PGAR, Proposed Residential Subdivision, Middle Road, Havelock North. Ref NAP2025-0024AB Rev 3, dated 2 April 2026

construction verification. I have experience in land development for Plan Change and providing geotechnical support for Resource and Building Consent.

I confirm that, in my capacity as reviewer of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses Practice Note 2023.

2.3 Robert Taylor (Report Reviewer)

I am a Principal Geotechnical Engineer at CMW Geosciences (CMW). CMW is a specialist geotechnical consultancy delivering first-class geotechnical engineering, engineering geology, hydrogeology and geophysics throughout Australia and New Zealand. I have been employed at CMW since February 2016.

I hold the qualification of a Bachelor of Earth Science, a Bachelor of Civil Engineering with honours and a Master of Engineering Science (Geotechnical) from the University of Waikato (2005), the University of Southern Queensland (2014) and the University of New South Wales (2019) respectively. I am a Chartered Professional Engineer (CPEng) in the field of Geotechnical Engineering, Chartered Member of the Engineering New Zealand (CMEng), a member of New Zealand Geotechnical Society (NZGS), a member of the International Society for Soil Mechanics and Geotechnical Engineering (ISSMGE) and a member of New Zealand Society on Large Dams (NZSOLD).

I have 20 years of professional experience investigating ground conditions across Australia and New Zealand and implementing practical design solutions for a multitude of projects. I have considerable experience in soft soil engineering and liquefiable soils.

I confirm that, in my capacity as an independent reviewer of this report, I have read and abide by the Environment Court of New Zealand's Code of Conduct for Expert Witness Practice Note 2023.

3.0 SITE DESCRIPTION

3.1 General

The application is for 92, 108, 148 Middle Road and 139 Te Aute Road in Havelock North. The site is held in five separate titles and consists of a combined area of approximately 30.6ha. The site is relatively flat and currently used for rural residential and grazing purposes with four existing dwellings. **Figure 1** shows the site extent within the context of Havelock North.



Figure 1: Middle Road Site Location

The site occupies the southwest side of Havelock North, approximately 900m south of the town centre. The wider land uses to the north and east of the site are predominantly suburban residential in character, with a retirement village to the northwest and larger rural landholdings to the southwest.

The Planning Report and other technical assessments prepared to support the substantive application under the FTAA provides a comprehensive description of the site and its context. With respect to matters relating to Geotechnical Engineering the following comments in Section 3.2 - 3.3 are made about the site and surrounds.

3.2 Landform

The current general landform, together with associated features located within and adjacent to the site is presented on the attached Geotechnical Investigation Plan as shown in ***Drawing 01.***

With reference to the most recent Land Information New Zealand (LINZ) 1m DEM[2], the site is generally flat but gently slopes towards the northeast with levels ranging from approximately RL 10.5m to 8.5m (NZVD2016). The lowest point on site is the central drain with an RL of approximately 7.5m which discharges into Herehere Stream.

The Herehere Stream is located along the northeastern boundary of the site, at approximately RL6.0m. This stream is channelised and up to 2m to 3m deep in places. The Karamu Stream is located approximately 150m northwest of the site at approximately RL5.0m.

The landuse is currently agricultural and horticultural. The property at 148 Middle Road has undergone previous consented earthworks associated with CDL's Iona Development. This includes raising the area by placing fill, temporary stockpiles and the construction of a stormwater basin to service that development.

The landform beyond the site to the north, northeast and west are generally flat at similar grades to the proposed development. To the immediate east/ southeast the site grades moderately upward reaching a

[2] https://data.linz.govt.nz/

maximum RL of approximately RL25m adjacent to Iona Road, approximately 500m from the site. The landform continues to grade upwards beyond this.

3.3 Site History

Based on our review of the historic aerial imagery[3], the landform appears to have undergone minor modifications, with the following land changes noted:

- 1949 (earliest available image): The majority of the site and immediate surrounding area appears to be in orchard with the surrounding area to the west being pastural. The dwellings at 92 and 148 Middle Road appear to be present.
- 1964: The majority of the site appears to be in pasture.
- 1994: Little change to the direct site, the majority of the site in still in pasture and the dwellings at 92 and 148 Middle Road are still present. Residential development to the east and south has increased.
- 2003: The dwelling at 139 Te Aute Road has been constructed and the site is used for orcharding. The rest of the site is in pasture. More intensive residential development to the east and south of the site has taken place.
- 2025-2026: Consented earthworks being undertaken at 148 Middle Road including placing fill material, construction of a detention basin and stockpiling for the CDL construction site across the road.

4.0 DEVELOPMENT DESCRIPTION

The proposed Middle Road residential subdivision will enable the development of approximately 317 lots. The intended subdivision layout will provide for a range of lot sizes to enable conventional residential development along with medium density development opportunities. A masterplan has been prepared to inform the substantive application and is provided as **Figure 2**. The development is supported by a suite of technical assessments addressing key environmental matters, including infrastructure, stormwater, geotechnical, groundwater, landscape, transport, ecology, contamination, productive land, noise, archaeology and urban design.

The Middle Road Project will be developed in two phases:

- **Phase 1 – Land Development:** CDL will undertake the subdivision, bulk earthworks, infrastructure, roads, stormwater works, reserves, landscaping and creation of the residential lots.
- **Phase 2 – Dwelling Construction:** CDL's build partners and future landowners will construct dwellings and associated site works in accordance with the consent notices applying the relevant Havelock North General Residential Zone or Medium Density Residential Zone provisions.

A full description of the Middle Road Project is provided in the Planning Report submitted in support of the Substantive Application. A copy of proposed development plan and earthworks plan is provided in ***Appendix C.***

[3] https://retrolens.co.nz/ & Google Earth Pro



Figure 2: Concept Plan

The development details, as relevant to geotechnical considerations, are summarised as follows:

- Provided earthwork plans show that the cut-to-fill earthworks are proposed with fills of between approximately 1m and up to 2.5m thick.
- Stormwater dry basins are proposed towards the northern, centre and southern ends of the site (refer to Figure 2), covering an area of approximately 7.5 hectares. Concentrated stormwater flows from roads, and future lots will be attenuated before being discharged. The stormwater basins are likely to be formed predominately in cut with minor embankment fill required to top-up embankment heights with batters up to 1(V):3(H).
- Wastewater will be connected to the existing reticulated council public network. A new wastewater pump station will be constructed in the central part of the development.
- Modification to the southwestern bank of the Herehere Stream to ease the bank grades to a batter of 1(V):3(H).

5.0 FIELD INVESTIGATIONS

5.1 Previous Investigations

WSP and CMW have previously completed geotechnical investigations near the site with the results presented in the following reports:

- WSP, Iona Road and Middle Road Subdivision, Geotechnical Due Diligence Report (ref. 2-S5334.02/20/01 Rev 0, dated 17 November 2020)
- CMW, Preliminary Geotechnical Appraisal Report, 139 Te Aute Road, Havelock North (ref. NAP2024-0002AD Rev 0, dated 31 July 2024)

From those reports, the following geotechnical investigations were undertaken directly at the site:

- 10 Cone Penetrometer Tests and twinned Test Pits across the entire site (WSP 2020)
- 3 Cone Penetrometer Tests with twinned hand auger tests at 139 Te Aute Road (CMW 2024)

The approximate locations of the relevant investigation referred to above are shown on ***Drawing 01***, and a copy of the investigation logs are presented in ***Appendix D*** and referenced throughout this report.

5.2 CMW Investigations

CMW field investigations were carried out between 25 May and 27 May 2026 in general accordance with the NZGS specifications[4] and logged in accordance with NZGS guidance[5]. The scope of fieldwork completed was as follows:

- A site walkover by a CMW Engineering Geologist to assess the general landform and site conditions.
- Ten Test Pits, denoted as TP01 to TP10, were excavated using a 10-tonne machine excavator to a target depth of 4.0m below existing ground levels. Engineering logs of the test pit, together with peak and remoulded vane shear strengths, are presented in ***Appendix D.***
- Three machine boreholes, denoted MH01 to MH03, were drilled using sonic drilling to depths of 6.45m. Standpipe piezometers were installed in all three machine boreholes and comprised a 50mm PVC pipe to 6m depth, with a slotted screen depth between 3m and 6m. Machine borehole logs are presented in ***Appendix D.***
- Ten Cone Penetrometer tests (CPT), denoted CPT01 to CPT10, were advanced to depths ranging between 9.77m and 15.04m to define the ground model and assist with settlement and liquefaction analysis. CPT test results are presented as traces of tip resistance (qc), friction resistance (fs), friction ratio and porewater pressure (u) are presented in ***Appendix D.***
- One hand auger borehole, denoted HA01 was drilled using a 50mm diameter auger to 2.5m below existing ground level to visually observe the near-surface soil profile and to facilitate in-situ vane shear strength testing. A hand auger was undertaken in place of the proposed Test Pit at this location due to the excavator being unable to access this area. The hand auger borehole refused at 2.5m due to hole collapse caused by the high groundwater level. The engineering logs of the hand auger borehole, together with peak and remoulded vane shear strengths, is presented in ***Appendix D.***
- Dynamic cone penetrometer (DCP) tests were carried out adjacent to each of the test pits and hand auger boreholes to provide soil density profiles. Graphical results of the DCP testing are presented on the engineering logs in ***Appendix D.***

[4] NZ Geotechnical Society (2017) NZ Ground Investigation Specification, Volume 1 – Master Specification
[5] NZ Geotechnical Society (2005), Field Description of Soil and Rock, Guideline for the classification and description of soil and rock for engineering purposes.

The approximate locations of the respective investigation locations referred to above are shown in ***Drawing 01***. Test locations were measured using handheld GPS. Elevations were inferred from the elevation survey model completed by Woods Engineering.

6.0 GROUND MODEL

6.1 Published Geology

The published geological map[6] of the area, as shown in Figure 3 below, depicts the regional geology for the area as comprising:

- Holocene aged alluvial and fan deposits, described as *"alluvial gravel, sand, silt and mud"* (htz)
- On the south-eastern side of the site, Holocene alluvial deposits are shown to overlay early Pleistocene aged "*conglomerate, sandstone and siltstone, fossiliferous and pumiceous sandstone and ignimbrite"* of the Kidnappers group (K).

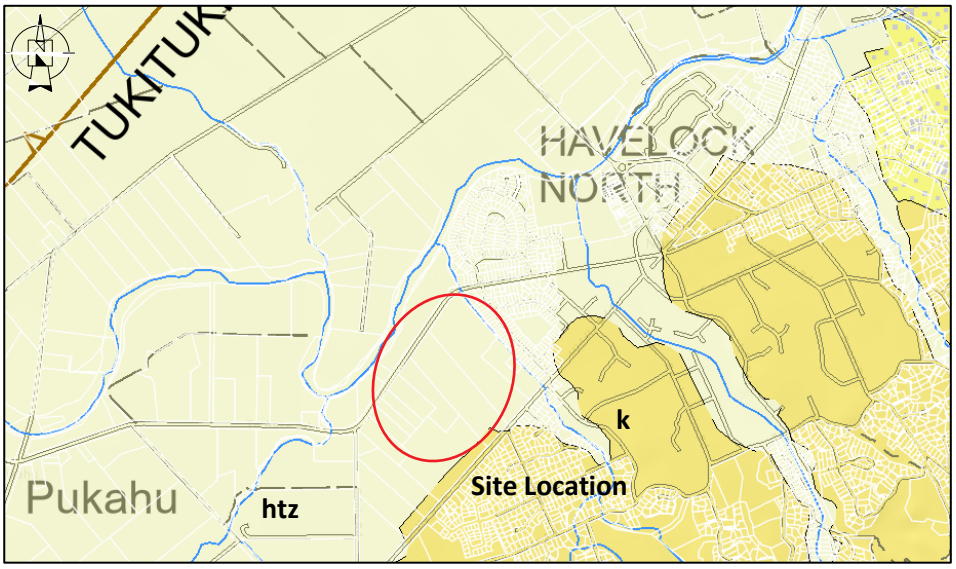


Figure 3: Regional Geology (sourced from GNS, Geological Map 7a)

6.2 Stratigraphic Units

The ground conditions encountered and inferred from the investigations were generally consistent with the published geological information for the area and can be generalised according to the following subsurface sequences, as presented on Table 1 and presented on the appended Cross Section A and Cross Section B as ***Drawing 02-03***.

Table 1: Summary of Strata Encountered

Geological Unit	Depth to base (m)*		Thickness (m)*	
	Min	Max	Min	Max
Topsoil – Organic SILT	0.1	0.4	0.1	0.4
SAND – medium dense, trace fibrous material (alluvium)**	2.0	3.5	2.0	3.3

[6] Geological and Nuclear Sciences, 1:75,000 Geological Map 7a, Geological map of the Napier-Hastings urban area

Geological Unit	Depth to base (m)*		Thickness (m)*	
	Min	Max	Min	Max
Interbedded Sandy Silt – firm and Silty Sand – medium dense to dense (alluvium)	2.5	6.5	2.1	6.4
SILT – firm to stiff (alluvium)	2.0	14.5	1.5	9
SAND – medium dense (alluvium)	-	-	0.5m+	10m+
Notes: *thickness and depth to base only given when depth is proven **within the top 2m thin layers of fibrous organic material were encountered.				

6.3 Groundwater

Groundwater was encountered in all but one of the investigations and recorded during site investigation on 2/6/2026.

Standpipe piezometers were installed in the three machine boreholes corresponding with the nearby ponds. MH01 in the northern pond, MH02, central pond and MH03 close to the southern pond. A second round of groundwater level measurements has been recorded within the piezometers on 14/7/2026 and are summarised in Table 2 below.

Based on these two readings, groundwater levels have raised approximately 0.2m to 0.65m between June and July, coinciding with winter conditions.

A conservative groundwater level of 1.5 m below existing bgl has been adopted for liquefaction assessment for the residential dwellings.

Groundwater readings at the stormwater ponds recorded:

- Northern Pond (MH01): 2.1m to 2.3m bgl; or 6.1m to 5.9mRL.
- Central Pond (MH02): 0.45m to 1.1m bgl; or 8.15m to 7.5mRL.
- Southern Pond (MH03): 1.1m to 1.4m bgl; or 7.4m to 7.1mRL.

Table 2: Groundwater Readings

Location ID	Ground Level (RL)	02/06/2026		14/07/2026	
		Groundwater Level (m bgl)	Groundwater Level (RL)	Groundwater Level (m bgl)	Groundwater Level (RL)
MH01	8.20	2.3	5.9	2.1	6.1
MH02	8.60	1.1	7.5	0.45	8.15
MH03	8.50	1.4	7.1	1.1	7.4
TP01	8.42	4	4.42	-	-
TP02	8.20	1.95	6.25	-	-
TP03	9.44	2	7.44	-	-
TP04	9.72	1.9	7.82	-	-
TP05	10.24	3.9	6.34	-	-
TP06	9.15	2.0	7.15	-	-
TP07	9.81	-	-	-	-

Location ID	Ground Level (RL)	02/06/2026		14/07/2026	
		Groundwater Level (m bgl)	Groundwater Level (RL)	Groundwater Level (m bgl)	Groundwater Level (RL)
TP08	10.54	1.8	8.74	-	-
TP09	8.38	2.5	5.88	-	-
TP10	8.30	2.5	5.8	-	-
HA01	8.47	2.8	5.97	-	-

CMW have been provided with the Groundwater Assessment Report[7] undertaken as part of the Substantive Application. This report is generally consistent with the presented groundwater levels provided. CMW have undertaken analysis in line with the transient raised groundwater conditions presented in the groundwater report, further detailed in Section 7.7.

7.0 GEOHAZARD ASSESSMENT

7.1 Context

The Natural Hazards 2025 (NPS-NH) requires an assessment of the risk from natural hazards to be carried out when considering the granting of a subdivision consent. The following sections of this report provide an assessment of the geohazards relevant to this site and provide the basis for the Natural Hazards Risk Assessment, provided in ***Appendix E***.

7.2 Seismicity

7.2.1 Seismic Site Subsoil Category

The geological units encountered beneath the site comprise soil strength materials, which with respect to the seismic site subsoil category defined in Section 3.1.3 of NZS1170.5, is defined as having a UCS < 1MPa.

Based on the site location, understanding the surrounding geology in the area coupled with the depth to bedrock not being known or proven at this location, the seismic site subsoil category is assessed as 'Class D' (deep soils) in accordance with NZS1170.5:2004.

7.2.2 Earthquake Loading

A seismic assessment has been carried out in general accordance with NZGS guidance[8]. The serviceability limit state (SLS) and ultimate limit state (ULS) peak ground accelerations (PGAs) were assessed based on a 50-year design life and an importance level (IL) 2 structure with the New Zealand Building Code[9].

The recommended PGAs and earthquake magnitudes for geotechnical assessment at this site are presented in Table 3.

[7] Williamson Water & Land Advisory, Groundwater Assessment Report, Middle Road Subdivision, Ref WWLA1869 Rev. 1, 24 August 2026
[8] NZ Geotechnical Society publication "Earthquake geotechnical engineering practice, Module 1: Overview of the standards', (November 2021)
[9] Ministry of Business, Innovation and Employment (1992) NZ Building Code Handbook, Third Edition, Amendment 13 (effective from 14 February 2014).

Table 3: Design Peak Ground Acceleration (PGA) for Various Limit States

Limit State	AEP	PGA (g)	$Magnitude_{eff}$
SLS	1/25	0.12	6.4
ULS	1/500	0.58	7.1
Note: AEP = annual exceedance probability			

7.3 Fault Rupture

The Institute of Geological and Nuclear Sciences (GNS) Active Faults Database[10] shows there are no known active fault that extend across the site. The nearest active fault is the Te Mata Fault Zone, located approximately 2.3km to the south of the site with a recurrence interval 5,000-10,000 years. The risk of fault rupture to the proposed development is therefore assessed as "Low".

7.4 Liquefaction

Liquefaction occurs in loose saturated cohesionless soils that are subject to cyclic shear loading during an earthquake. This process leads to pore pressure build-ups, soil grains moving into suspension and temporary loss of strength causing vertical ground deformation.

Following the onset of liquefaction, the liquefied soils behave as a very weak undrained material, which at shallow depths can give rise to lateral spreading where a free face is present within the vicinity of the site or across the sloping ground. For lateral spread to occur, liquefaction must develop within shallow continuous soil layers that extend a sufficient length and width towards a free face or across sloping ground.

Review of the Hawkes Bay Regional Council Hazard Portal[11] indicates the site is located within a zone denoted as having a 'medium' liquefaction vulnerability whereby liquefaction damage is 'possible'. A 50m wide zone running parallel to Middle Road is described as 'low' liquefaction vulnerability whereby 'liquefaction damage is unlikely. This correlates to the slightly elevated ground where the regional geology map identifies the site as being underlain by the Kidnappers Group.

7.4.1 Methodology

In accordance with MBIE/NZGS guidance the liquefaction susceptibility of the soils at this site was assessed with respect to geological age and compositional (soil fabric and density) criteria, based on the following assumptions:

- Only saturated soils below the groundwater level within each CPT were modelled as being susceptible to liquefaction.
- In accordance with MBIE/NZGS guidance and in the absence of site-specific shear wave velocity measurements, no aging / strength gain factor has been applied.
- Soils are also classified with respect to their grain size and plasticity to assess liquefaction susceptibility.
- For this project, a cut-off threshold soil behaviour type index value (Ic) of 2.6 was used to distinguish between liquefiable (Ic<2.6) and non-liquefiable (Ic>2.6) soils.
- Specific liquefaction analyses were undertaken adopting design PGAs above, using the software package CLiq and the Boulanger and Idriss (2014) method. The cyclic stress ratio (CSR), being a function of the earthquake magnitude for the design return period event, was compared to the cyclic resistance ratio (CRR), being a function of the CPT cone resistance (qc) and friction ratio (Fr).

[10] https://data.gns.cri.nz/af/
[11] https://gis.hbrc.govt.nz/Hazards/

- Free-field liquefaction induced settlements were determined in accordance with Zhang et al. (2002).
- In accordance with MBIE guidance, only index settlements are reported whereby a 10m cutoff has been applied.
- Analyses was undertaken on the existing ground levels, assuming a groundwater level of 1.5m bgl.

7.4.2 Liquefaction Assessment Results

The results of our liquefaction assessment undertaken using all existing data to date are outlined in Table 4. Liquefaction assessment results are presented in ***Appendix F.***

Table 4: Liquefaction Assessment Results

CPT Reference	SLS		ULS	
	Settlement (mm)	Depth to Liquefied Layer (m)	Settlement (mm)	Depth to Liquefied Layer (m)
CPT01	10	5.0	55	3.0
CPT02	2	4.0	40	3.0
CPT03	11	3.0	82	1.8
CPT04	9	2.5	77	2.0
CPT05	3	5.5	131	1.5
CPT06	12	4.5	84	2.0
CPT07	10	4.0	68	2.0
CPT08	5	2.5	44	2.5
CPT09	7	3.0	60	1.5
CPT10	9	2.5	110	2.0
CPT01– CMW 2024	4	4.25	53	1.5
CPT02– CMW 2024	10	4.75	119	2.0
CPT03– CMW 2024	2	4.0	50	1.5
CPT09 – WSP 2020	6	4.25	146	1.8
CPT10– WSP 2020	4	3.5	38	2.25
CPT11 – WSP 2020	5	3.0	63	2.0
CPT12 – WSP 2020	3	3.25	24	1.5
CPT13 – WSP 2020	9	5.5	77	1.6
CPT14 – WSP 2020	11	3.5	40	1.5
CPT15 – WSP 2020	6	4.0	59	1.5
CPT16 – WSP 2020	4	2.8	36	2.4
CPT17 – WSP 2020	11	2.5	71	2.4
CPT18 – WSP 2020	2	2.6	38	1.7

Liquefaction analyses results show low (generally less than 15mm) liquefaction induced settlements predicted for the SLS seismic event with the ULS index generally less than 100mm but up to 150mm in discrete locations. ULS liquefaction induced settlements in excess of 100mm are all located on the south-eastern side of the site.

ULS index settlements will need to be considered for residential foundation design and recommendations for liquefaction mitigation are provided in Section 8.1 below.

Review of the liquefaction assessment will be needed once earthworks volumes have been confirmed at the detailed design phase. Net filling across the site is likely to increase the depth to groundwater and in turn lower the depth to liquifiable material. However, this will need to be confirmed at the detailed design phase.

7.5 Lateral Spreading

Following the onset of liquefaction, the liquefied soils behave as a very weak undrained material, which can give rise to lateral spreading where a free face is present. A free face is available at the edge of the Herehere Stream and where detention ponds and embankments are developed.

Based on the landform, ground conditions and liquefaction results outlined above, lateral spreading has been identified as a potential risk for the development. The potential for lateral spread and lateral stretch near the proposed embankments of the stormwater ponds adjacent to the Herehere Stream has been assessed in Section 7.7.4 below.

7.6 Bearing Capacity Assessment

A geotechnical ultimate bearing capacity of 200kPa should be available for the construction of shallow strip and pad foundations up to 0.5m wide in accordance with B1/VM2. For foundations located within the engineered fill, a geotechnical ultimate bearing capacity of 300kPa should be available.

Taking into consideration the liquefaction potential for the site, sufficient free board to liquified soils are shown to exist for shallow foundations.

7.7 Slope Stability

7.7.1 Overview

A review of the Hawkes Bay Hazard Portal indicates that the site is located outside any mapped landslide risk areas.

The site comprises relatively flat terrain apart from steep slopes forming the Herehere stream margins and future stormwater ponds.

Slope stability analyses were carried out on two representative sections (Cross Section A and Cross Section B), through the proposed stormwater ponds, where 1(H):3(V) slopes are proposed. Cross Section A is adjacent to the Herehere Stream and includes the proposed modifications for the stream bank to a 1(H):3(V) slope. Cross Section B is through the proposed central stormwater pond near the area of higher predicted liquefaction induced vertical settlements.

A dead load of 10kPa was adopted within residential properties for proposed two-story house sites.

7.7.2 Design Criteria

The stability of the embankment slopes under a range of design conditions is expressed in terms of a factor of safety (FoS), which is defined as the ratio of forces resisting failure to the forces causing failure. The following performance standards are recommended for slope stability assessment.

Table 5: Slope Stability Factor of Safety Criteria

Case	Target Factor of Safety (FoS)
Static long-term conditions (Drained soil conditions, normal groundwater)	1.5
Transient short-term conditions (Elevated groundwater, Ru=0.15 to 0.3)	1.2
Ultimate Limit State (ULS) seismic conditions	1.0*
Notes: *Factor of safety <1.0 is acceptable where a displacement-based approach is adopted.	

7.7.3 Geotechnical Parameters

Representative effective stress parameters were developed for each of the identified geological units based on the results of the geotechnical investigations, and experience in modelling these materials.

The strength parameters adopted for the site are summarised in Table 6 below.

Table 6: Effective Stress Shear Strength Parameters

Geological Unit	Unit Weight (kN/m^3)	c' (kPa)	Ø' (deg)	Su (kPa)
Engineering site won fill	19	2	35	100
Sand	19	0	35	
Interbedded Sandy Silt/ Silty Sand	18	1	30	25
Silt	16	2	28	-
Liquefied sandy silt/ silty sand	18			5 - 70
Liquefied silt	16			5 - 50
Note: Where c' = effective cohesion, Ø' = effective friction angle, Su = undrained shear strength				

7.7.4 Results

Slope stability analyses were undertaken using the Morgenstern-Price method of slices under both circular and translational failure mechanisms using the proprietary software Rocscience Slide.

For the ULS seismic case relevant soil units have assumed to have a liquefied strength at the lower SLS limit and therefore adopted liquefied strengths in the analysis.

Where the ULS seismic Factor of Safety (FoS) < 1.0, seismic displacements (lateral spread) were estimated based on a Newmark Sliding Block approach using 50th percentile correlations published in Macedo et al. (2023) for liquefied soil conditions, considering a subduction interface seismic source.

Selected stability outputs and Newmark Displacements are presented in ***Appendix G*** and summarised in Table 7 below.

Table 7: Slope Stability Analysis Results – Global Stability and Lateral Spread

Slope Stability Factor of Safety					Seismic Yield Ac	ULS Displacement (mm)	Lateral Strech (mm)
Scenario	Prevailing	Transient Groundwater	Rapid Drawdown	ULS Seismic			
Cross Section A - 1(V):3(H) slope	>1.5	>1.2	>1.2	0.28	0.26	44	8
Cross Section B – 1(V):3(H) slope	>1.5	>1.2	>1.2	0.49	0.22	55	25

Results show the requisite FoS under prevailing long term and transient elevated groundwater conditions are achieved with the proposed 1(V):3(H) slope face.

Under ULS seismic loading, based on the yield accelerations presented in Table 7 above, seismic global displacements are predicted between 44 – 55mm and lateral stretch between 8mm and 20mm. Lateral stretch less than 50mm are generally considered suitable for residential development and can typically be accommodated during foundation design.

7.8 Load-Induced Settlement

Load induced settlement occurs in soils that are subject to static loading (e.g., by fill and/or building loads) where the magnitude of settlement is governed by the soil stiffness and the load applied.

The natural subsoils are anticipated to generally comprise soft to stiff silts and clays, and medium dense to dense sands which are not considered to be prone to significant or excessive static settlements for typical at-grade residential buildings.

Static settlement analyses were completed for the proposed residential dwellings using the proprietary software CPeT-IT which calculates the change in vertical stress based on Boussinesq distribution, with the 1-D constrained modulus estimated from CPT tip (resistance (qc).

Settlements in response to building loads are anticipated to be less than 50mm, as such differential settlements are expected to be within NZ Building Code recommended tolerances of 1:240. Settlement results are presented in ***Appendix H.***

Settlements with response to fill loads are expected to predominantly occur during construction. Some localised soft alluvium and buried topsoil is anticipated to underlie the site, where these deposits are identified at subgrade level during bulk earthworks, it is recommended that they are over-excavated and backfilled with engineered fill.

8.0 GEOTECHNICAL RECOMMENDATIONS

8.1 Liquefaction and Lateral Spread Mitigation

Based on the predicted SLS and ULS index liquefaction values presented in Section 7.4 and giving consideration to the depth of liquefiable layers, the majority of the site can be categorised as Technical Category 2 (TC2) with a portion of the site on the south-eastern side of the site falling into the Technical Category (TC2/TC3 hybrid) as outlined in Section 15.4.6 of the MBIE Part C Canterbury Rebuild Technical Guidance[12].

[12] https://www.building.govt.nz/assets/Uploads/building-code-compliance/canterbury-rebuild/repairing-and-rebuilding-houses/canterbury-guidance-part-c.pdf

The areas anticipated to require the (TC2/TC3 hybrid) foundation solutions are where ULS liquefaction settlements are in excess of 100mm, as presented in Table 4, these locations are mostly isolated to the area on the southeastern side of the site comprising lots 15- 47, 230-235 and 307-318 as well as a small area on the western side of the site, comprising lots 93-37. These regions are based on limited numbers of CPTs, further testing is recommended to define the lateral extent of these margins.

The distribution of these areas is shown on ***Drawing 04.***

8.2 Foundations

8.2.1 TC 2 Type Foundations

The majority of the site is suitable for TC2 type foundations in accordance with MBIE Part A Technical Guidance. Suitable foundations will include Options 1 to 4 from MBIE Part A, Section 5.3.1 for concrete slab on grade or Type A or Type B Dwelling in Section 5.3.2 for timber floor dwellings.

These results are subject to further earthworks supervision, post-earthworks testing and analysis as part of residential development with results and foundation requirements further confirmed in the Geotechnical Completion Report. As detailed in Section 7.6, a geotechnical ultimate bearing capacity of 300kPa should be available on engineered fill surfaces or 200kPa on natural surfaces.

8.2.2 TC2/TC3 Hybrid Foundations

The zone susceptible to TC2/TC3 Hybrid technical category foundations outlined in Section 8.1 require further geotechnical investigation to confirm lateral extent.

TC2/TC3 type foundations include a TC2 Option 2 enhanced slab on grade or Option type raft foundation overlying a TC2 Option 1 reinforced gravel raft foundation improvement in accordance with MBIE, Part C.

The gravel raft should comprise imported compacted well-graded sandy gravel (ie GAP65 or similar approved) with a layer of geogrid in the base and wrapped up the sides.

There may be areas where localised variations in shear strength / density within the natural cut ground may occur. Further confirmation of available bearing pressures will be addressed at the time of post earthworks soil testing. At the completion of development earthworks, a GCR will be prepared, which will advise on anticipated foundation design parameters based on the results of post earthworks soil testing.

As required by section B1/VM4[11] of the New Zealand Building Code Handbook, the following strength reduction factors must be applied to all recommended geotechnical ultimate soil capacities in conjunction with their use in factored design load cases:

- 0.8 for load combinations involving earthquake overstrength;
- 0.5 for all other load combinations.

8.3 Earthworks

8.3.1 Overview

All earthworks and building platform preparation activity must be carried out in general accordance with the requirements of NZS 4431[13] and the requirements of the District and Regional Council's and any other relevant documentation under the guidance of a Chartered Geoprofessional.

[13] NZS 4431:2022 Engineered fill construction for lightweight structures, New Zealand Standard.

8.3.2 Site Won Fills

Generally, the proposed minor cuts across the site are likely to encounter Holocene alluvial sands and silts.

The material is generally considered to be suitable for reuse as engineered fill for TC2 sites, provided it is free from any organic material and is source tested in accordance with NZS4431:2022 requirements.

Alluvial materials can have high natural moisture contents relative to optimum and may require careful management, conditioning and compaction control.

8.3.3 Imported Fills

Areas that require TC2/TC3 Hybrid foundations require imported granular fill in accordance with MBIE Part A & C technical guidance. Granular fills are anticipated to comprise a GAP65 or equivalent tested in accordance with NZS4431.

8.3.4 Cut and Fill Batter Gradients

To reduce the effects of possible minor slumping or scour, self-supporting long term cut and fill batters on this site should be formed to no steeper than the proposed 1(V):3(H) where natural sands and silts are exposed.

All formed batters should be covered by topsoil and then grassed as soon as practicable following construction to reduce the effects of surficial scour/rilling or alternatively supported to full height by specifically designed retaining walls.

Temporary construction cut and fill batters (ie. Less than 2 to 3 months duration) may be formed up to 1(V):1(H) to a maximum height of 2m where no groundwater seepage is evident (not expected based on deep groundwater) and not having any surcharge loading within 3 metres of the batter crest.

8.4 Stormwater

8.4.1 General

The management of stormwater flows is important to help promote site stability.

It is important that all concentrated flows of stormwater generated from roof, driveway and other impervious surfaces are collected and diverted away from the steeper parts of the site to where the risk of erosion is low

Under no circumstances should concentrated stormwater be discharged into the ground or over slopes on account of slope stability considerations.

Based on the Hawke's Bay Regional Council Open Data Portal, the site is located above the mapped Heretaunga Plains Aquifer which is a significant water resource for the Hawke's Bay region.

8.4.2 Stormwater Dry Basins

Four stormwater dry basins and associated discharge infrastructure are required to collect stormwater generated from the development before being discharged to the existing watercourses, including the Herehere Stream and Gilpin Drain.

We understand that the design of the dry basins will involve excavation of the internal base with the opportunity to reuse these materials to lift embankment heights.

Based on the results of the field investigation the materials are likely to comprise alluvial sands and silts. These materials are likely to be relatively permeable and unstable at elevated groundwater conditions.

The design of the stormwater dry basins and associated discharge infrastructure must be subject to specific geotechnical assessment and design by a Chartered Professional Geotechnical Engineer at the detailed design phase to consider the range of operating conditions and design criteria.

Stormwater dry basin design and capacity should be designed taking into account the seasonal groundwater levels, presented in Section 6.3. Groundwater at the site is currently being monitored and varies between 0.5m to 2.3m below ground level. It is understood that a groundwater assessment is being carried out for use at the detailed design phase.

8.5 Civil Works

8.5.1 Retaining Walls

Specific engineer designed retaining walls may be required to support cuts and/or fills and terraced lots as part of the proposed residential development. It is anticipated that these will be completed in conjunction with the development earthworks to provide near level building platforms for future lot owners.

Retaining walls, aside from those considered 'landscape walls', should be designed by a suitably qualified and experienced Chartered Professional Engineer familiar with the contents of this report, taking into consideration undrained (short term) and drained (long term) ground conditions, seismic loads, groundwater conditions, and surcharge.

Recommended design parameters are provided in Section 7.7.3. These design parameters assume a horizontal ground surface above and below the retaining structure.

It is noted that some ground movement may occur behind temporary or permanent flexible retaining walls. By definition movements of the walls must occur to fully mobilise the active and passive earth pressure coefficient provided in the above. The extent of this movement is dependent on the height of retaining, the type of wall selected methodology. This must be considered during the design and construction of the retaining wall to ensure that adjacent structures are not adversely affected.

Wall setback areas are expected to be applied to protect retaining walls from future overloading at the crest or undermining at the toe that could lead to instability. These zones typically extend the same distance as the wall height, and where they are present above a wall require deepening of foundations unless the wall has been designed for future foundation loads. Where they are present below a wall, careful consideration needs to be given to the location, depth and timing of any future excavations. Wall setback zones will be identified within the GCR once development earthworks and retaining wall construction is complete.

8.5.2 Subgrade CBR

The internal roads and pavements are likely to be formed in a combination of cut and fill. Following earthworks and subgrade trimming, a CBR of between 4% and 6% is anticipated for the natural soils and with an improved value of between 5% to 7% for engineered fills.

It is recommended further testing is carried out at routine intervals to confirm subgrade road and pavement strengths for actual CBR values.

8.5.3 Service Trenches

Most of the materials expected to be exposed during the excavation of service trenches should be able to be removed using an excavator.

Trench collapse may need to be accounted for considering groundwater levels of 1m to 2m recorded and where excavations/trenches are left exposed for longer durations due to the drying of exposed surfaces.

At the completion of the development, Specific Design Zones for services will be applied to restrict building foundations within a 45-degree zone of influence from services.

9.0 RECOMMENDATIONS AND CONDITIONS OF CONSENT

Additional geotechnical inputs are anticipated to be required during the detailed design and construction phases of the project, including:

- Geotechnical plan review of the final earthworks and landform design plans prior to earthworks commencement at the detailed design phase.
- Further Geotechnical investigation, including CPT testing in the area potentially identified as requiring TC2/TC3 Hybrid foundations, analyses and specific design of ground improvement (if required) at the detailed design phase.
- Geotechnical investigation, analyses and specific design of stormwater ponds and associated discharge infrastructure at the detailed design phase.
- Further testing to confirm subgrade CBR requirements for pavement design at the detailed design phase.
- Laboratory testing for earthworks, including standard compaction testing, solid densities and moisture contents in proposed fill materials at the detailed design phase.
- Detailed design of retaining walls (if required) at the detailed design phase.
- Construction monitoring, including earthfill compaction control testing during the construction phase.
- Post construction verification testing across building platforms prior to building consent applications post the construction phase.
- Preparation of geotechnical completion reports intended to be used for geotechnical certification for the future residential allotments following completion of bulk earthworks, providing the results of geotechnical observations and relevant quality control data as well as recommendations/requirements specific to each of the lots. It is anticipated that the GCR would be suitable as one of the documents to support a building consent application for the future lot owners, this will be undertaken in the post construction phase.

10.0 CLOSURE

This report has been prepared for use by CDL Land New Zealand Ltd in relation to the proposed residential subdivision located at Middle Road, Havelock North in accordance with the scope, proposed uses and limitations described in the report. Should you have further questions relating to the use of your report please do not hesitate to contact us.

Where a party other than CDL Land New Zealand Ltd seeks to rely upon or otherwise use this report, the consent of CMW should be sought prior to any such use. CMW can then advise whether the report and its contents are suitable for the intended use by the other party.

While the Report is subject to a standard disclaimer stating that the report is not for use by persons other than the Applicant, we can confirm that the Report can be relied upon by the Panel and participants for the purposes of considering the Application under the FTAA.

USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project's requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Environmental matters are not covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

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APPENDIX A
Drawings



LEGEND:

- SITE BOUNDARY
- PROPOSED LOT BOUNDARY
- EXISTING GROUND CONTOUR (MAJOR)
- EXISTING GROUND CONTOUR (MINOR)
- HA01 HAND AUGER (HA) LOCATION
- CPT01 CONE PENETROMETER TEST (CPT) LOCATION
- TP01 TEST PIT (TP) LOCATION
- HA01 HISTORIC HAND AUGER - 2024 (HA) LOCATION
- CPT01 HISTORIC CONE PENETROMETER TEST - 2020 (CPT) LOCATION
- TP01 HISTORIC TEST PIT - 2020 (TP) LOCATION
- MH01 MACHINE BOREHOLE (MH) LOCATION

NOTES:

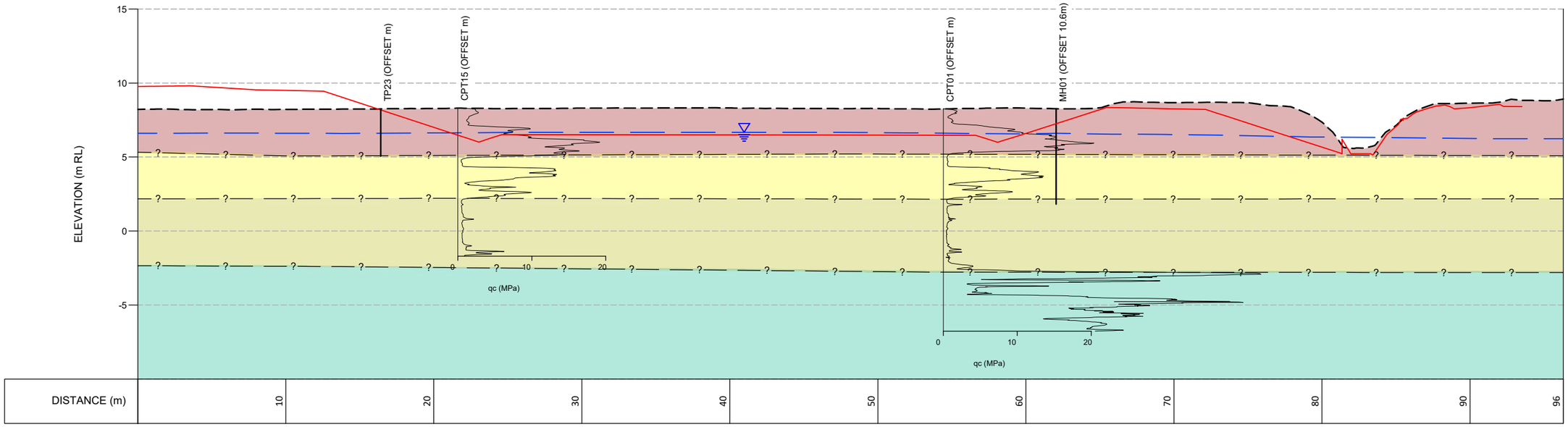
1. AERIAL IMAGE COURTESY OF LINZ - HAWKES-BAY-02m-RURAL-AERIAL-PHOTOS-2025-2026
2. SCHEME/BASE PLAN OBTAINED FROM CDL LAND NEW ZEALAND LIMITED - COORDINATION DRAWING FOR EXTERNALS - XP25-496_ENG FOR EXTERNALS
3. EXISTING GROUND CONTOURS CREATED FROM LINZ - HAWKES-BAY-LIDAR-1m-DEM-2023-2024, CONTOURS SHOWN IN 0.5m INTERVALS.
4. CRS: NZGD2000HAWKESBAY. VERTICAL DATUM IN TERMS OF NZVD2016.
5. TEST LOCATIONS ARE INDICATIVE ONLY.

1:3000 0 30 60 90 120 150 m

PRINT IN COLOUR

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CLIENT: CDL LAND NEW ZEALAND LTD		DRAWN: EH	PROJECT: NAP2025-0024
PROJECT: MIDDLE ROAD SUBDIVISION		CHECKED: IA	DRAWING: 01
		REVISION: 0	SCALE: 1:3000
TITLE: GEOTECHNICAL INVESTIGATION PLAN		DATE: 29/07/2026	SHEET: A3 P



CROSS SECTION A

LEGEND:

- EXISTING GROUND PROFILE
- DESIGN PROFILE
- INFERRED GEOLOGY BOUNDARY
- GROUND WATER LEVEL
- MEDIUM DENSE SAND (ALLUVIUM)
- SOFT TO FIRM SILT (ALLUVIUM)
- INTERBEDDED SAND SILT / SILTY SAND
- DENSE SAND (ALLUVIUM)

NOTES:

1. EXISTING GROUND PROFILE CREATED FROM LINZ - HAWKES-BAY-LIDAR-1m-DEM-2023-2024.
2. DESIGN PROFILE SOURCED FROM EARTHWORK SECTIONS, RECEIVED 20.07.26.
3. VERTICAL DATUM IN TERMS OF NZVD2016.
4. TEST LOCATIONS ARE INDICATIVE ONLY.

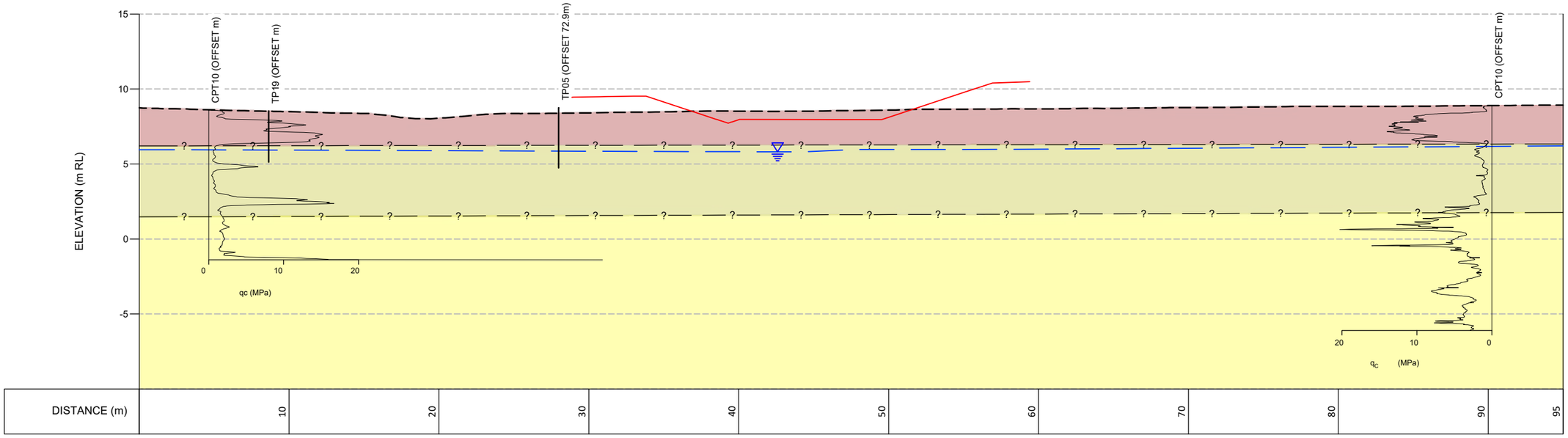
1:300 0 3 6 9 12 15 m

PRINT IN COLOUR

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CLIENT: CDL LAND NEW ZEALAND LTD		DRAWN: EH	PROJECT: NAP2025-0024
PROJECT: MIDDLE ROAD SUBDIVISION		CHECKED: IA	DRAWING: 02
		REVISION: 0	SCALE: 1:300
TITLE: CROSS SECTION A		DATE: 29/07/2026	SHEET: A3 L

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CROSS SECTION B

LEGEND:

- EXISTING GROUND PROFILE
- DESIGN PROFILE
- INFERRED GEOLOGY BOUNDARY
- GROUND WATER LEVEL
- MEDIUM DENSE SAND (ALLUVIUM)
- SOFT TO FIRM SILT (ALLUVIUM)
- INTERBEDDED SAND SILT / SILTY SAND
- DENSE SAND (ALLUVIUM

NOTES:

1. EXISTING GROUND PROFILE CREATED FROM LINZ - HAWKES-BAY-LIDAR-1m-DEM-2023-2024.
2. DESIGN PROFILE SOURCED FROM EARTHWORK SECTIONS, RECEIVED 20.07.26.
3. VERTICAL DATUM IN TERMS OF NZVD2016.
4. TEST LOCATIONS ARE INDICATIVE ONLY.

1:300 0 3 6 9 12 15 m

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CLIENT: CDL LAND NEW ZEALAND LTD		DRAWN: EH	PROJECT: NAP2025-0024
PROJECT: MIDDLE ROAD SUBDIVISION		CHECKED: IA	DRAWING: 03
		REVISION: 0	SCALE: 1:300
TITLE: CROSS SECTION B		DATE: 29/07/2026	SHEET: A3 L

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LEGEND:

- SITE BOUNDARY
- PROPOSED LOT BOUNDARY
- EXISTING GROUND CONTOUR (MAJOR)
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- TP01 HISTORIC TEST PIT - 2020 (TP) LOCATION
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NOTES:

1. AERIAL IMAGE COURTESY OF LINZ - HAWKES-BAY-02m-RURAL-AERIAL-PHOTOS-2025-2026
2. SCHEME/BASE PLAN OBTAINED FROM CDL LAND NEW ZEALAND LIMITED - COORDINATION DRAWING FOR EXTERNALS - XP25-496_ENG FOR EXTERNALS
3. EXISTING GROUND CONTOURS CREATED FROM LINZ - HAWKES-BAY-LIDAR-1m-DEM-2023-2024, CONTOURS SHOWN IN 0.5m INTERVALS.
4. CRS: NZGD2000HAWKESBAY. VERTICAL DATUM IN TERMS OF NZVD2016.
5. TEST LOCATIONS ARE INDICATIVE ONLY.

1:3000 0 30 60 90 120 150 m

PRINT IN COLOUR

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CLIENT: CDL LAND NEW ZEALAND LTD		DRAWN: EH	PROJECT: NAP2025-0024
PROJECT: MIDDLE ROAD SUBDIVISION		CHECKED: IA	DRAWING: 04
		REVISION: D	SCALE: 1:3000
TITLE: GEOTECHNICAL INVESTIGATION PLAN- GROUND IMPROVEMENT AREAS		DATE: 23/07/2026	SHEET: A3 P

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APPENDIX B
Statement of Professional Opinion

APPENDIX 62
FORM 2

To: Hastings District Council
Private Bag 9002
HASTINGS 4156

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR SUBDIVISION PRELIMINARY GEOTECHNICAL REPORT (Submit with Subdivision Consent Application)

Subdivision..... Middle Road and Te Aute Road, Havelock North .....

Owner/Developer: CDL Land New Zealand Ltd

Location: 92,108,148 Middle Road and 139 Te Aute Road, Havelock North, Hawkes Bay .....

I ... Robert Taylor ... of CMW Geosciences (CMW Geotechnical NZ Ltd) .....
(Name and address)

hereby confirm that:

1. I am a suitably qualified and registered professional experienced in the field of Geotechnical Engineering and was retained by the owner/developer in this regard on the above subdivision. My qualifications are: BEng, BSc, MEngSC, CMEngNZ, CPEng .....

2. Site investigations have been carried out under my direction and are described in my report dated 11 August 2026, ref NAP2025-0024AD .....

3. I am aware of the details of the proposed scheme of subdivision and of the general nature of the proposed engineering works as shown on the following drawings .....
CMW Drawing 01, dated 15 July 2026, ref NAP2025-0024 .....
WOODS, Middle Road Development - Co-ordination drawing for externals DWG No. P25-496-00-9010-SK, dated July 2026 .....

4. In my professional opinion, I consider that the proposed works give due regard to land slope and foundation stability considerations that the land is suitable for the proposed subdivision, providing that:

   a The recommendations in my report dated 11 August 2026, ref NAP2025-0024AD are followed. .....

   b .....

   c .....

This professional opinion is furnished to the Council and the owner/developer for their purposes alone, on the express conditions that it will not be relied upon by any other person and does not remove the necessity for further inspection during the course of the works.

Signed: . ..... Date 24 July 2026 .....

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APPENDIX C
Development Plans

REVISION RECORD

GENERAL NOTES:
ROAD CROSS SECTIONS ARE HEAVILY BASED OFF THE ARATAKI ROAD CROSS SECTIONS. THE 16m WIDE LOCAL ROAD CROSS SECTIONS DO NOT CURRENTLY CONTAIN PARKING BAYS BUT THESE ARE TO BE ADDED SUBSEQUENT TO DISCUSSIONS WITH EXTERNAL TEAM.

REVISION 1, DATE: 29/05/2026
ISSUE FOR EXTERNAL CONSULTANTS USE.
NOTE: INITIAL DRAWING ISSUE, THIS ISSUE IS A STARTING POINT FOR EXTERNAL DESIGNERS USE IN THEIR DESIGNS AND DESIGN INPUTS. FURTHER REFINEMENT IS REQUIRED.

REVISION 2, DATE: 12/06/2026
UPDATED TO LATEST SCHEME PLAN DATED 11/06/2026. UPDATED SHARED PATH WIDTHS TO 2.8m. UPDATED JOAL AND ACCESSWAY CONCRETE TO ALIGN WITH LATEST SCHEME. UPDATED VEHICLE CROSSINGS TO MATCH LATEST SCHEME. UPDATED ROAD CROSS SECTIONS TO MATCH DRAFT SECTIONS ISSUED BY WOODS 05/06/2026. ADDED INFORMAL FOOTPATH ALIGNMENTS AROUND NORTHERN POND AREAS. UPDATED POND LAYOUTS TO ACCOMMODATE SCHEME CHANGES. ADDED FOOTPATHS ALONG SITE FRONTAGE ON TE AUTE ROAD AND MIDDLE ROAD. ADDED EXISTING IONA POND BANKS AND FOOTPATHS SURVEY LOCATIONS.
NOTE: CENTRAL INTERSECTION ROUNDABOUT AND MIDDLE ROAD ZEBRA CROSSING NOT YET SHOWN, FLOW TO PROVIDE INPUT ON THESE ITEMS.

REVISION 3, DATE: 30/06/2026
LANDSCAPING PLAY ALONG THE WAY LOCATIONS ADDED, SPORTS FIELD LOCATIONS ADDED. CENTRAL WW PUMP STATION ADDED WITH CONCRETE DRIVEWAYS. UPDATED TO LATEST SCHEME PLAN DATED 24/06/2026. ADDED ZEBRA CROSSINGS, PEDESTRIAN CROSSINGS AND ASSOCIATED LINEWORK ON TE AUTE AND MIDDLE RD. ADDED CENTRAL INTERSECTION ROUNDABOUT AND ASSOCIATED LINEWORK. FLIPPED PARKING LANE SIDE ON NORTH EASTERN ROAD FRONTING MCKENNA BLOCK. ADDED SURFACE TREATMENT AT INTERSECTIONS PER FLOW'S DIRECTION. ADDED SPLITTER ISLANDS AT INTERSECTIONS TO TE AUTE RD AND MIDDLE RD. ADDED FUTURE BUS STOP LINE WORK. ADDED ZEBRA CROSSING ON CENTRAL ROAD. ADDED RIGHT TURNING BAY ON TE AUTE RD AND INDICATED ITEMS TO BE REMOVED.

REVISION 4, DATE; 06/07/2026
ADJUSTED POND BATTERS TO ALIGN WITH PLAY ALONG THE WAY LOCATIONS AND ADD FURTHER MEANDERING TO LOW FLOW CHANNELS. ADJUSTED INFORMAL FOOTPATH ALIGNMENTS AROUND THE PONDS TO ALIGN WITH THE LATEST TOP OF BATTER LOCATIONS. ADJUSTED HEREHERE STREAM WIDENING TOP OF BATTER MEANDERING. SHIFTED WASTEWATER PUMP STATION TO EASTERN SIDE OF POND CULVERT AS PER CLIENT REQUEST AND REMOVED EFFECTED LOT BOUNDARIES. MINOR DRAFTING UPDATES TO PEDESTRIAN CROSSINGS. EXTENDED FOOTPATH ON NORTHERN SIDE OF MIDDLE ROAD TO OTHER SIDE OF HEREHERE STREAM AND ADDED INDICATIVE FOOTBRIDGE LOCATION.

REVISION 5, DATE; 16/07/2026
UPDATED TO LATEST SCHEME PLAN DATED 15/07/2026. UPDATED VEHICLE CROSSINGS TO MATCH LATEST SCHEME BOUNDARIES. ADDED PROPOSED CONTOURS AND RETAINING WALLS. ADDED PRAM CROSSINGS AT ALL ACCESS ROAD INTERSECTIONS. MINOR ROADING UPDATES AS PER FLOW COMMENTS IN EMAIL DATED 06/07/2026.

REVISION 6, DATE: 28/07/2026
UPDATED TO LATEST SCHEME PLAN DATED 22/07/2026, UPDATED VEHICLE CROSSINGS TO MATCH. UPDATED WASTEWATER PUMPSTATION LAYOUT. ADDED RETAINING WALLS ALONG REAR OF LOTS ADJACENT TO DRY BASINS. UPDATED PROPOSED CONTOURS WITH LATEST SURFACE MODELLING. UPDATED DRY BASIN BATTERS AND LOW FLOW ALIGNMENTS. ADDED STREET LIGHTING LAYOUT.

DRAFT

LEGEND

- ROAD CENTERLINE
- PROPOSED KERB AND CHANNEL
- PROPOSED DECORATIVE CONCRETE
- PROPOSED GARDEN / FEATURE AREA
- PROPOSED RETAINING WALL
- EXISTING TREE
- EXISTING STREETLIGHT
- EXISTING POWER POLE
- AREA RESERVED FOR POWER
- AREA RESERVED FOR TELCO

NOTES

1. THIS DRAWING HAS BEEN PREPARED FOR INFORMATION ONLY WITH THE SOLE PURPOSE OF INFORMING EXTERNAL CONSULTANTS OF THE CURRENT WOODS ENGINEERING DESIGN.
2. THIS DRAWING IS SUBJECT TO CHANGE. ANY DISCREPANCIES OR CORRECTIONS SHOULD BE DIRECTED TO THE WOODS ENGINEERING TEAM.
3. THIS DRAWINGS IS TO ACCOMPANY THE RELEVANT .DWG FILE TITLED "xP25-496_Eng For Externals.dwg"
4. EXISTING FEATURES SHOWN ARE ANTICIPATED TO BE RETAINED.

DRAFT

SCALEBAR (m) 0 30 60 150 — SCALE | 1:3000 @A3 | 1:1500 @A1|

Plot Date: 1:11:50 pm,28 July 2026, LOUISZS

File: C:\12DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK, 22600\02 DRAWINGS\01 ENG\P25-496-00-9010 DWG FOR EXTERNALS.DWG

REVISION DETAILS		INT	DATE	SURVEYED	
3	FLOW'S UPDATES, LANDSCAPING, WWPS	NV	30/06/2026	DESIGNED	GP
4	POND/FP UPDATES, WWPS, FOOTBRIDGE	LZM	06/07/2026	DRAWN	NV
5	CONTOURS, RETAINING, PRAM CROSSINGS	LZM	16/07/2026	CHECKED	LZM
6	LATEST SCHEME, STREETLIGHTS, WWPS	LZM	28/07/2026	APPROVED	BLO

BUILDING B, LEVEL 1
8 NUGENT ST, GRAFTON,
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WOODS.CO.NZ

CDL LAND NEW ZEALAND LIMITED

MIDDLE RD DEVELOPMENT

COORDINATION DRAWING FOR EXTERNALS

STATUS	ISSUED FOR INFORMATION
SCALE	1:3000 @ A3
COUNCIL	HASTINGS DISTRICT
DWG NO	P25-496-00-9010-SK
REV	6

DRAFT

NOTES

1. UNDERFILL DRAINAGE IS TO BE INSTALLED AT THE DIRECTION OF THE ENGINEER. IF THE CONTRACTOR ENCOUNTERS SPRINGS OR OTHER SOURCES OF WATER HE IS TO NOTIFY THE ENGINEER.
2. ALL UNSUITABLE MATERIAL AS DEFINED IN THE SPECIFICATION IS TO BE REMOVED AND THE STRIPPED AREAS INSPECTED BY THE ENGINEER BEFORE WORK COMMENCES.
3. EARTHWORKS ARE NOT TO BE EXTENDED INTO ADJOINING SITES UNLESS THE ENGINEER HAS ISSUED SPECIFIC INSTRUCTIONS.
4. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING AND PROTECTING EXISTING SERVICES AND DRAINAGE ON SITE.
5. THE CONTRACTOR SHALL CLARIFY THE AREAS AND EXTENT OF CLEARING WITH THE ENGINEER BEFORE COMMENCEMENT AND CONFIRM THAT ALL NECESSARY CONSENTS AND APPROVALS ARE IN PLACE.
6. REFER TO SITE CLEARING PLAN P25-496-00-0030-GE FOR AREAS OF CONTAMINATION AND ARCHAEOLOGICAL VALUE.

LEGEND

- STAGE BOUNDARIES
- EXTENTS OF WORKS
- AREA OF FILL
- AREA OF CUT
- CUT/FILL CONTOUR (0.5m) — 1.5
- CUT/FILL ZERO LINE — 0.0
- EXISTING CONTAMINATION - ZONE 1
- EXISTING CONTAMINATION - ZONE 2 / 3
- EXISTING CONTAMINATION - ZONE 4

VOLUMES

CUT / FILL VOLUMES

CUT: 70,500m³,

FILL: 255,100m³,

BALANCE: 184,600m³, SHORTAGE FILL TO BE IMPORTED TO SITE

NOTE:
CUT / FILL VOLUMES EXCLUDE TOPSOIL.
EXCLUDES BULKING / COMPACTION FACTORS.

NOTE:

ASSUMED DESIGN DEPTH TO SUBGRADE 350mm THICK FOR ROADS (BACK OF KERB TO BACK OF KERB), 200mm THICK FOR FOOTPATHS, 400mm THICK FOR HOGGIN FOOTPATH. REFER TO TOPSOIL DEPTHS BELOW FOR BERM/LOT/GARDEN AREAS.

TOPSOIL VOLUMES

TOPSOIL STRIP: 90,500m³, ASSUMED 300mm DEPTH

TOPSOIL PLACE: 60,000m³,

NOTE:
TOPSOIL STRIP IS ASSUMED AS 300mm DEPTH OVER THE SITE.
TOPSOIL PLACE IS ASSUMED AS 150mm DEPTH OVER LOTS, 500mm DEPTH OVER GARDEN AREAS, AND 150mm DEPTH OVER BERMS.

RYMAN JAMES WATTIE
RETIREMENT VILLAGE

TE AUTE ROAD

GILPIN ROAD

ELLIOT CRESCENT

LUCKNOW SCHOOL

UPHAM STREET

MIDDLE ROAD

STAGE 9
STAGE 8
STAGE 7B
STAGE 6B
STAGE 11A
STAGE 7A
STAGE 3
STAGE 11B
STAGE 5
STAGE 6A
STAGE 10
STAGE 1
STAGE 2A
STAGE 3
STAGE 4
STAGE 2B

REFER SHEET 1202
REFER SHEET 1201
REFER SHEET 1205
REFER SHEET 1204
REFER SHEET 1203

SCALEBAR (m) 0 30 60 150
SCALE | 1:3000 @A3 | 1:1500 @A1|

Plot Date: 5:41:43 pm,5 August 2026, LOUISZS

File: C:\12DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK_22600\02 DRAWINGS\01 ENG\P25-496-00-1200 CUT FILL PLAN.DWG

REVI	N DETAILS	INT	DATE
1	I JED FOR FT SUBS V EN		3/2026

DRAFT

SURVE D	
DESIGN D	GP
DRAWI	NV
CHECK	LZM/BLO
APPROVED	BF

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8 NUGENT ST, GRAFTON,
AUCKLAND 1023
+64 9 308 9229
WOODS.CO.NZ

CDL LAND
NEW ZEALAND LIMITED

MIDDLE ROAD PROJECT

OVERALL CUT/FILL PLAN

STATUS	ISSUED FOR CONSENT
SCALE	1:3000 @ A3
COUNCIL	HASTINGS DISTRICT
DWG NO	P25-496-00-1200-EW

REV 1

DRAFT

NOTES

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6. REFER TO SITE CLEARING PLAN P25-496-00-0030-GE FOR AREAS OF CONTAMINATION AND ARCHAEOLOGICAL VALUE.

VOLUMES

CUT / FILL VOLUMES

CUT: 70,500m³,

FILL: 255,100m³,

BALANCE: 184,600m³, SHORTAGE FILL TO BE IMPORTED TO SITE

NOTE:
CUT / FILL VOLUMES EXCLUDE TOPSOIL.
EXCLUDES BULKING / COMPACTION FACTORS.

NOTE:

ASSUMED DESIGN DEPTH TO SUBGRADE 350mm THICK FOR ROADS (BACK OF KERB TO BACK OF KERB), 200mm THICK FOR FOOTPATHS, 400mm THICK FOR HOGGIN FOOTPATH. REFER TO TOPSOIL DEPTHS BELOW FOR BERM/LOT/GARDEN AREAS.

TOPSOIL VOLUMES

TOPSOIL STRIP: 90,500m³, ASSUMED 300mm DEPTH

TOPSOIL PLACE: 60,000m³,

NOTE:
TOPSOIL STRIP IS ASSUMED AS 300mm DEPTH OVER THE SITE.
TOPSOIL PLACE IS ASSUMED AS 150mm DEPTH OVER LOTS, 500mm DEPTH OVER GARDEN AREAS, AND 150mm DEPTH OVER BERMS.

LEGEND

- STAGE BOUNDARIES
- EXTENTS OF WORKS
- AREA OF FILL
- AREA OF CUT
- CUT/FILL CONTOUR (0.5m) — 1.5
- CUT/FILL ZERO LINE — 0.0
- EXISTING CONTAMINATION - ZONE 1
- EXISTING CONTAMINATION - ZONE 2 / 3
- EXISTING CONTAMINATION - ZONE 4

STAGE 3

STAGE 8

STAGE 7A

1003

TE AUTE ROAD

SCALEBAR (m) 0 10 20 50

SCALE | 1:1000 @A3 | 1:500 @A1|

Plot Date: 5:41:46 pm,5 August 2026, LOUISZS

File: C:\12DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK_22600\02 DRAWINGS\01 ENG\P25-496-00-1200 CUT FILL PLAN.DWG

NO	DESCRIPTION	INT	DATE
1	ISSUED FOR FT SUBSTANTIVE CONSENT	NV	05/08/2026

DRAFT

SURVEYED	
DESIGNED	GP
DRAWN	NV
CHECKED	LZM/BLO
APPROVED	BF

BUILDING B, LEVEL 1
8 NUGENT ST, GRAFTON,
AUCKLAND 1023
+64 9 308 9229
WOODS.CO.NZ

CDL LAND NEW ZEALAND LIMITED

MIDDLE ROAD PROJECT

CUT/FILL PLAN - SHEET 1

STATUS	ISSUED FOR CONSENT
SCALE	1:1000 @ A3
COUNCIL	HASTINGS DISTRICT
DWG NO	P25-496-00-1201-EW
REV	1

DRAFT

STAGE 7A

STAGE 7B

STAGE 9

STAGE 6A

STAGE 6B

STAGE 11A

EXISTING CONTAMINATION ZONE 4 - REFER TO THE REMEDIAL ACTION PLAN PREPARED BY AGFIRST FOR REMEDIATION METHODOLOGY

VOLUMES

CUT / FILL VOLUMES

CUT: 70,500m³,

FILL: 255,100m³,

BALANCE: 184,600m³, SHORTAGE FILL TO BE IMPORTED TO SITE

NOTE:
CUT / FILL VOLUMES EXCLUDE TOPSOIL.
EXCLUDES BULKING / COMPACTION FACTORS.

NOTE:

ASSUMED DESIGN DEPTH TO SUBGRADE 350mm THICK FOR ROADS (BACK OF KERB TO BACK OF KERB), 200mm THICK FOR FOOTPATHS, 400mm THICK FOR HOGGIN FOOTPATH. REFER TO TOPSOIL DEPTHS BELOW FOR BERM/LOT/GARDEN AREAS.

TOPSOIL VOLUMES

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TOPSOIL PLACE: 60,000m³,

NOTE:
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NOTES

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6. REFER TO SITE CLEARING PLAN P25-496-00-0030-GE FOR AREAS OF CONTAMINATION AND ARCHAEOLOGICAL VALUE.

LEGEND

- STAGE BOUNDARIES
- EXTENTS OF WORKS
- AREA OF FILL
- AREA OF CUT
- CUT/FILL CONTOUR (0.5m) — 1.5
- CUT/FILL ZERO LINE — 0.0
- EXISTING CONTAMINATION - ZONE 1
- EXISTING CONTAMINATION - ZONE 2 / 3
- EXISTING CONTAMINATION - ZONE 4

SCALEBAR (m) 0 10 20 50

SCALE | 1:1000 @A3 | 1:500 @A1|

ISSUE DETAILS	INT	DATE
ISSUED FOR FT... ESTA... CONSENT		05/08/2026

DRAFT

SURVEYED	
DESIGNED	GP
DRAWN	NV
CHECKED	LZM/BLO
APPROVED	BF

BUILDING B, LEVEL 1
8 NUGENT ST, GRAFTON,
AUCKLAND 1023
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WOODS.CO.NZ

CDL LAND NEW ZEALAND LIMITED

MIDDLE ROAD PROJECT

CUT/FILL PLAN - SHEET 2

STATUS	ISSUED FOR CONSENT	REV
SCALE	1:1000 @ A3	1
COUNCIL	HASTINGS DISTRICT	
DWG NO	P25-496-00-1202-EW	

Plot Date: 5:41:49 pm,5 August 2026, LOUISZS

File: C:\12DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK_22600\02 DRAWINGS\01 ENG\P25-496-00-1200 CUT FILL PLAN.DWG

DRAFT

WOODS
EST.1970

LEGEND

- STAGE BOUNDARIES
- EXTENTS OF WORKS
- AREA OF FILL
- AREA OF CUT
- CUT/FILL CONTOUR (0.5m) — 1.5
- CUT/FILL ZERO LINE — 0.0
- EXISTING CONTAMINATION - ZONE 1
- EXISTING CONTAMINATION - ZONE 2 / 3
- EXISTING CONTAMINATION - ZONE 4

MIDDLE ROAD

STAGE 4

EXISTING CONTAMINATION ZONE 1 - REFER TO THE REMEDIAL ACTION PLAN PREPARED BY AGFIRST FOR REMEDIATION METHODOLOGY

STAGE 3

EXISTING CONTAMINATION ZONE 2 / 3 - REFER TO THE REMEDIAL ACTION PLAN PREPARED BY AGFIRST FOR REMEDIATION METHODOLOGY

STAGE 2B

STAGE 6A

NOTES

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6. REFER TO SITE CLEARING PLAN P25-496-00-0030-GE FOR AREAS OF CONTAMINATION AND ARCHAEOLOGICAL VALUE.

VOLUMES

CUT / FILL VOLUMES

CUT: 70,500m³,

FILL: 255,100m³,

BALANCE: 184,600m³, SHORTAGE FILL TO BE IMPORTED TO SITE

NOTE:
CUT / FILL VOLUMES EXCLUDE TOPSOIL.
EXCLUDES BULKING / COMPACTION FACTORS.

NOTE:

ASSUMED DESIGN DEPTH TO SUBGRADE 350mm THICK FOR ROADS (BACK OF KERB TO BACK OF KERB), 200mm THICK FOR FOOTPATHS, 400mm THICK FOR HOGGIN FOOTPATH. REFER TO TOPSOIL DEPTHS BELOW FOR BERM/LOT/GARDEN AREAS.

TOPSOIL VOLUMES

TOPSOIL STRIP: 90,500m³, ASSUMED 300mm DEPTH

TOPSOIL PLACE: 60,000m³,

NOTE:
TOPSOIL STRIP IS ASSUMED AS 300mm DEPTH OVER THE SITE.
TOPSOIL PLACE IS ASSUMED AS 150mm DEPTH OVER LOTS, 500mm DEPTH OVER GARDEN AREAS, AND 150mm DEPTH OVER BERMS.

SCALEBAR (m) 0 10 20 50

SCALE | 1:1000 @A3 | 1:500 @A1|

REVISION DETAILS		INT	DATE
1	ISSUED FOR RESOURCE CONSENT		05/08/2026

DRAFT

SURVEYED	
DESIGNED	GP
DRAWN	NV
CHECKED	LZM/BLO
APPROVED	BF

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8 NUGENT ST, GRAFTON,
AUCKLAND 1023
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WOODS.CO.NZ

CDL LAND
NEW ZEALAND LIMITED

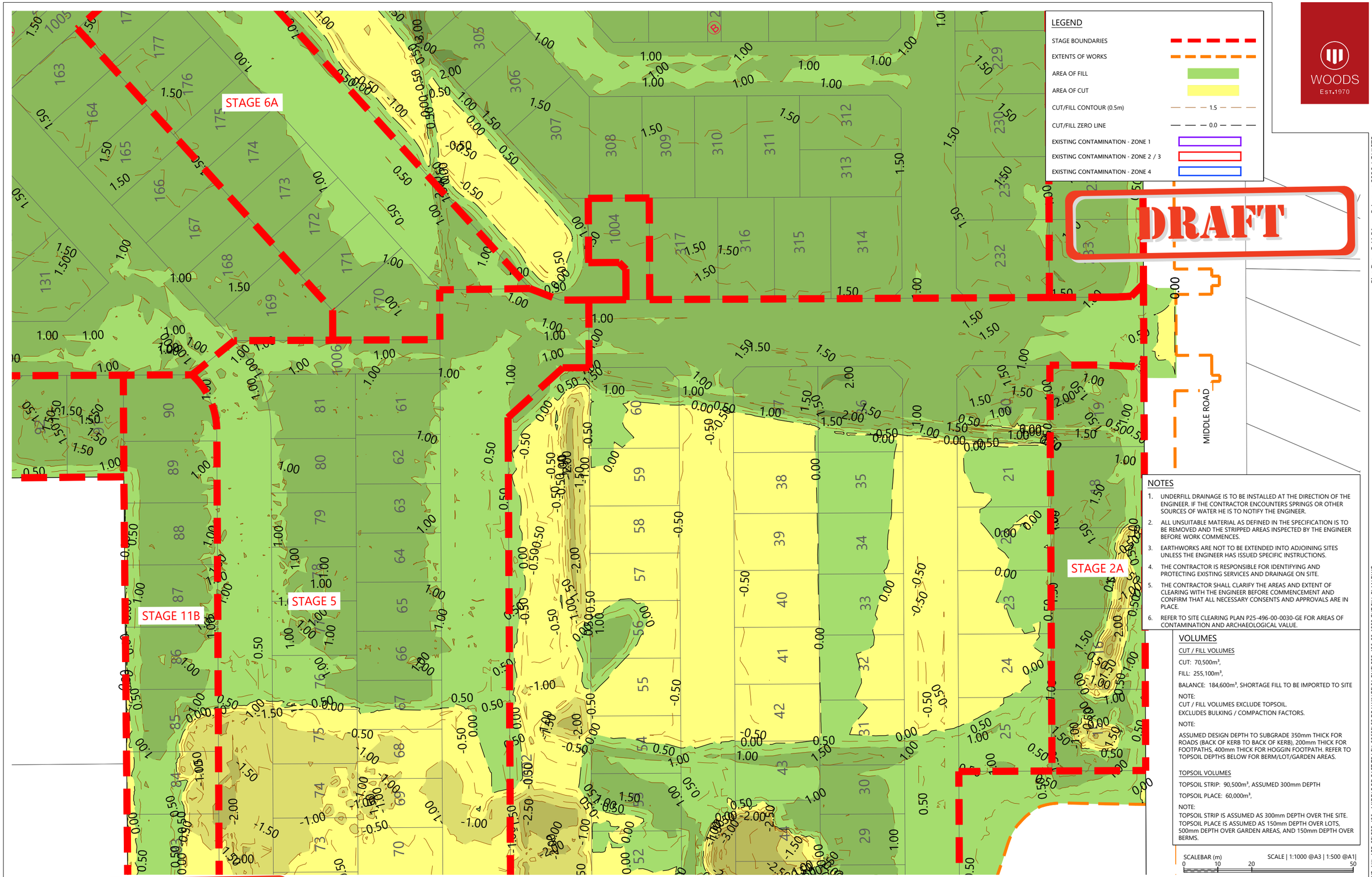
MIDDLE ROAD PROJECT

CUT/FILL PLAN - SHEET 3

STATUS	ISSUED FOR CONSENT	REV
SCALE	1:1000 @ A3	1
COUNCIL	HASTINGS DISTRICT	
DWG NO	P25-496-00-1203-EW	

Plot Date: 5:41:50 pm,5 August 2026, LOUISZS

File: C:\12DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK_226000\02 DRAWINGS\01 ENG\P25-496-00-1200 CUT FILL PLAN.DWG



WOODS
EST. 1970

NOTES

1. UNDERFILL DRAINAGE IS TO BE INSTALLED AT THE DIRECTION OF THE ENGINEER. IF THE CONTRACTOR ENCOUNTERS SPRINGS OR OTHER SOURCES OF WATER HE IS TO NOTIFY THE ENGINEER.
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6. REFER TO SITE CLEARING PLAN P25-496-00-0030-GE FOR AREAS OF CONTAMINATION AND ARCHAEOLOGICAL VALUE.

VOLUMES

CUT / FILL VOLUMES

CUT: 70,500m³,

FILL: 255,100m³,

BALANCE: 184,600m³, SHORTAGE FILL TO BE IMPORTED TO SITE

NOTE:
CUT / FILL VOLUMES EXCLUDE TOPSOIL.
EXCLUDES BULKING / COMPACTION FACTORS.

NOTE:

ASSUMED DESIGN DEPTH TO SUBGRADE 350mm THICK FOR ROADS (BACK OF KERB TO BACK OF KERB), 200mm THICK FOR FOOTPATHS, 400mm THICK FOR HOGGIN FOOTPATH. REFER TO TOPSOIL DEPTHS BELOW FOR BERM/LOT/GARDEN AREAS.

TOPSOIL VOLUMES

TOPSOIL STRIP: 90,500m³, ASSUMED 300mm DEPTH

TOPSOIL PLACE: 60,000m³,

NOTE:
TOPSOIL STRIP IS ASSUMED AS 300mm DEPTH OVER THE SITE.
TOPSOIL PLACE IS ASSUMED AS 150mm DEPTH OVER LOTS, 500mm DEPTH OVER GARDEN AREAS, AND 150mm DEPTH OVER BERMS.

SCALEBAR (m) 0 10 20 50
SCALE | 1:1000 @A3 | 1:500 @A1|

Plot Date: 5:41:51 pm,5 August 2026, LOUISZS

REVISION DETAILS		INT	DATE
1	ISSUED FOR R[illegible]		05/08/2026

DRAFT

SURVEYED		
DESIGNED	GP	
DRAWN	NV	
CHECKED	LZM/BLO	
APPROVED	BF	

BUILDING B, LEVEL 1
8 NUGENT ST, GRAFTON,
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+64 9 308 9229

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CDL LAND
NEW ZEALAND LIMITED

MIDDLE ROAD PROJECT

CUT/FILL PLAN - SHEET 4

STATUS	ISSUED FOR CONSENT	REV
SCALE	1:1000 @ A3	1
COUNCIL	HASTINGS DISTRICT	
DWG NO	P25-496-00-1204-EW	

File: C:\12DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK_226000\02 DRAWINGS\01 ENG\P25-496-00-1200 CUT FILL PLAN.DWG

DRAFT

STAGE 1

STAGE 10

MIDDLE ROAD

1000

1001

VOLUMES

CUT / FILL VOLUMES

CUT: 70,500m³,

FILL: 255,100m³,

BALANCE: 184,600m³, SHORTAGE FILL TO BE IMPORTED TO SITE

NOTE:
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NOTE:

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TOPSOIL PLACE: 60,000m³,

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TOPSOIL PLACE IS ASSUMED AS 150mm DEPTH OVER LOTS, 500mm DEPTH OVER GARDEN AREAS, AND 150mm DEPTH OVER BERMS.

LEGEND

- STAGE BOUNDARIES
- EXTENTS OF WORKS
- AREA OF FILL
- AREA OF CUT
- CUT/FILL CONTOUR (0.5m) — 1.5
- CUT/FILL ZERO LINE — 0.0
- EXISTING CONTAMINATION - ZONE 1
- EXISTING CONTAMINATION - ZONE 2 / 3
- EXISTING CONTAMINATION - ZONE 4

NOTES

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SCALEBAR (m) 0 10 20 50

SCALE | 1:1000 @A3 | 1:500 @A1|

REVISION DETAILS		INT	DATE
1	ISSUED FOR [illegible]	[illegible]	05/08/2026

DRAFT

SURVEYED		
DESIGNED	GP	
DRAWN	NV	
CHECKED	LZM/BLO	
APPROVED	BF	

BUILDING B, LEVEL 1
8 NUGENT ST, GRAFTON,
AUCKLAND 1023
+64 9 308 9229
WOODS.CO.NZ

CDL LAND NEW ZEALAND LIMITED

MIDDLE ROAD PROJECT

CUT/FILL PLAN - SHEET 5

STATUS	ISSUED FOR CONSENT	REV
SCALE	1:1000 @ A3	1
COUNCIL	HASTINGS DISTRICT	
DWG NO	P25-496-00-1205-EW	

Plot Date: 5:41:53 pm,5 August 2026, LOUISZS

File: C:\2DSYNERGY\DATA\WP-AKL-APP-02\P25-496 - MIDDLE RD FAST TRACK_22600\02 DRAWINGS\01 ENG\P25-496-00-1200 CUT FILL PLAN.DWG

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APPENDIX D
Site Investigation Data

HAND AUGER BOREHOLE LOG - HA01

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 27/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 1

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Position: 1931485.4mE; 5600625.6mN Projection: NZTM
Elevation: 8.60m Datum: NZVD 2016 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description (Soil: Soil symbol; soil type; colour; structure; bedding; plasticity; sensitivity; additional comments. (origin/geological unit) Rock: Colour; fabric; rock name; additional comments. (origin/geological unit))	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)
			8.6			OL: Organic SILT with some sand and trace organics: dark brown. Sand; fine. Organics; rootlets. Low plasticity. (Topsoil)	D		2, 2, 2
	0.3	Peak = 160kPa Residual = 44kPa	8.3			SP: Fine SAND with some silt: light grey. Poorly graded. (Alluvium)	M	MD to D	4, 6, 7, 10, 10, 10
				1			W		5, 6, 8, 8, 9, 10
						... at 1.50m, becomes dark grey	S	D	14, 15, 17, 15, 11, 15
	2.0	Peak = UTP		2				D to VD	19, 14, 17, 20
27-05-2026						Borehole terminated at 2.5 m			
				3					
				4					
				5					

Termination Reason: Hole collapse due to groundwater.
Shear Vane No: 3965 DCP No: 36
Remarks: Groundwater encountered at 1.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

BOREHOLE LOG - MH01

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 25/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 2

CMW Geosciences
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Position: 1931685.7mE; 5601399.4mN Projection: NZTM
Elevation: 8.20m Datum: NZVD 2016 Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering	Recovery	RQD	Estimated Strength	Defect Spacing (mm)	Drilling Method/ Support	Structure & Other Observations
				8.2			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)									
				8.0			ML: SILT with some fine sand and trace organics: orange mottled brownish grey. Sand; fine. Organics; fibrous. Low plasticity. (Alluvium)	M			80				SNC	
				7.3	1		SP: Fine SAND with some SILT: light greyish white. Poorly graded. (Alluvium)									
		1.5	SPT: N* = 14 (2, 3 / 3, 3, 4, 4)				*... from 1.50m to 2.10m, Grades to include some black fibrous organics*	W			100				SPT	
					2				MD							
		3.0	SPT: N* = 4 (0, 0 / 0, 0, 4, 0)	5.2	3		ML: SILT with some sand and trace organics: bluish grey. Sand; fine. Organics; fibrous. Low plasticity. (Alluvium)	S			100				SNC	
				4.6			SM: Sandy SILT with trace organics: bluish grey. Sand; fine to medium, pumiceous. Organics; fibrous. Low plasticity. (Alluvium)		F to St		100				SPT	
					4											
				4.1			ML: SILT with some sand and trace organics: grey. Sand; fine. Organics; bark and fibrous. Low plasticity. (Alluvium)				100				SNC	
		4.5	SPT: N* = 6 (1, 1 / 0, 0, 2, 4)	3.7			SM: Silty fine to medium SAND: grey. Poorly graded. (Alluvium)		L		100				SPT	
					5		*... from 4.95m to 5.10m, Includes trace gravel, sandstone*									

Termination Reason: Target Depth Reached.
Shear Vane No: DCP No:

Remarks: Groundwater encountered at 1.95m. Piezometer installed.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

BOREHOLE LOG - MH01

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 25/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 2 of 2

CMW Geosciences
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Position: 1931685.7mE; 5601399.4mN Projection: NZTM
Elevation: 8.20m Datum: NZVD 2016 Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering	Recovery	RQD	Estimated Strength	Defect Spacing (mm)	Drilling Method/ Support	Structure & Other Observations
				2.7			SM: Silty fine to medium SAND: grey. Poorly graded. (Alluvium)									
							ML: SILT with trace sand: dark brown. Sand; fine. Low plasticity. (Alluvium)				100				SNC	
		6.0	SPT: N* = 0 (1, 0 / 0, 0, 0, 0)		6				VS		100				SPT	
							Borehole terminated at 6.45 m									
					7											
					8											
					9											
					10											

Weathering: RS, CW, HW, MW, SW, UW
Estimated Strength: EW, VW, W, MS, S, VS, ES
Defect Spacing (mm): <20, 20-60, 60-200, 200-600, 600-2000, >2000

Termination Reason: Target Depth Reached.
Shear Vane No: DCP No:
Remarks: Groundwater encountered at 1.95m. Piezometer installed.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

BOREHOLE CORE PHOTOGRAPHS: BH-01

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	25/05/2025
Position:	1931685.7mE; 5601399.4mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA



BH-01: 0m to 3.0m



BH-01: 3.0m to 5.65m



BH-01: 5.65m to 6.45m

BOREHOLE LOG - MH02

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 25/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 2

CMW Geosciences
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Position: 1931882.6mE; 5601135.5mN Projection: NZTM
Elevation: 8.60m Datum: NZVD 2016 Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering: RS	CW	HW	MW	SW	UW	Recovery	RQD	Estimated Strength: EW	VW	W	MS	S	VS	ES	Defect Spacing (mm): <20	20-60	60-200	200-600	600-2000	>2000	Drilling Method/ Support	Structure & Other Observations
				8.6			OL: SILT with trace organics (rootlets): dark brown. Low plasticity. (Topsoil)																									
				8.4			ML: SILT: brown. Low plasticity. (Alluvium)	M																							
				8.1			SM: Silty SAND: light greyish brown. Poorly graded. (Alluvium)									77														SNC	
					1			W																							
		1.5	SPT: N* = 16 (3, 3 / 4, 4, 4, 4)						MD							100													SPT	
					2																										
				6.2			SM: silty fine to coarse pumiceous SAND with trace gravel: dark grey. Gravel; fine to coarse, sub angular to sub rounded, pumice. Well graded. (Alluvium)									100													SNC	
				5.8			ML: SILT with some sand and trace organics: bluish grey. Sand; fine. Organics; fibrous. Low plasticity. (Alluvium) *... from 2.80m to 3.00m, large fibrous roots*																							
		3.0	SPT: N* = 1 (0, 0 / 0, 0, 1, 0)		3			S	S							100													SPT	
					4											100													SNC	
				4.2					L																						
		4.5	SPT: N* = 0 (0, 0 / 0, 0, 0, 0)													100													SPT	
					5																										

Termination Reason: Target Depth Reached.
Shear Vane No: DCP No:

Remarks: Groundwater encountered at 1.95m. Piezometer installed.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

BOREHOLE LOG - MH02

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 25/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 2 of 2

CMW Geosciences
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Position: 1931882.6mE; 5601135.5mN Projection: NZTM
Elevation: 8.60m Datum: NZVD 2016 Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering: RS CW HW MW SW UW	Recovery	RQD	Estimated Strength: EW VW W MS S VS ES	Defect Spacing (mm): <20 20-60 60-200 200-600 600-2000 >2000	Drilling Method/ Support	Structure & Other Observations
				3.1			ML: SILT with some sand and trace organics: bluish grey. Sand; fine. Organics; fibrous. Low plasticity. (Alluvium)								SNC	
							... at 5.20m, brown mottled bluish grey, fibrous material increasing.									
							SM: Sandy SILT: light pink & blue. Sand; fine to coarse, pumiceous. Low plasticity. (Alluvium)				100					
		6.0	SPT: N* = 2 (2, 2 / 1, 0, 0, 1)		6		GM: Gravelly SILT: grey. Gravel; fine to coarse. Low plasticity. (Alluvium)		F						SPT	
							Borehole terminated at 6.45 m									
					7											
					8											
					9											
					10											

Termination Reason: Target Depth Reached.
Shear Vane No: DCP No:

Remarks: Groundwater encountered at 1.95m. Piezometer installed.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

BOREHOLE CORE PHOTOGRAPHS: BH-02

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	TGA2025-0024	**Date:**	25/05/2025
Position:	1931882.6mE; 5601135.5mN	**Contractor:**	Geotechnics
Logged by:	AG	**Checked by:**	IA



BH-02: 0m to 2.8m



BH-02: 2.8m to 5.5m



BH-02: 5.5m to 6.45m

BOREHOLE LOG - MH03

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 25/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 2

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Position: 1931525.2mE; 5600861.3mN Projection: NZTM
Elevation: 8.50m Datum: NZVD 2016 Survey Source: Handheld GPS

Depth	Type & Results	RL (m)	Depth (m)	Material Description	Moisture Condition	Consistency/ Relative Density	Recovery	Drilling Method/ Support
		8.5		OL: Organic SILT with trace organics (rootlets): dark brown. Organics; rootlets. Low plasticity. (Topsoil)				
		8.3		ML: SILT with some sand and trace organics: light greyish brown. Sand; fine. Organics; rootlets. Low plasticity. (Alluvium)	M			
		8.0		SM: Silty fine SAND with trace organics: grey. Organics; fibrous and black bark. Poorly graded. (Alluvium)	W	MD	80	SNC
1.5	SPT: N* = 14 (3, 3 / 4, 3, 3, 4)		1				100	SPT
		6.6	2	SP: Fine SAND with some organics : greyish brown. Organics; dark brown to black bark. Poorly graded. (Alluvium)	S		100	SNC
		6.2		SM: Sandy organic SILT: bluish grey. Sand; fine. Organics; bark and fibrous. Low plasticity. (Alluvium)		F to St		
		6.1		SM: Silty fine SAND with trace organics: dark bluish brown. Organics; rootlets. Poorly graded. (Alluvium)				
3.0	SPT: N* = 3 (1, 1 / 0, 1, 1, 1)		3				100	SPT
		5.0		SM: Sandy SILT with trace organics: greyish blue. Sand; fine to medium. Organics; fibrous. Low plasticity. (Alluvium)			100	SNC
			4			F to St		
4.5	SPT: N* = 2 (0, 0 / 0, 1, 0, 1)						100	SPT
			5	*... from 4.95m to 6.45m, becoming less sandy, blue. Sand; fine to coarse*				

Termination Reason: Target Depth Reached.
Shear Vane No: DCP No:

Remarks: Groundwater encountered at 1.95m. Piezometer installed.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

BOREHOLE LOG - MH03

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 25/05/2026
Borehole Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 2 of 2

CMW Geosciences
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Position: 1931525.2mE; 5600861.3mN Projection: NZTM
Elevation: 8.50m Datum: NZVD 2016 Survey Source: Handheld GPS

Well	Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Weathering: RS CW HW MW SW UW	Recovery	RQD	Estimated Strength: EW VW W MS S VS ES	Defect Spacing (mm): <20 20-60 60-200 200-600 600-2000 >2000	Drilling Method/ Support	Structure & Other Observations
					6		SM: Sandy SILT with trace organics: greyish blue. Sand; fine to medium. Organics; fibrous. Low plasticity. (Alluvium)				100				SNC	
		6.0	SPT: N* = 3 (0, 0 / 0, 1, 0, 2)								100				SPT	
							Borehole terminated at 6.45 m									
					7											
					8											
					9											
					10											

Termination Reason: Target Depth Reached.
Shear Vane No: DCP No:

Remarks: Groundwater encountered at 1.95m. Piezometer installed.

BOREHOLE CORE PHOTOGRAPHS: BH-03

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	TGA2025-0024	**Date:**	25/05/2025
Position:	1931525.2mE; 5600861.3mN	**Contractor:**	Geotechnics
Logged by:	AG	**Checked by:**	IA



BH-03: 0m to 3.0m



BH-03: 3.0m to 5.7m



BH-03: 5.7m to 6.45m

TEST PIT LOG - TP01

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026

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Test Pit Location: Refer to Site Plan | Logged by: AJG | Checked by: IA | Scale: 1:25 | Sheet 1 of 1

Position: 1931542.5mE; 5601390.6mN Projection: NZTM | Pit Dimensions: m by m

Elevation: 8.42m | Datum: NZVD 2016 | Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			8.4			OL: Organic SILT with some sand and trace rootlets: dark brown. Sand; fine. Low plasticity. (Topsoil)	D to M		2 2 3	
			8.1			MH: SILT with trace sand and organics: orange mottled greyish brown. Sand; fine. Organics; black fibrous and rootlets. Low plasticity. (Alluvium)		St	2 4 3 3 2 2 1	
	0.4	Peak = 70kPa Residual = 30kPa		1						
			7.2			SP: Fine SAND: greyish white. Poorly graded. (Alluvium)	M	D	3 8 9 9 12 9 9 10 9 10	
			6.5	2		SP: Fine SAND with some silt.: yellowish orange mottled grey, streaked. Poorly graded. (Alluvium)			14	
			6.3			SM: Sandy SILT: dark brownish grey. Sand; fine. Low plasticity. Includes some pumiceous sand; fine to medium. (Alluvium)		VD	15 20	
			5.2	3		MH: SILT with some organics and trace sand: black. Organics; tree root and bark. Sand; fine. Low plasticity. (Alluvium)	M to W			
			4.8			SM: Sandy SILT with trace organics: blue. Sand; fine. Organics; rootlets and fibrous. Low plasticity. (Alluvium)				
26-05-2026				4			S			
						Test pit terminated at 4.10 m				
				5						

Termination Reason: Target Depth Reached.

Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 4.0m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP01

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931542.5mE; 5601390.6mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP01 – TEST PIT EXCAVATION



TP01 – Test Pit Excavation

TEST PIT LOG - TP02

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026
Test Pit Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 1

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Position: 1931873.7mE; 5600892.1mN Projection: NZTM Pit Dimensions: m by m
Elevation: 8.20m Datum: NZVD 2016 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			8.2			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)			4	
									4	
									3	
									2	
			7.8			MH: SILT with some sand: orange mottled grey. Sand; fine. Low plasticity. (Alluvium)	D to M	St	3	
									3	
	0.6	Peak = 79kPa Residual = 29kPa	7.6			SP: Fine SAND: greyish white. Poorly graded. (Alluvium)			2	
								L	2	
									2	
				1					8	
									8	
									6	
			7.0			SW: Fine to coarse pumiceous SAND with some SILT: Light grey. Well graded. (Alluvium)	M to W		7	
									8	
									8	
									8	
									7	
									12	
26-05-2026									15	
			6.3			GM: Silty SAND with some gravel and minor cobbles: grey. Sand; fine to coarse, pumiceous. Gravel; subrounded, pumiceous. Cobbles up to 100mm, subrounded. Low plasticity. (Alluvium)			8	
				2					12	
									15	
									14	
								D	19	
									12	
									15	
									12	
									11	
							S		17	
				3						
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Hole collapse due to groundwater.
Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 1.9m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP02

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931873.7mE; 5600892.1mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP02 – Test Pit Excavation

TEST PIT LOG - TP03

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026
Test Pit Location: Refer to Site Plan Logged by: AJD Checked by: IA Scale: 1:25 Sheet 1 of 1

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Position: 1931834.2mE; 5601037.3mN Projection: NZTM
Elevation: 9.44m Datum: NZVD 2016
Pit Dimensions: m by m
Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			9.4			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)			2	
									2	
			9.1						2	
	0.4	Peak = 90kPa Residual = 33kPa				SM: Sandy SILT: light brown. Sand; fine. Low plasticity. (Alluvium)			3	
									2	
									2	
									2	
								St	1	
							D to M		2	
				1					4	
	1.1	Peak = 76kPa Residual = 30kPa							9	
			8.2			SP: Fine SAND: grey. Poorly graded. (Alluvium)			12	
									11	
									12	
									12	
								D	15	
									16	
									14	
27-05-2026							W		2	
			7.5						0	
				2		SM: Sandy SILT: brown. Sand; fine. Low plasticity. (Alluvium)				
						... at 2.20m, Grades to greyish blue				
							S			
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.
Shear Vane No: 3965 DCP No: 36
Remarks: Groundwater encountered at 2m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP03

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931834.2mE; 5601037.3mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP03 – Test Pit Excavation



TP03 – Test Pit Excavation

TEST PIT LOG - TP04

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026
Test Pit Location: Refer to Site Plan

CMW Geosciences
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Checked by: IA Scale: 1:25 Sheet 1 of 1

Position: 1931809.1mE; 5600781.8mN Projection: NZTM
Elevation: 9.72m Datum: NZVD 2016

Pit Dimensions: m by m
Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			9.7			OL: Organic SILT with trace rootlets: brown. Low plasticity. (Topsoil)	M		0	
			9.4						0	
	0.4	Peak = 38kPa Residual = 15kPa				SM: Silty fine SAND: light brown. Poorly graded. (Alluvium)		L	1	
			9.1						1	
						SP: Fine to medium SAND: light brown. Sand; pumiceous. Well graded. (Alluvium)		MD	2	
			8.8				M		4	
	1.0	Peak = 38kPa Residual = 27kPa		1		SM: Sandy SILT: grey. Low plasticity. (Alluvium)			7	
									7	
									11	
									10	
									11	
									11	
								F	14	
									14	
									14	
26-05-2026							W		16	
									14	
									13	
			7.8						14	
				2		SM: Sandy SILT with trace organics: blue. Sand; fine. Organics; fibrous. Low plasticity. (Alluvium)			15	
									7	
									10	
									11	
									13	
									14	
									12	
									17	
									17	
				3			S			
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.

Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 1.9m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP04

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931809.1mE; 5600781.8mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP04 – Test Pit Excavation



TP04 – Test Pit Excavation

TEST PIT LOG - TP05

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026
Test Pit Location: Refer to Site Plan

CMW Geosciences
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Checked by: IA Scale: 1:25 Sheet 1 of 1

Position: 1931868.5mE; 5600860.9mN Projection: NZTM
Elevation: 10.24m Datum: NZVD 2016

Pit Dimensions: m by m
Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			10.2			OL: Organic SILT with trace sand and organics: dark brown. Sand; fine. Organics; rootlets and fibrous. Low plasticity. (Topsoil)			3	
			9.9			GM: Gravelly SILT: light brown. Gravel; fine to coarse, subrounded. Low plasticity. (Existing Fill)			3	
	0.8	Peak = 88kPa Residual = 29kPa							5	
									7	
									5	
									5	
									4	
									7	
								St	3	
				1		... from 1.00m to 2.00m, Grades to some fine gravel			3	
	1.2	Peak = 90kPa Residual = 24kPa							4	
									4	
									7	
							D to M		7	
									6	
									5	
									6	
									6	
			8.3			SP: Fine SAND: light grey. Poorly graded. (Alluvium)			12	
				2				D	13	
									16	
			7.2	3		SM: Silty SAND: dark grey. Poorly graded. Dense. (Alluvium)	M to W			
26-05-2026							S			
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.

Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 3.9m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP05

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931868.5mE; 5600860.9mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP05 – Test Pit Excavation



TP05 – Test Pit Excavation

TEST PIT LOG - TP06

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 27/05/2026
Test Pit Location: Refer to Site Plan

CMW Geosciences
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Checked by: IA Scale: 1:25 Sheet 1 of 1

Position: 1931590.0mE; 5600519.6mN Projection: NZTM
Elevation: 9.15m Datum: NZVD 2016

Pit Dimensions: m by m
Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			9.2			OL: Organic SILT with trace organics (rootlets): dark brown. Low plasticity. (Topsoil)			5 3	
			9.0			GM: Gravelly SILT with some cobbles and sand and trace organics: orange and dark brown mottled light brown. Gravel; fine to coarse, subrounded to subangular. Sand; fine. Cobbles; up to 100mm, subrounded. Organics; rootlets and bark. Low plasticity. (Existing Fill)		VSt	6 6 7 3 6 7	
	0.6	Peak = 129kPa Residual = 21kPa					D to M			
			8.4			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)			9 4	
			8.2	1		SP: Fine SAND: grey. Poorly graded. (Alluvium)		MD	4 6	
			7.8			SM: Silty fine SAND: yellowish orange mottled brown. Poorly graded. (Alluvium)		D	10 13 15	
			7.6			SM: Sandy SILT: dark bluish grey. Sand; fine. Low plasticity. (Alluvium)	M to W		15 17	
27-05-2026				2				VD	2 0	
						... at 2.20m, Trace boulders and cobbles				
				3			S			
			5.6			SM: Sandy SILT with trace organics: blue. Sand; fine to medium. Organics; fibrous. Low plasticity. (Alluvium)				
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.

Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 2.0m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP06

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	27/05/2025
Position:	1931590.0mE; 5600519.6mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP06 – Test Pit Excavation



TP06 – Test Pit Excavation

TEST PIT LOG - TP07

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 27/05/2026
Test Pit Location: Refer to Site Plan | Checked by: IA | Scale: 1:25 | Sheet 1 of 1

CMW Geosciences
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Position: 1931422.1mE; 5600759.5mN Projection: NZTM | Pit Dimensions: m by m
Elevation: 9.81m | Datum: NZVD 2016 | Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			9.8			SM: Sandy SILT with some gravel with trace cobbles and organics: light orange and black mottled brown. Sand; fine. Gravel; fine to coarse, subrounded to angular. Cobbles; up to 80mm, subangular. Organics; roots and fibrous. Low plasticity. (Existing Fill)			1	
	0.5	Peak = 90kPa Residual = 21kPa							4	
									3	
									8	
									9	
									9	
									6	
									6	
									5	
				1					3	
								St	6	
									6	
									6	
									8	
									11	
									8	
									9	
									9	
									8	
				2			D to M		8	
									9	
			7.7			OL: Organic SILT with trace organics: dark brown. Organics; rootlets and bark. Low plasticity. (Topsoil)			9	
			7.6			SP: Fine pumiceous SAND with trace cobbles: light grey. Cobbles up to 80mm, rounded, pumice. Poorly graded. (Alluvium)			15	
								D	15	
									16	
			7.3			SP: Fine SAND with some silt: yellowish orange mottled light grey. Poorly graded. (Alluvium)			15	
									17	
								VD	2	
			7.0			SP: Fine SAND: grey. Poorly graded. (Alluvium)			0	
				3		*... at 2.80m, becomes dark grey*				
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.
Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater not encountered.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP07

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	27/05/2025
Position:	1931422.1mE; 5600759.5mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP07 – Test Pit Excavation



TP07 – Test Pit Excavation

TEST PIT LOG - TP08

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026
Test Pit Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 1

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Position: 1931977.8mE; 5600952.0mN Projection: NZTM Pit Dimensions: m by m
Elevation: 10.54m Datum: NZVD 2016 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			10.5			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)			2 2	
			10.2						4	
	0.4	Peak = 90kPa Residual = 29kPa				SM: Sandy SILT with trace organics: light whitish brown. Sand; fine to coarse, calcareous. Organics; rootlets. Low plasticity. (Alluvium)	D to M	F to St	4 4 3 4 4 3 1 1	
				1						
	1.2	Peak = 50kPa Residual = 27kPa	9.3			SP: Fine SAND: light brown. Poorly graded. (Alluvium)			2 2 2 4	
26-05-2026							W	VL to L	2 3 2	
								MD to D	6 12 10	
			8.5	2		SM: Sandy SILT with trace organics: blue. Sand; fine to medium. Organics; fibrous. Low plasticity. (Alluvium)	S	St to VSt	11 2 2	
				3						
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.
Shear Vane No: 3965 DCP No: 36
Remarks: Groundwater encountered at 1.8m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP08

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931977.8mE; 5600952.0mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP08 – Test Pit Excavation



TP08 **– Test Pit Excavation**

TEST PIT LOG - TP09

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026

CMW Geosciences
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Test Pit Location: Refer to Site Plan | Logged by: AJD | Checked by: IA | Scale: 1:25 | Sheet 1 of 1

Position: 1931796.3mE; 5600989.1mN Projection: NZTM | Pit Dimensions: m by m

Elevation: 8.38m | Datum: NZVD 2016 | Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			8.4			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)			2	
			8.3			SM: Sandy SILT: brown. Sand; fine. Low plasticity. (Alluvium)			4	
	0.4	Peak = 100kPa Residual = 23kPa						St	4	
									4	
							D to M		2	
									3	
									6	
									10	
			7.6			SP: SAND with some silt: greyish white. Poorly graded. (Alluvium)			9	
									8	
			7.4	1		SM: Silty SAND: brown. Poorly graded. (Alluvium)			14	
								D	11	
									12	
									12	
									14	
								VD	20	
							M			
				2						
26-05-2026							W			
			6.0			SP: Fine to coarse SAND: grey. Sand; fine, partially fine to coarse pumiceous sand. Well graded. (Alluvium)				
			5.4	3		SM: Sandy SILT with trace organics: blue. Sand; fine to medium. Organics; fibrous. Low plasticity. (Alluvium)				
						... at 3.00m, Tree roots	S			
				4		Test pit terminated at 4.00 m				
				5						

Termination Reason: Target Depth Reached.

Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 2.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP09

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931796.3mE; 5600989.1mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP09 – Test Pit Excavation



TP09– Test Pit Excavation

TEST PIT LOG - TP10

Client: CDL Land New Zealand Ltd
Project: Middle Road Subdivision, Havelock North
Site Location: Middle Road, Havelock North
Project No.: NAP2025-0024
Date: 26/05/2026
Test Pit Location: Refer to Site Plan Logged by: AJG Checked by: IA Scale: 1:25 Sheet 1 of 1

CMW Geosciences
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Position: 1931487.1mE; 5601343.0mN Projection: NZTM Pit Dimensions: m by m
Elevation: 8.30m Datum: NZVD 2016 Survey Source: Hand-held GPS

Groundwater	Samples & Insitu Tests: Depth	Samples & Insitu Tests: Type & Results	RL (m)	Depth (m)	Graphic Log	Material Description	Moisture Condition	Consistency/ Relative Density	Dynamic Cone Penetrometer (Blows/100mm)	Structure & Other Observations
			8.3			OL: Organic SILT with trace rootlets: dark brown. Low plasticity. (Topsoil)			2	
									3	
			8.0			MH: SILT with some organics: orange mottled brown. Organics; black bark. Low plasticity. (Alluvium)	D to M	St	3	
	0.6	Peak = 88kPa Residual = 17kPa							4	
									3	
									4	
			7.6			SP: Fine SAND with some silt: greyish white. Poorly graded. (Alluvium)		L	2	
									3	
									12	
									11	
			7.3	1		SP: Fine to coarse SAND with some silt: orange streaked light grey. Sand; fine, partially fine to coarse pumiceous. Well graded. (Alluvium)	M		12	
									13	
									13	
			7.0			SP: Fine SAND: grey. Poorly graded. (Alluvium)		D	13	
									8	
									14	
									14	
									15	
									14	
									15	
				2					15	
								VD	2	
26-05-2026			6.1			SM: Sandy SILT with some organics: greyish blue. Sand; fine. Organics; dark brown bark. Low plasticity. (Alluvium)			0	
							W			
				3						
							S			
				4						
						Test pit terminated at 4.20 m				
				5						

Termination Reason: Target Depth Reached.
Shear Vane No: 3965 DCP No: 36

Remarks: Groundwater encountered at 2.5m.

This report is based on the attached field description for soil and rock, CMW Geosciences - Field Logging Guide, Revision 5 - August 2024.

TEST PIT PHOTOGRAPHS: TP10

Client:	CDL Land New Zealand Ltd		
Project:	Middle Road Subdivision	**Location:**	Middle Road, Havelock North
Project No:	NAP2025-0024AD	**Date:**	26/05/2025
Position:	1931487.1mE; 5601343.0mN	**Contractor:**	Kaweka Contractors Hawke's Bay
Logged by:	AG	**Checked by:**	IA
Dimensions:	4 x 1.5m	**Termination Depth:**	4m below existing ground level.



TP10 – Test Pit Excavation



TP10 – Test Pit Excavation

CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT01

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

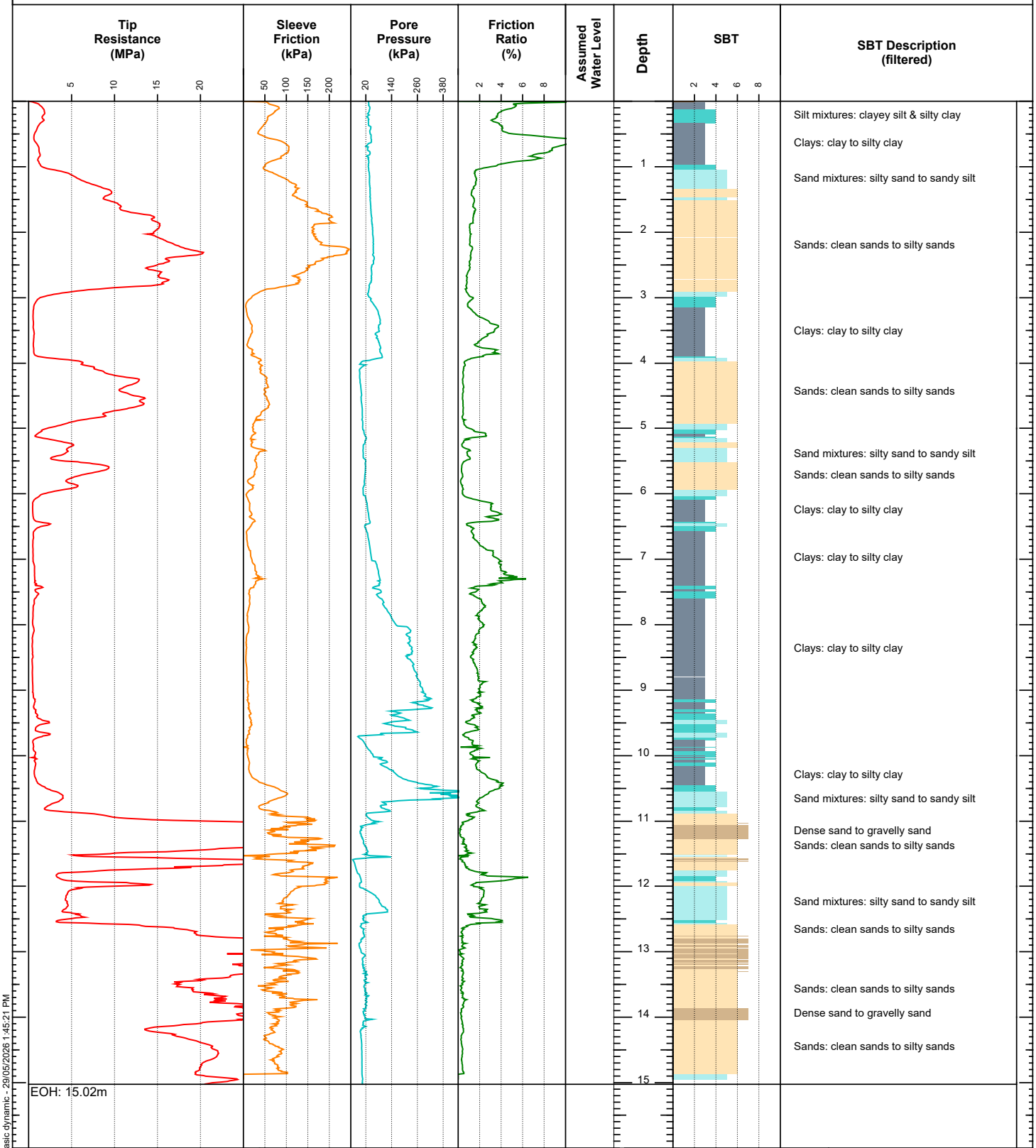
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931644mE, 5601436mN

ELEVATION: Ground

END DATE: 26/05/2026



SBT Description (filtered)

- Silt mixtures: clayey silt & silty clay
- Clays: clay to silty clay
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Clays: clay to silty clay
- Sands: clean sands to silty sands
- Sand mixtures: silty sand to sandy silt
- Sands: clean sands to silty sands
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Clays: clay to silty clay
- Sand mixtures: silty sand to sandy silt
- Dense sand to gravelly sand
- 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
- Dense sand to gravelly sand
- Sands: clean sands to silty sands

NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

Artesian 9m

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT02

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

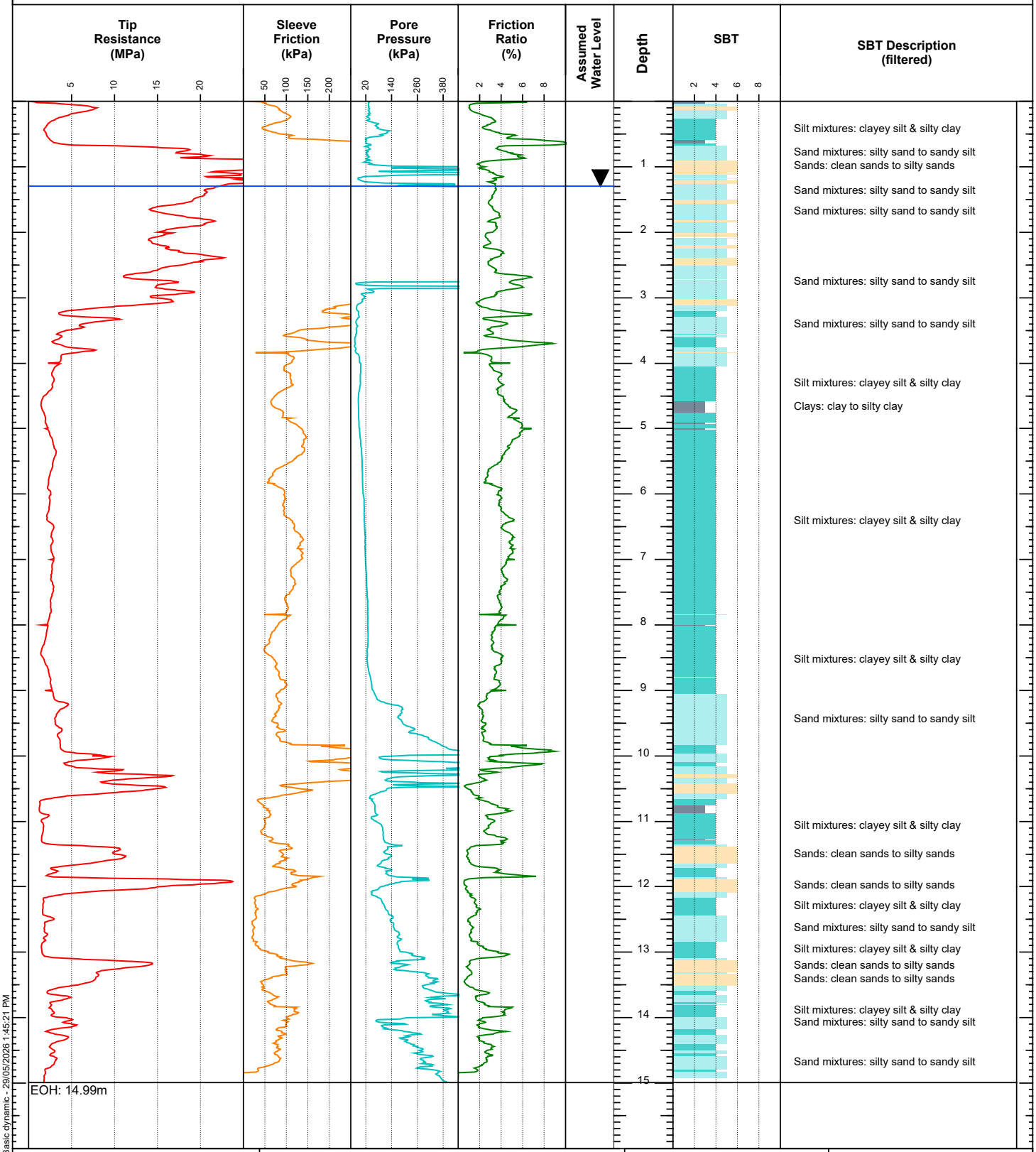
CONTRACTOR: Geotech Drilling Ltd

START DATE: 25/05/2026

CO-ORDINATES: 1931825mE, 5600870mN

ELEVATION: Ground

END DATE: 25/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT03

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

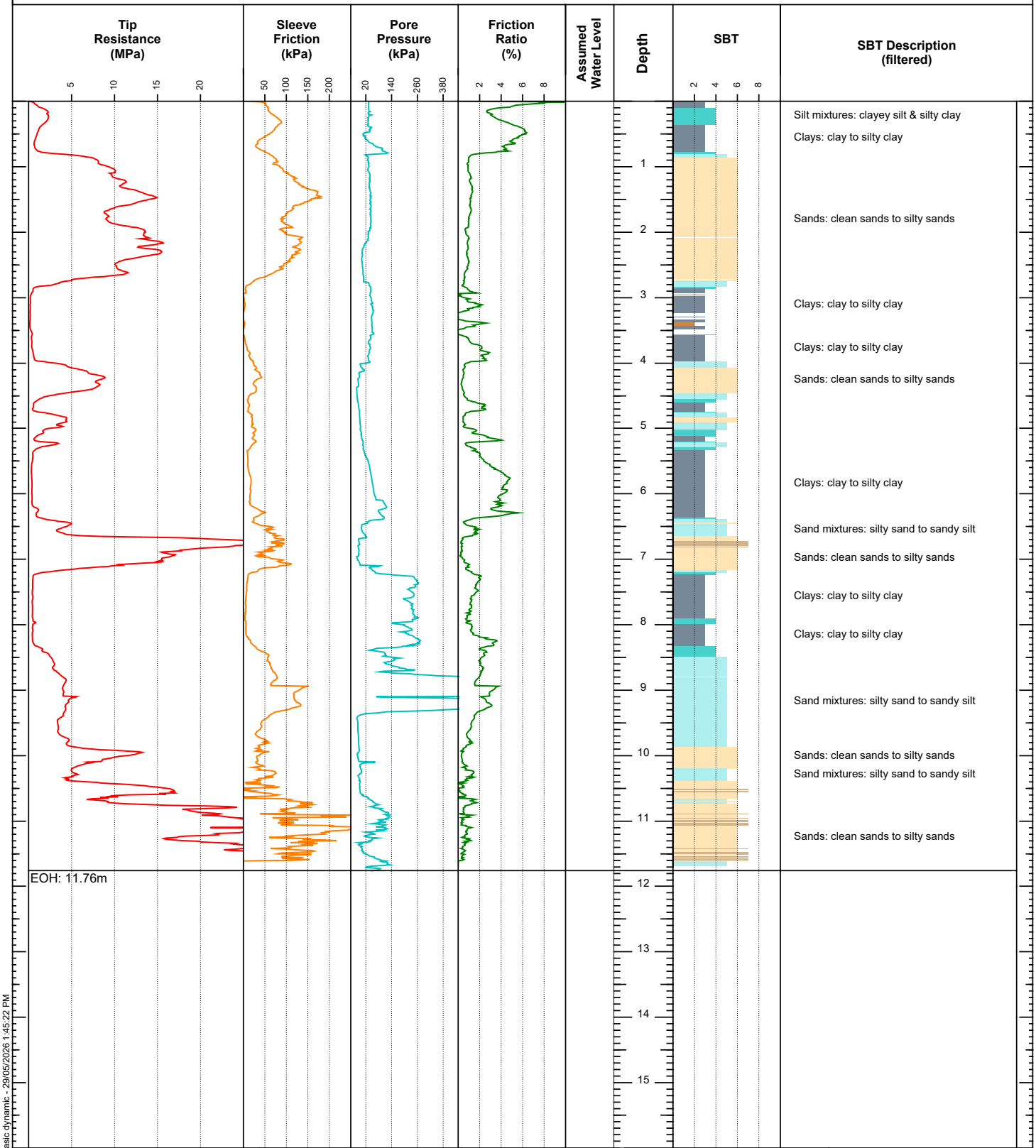
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931633mE, 5601265mN

ELEVATION: Ground

END DATE: 26/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

Artesian Aquifer

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT04

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

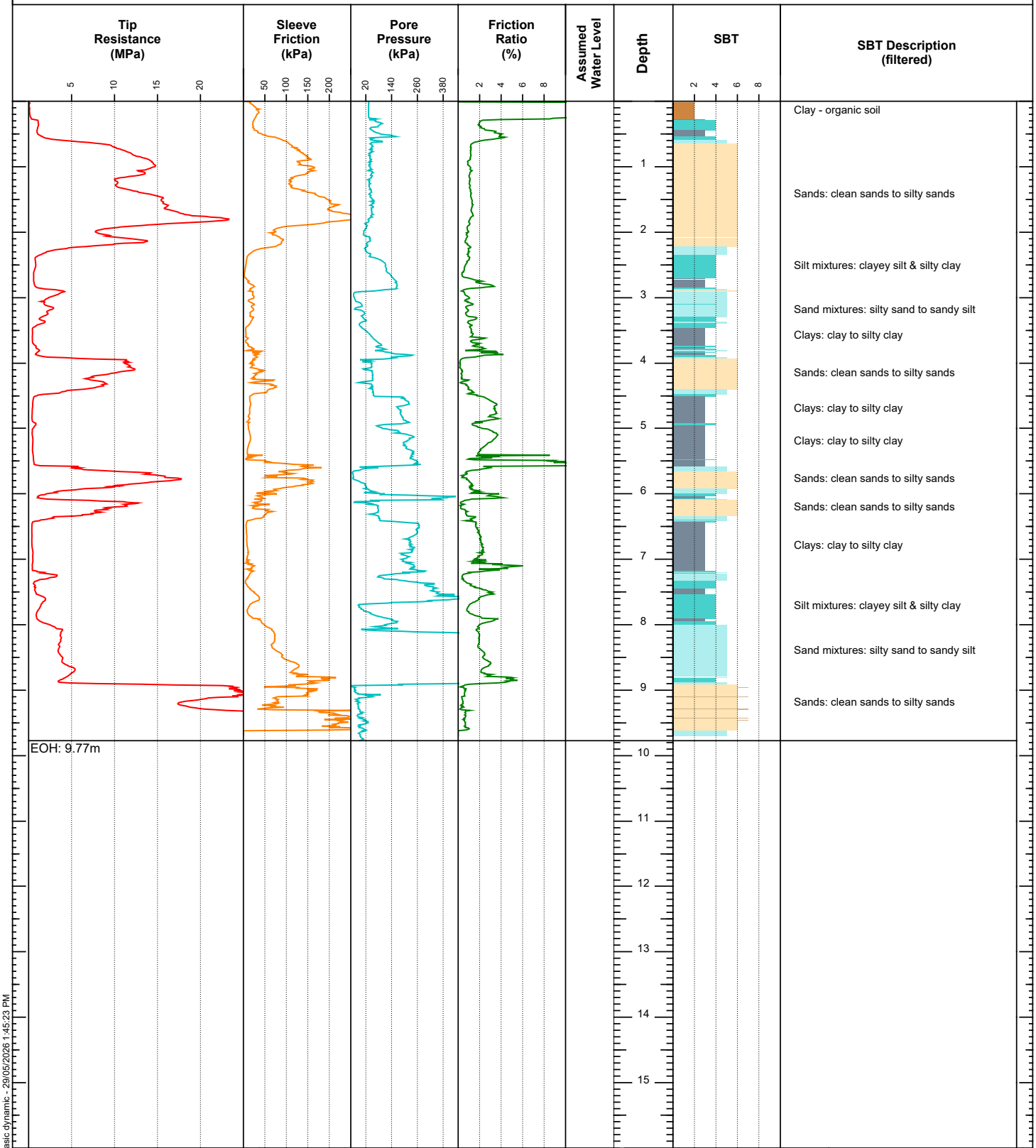
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931769mE, 5601298mN

ELEVATION: Ground

END DATE: 26/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

Artesian 5m

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT05

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

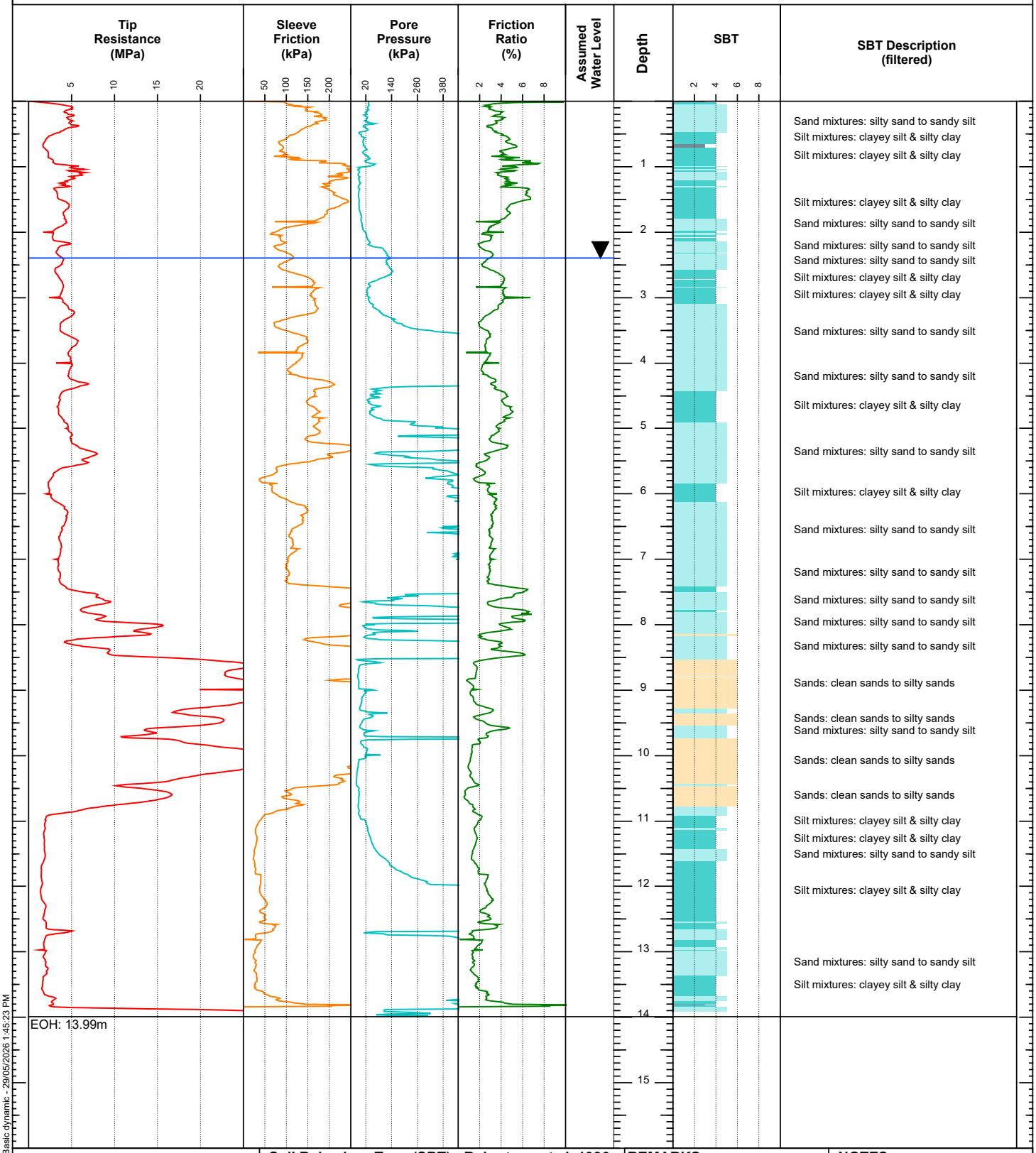
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931625mE, 5600685mN

ELEVATION: Ground

END DATE: 26/05/2026



SBT Description (filtered)

- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- Sand mixtures: silty sand to sandy silt
- 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
- Silt mixtures: clayey silt & silty clay
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay
- Sand mixtures: silty sand to sandy silt
- Silt mixtures: clayey silt & silty clay

NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT06

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

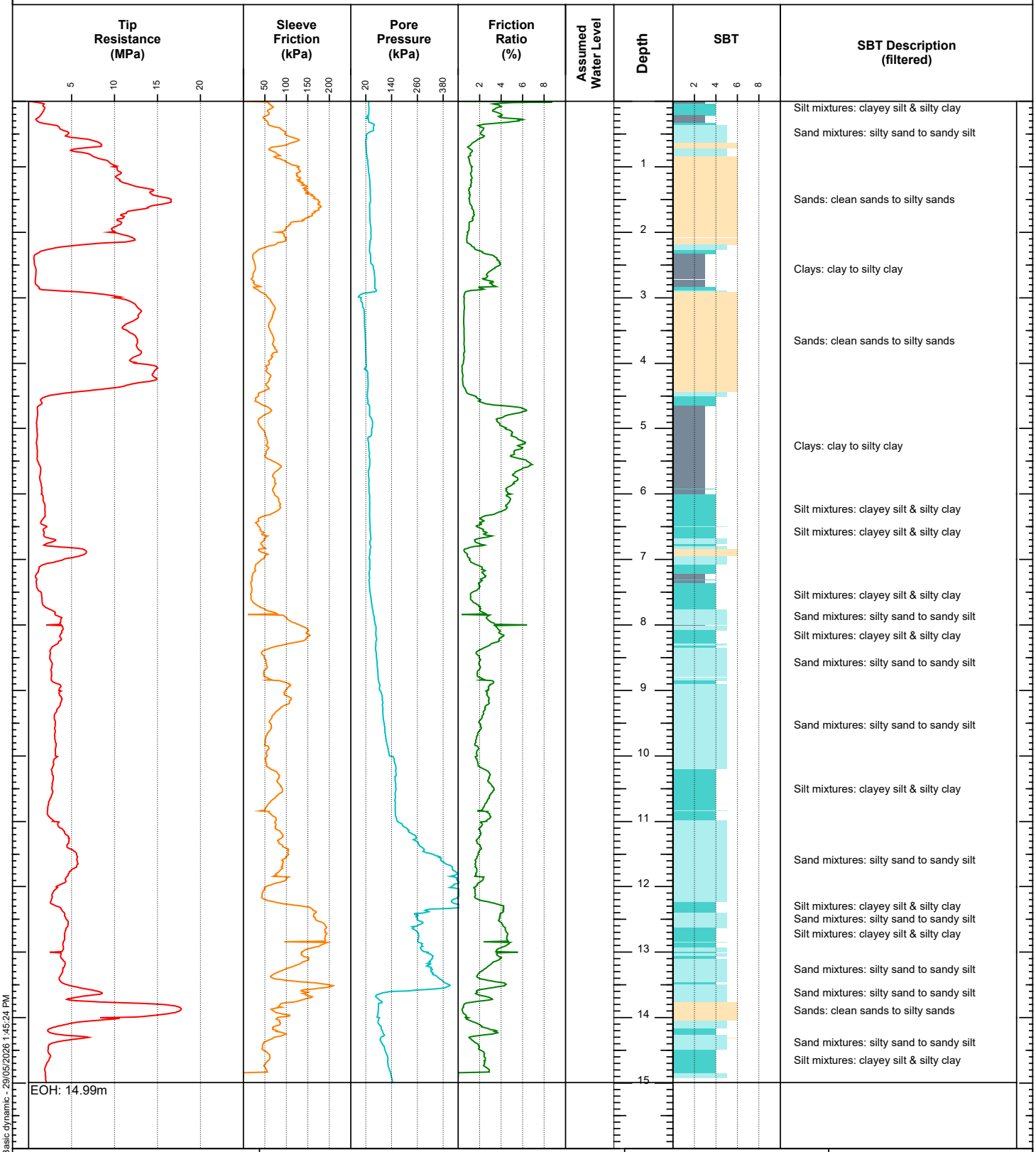
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931427mE, 5600635mN

ELEVATION: Ground

END DATE: 26/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

Collapsed at 1.8m

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT07

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

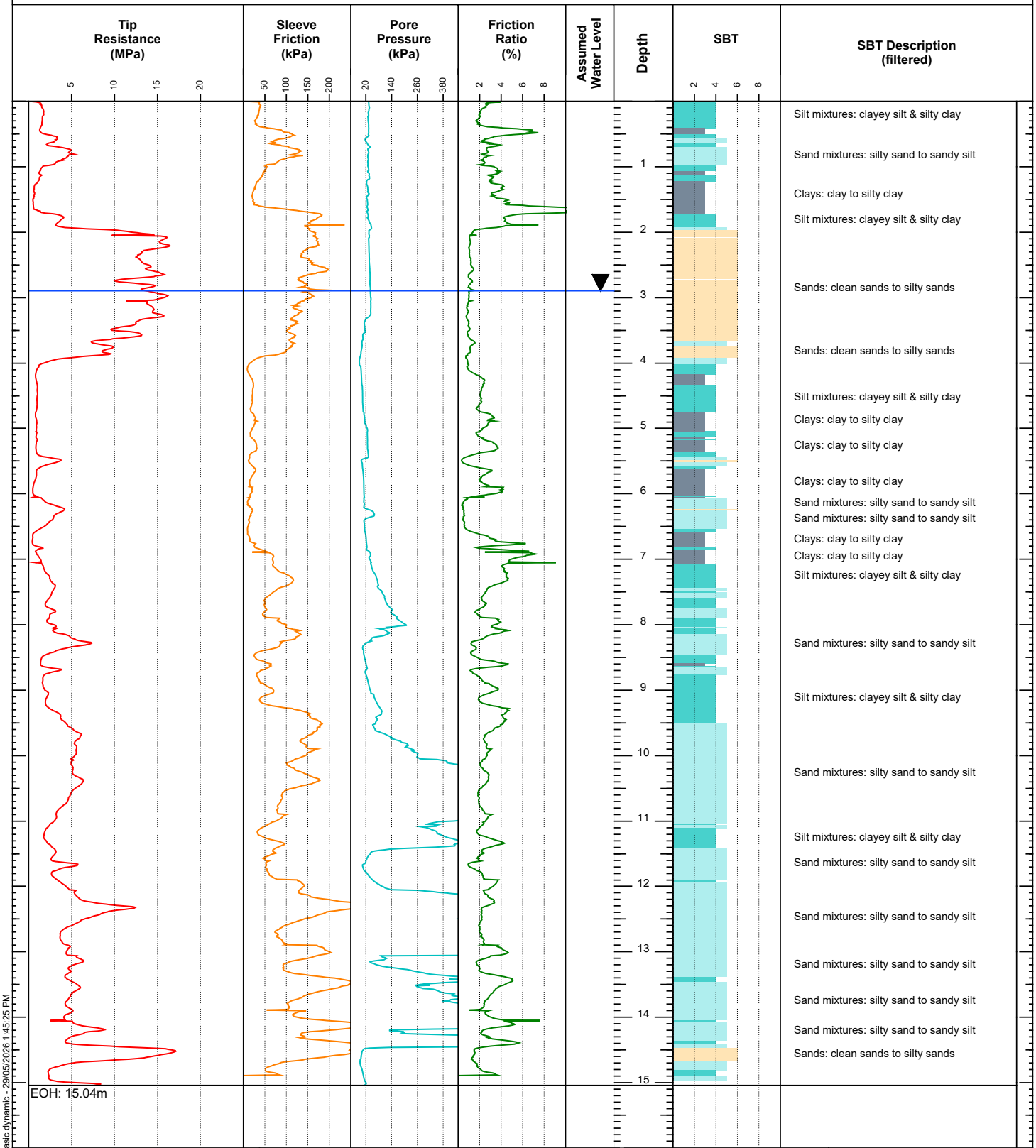
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931584mE, 5600795mN

ELEVATION: Ground

END DATE: 26/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT08

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

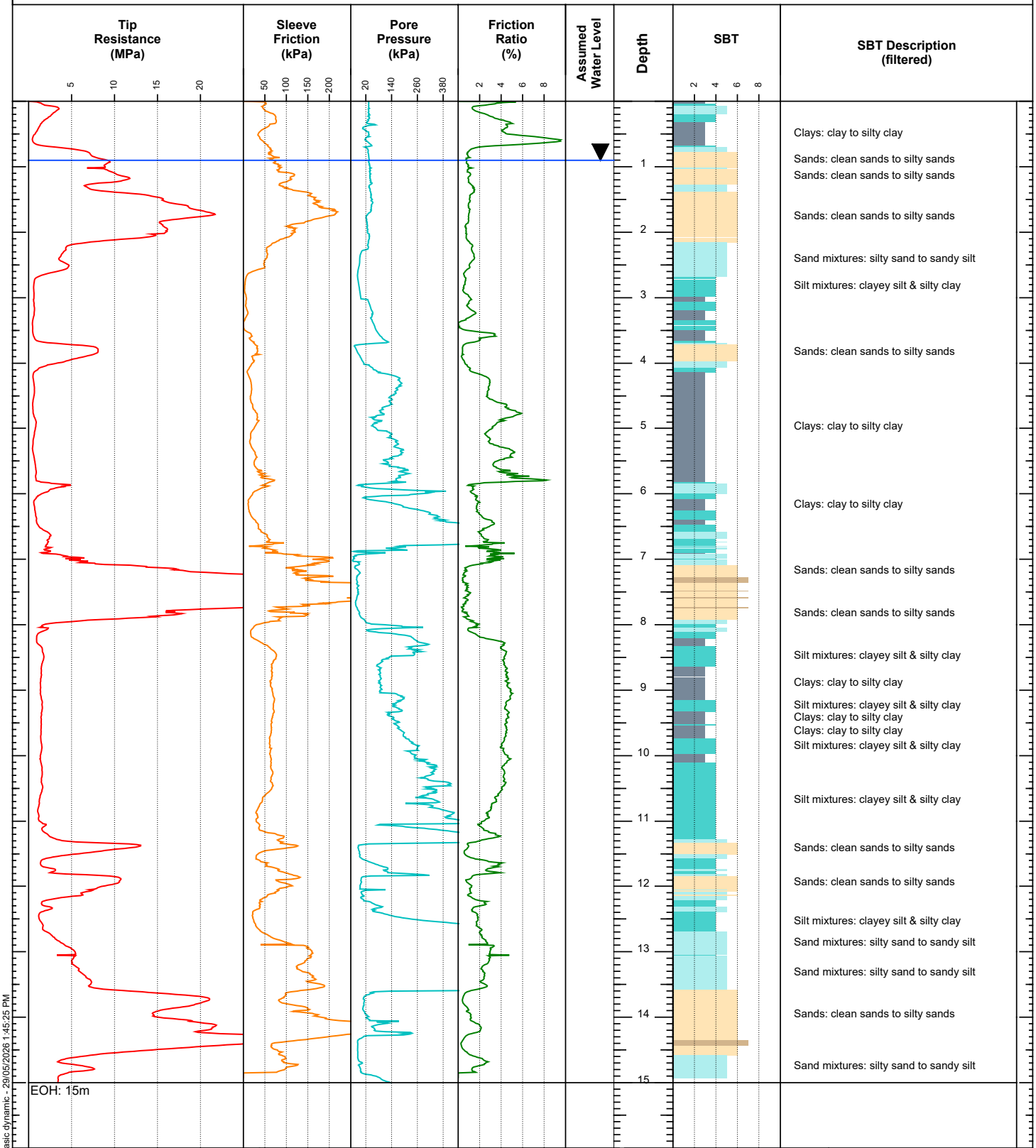
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931644mE, 5601017mN

ELEVATION: Ground

END DATE: 26/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT09

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

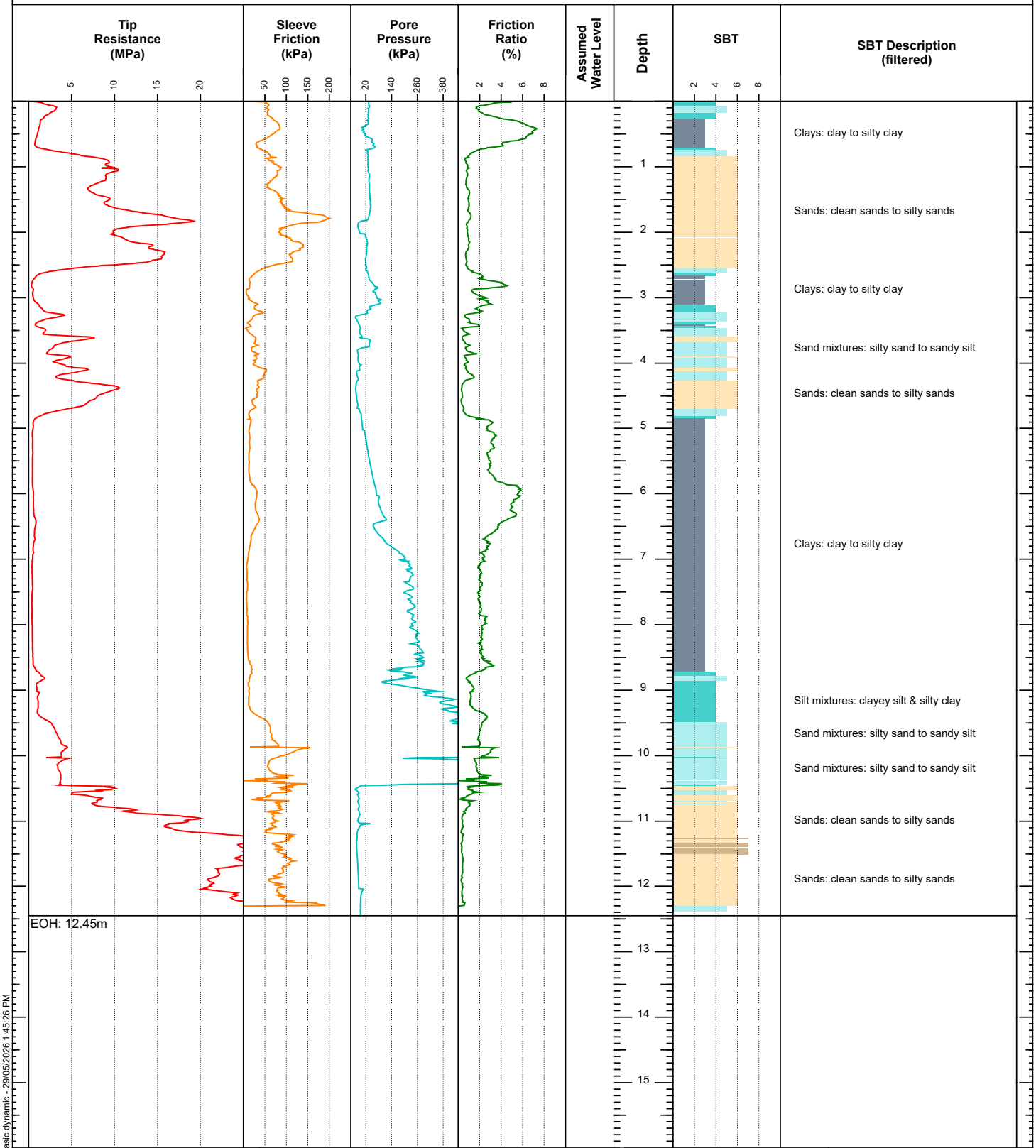
CONTRACTOR: Geotech Drilling Ltd

START DATE: 26/05/2026

CO-ORDINATES: 1931530mE, 5601164mN

ELEVATION: Ground

END DATE: 26/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

Artesian Aquifer

NOTES:

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CONE PENETRATION TEST (CPT) LOG

HOLE NO.: CPT10

CLIENT: CMW

PROJECT: Middle Road, Havelock North

JOB NO.: Middle Road

SITE LOCATION: Havelock North

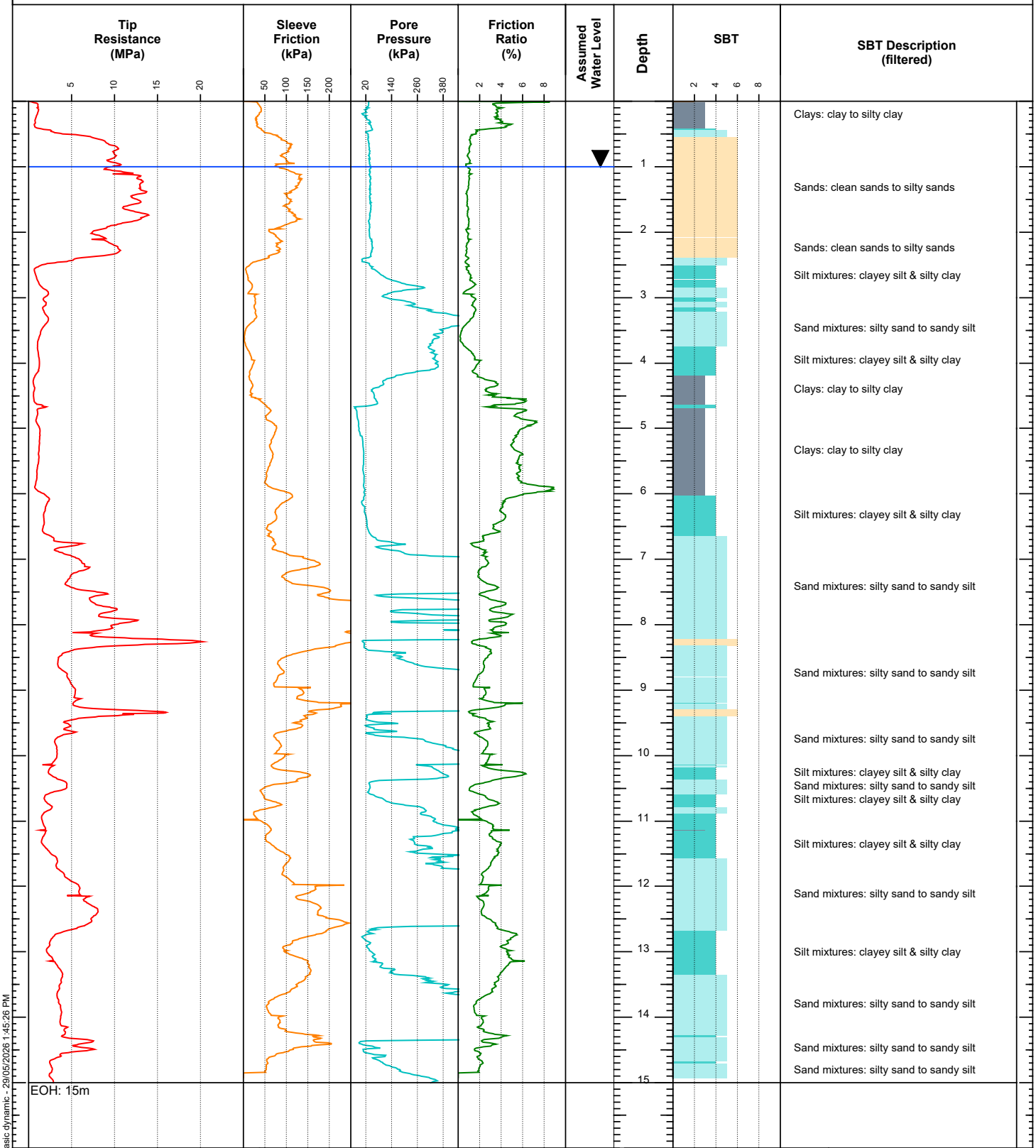
CONTRACTOR: Geotech Drilling Ltd

START DATE: 25/05/2026

CO-ORDINATES: 1931711mE, 5600930mN

ELEVATION: Ground

END DATE: 25/05/2026



NOTES & LIMITATIONS:

Data shown on this report has been assessed to provide a basic interpretation in terms of Soil Behaviour Type (SBT) and various geotechnical soil and design parameters using methods published in P. K. Robertson and K.L. Cabal (2010), Guide to Cone Penetration Testing for Geotechnical Engineering, 4th Edition. The interpretations are presented only as a guide for geotechnical use, and should be carefully reviewed by the user. Geroc Solutions Ltd do not warranty the correctness or the applicability of any of the geotechnical soil and design parameters shown and does not assume any liability for any use of the results in any design or review. The user should be fully aware of the techniques and limitations of any method used to derive data shown in this report.

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:

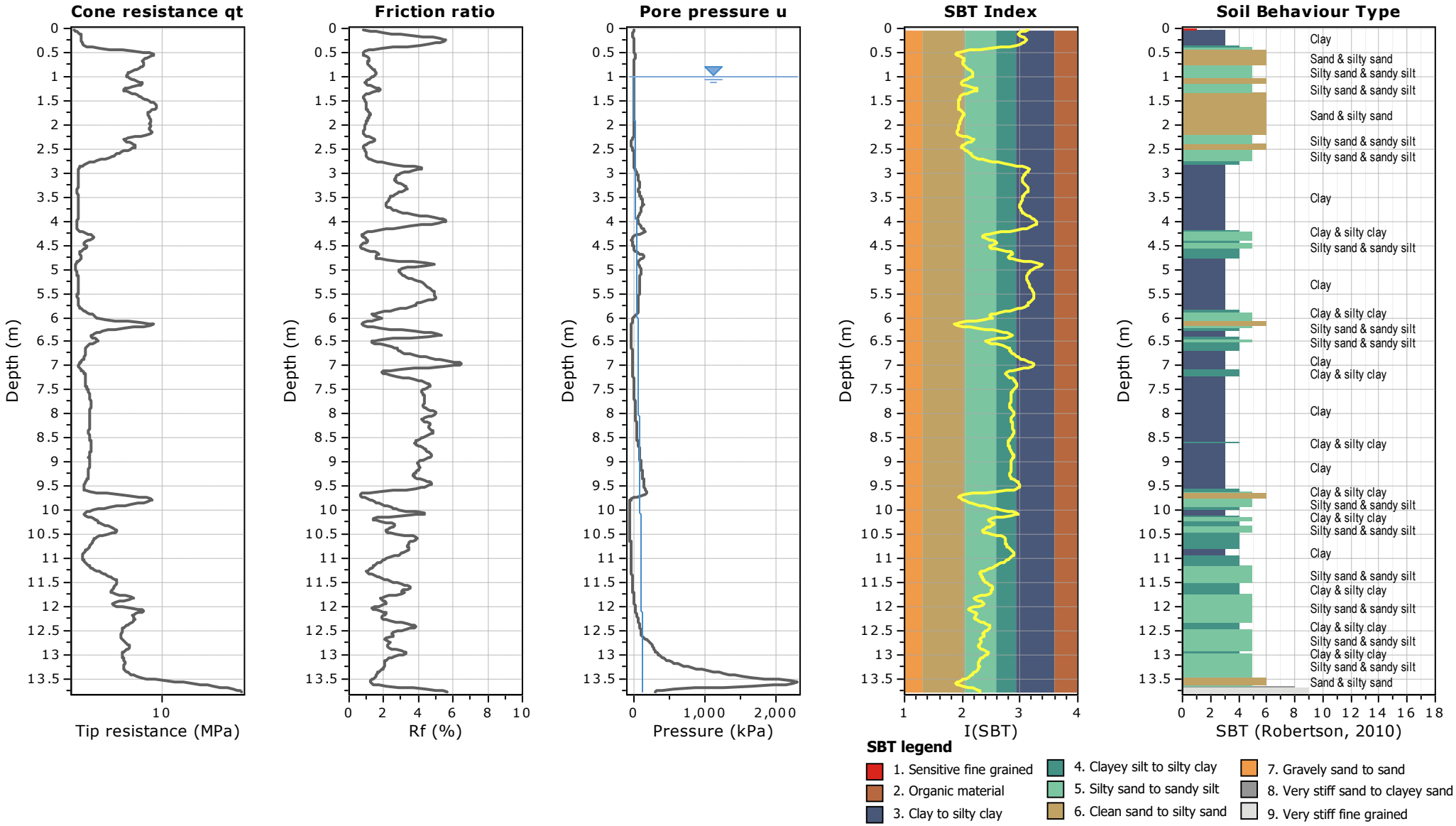
NOTES:

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GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT01, 139 Te Aute Road, Havelo
Total depth: 13.78 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

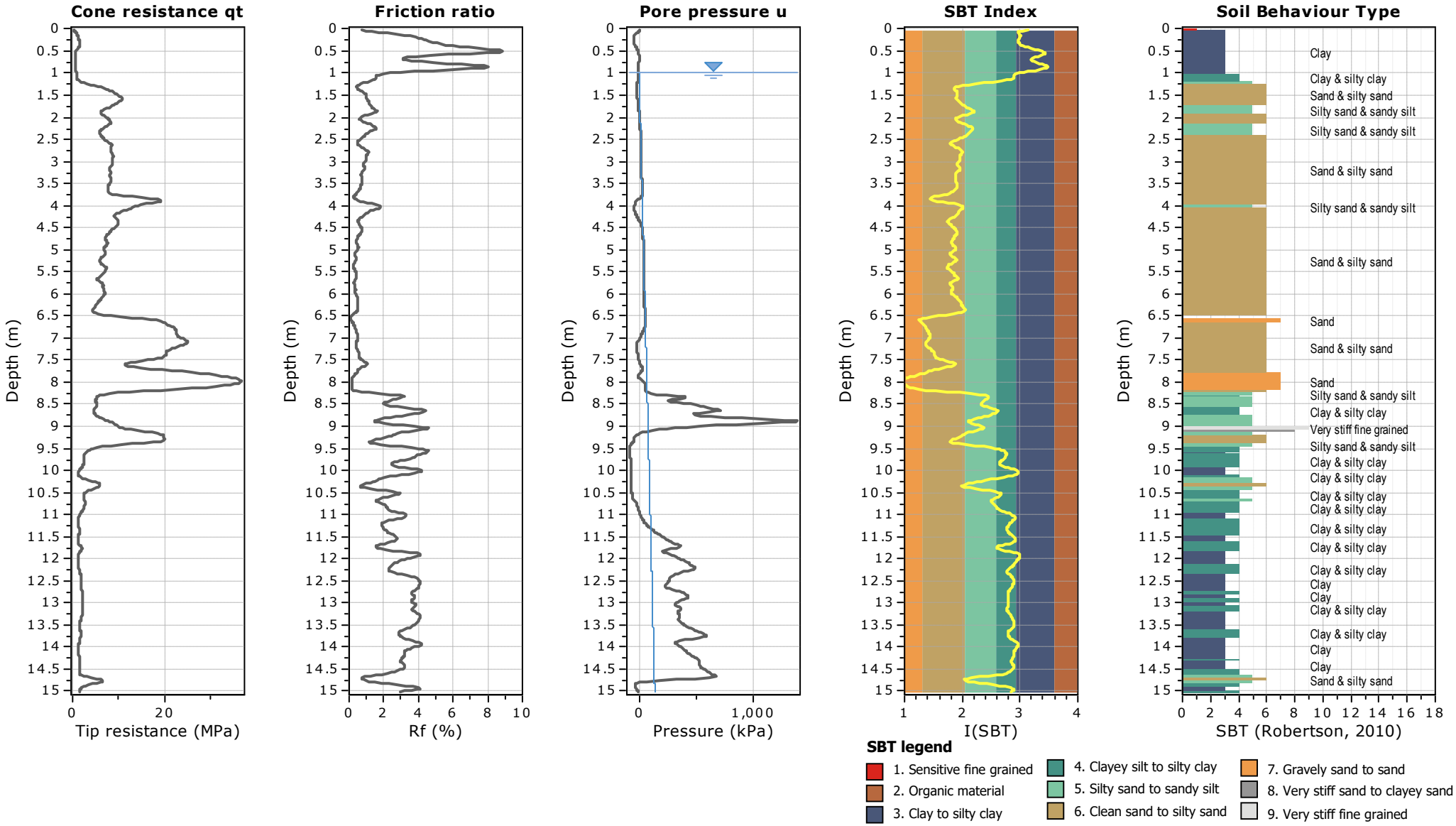
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT02, 139 Te Aute Road, Havelo
Total depth: 15.02 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

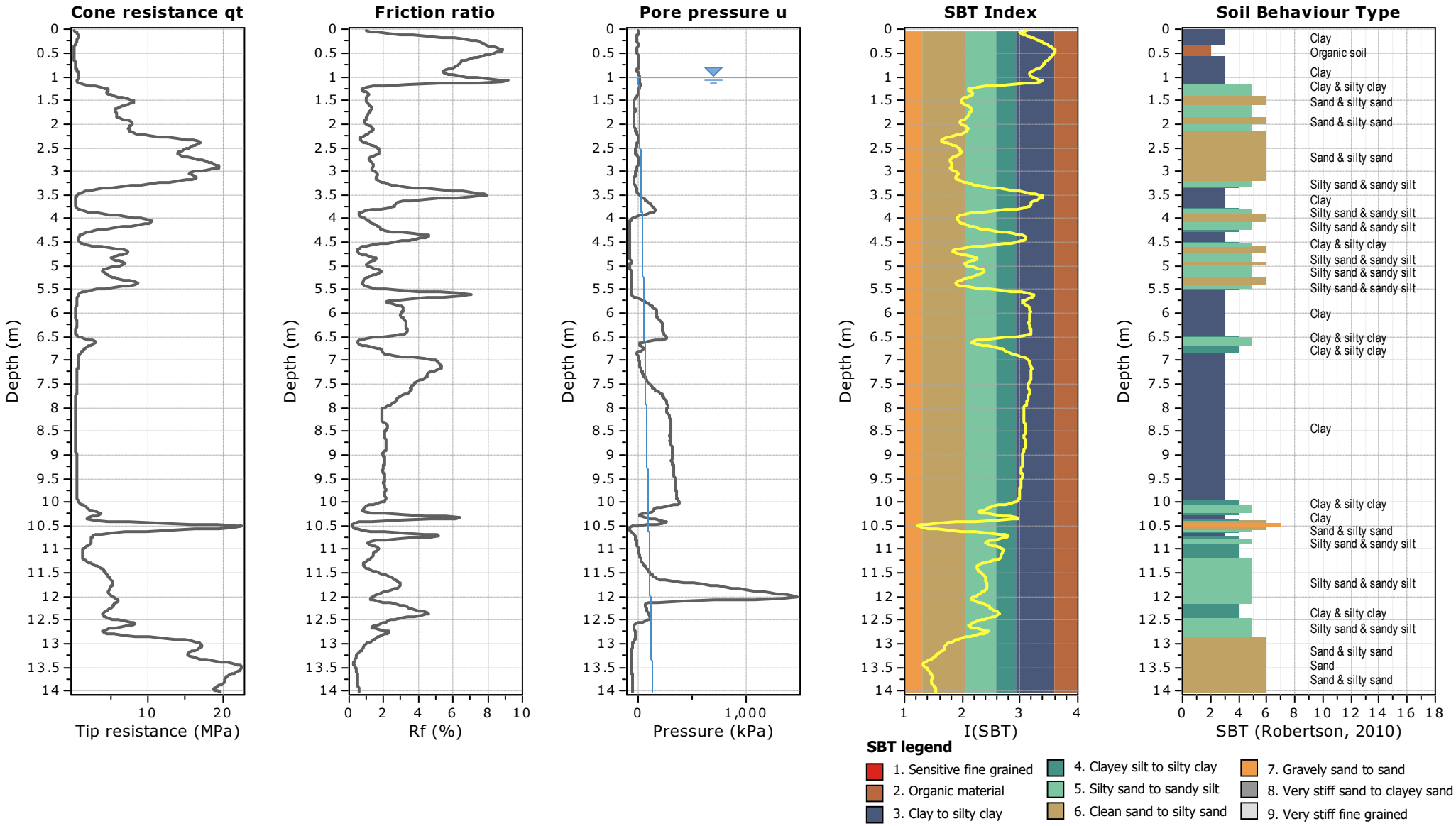
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT03, 139 Te Aute Road, Havelo
Total depth: 14.02 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
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Cone Type:
Cone Operator:

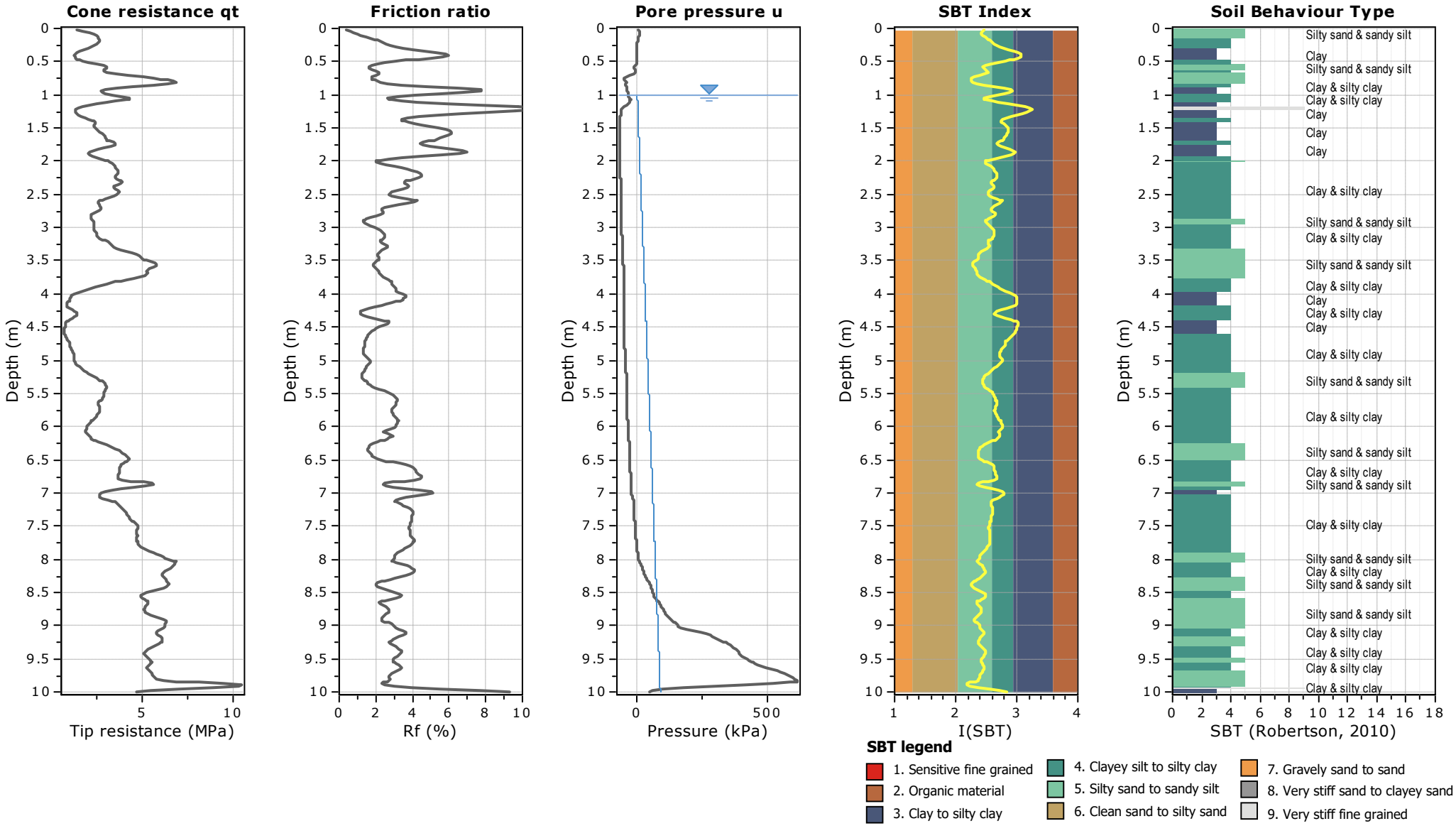
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT09
Total depth: 10.00 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

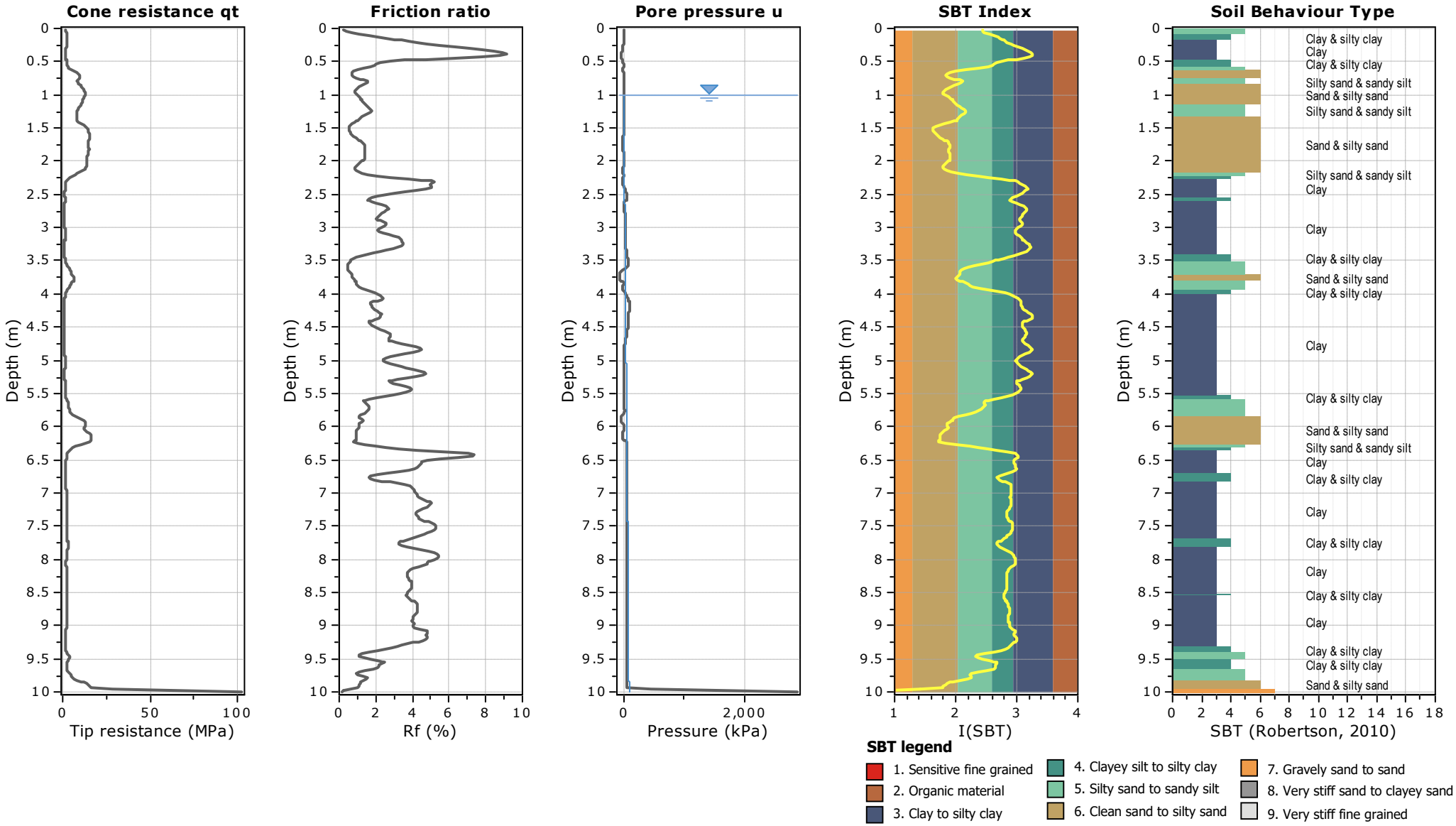
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT10
Total depth: 10.00 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

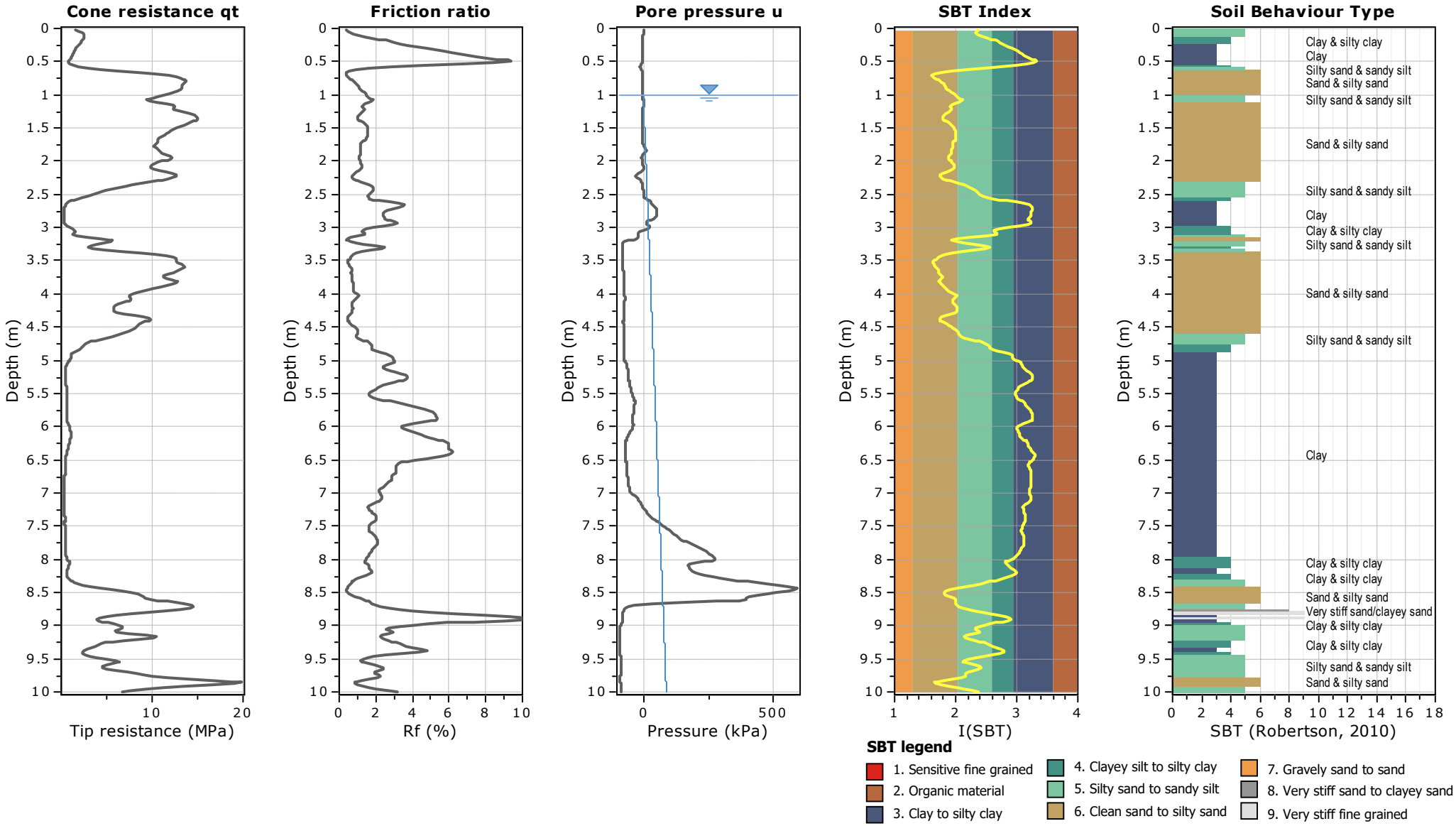
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT11
Total depth: 10.00 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

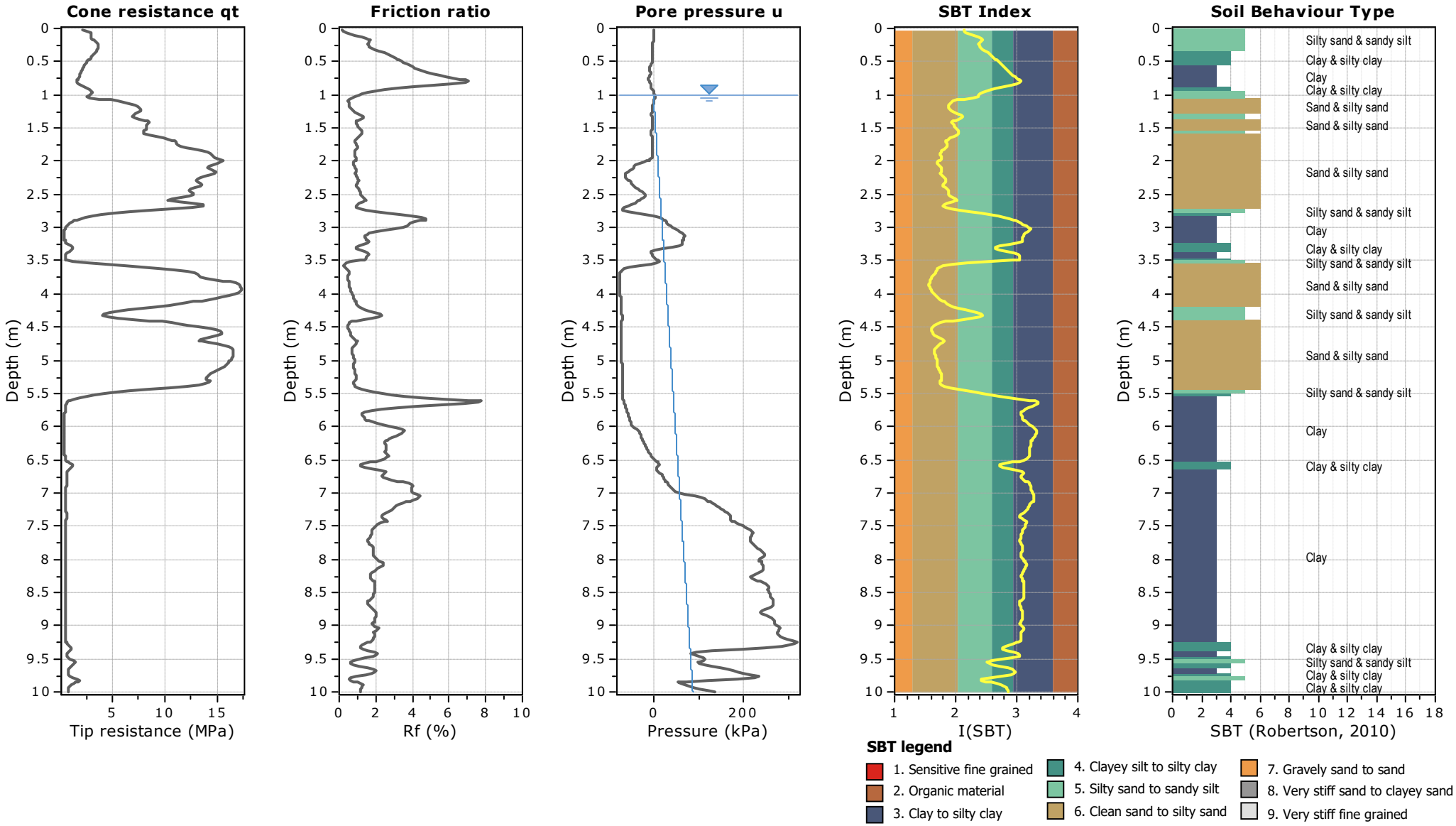
Project:
Location:



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http://www.geologismiki.gr

CPT: WSP_CPT12
Total depth: 10.00 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

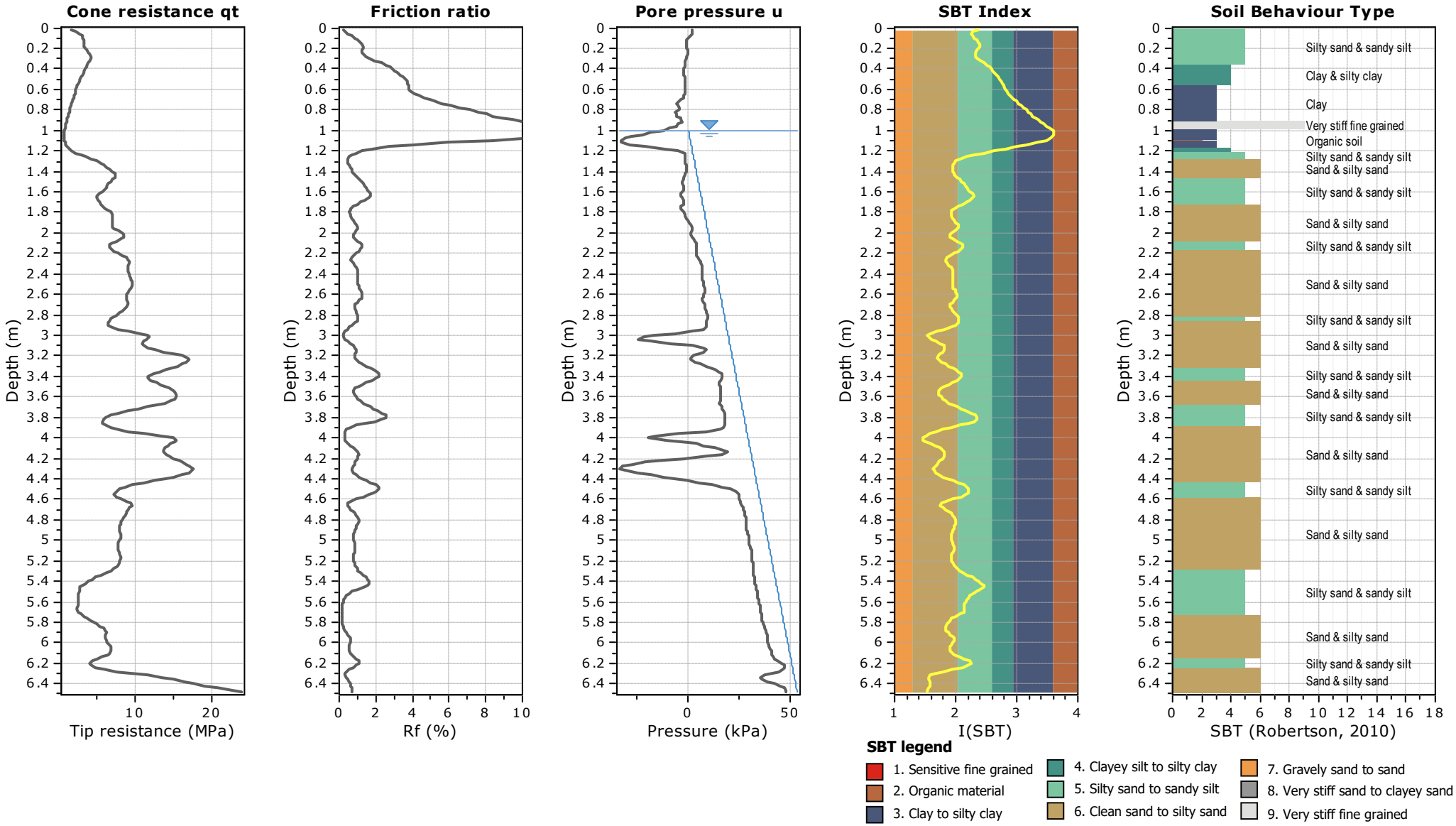
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT13
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Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

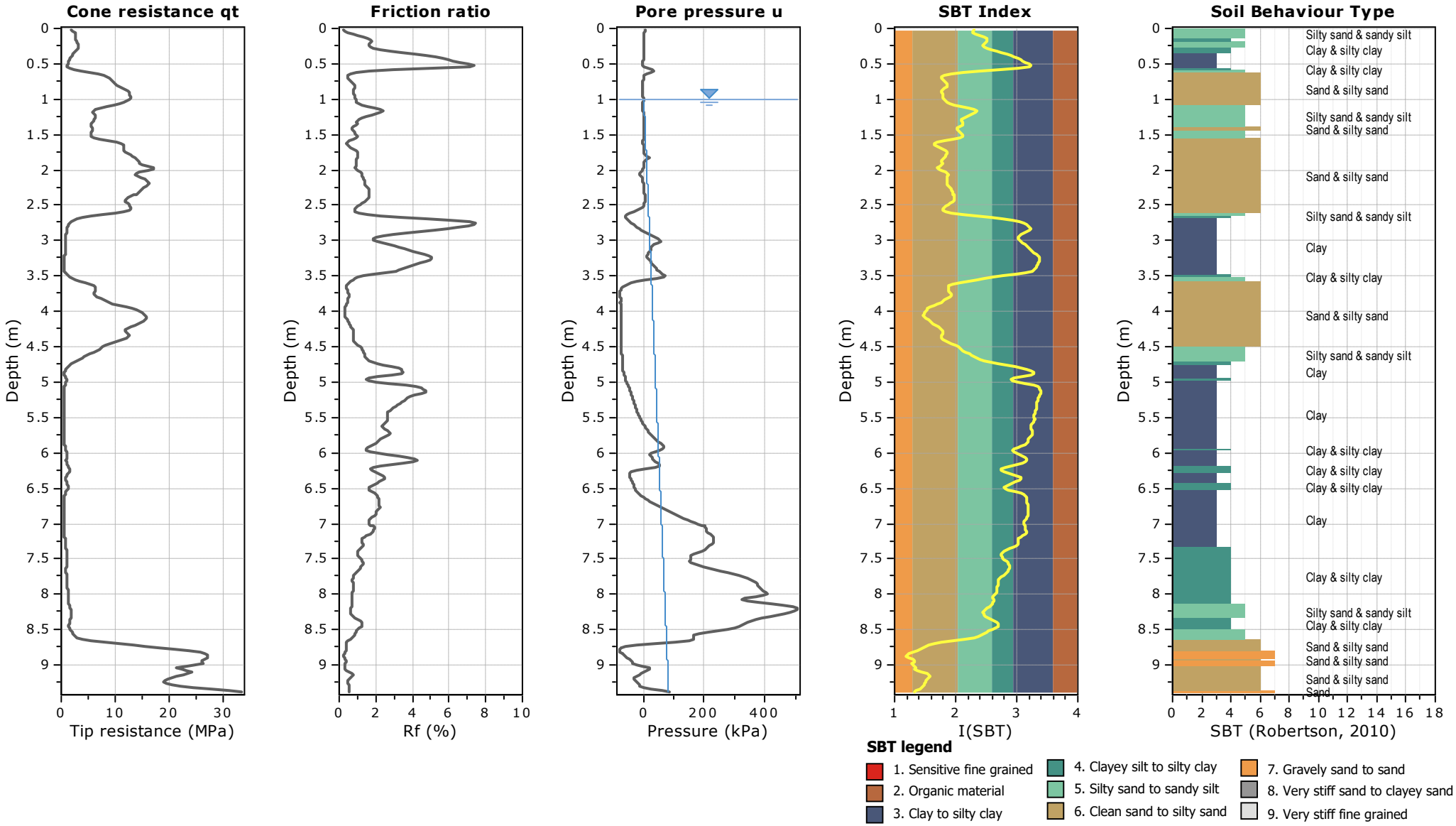
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Location:



GeoLogismiki
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Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT14
Total depth: 9.38 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
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Cone Type:
Cone Operator:

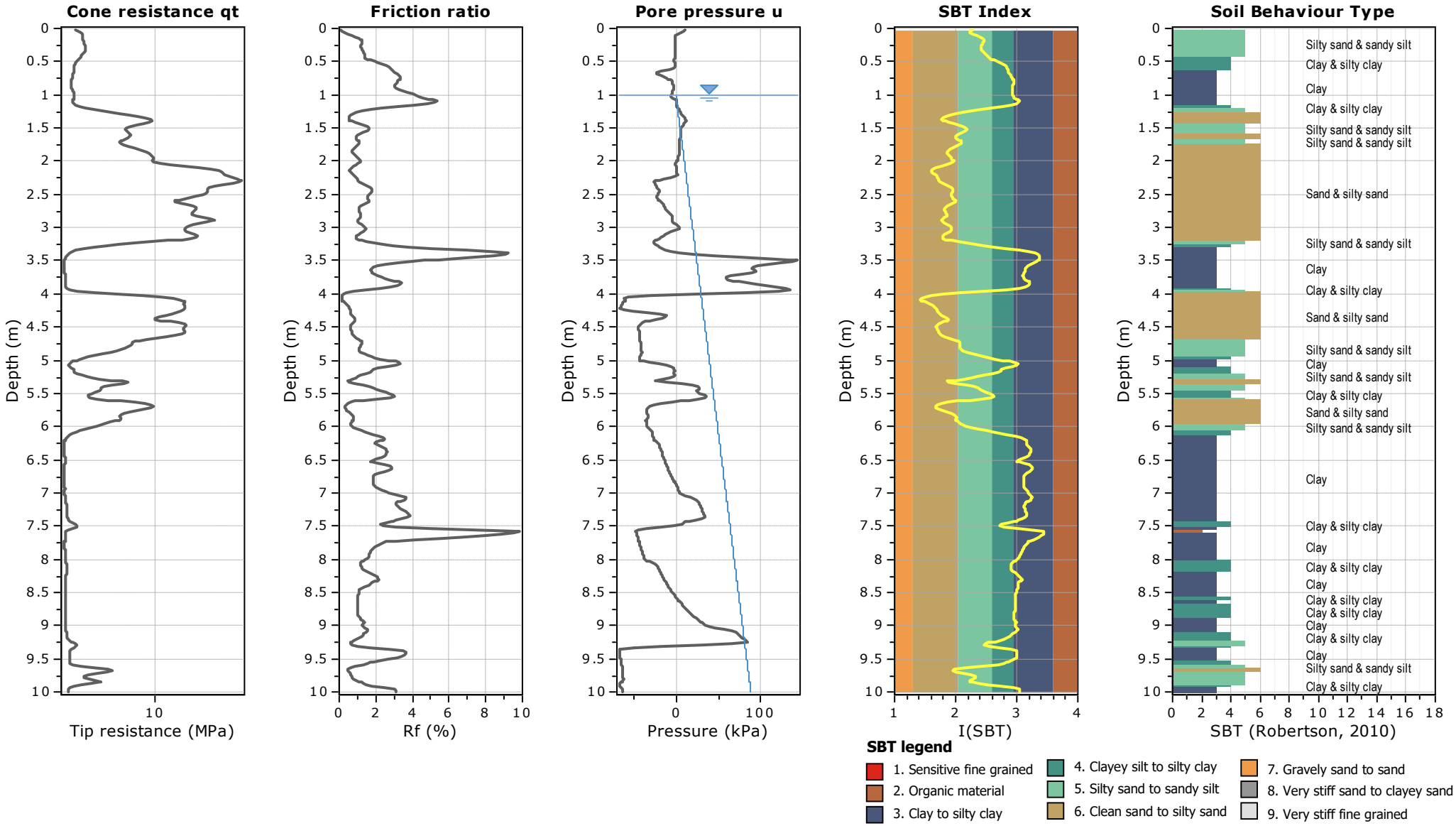
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Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT15
Total depth: 10.00 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
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Cone Type:
Cone Operator:

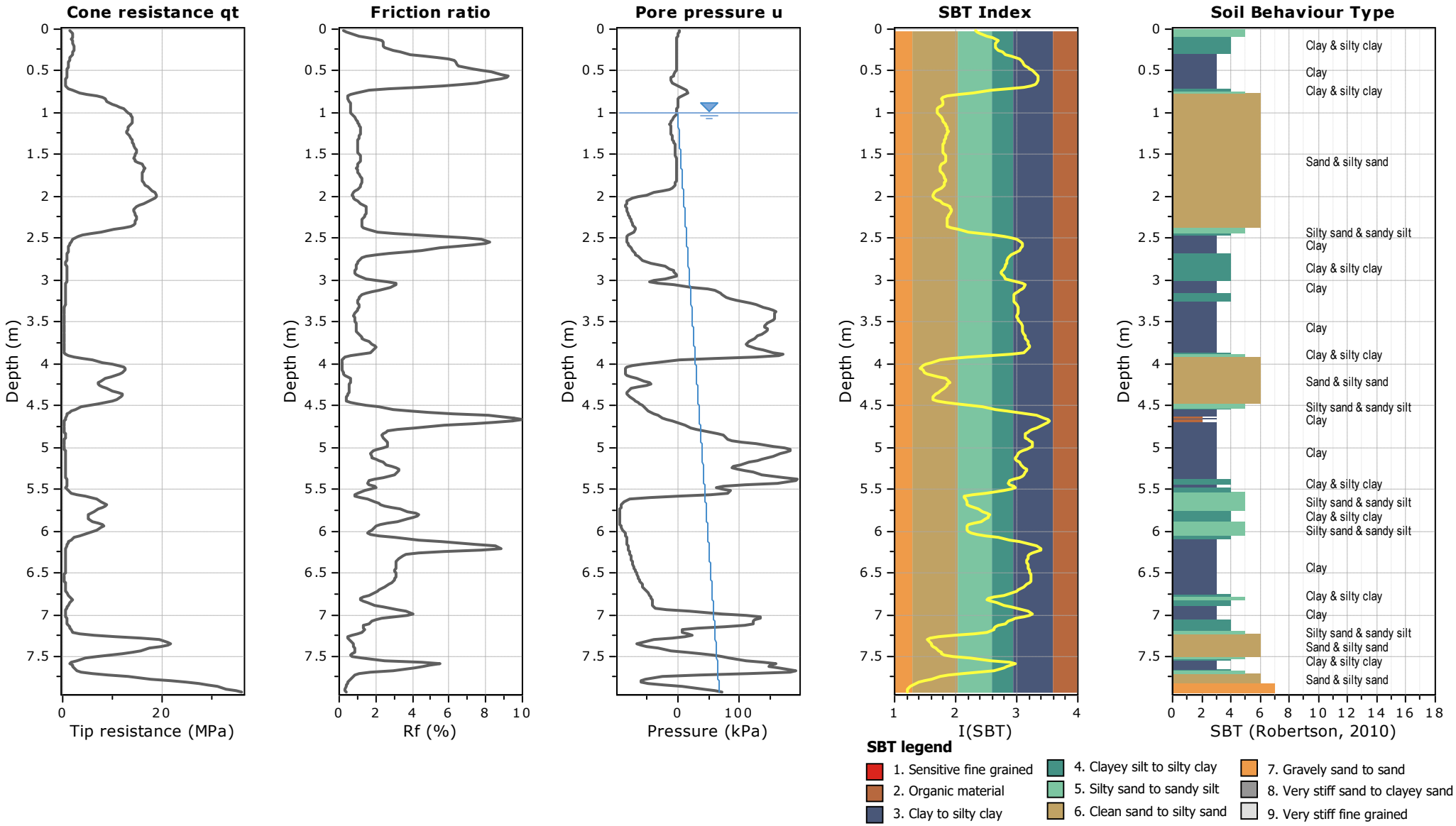
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Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT16
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Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

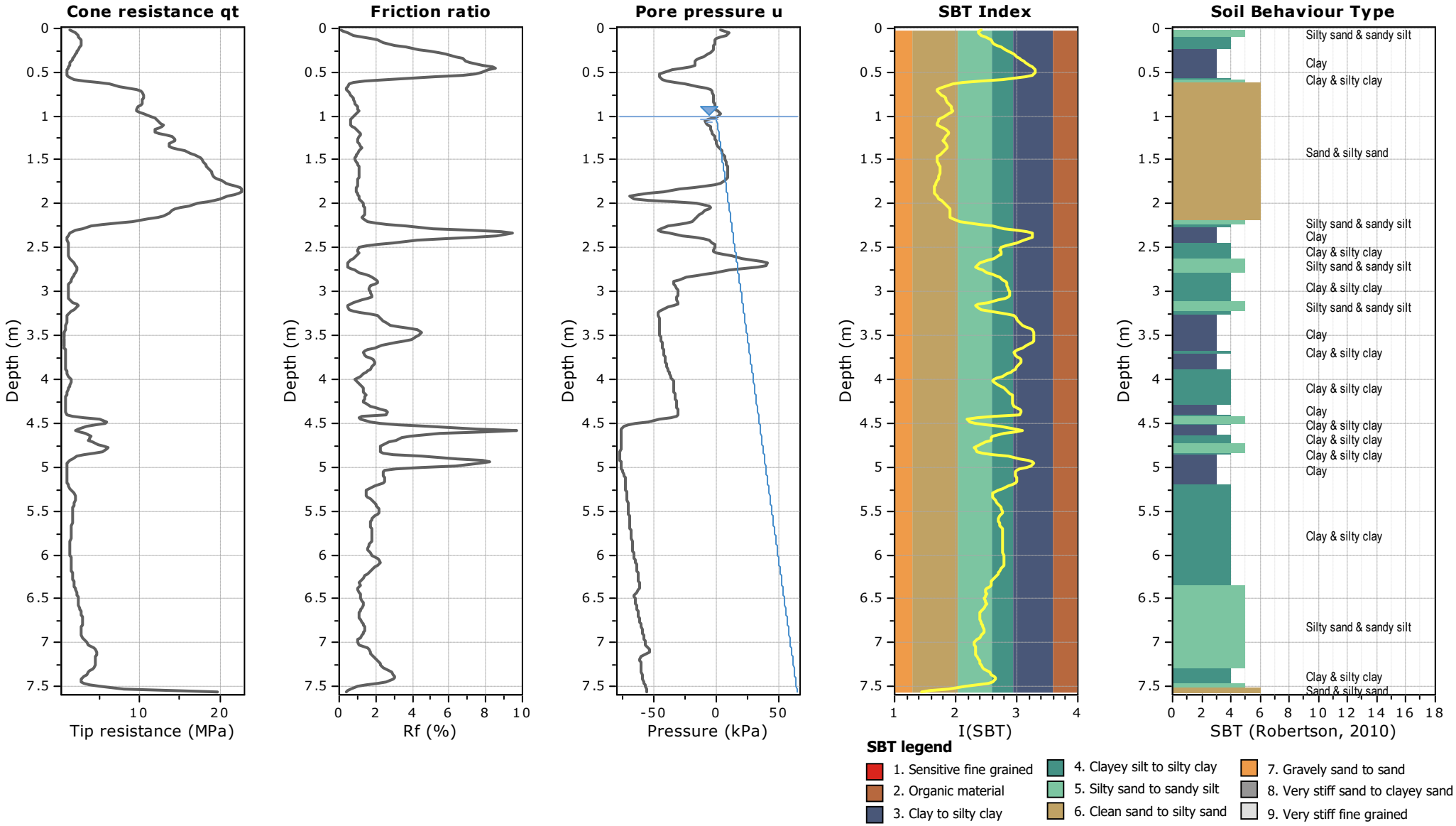
Project:
Location:



GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT17
Total depth: 7.56 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
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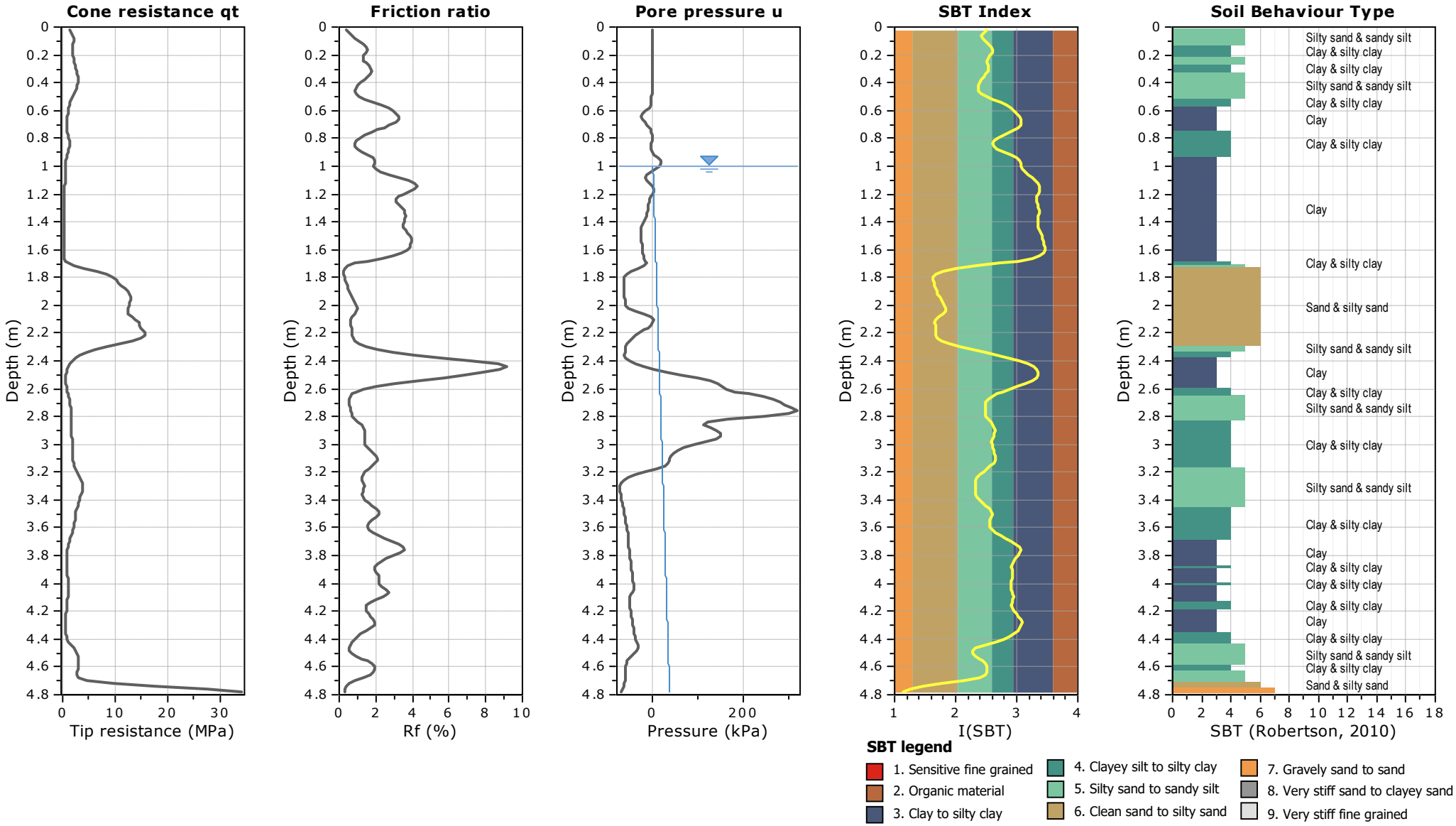
Project:
Location:



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Merarhias 56
http://www.geologismiki.gr

CPT: WSP_CPT18
Total depth: 4.78 m, Date: 12/01/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:



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APPENDIX E
Natural Hazard Risk Assessment

NATURAL HAZARDS RISK ASSESSMENT FOR LAND SUBDIVISION

PROPOSED RESIDENTIAL SUBDIVISION, MIDDLE ROAD, HAVELOCK NORTH

1 CONTEXT

This appendix to CMW report reference NAP2025-0024AD Rev 0 sets out the criteria for and presents the results of an assessment of the geotechnical-related natural hazards associated with this proposed subdivision development.

Section 106 of the Resource Management Act (RMA) requires an assessment of the risk from natural hazards to be carried out when considering the granting of a subdivision consent. S106 RMA specifically states that the assessment must consider the combined effect of the natural hazard likelihood and material damage to land, other land or structures (consequence).

Section 2 of the RMA defines natural hazards as any atmospheric or earth or water related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding) the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.

The National Policy Statement for Natural Hazards 2025 (NPS-NH) provides direction under the Resource Management Act 1991 for assessing the risk associated with natural hazards for subdivision, use and development.

2 BASIS OF ASSESSMENT

2.1 Risk Classification

The occurrence of natural hazards and their potential impacts on the proposed subdivision development is assessed in terms of risk significance, which is based on likelihood and consequence factors. A risk table is used to help assess the likelihood and consequence factors, the form of which used by the form of which used by CMW for this project is presented in Table 1 which is derived from Appendix 1 of the NPS-NH.

Table 1: Risk Matrix

ARI (Years) AEP	Almost certain Up to 10 10% or more	Very Likely 10-20 10% to 5%	Likely 20 – 50 5% to 2%	Possible 50 – 100 2% to 1%	Unlikely 100 – 500 1% to 0.2%	Rare 500 – 5000 0.2% to 0.02%	Very rare >5000 <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

2.2 Likelihood

With respect to assessing the likelihood or chance of the risk occurring, the qualitative definitions used by CMW for this project are provided in Table 2 for each likelihood classification, which is derived from Appendix 1 of the NPS-NH.

Table 2: Likelihood Classification (extract from NPS-NH)

Likelihood level	Annual exceedance probability (AEP)	Average recurrence interval (ARI) or 'return period'
Almost certain	10% or more	Up to and including 10 years
Very likely	10% to 5%	Over 10 and up to and including 20 years
Likely	5% to 2%	Over 20 and up to and including 50 years
Possible	2% to 1%	Over 50 and up to and including 100 years
Unlikely	1% to 0.2%	Over 100 and up to and including 500 years
Rare	0.2% to 0.02%	Over 500 and up to and including 5,000 years
Very rare	Less than 0.02%	More than 5,000 years

2.3 Consequence

In terms of determining the consequence or severity of the natural hazard occurring, the qualitative definitions used by CMW for this project are provided in are provided in Table 3 for each consequence classification, which is derived from Appendix 1 of the NPS-NH.

Table 3: Consequence Table (extract from NPS-NH)

Consequence Level	Damage to Property	Potential for Injury or Fatalities
Catastrophic	Severe damage to land and building(s), potential for collapse or total destruction of structures. Building(s) need to be demolished, rebuilt or relocated.	High threat to life safety, with probable fatalities and/or critical injuries.
Major	Major damage to land and building(s), including structural damage. Loss of use and substantial repair required.	Unsafe for people, with potential for many injuries, or critical injuries and/or fatalities.
Moderate	Some damage to land and non-structural damage to building(s). Limited loss of use, repairs required.	Unsafe for people, with potential for injuries, although expected to be minor.
Minor	Minor damage to land and building(s). No loss of use, minimal repairs required.	Isolated minor injuries possible.
Negligible	No loss of use, no building repairs required.	No injuries.

2.4 Proportionate Management of Natural Hazard Risk

It is recognised that the natural hazard risk assessment provided herein is qualitative and, due to the wide range of possible geohazards that could occur, is somewhat subjective. Decision-makers must consider the scale and detail of information necessary to assess the risk by having regard to the anticipated level of risk.

Other methods are available to quantitatively assess an acceptable level of geotechnical related natural hazard risk, such as defining an acceptable factor of safety with respect to slope stability or acceptable differential ground settlements with respect to recommended building code limits.

When managing natural hazard risk associated with subdivision, use and development, decision-makers must apply mitigation measures, including location and design, for the purposes of ensuring that:

(a) very high natural hazard risk is avoided;

(b) high or medium natural hazard risk is avoided or mitigated proportionate to the

level of risk; and

(c) any creation of, or increase in, significant natural hazard risk on other sites is avoided or mitigated proportionate to the level of natural hazard risk.

3 RISK ASSESSMENT

The natural hazards relevant to this proposed subdivision development and adjacent, potentially affected land have been assessed with respect to the criteria outlined above.

Assessment is based on proposed post development ground conditions with and without any geotechnical controls. The latent risk was first assessed with the site in its proposed developed state to consider the risks to the development and surrounding land, including assessment of land modifications from the pre-existing natural state, without any implemented geotechnical controls. The specific geotechnical mitigation measures and engineering design solutions outlined in the table below and CMW report, where relevant, were then considered to determine the natural hazard residual risk remaining after the proposed controls have been implemented.

Results of this assessment are presented in Table 4 below.

Table 4: Natural Hazard Risk Assessment Results

RMA S2 Hazard	Description	Proposed Site Latent Risk of Damage to Land / Structures			Comments and Geotechnical Control	Proposed Site Residual Risk of Damage to Land / Structures OR Acceleration/ Worsening of Hazard with Geotechnical Controls Implemented		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
Earthquake	Fault Rupture	Rare	Moderate	Low	The closest known active fault is approximately 2km to the site. Site is located outside of fault avoidance zone.	Rare	Moderate	Low

Table 4: Natural Hazard Risk Assessment Results								
RMA S2 Hazard	Description	Proposed Site Latent Risk of Damage to Land / Structures			Comments and Geotechnical Control	Proposed Site Residual Risk of Damage to Land / Structures OR Acceleration/ Worsening of Hazard with Geotechnical Controls Implemented		
		Likelihood	Consequence	Risk Rating		Likelihood	Consequence	Risk Rating
	Liquefaction Induced Subsidence	Likely	Moderate	High	Specific foundation design, ground improvement or locate buildings / sensitive infrastructure to low liquefaction risk zone	Rare	Moderate	Low
	Lateral Spread	Likely	Moderate	High	Locate buildings outside of lateral spread risk zone, Specific foundation design, lateral spread mitigation measures	Rare	Moderate	Low
Erosion	Cut Batters	Possible	Moderate	Medium	Max 1(V):2.5(H) gradient without further investigation and analysis. Proposed 1(V):3(H) deemed suitable.	Rare	Moderate	Low
	Fill Batters	Possible	Moderate	Medium	Max 1(V):2.5(H) gradient without further investigation and analysis. Proposed 1(V):3(H) deemed suitable.	Rare	Moderate	Low
Landslip	Global Slope Instability along Herehere Stream boundary	Possible	Moderate	Medium	Engineering Control. Proposed 1(V):3(H) gradient deemed suitable for earthfill embankments. Building setbacks	Rare	Moderate	Low
Subsidence	Soft Soils	Unlikely	Moderate	Medium	Undercut and remove soft alluvium /peat or preload to reduce excessive static settlements. Geotechnical Engineer to observe building platform preparation.	Rare	Moderate	Low
	Bearing Capacity Failure	Possible	Moderate	Medium	Undercut and replace any unsuitable near surface soils such as peat and historic fill	Rare	Moderate	Low
Flooding	Floor Level Requirement	Likely	Moderate	High	Buildings designed so floor level is raised above flood level	Rare	Moderate	Low

Notes:

Assessments include the impact of the proposed subdivision work on adjacent properties.

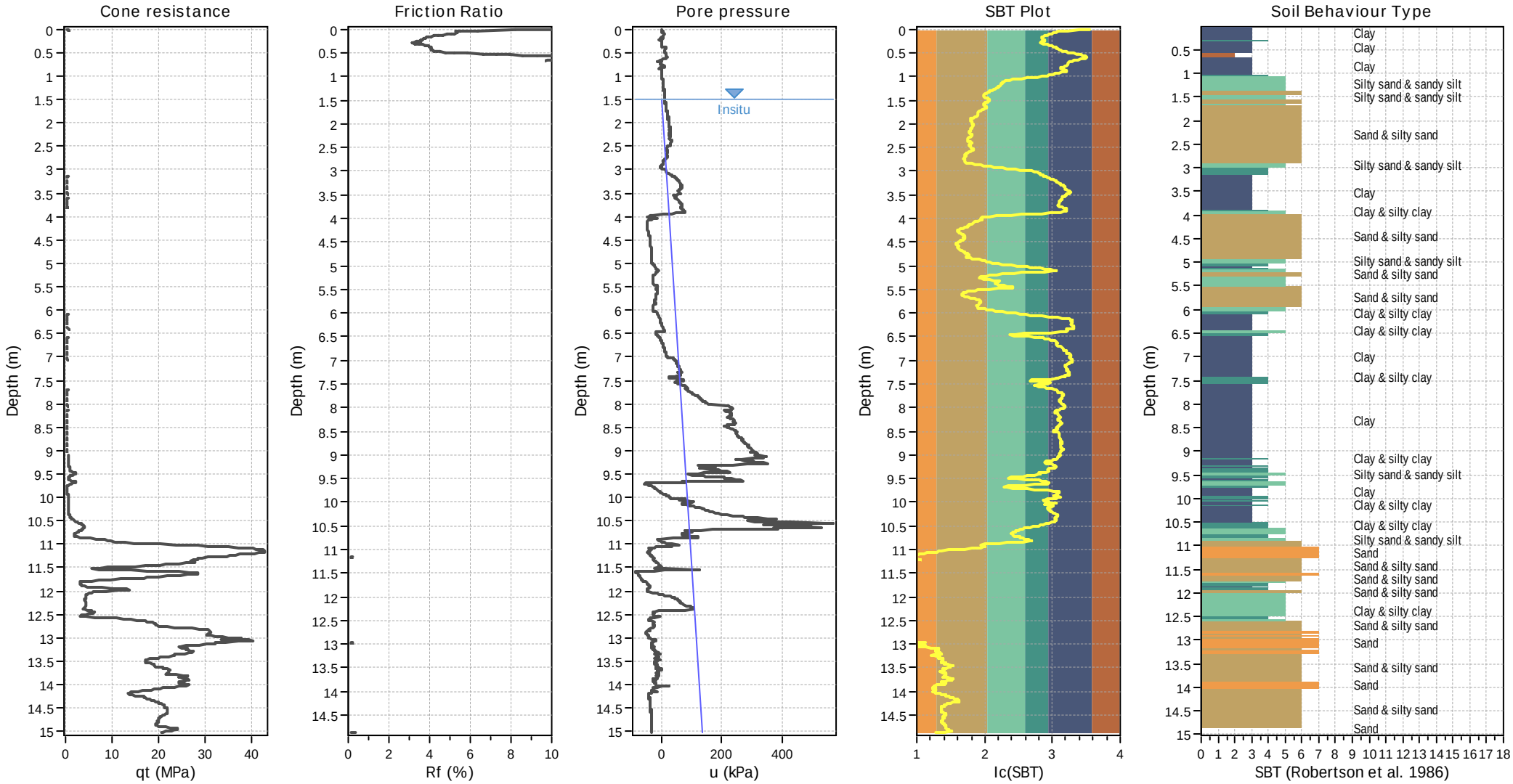
The following reference(s) contain information on the hazards contained in this assessment and the non-geotechnical hazards that have not been included:

- Hawke's Bay Hazard Portal, https://gid.hbrc.govt.nz/hazards/

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APPENDIX F
Liquefaction Assessment

CPT basic interpretation plots



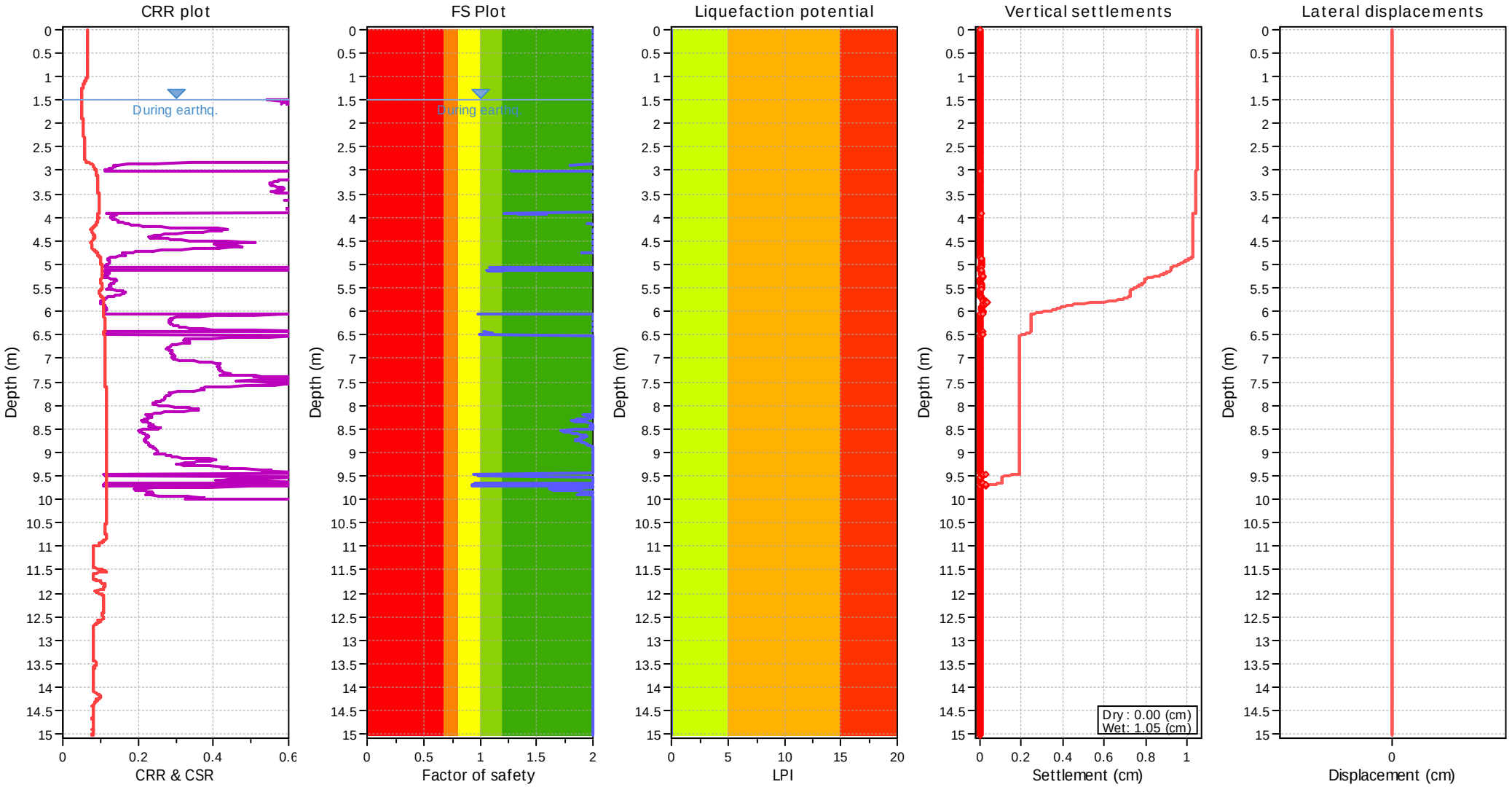
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Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
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Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

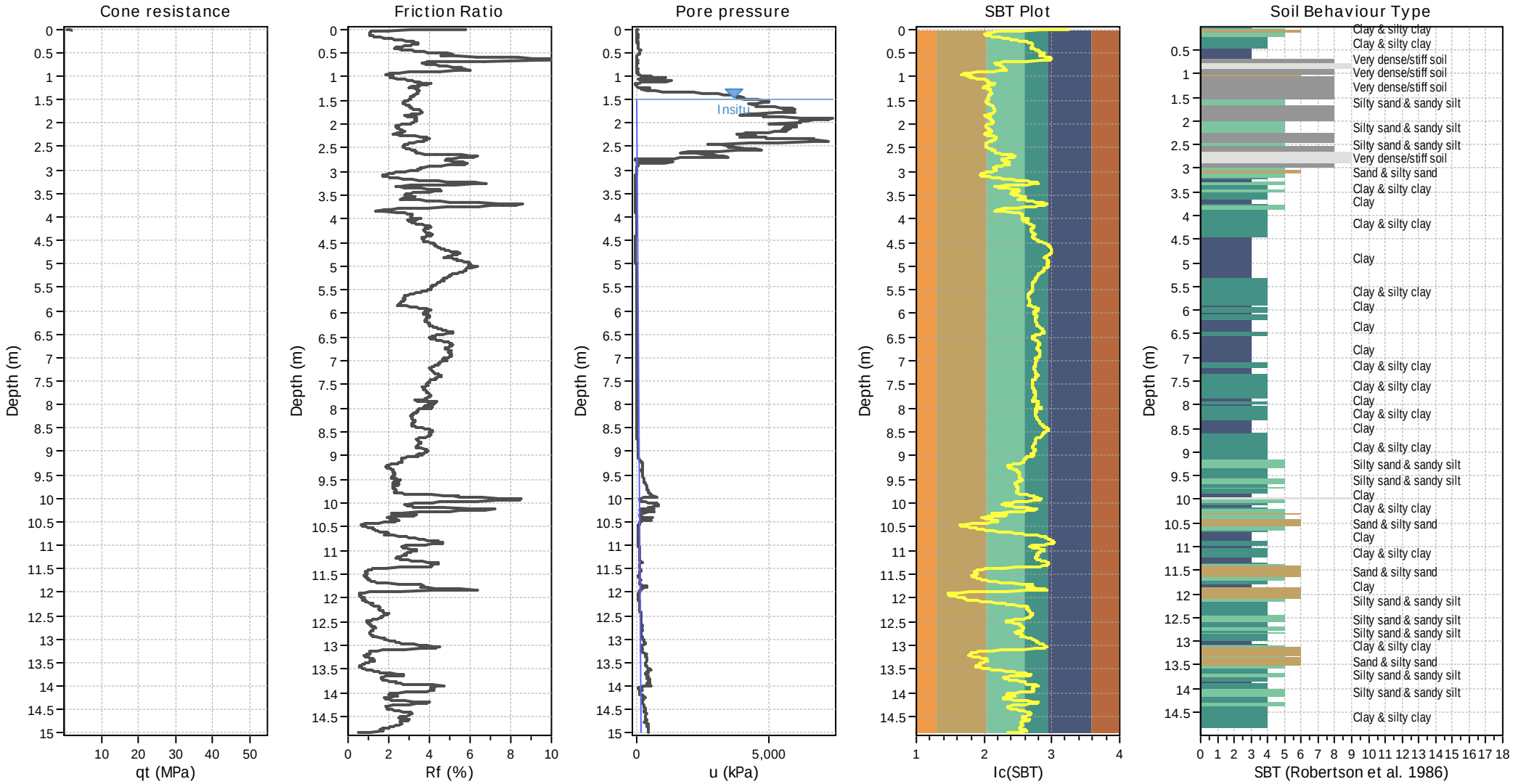
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



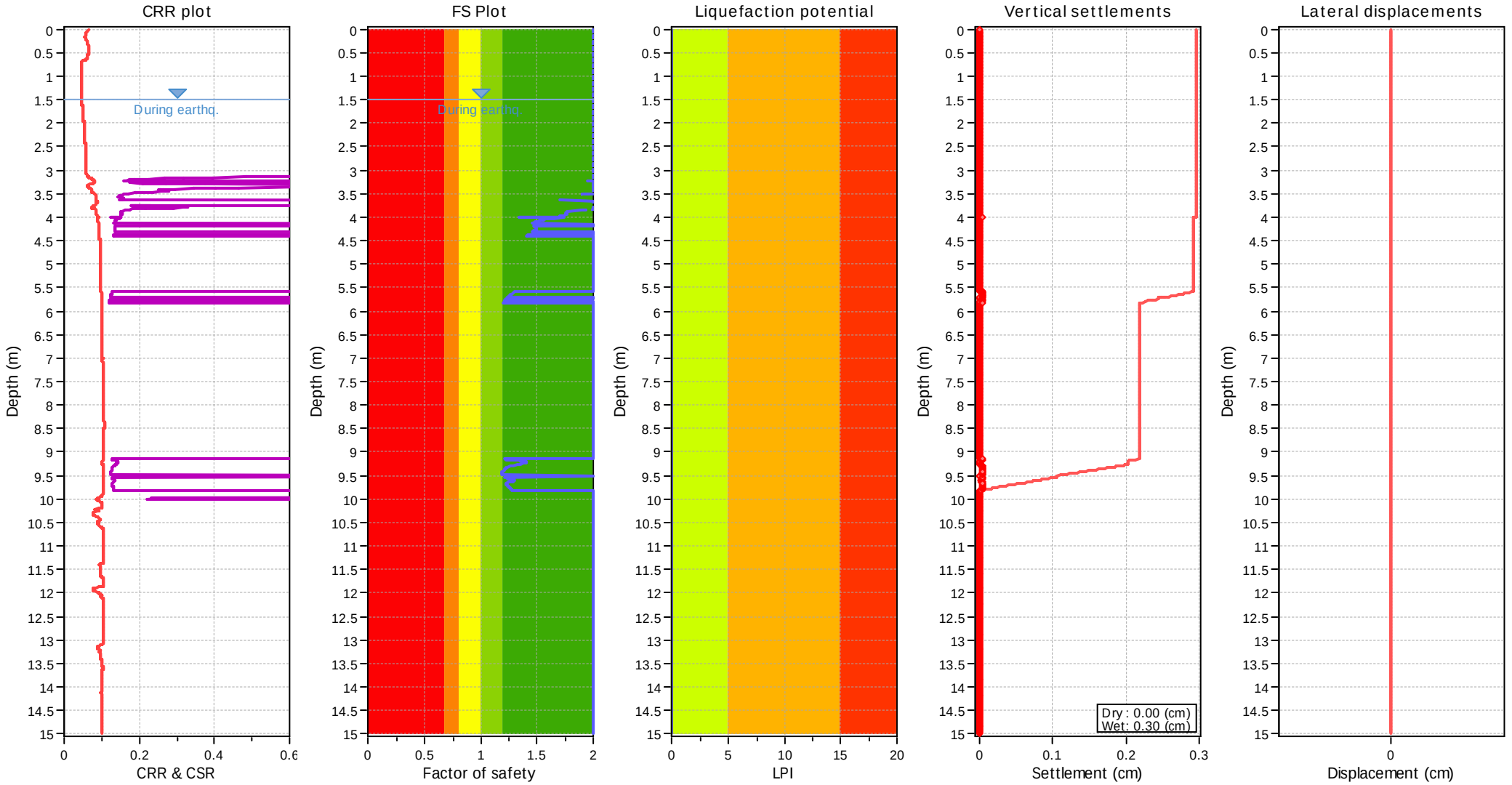
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Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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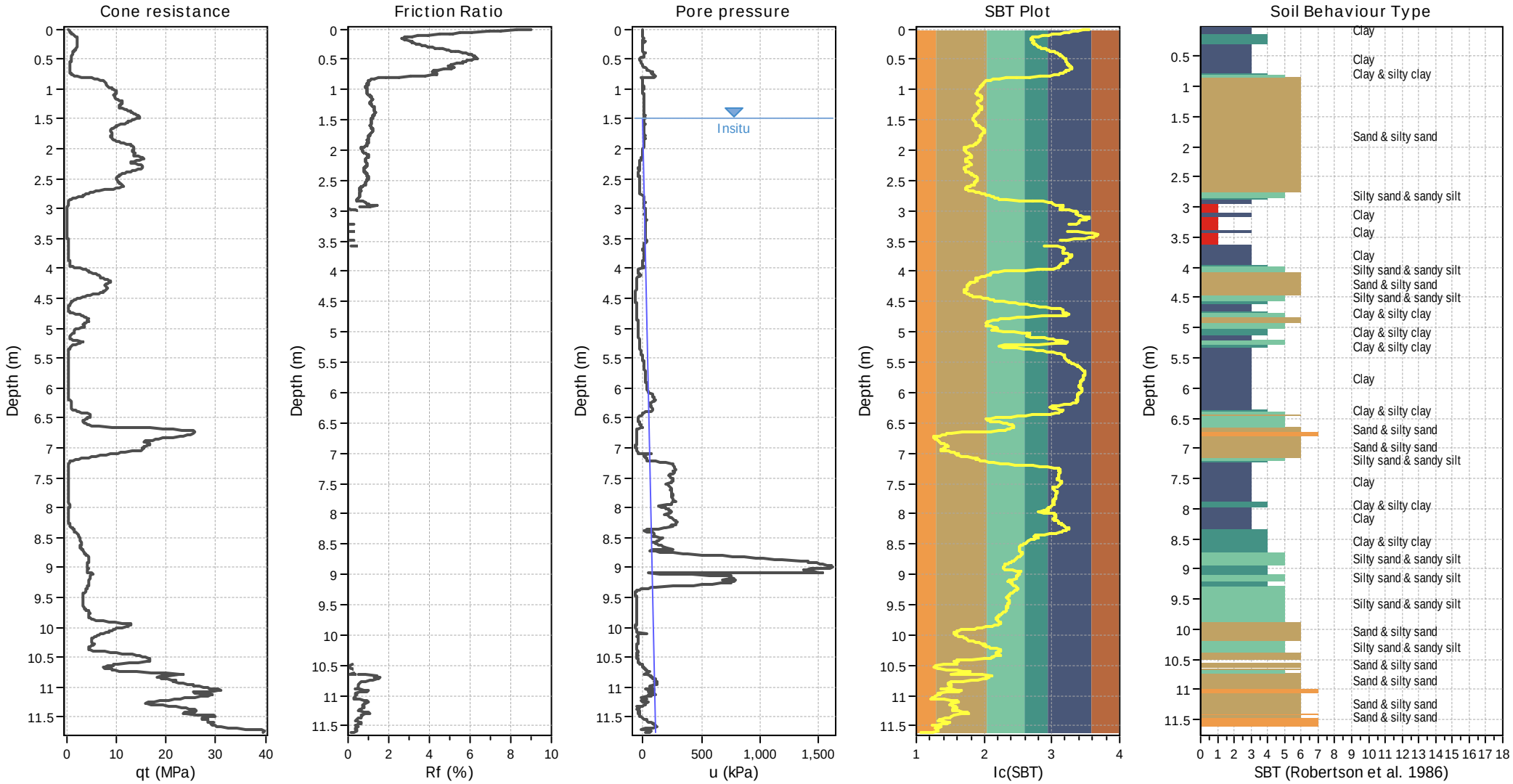
F.S. color scheme

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- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



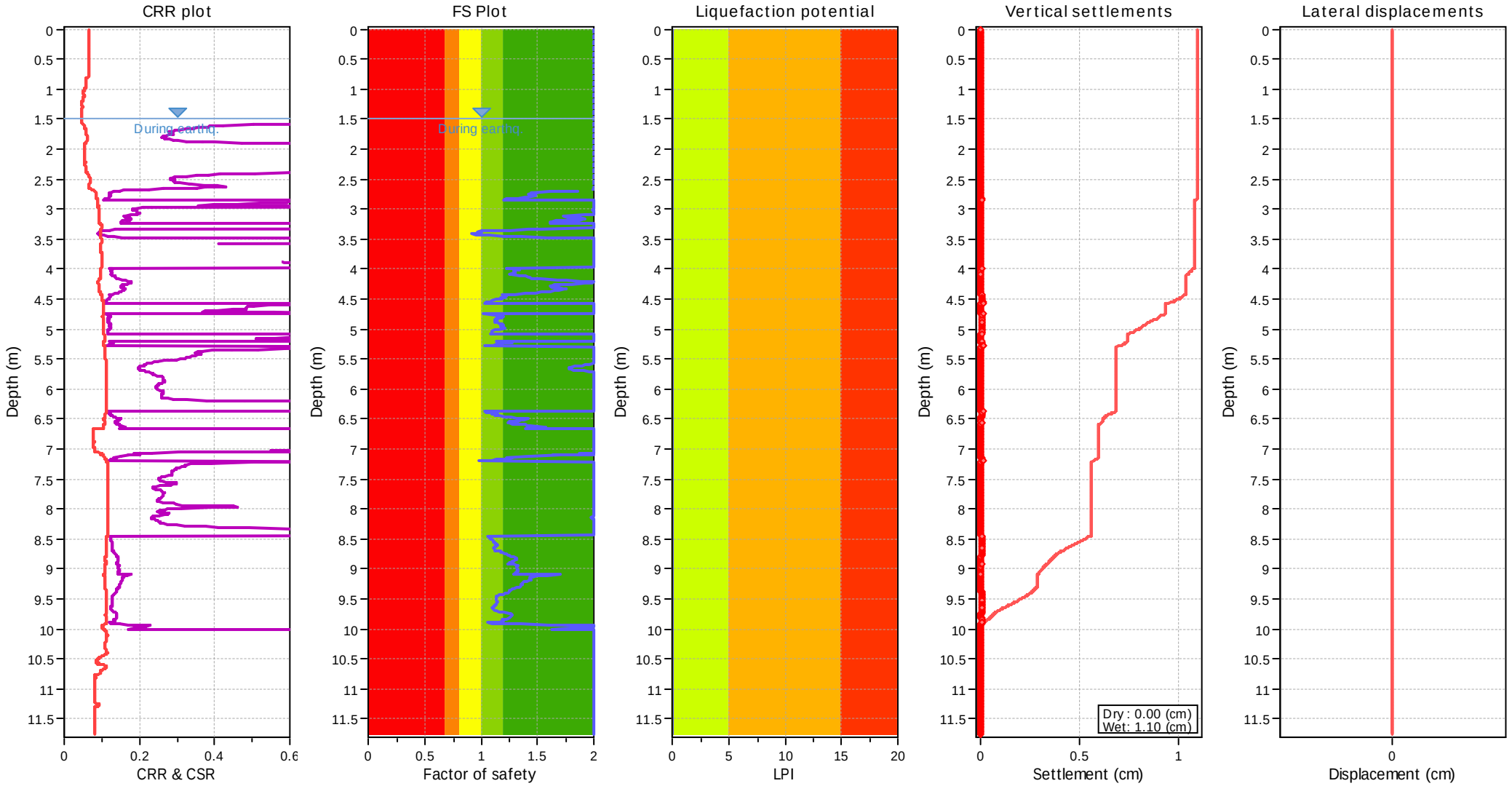
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5. Silty sand to sandy silt
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7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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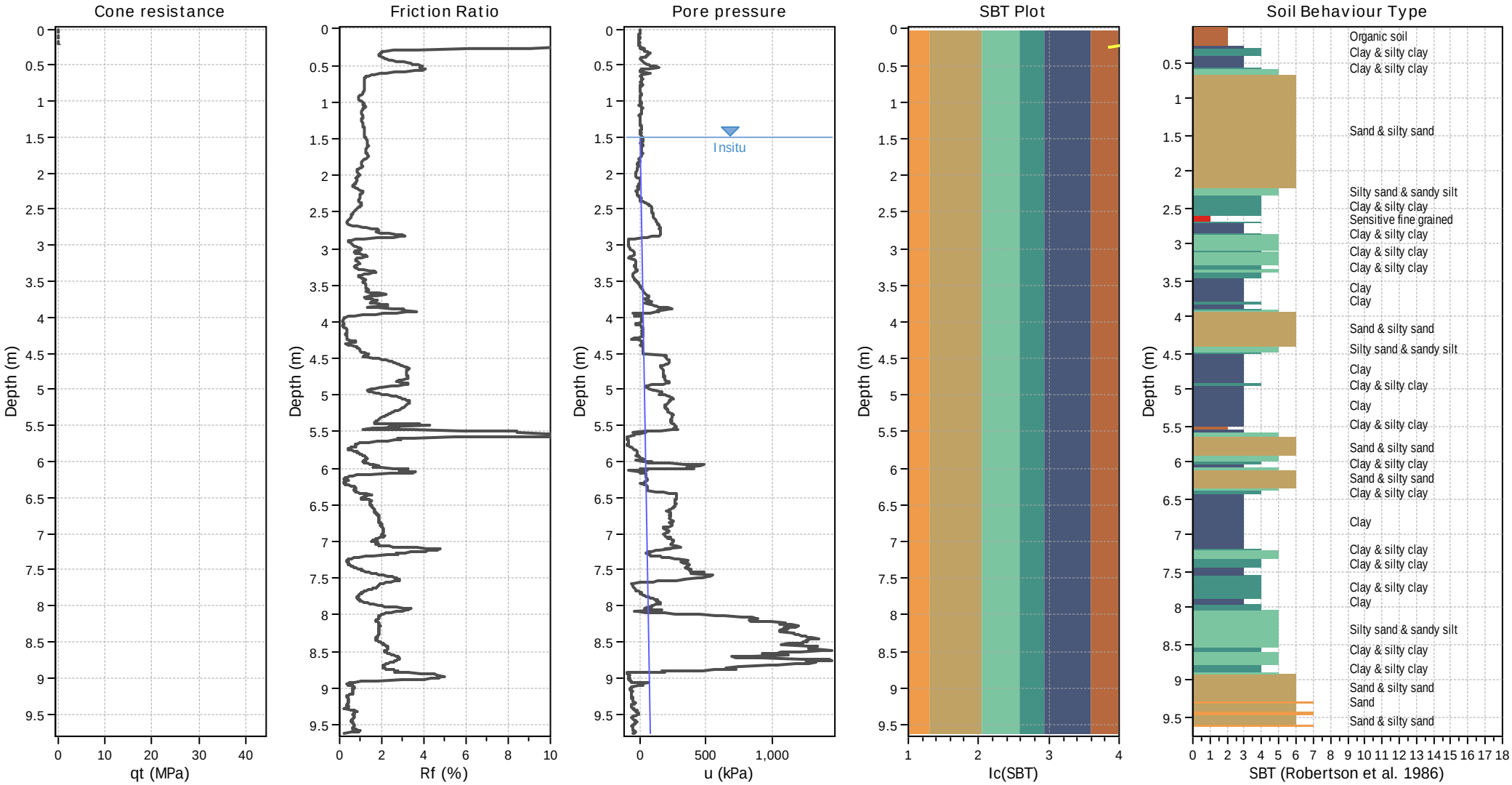
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LPI color scheme

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CPT basic interpretation plots



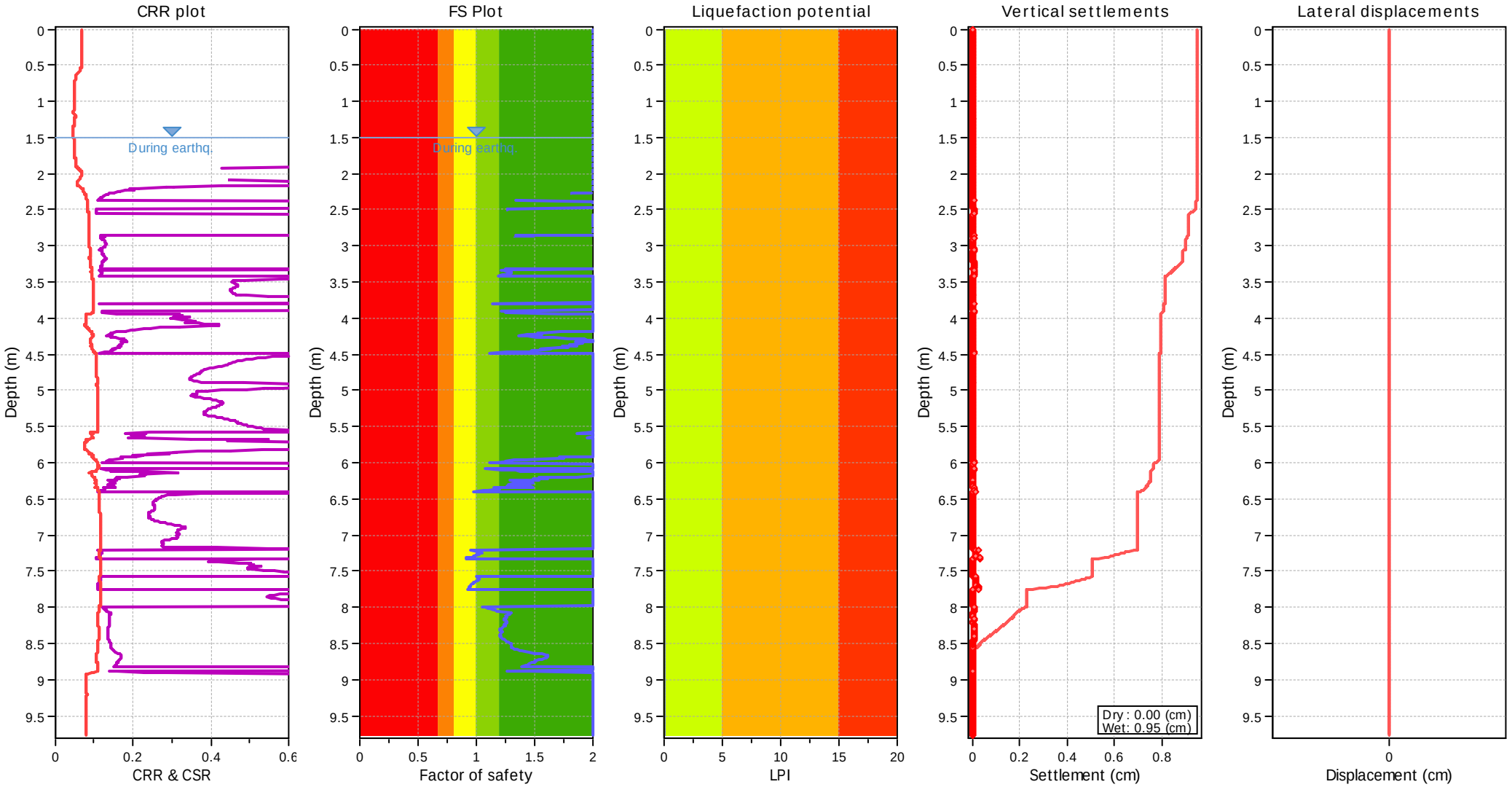
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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
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Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

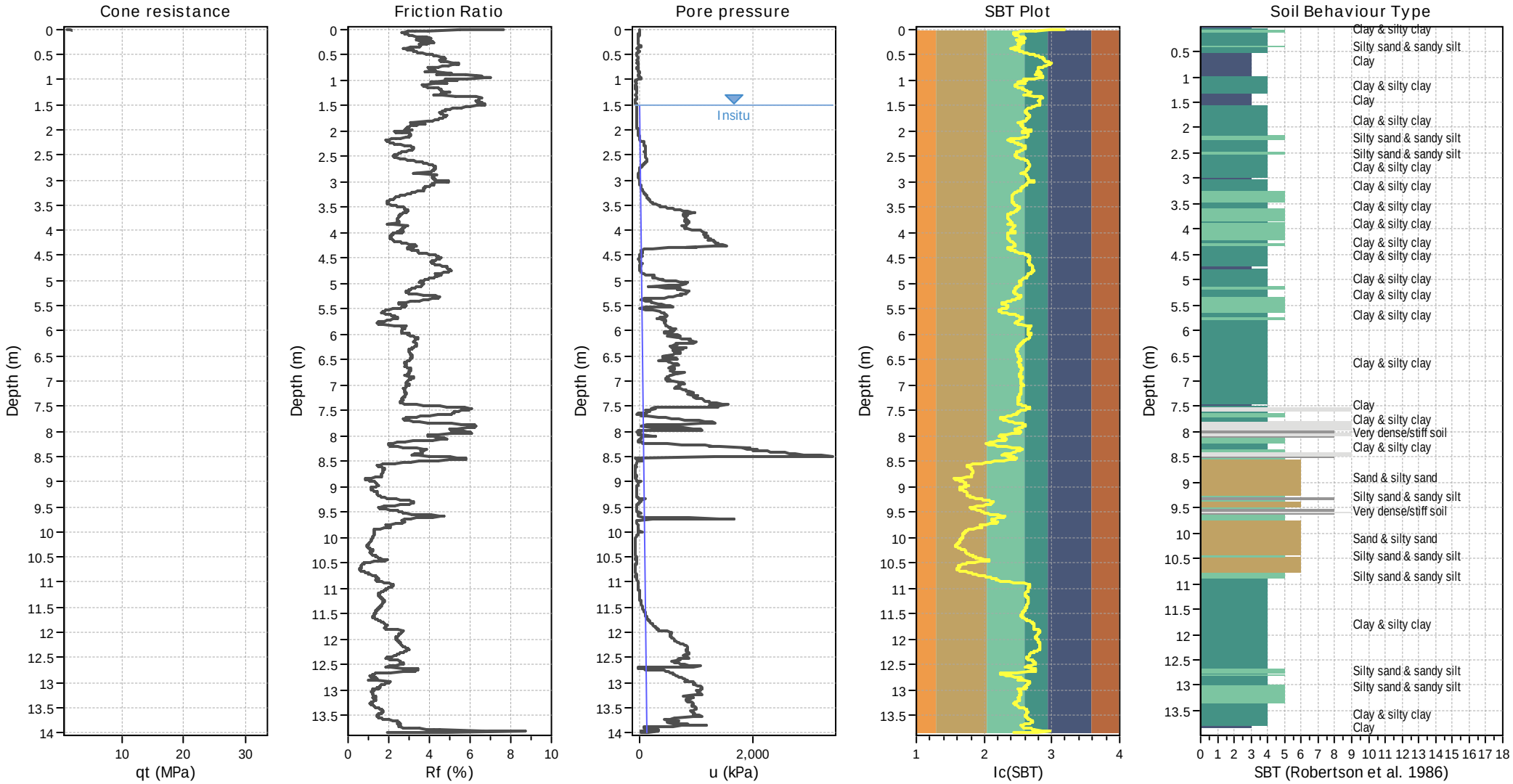
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LPI color scheme

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CPT basic interpretation plots



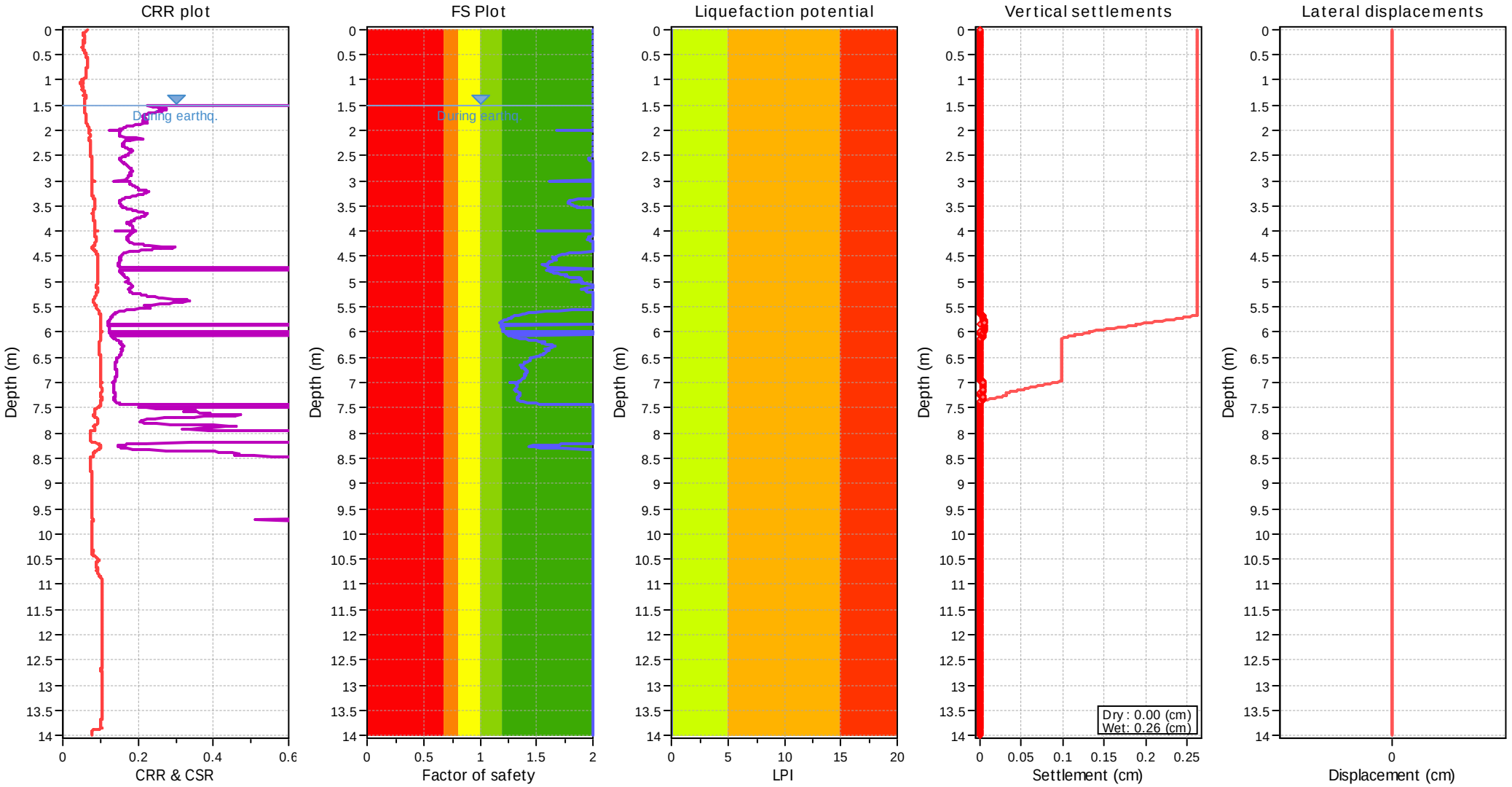
Input parameters and analysis data

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9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

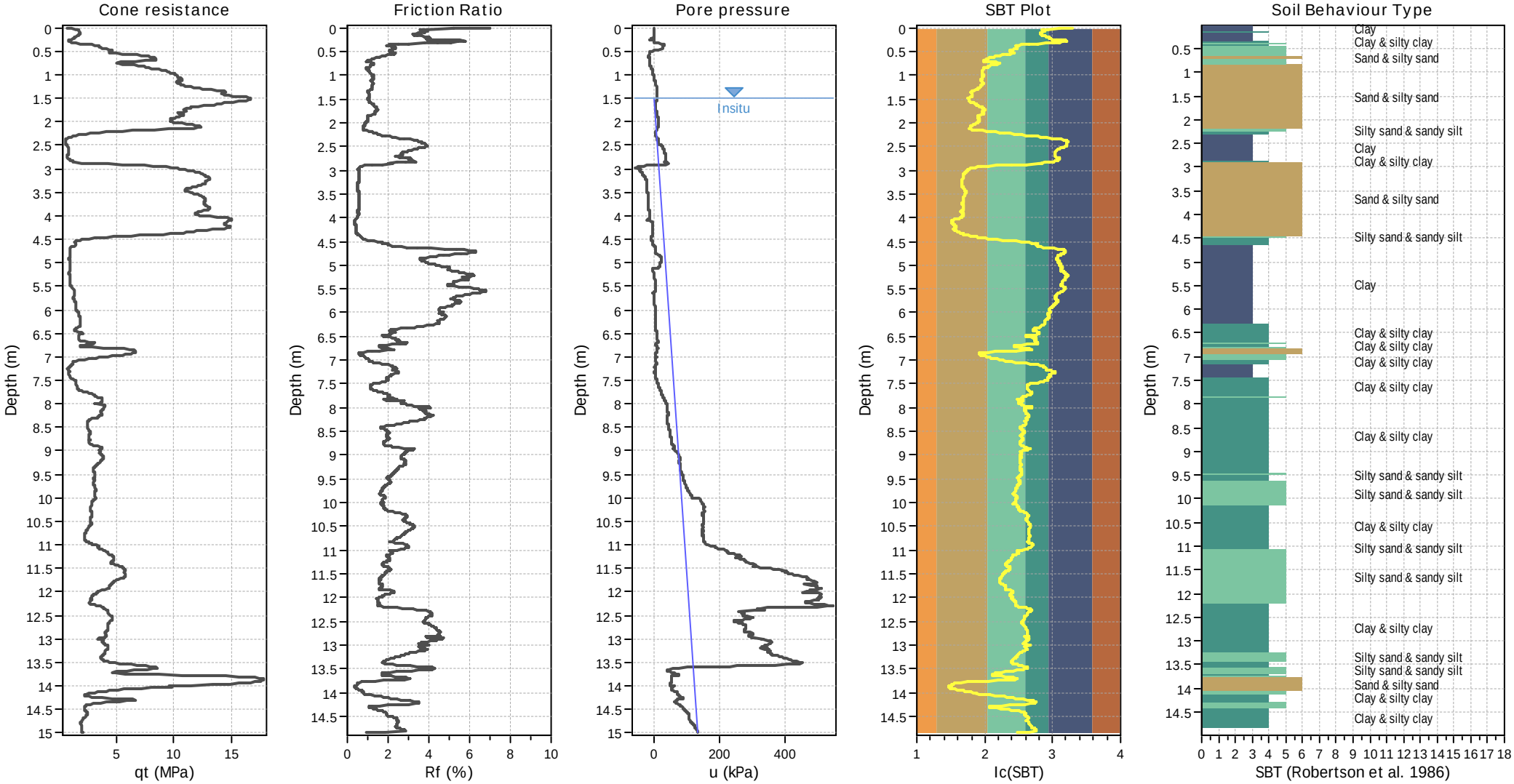
F.S. color scheme

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LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



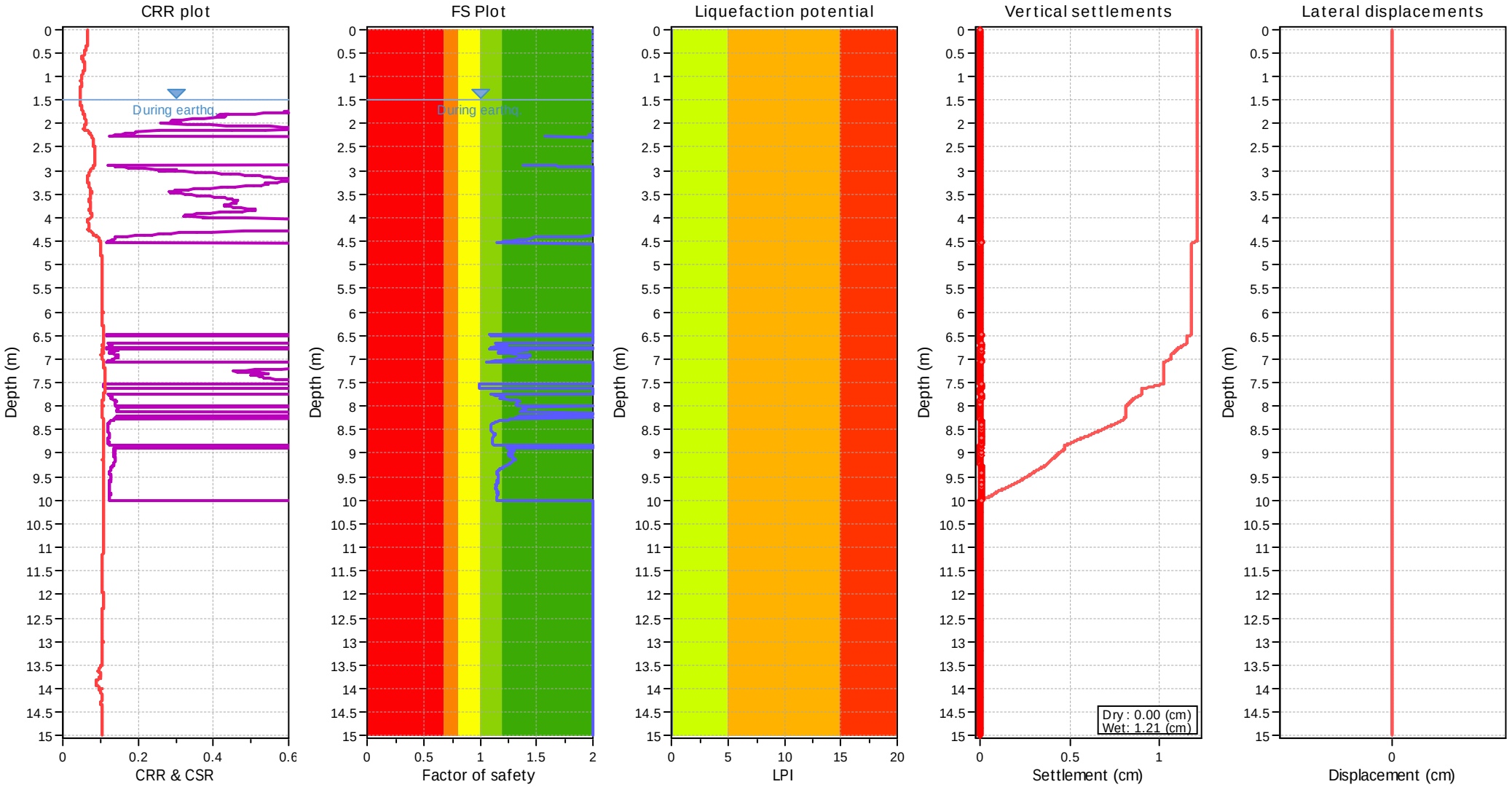
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

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Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

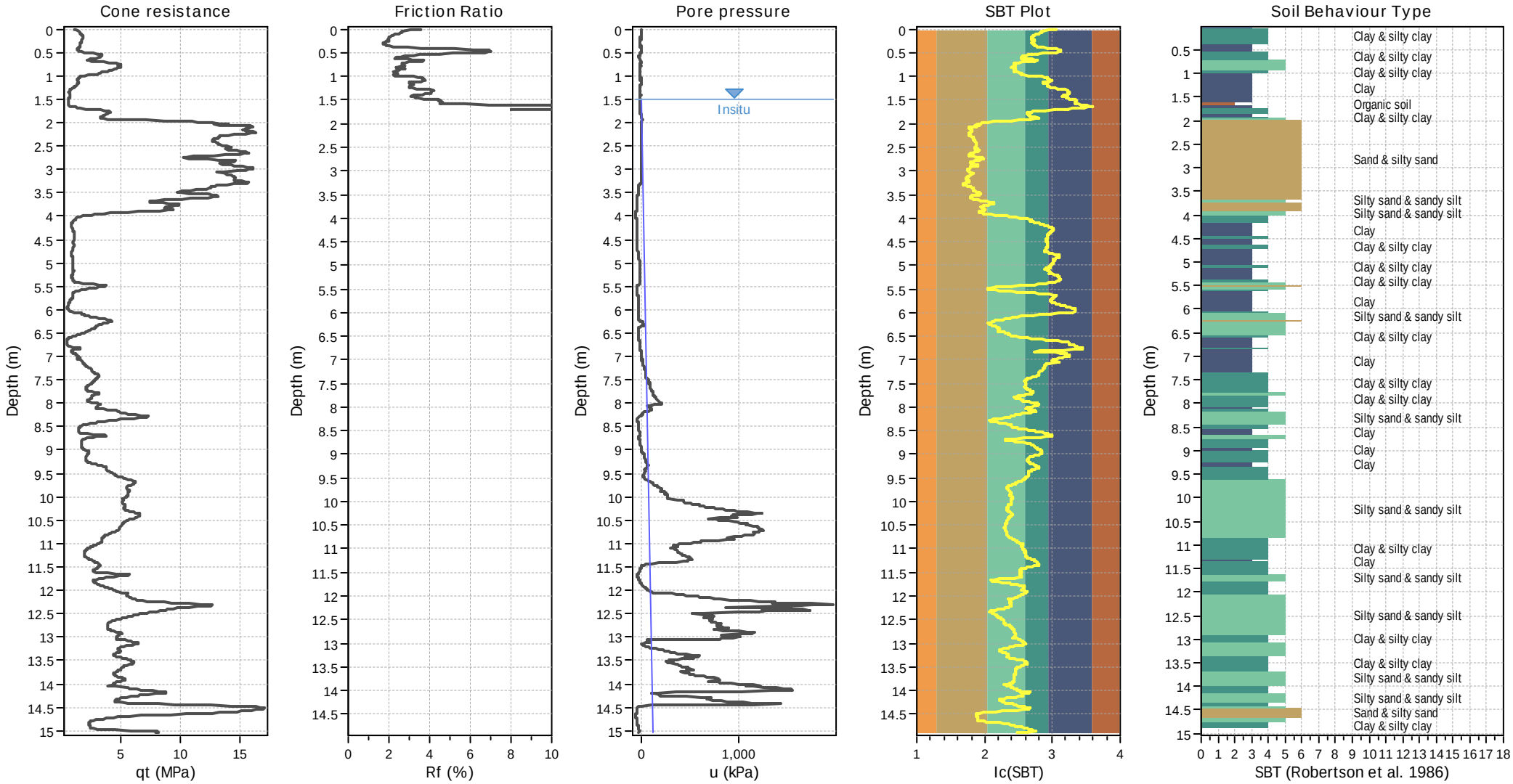
F.S. color scheme

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LPI color scheme

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- Low risk

CPT basic interpretation plots



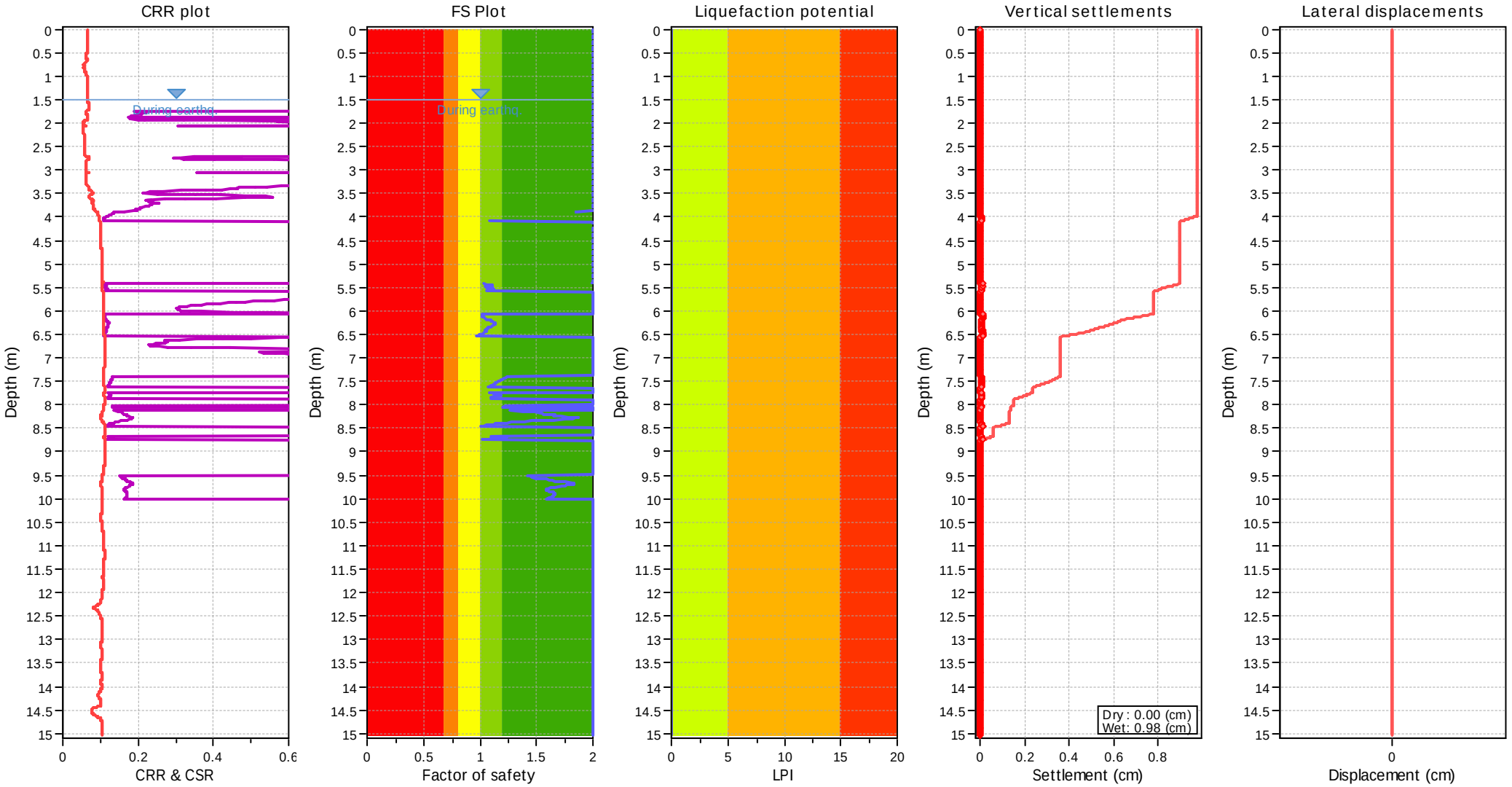
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
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SBT legend

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8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
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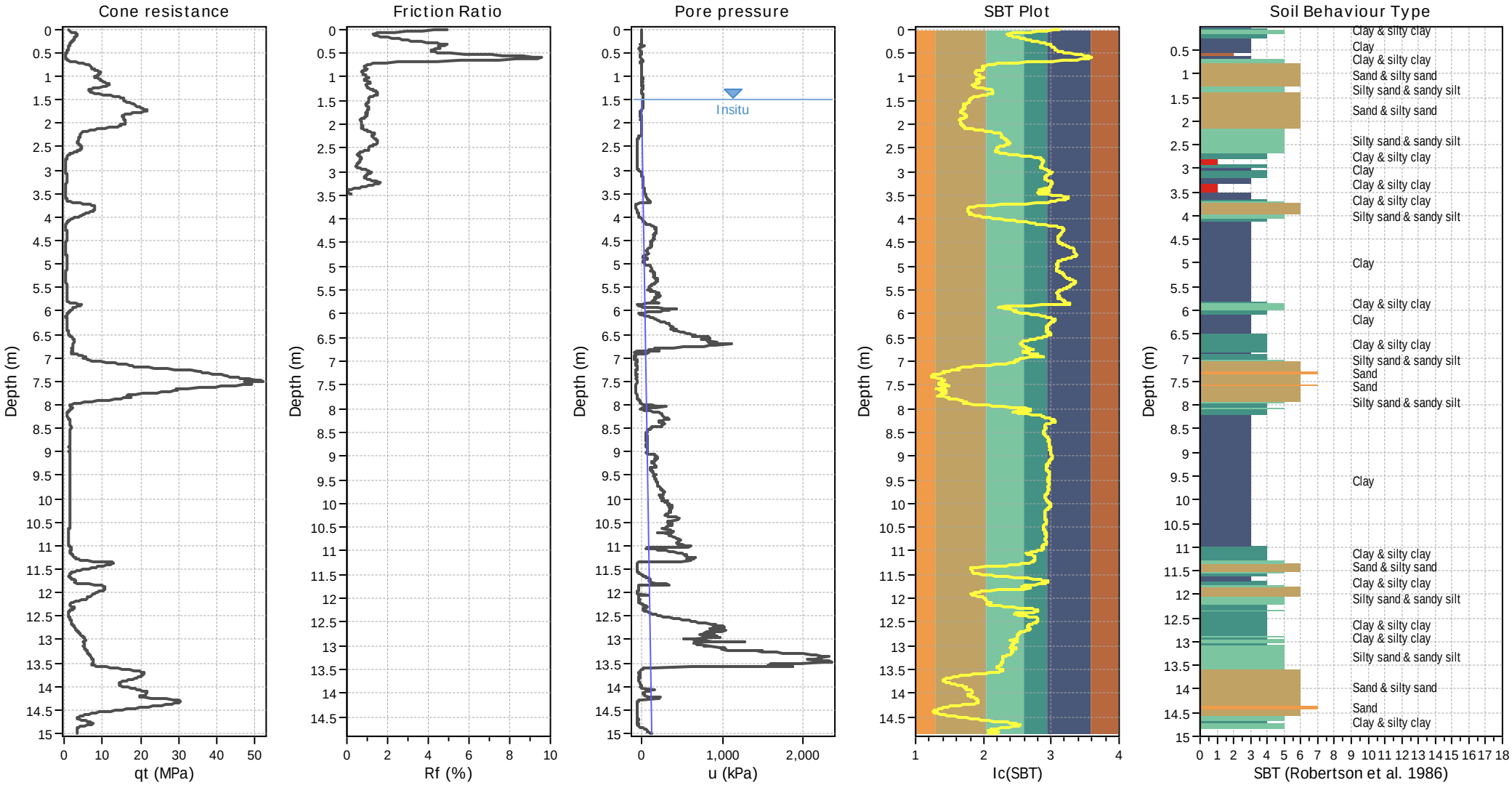
F.S. color scheme

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LPI color scheme

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CPT basic interpretation plots



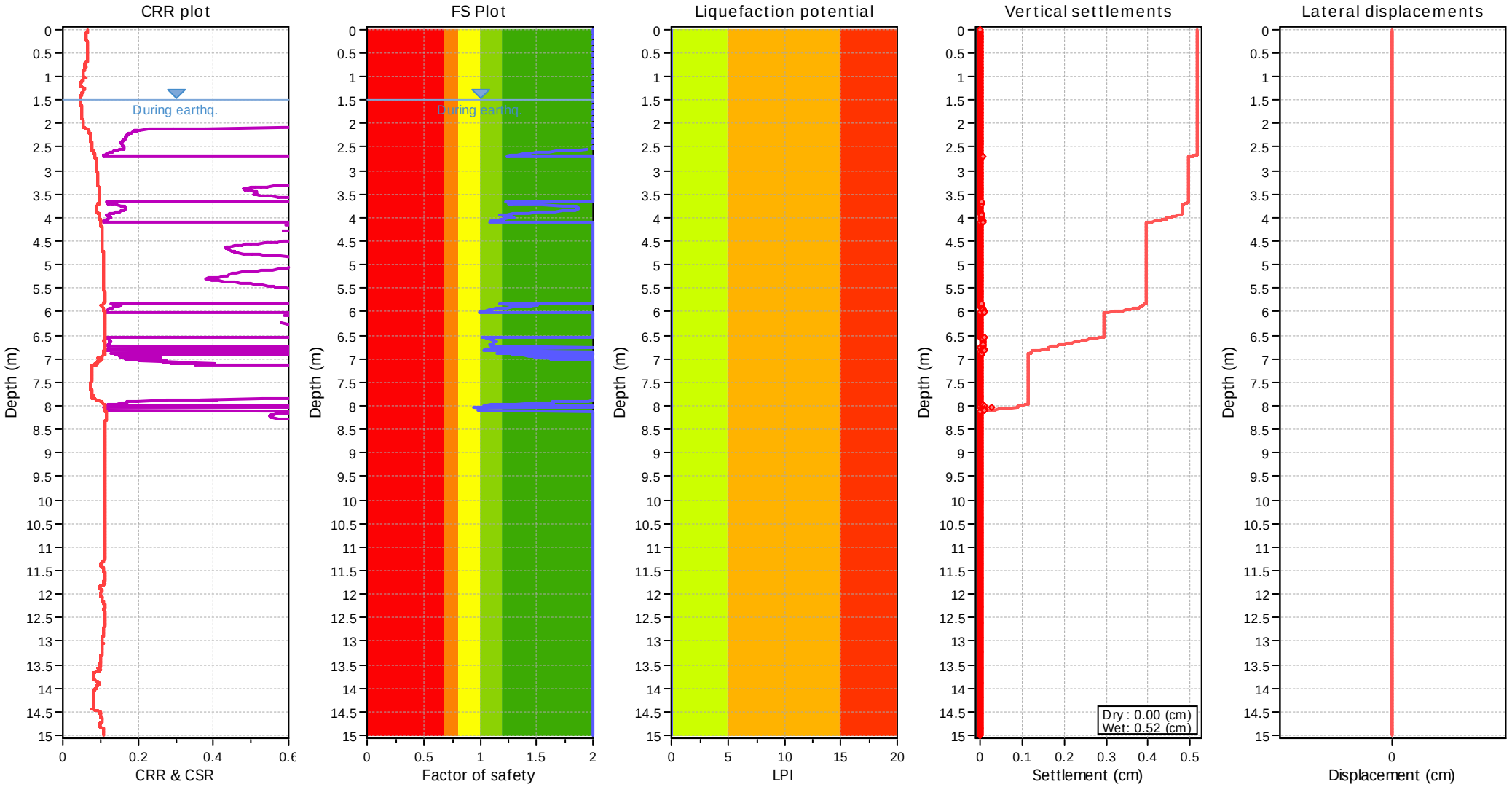
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
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Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
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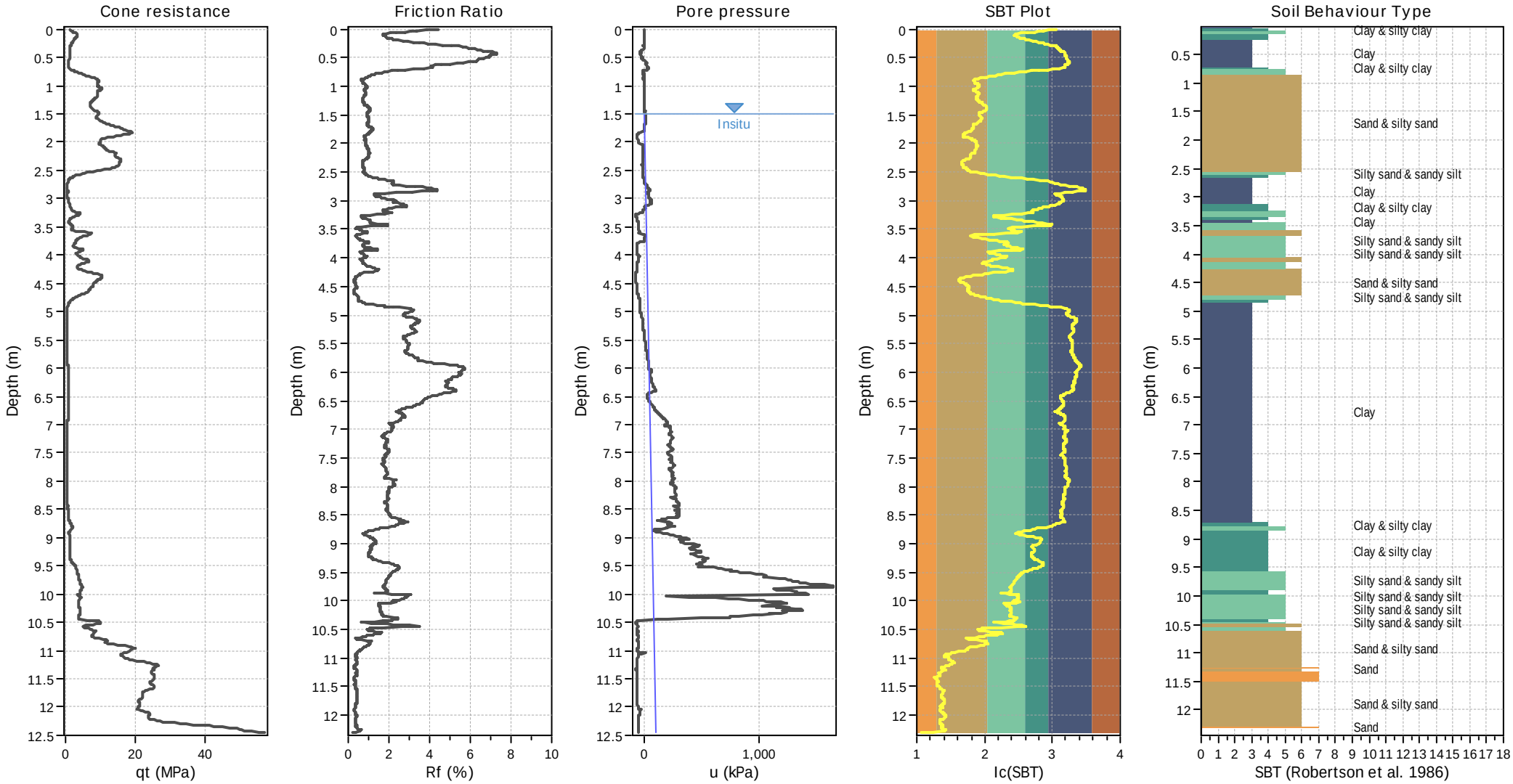
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



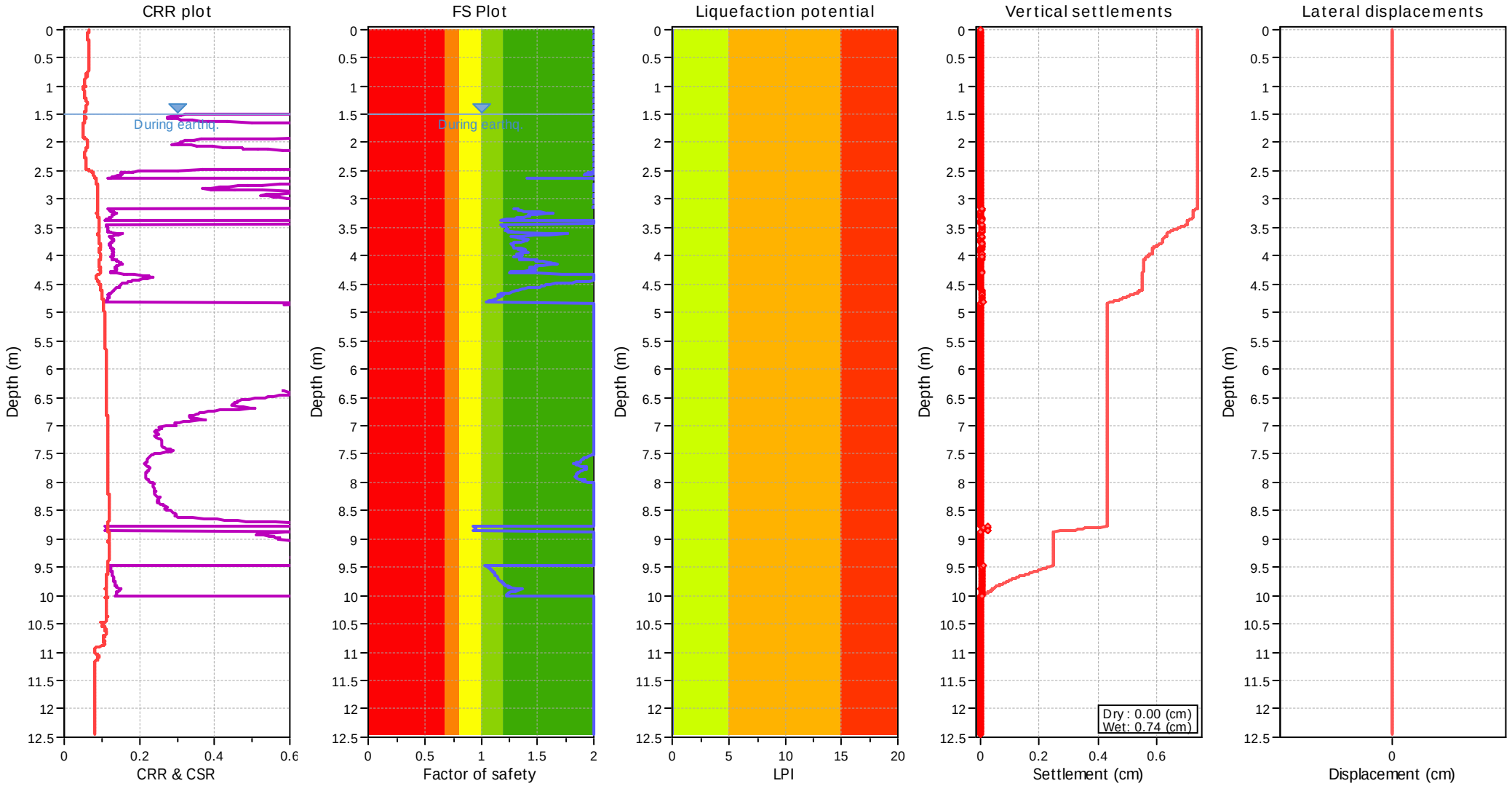
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

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5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



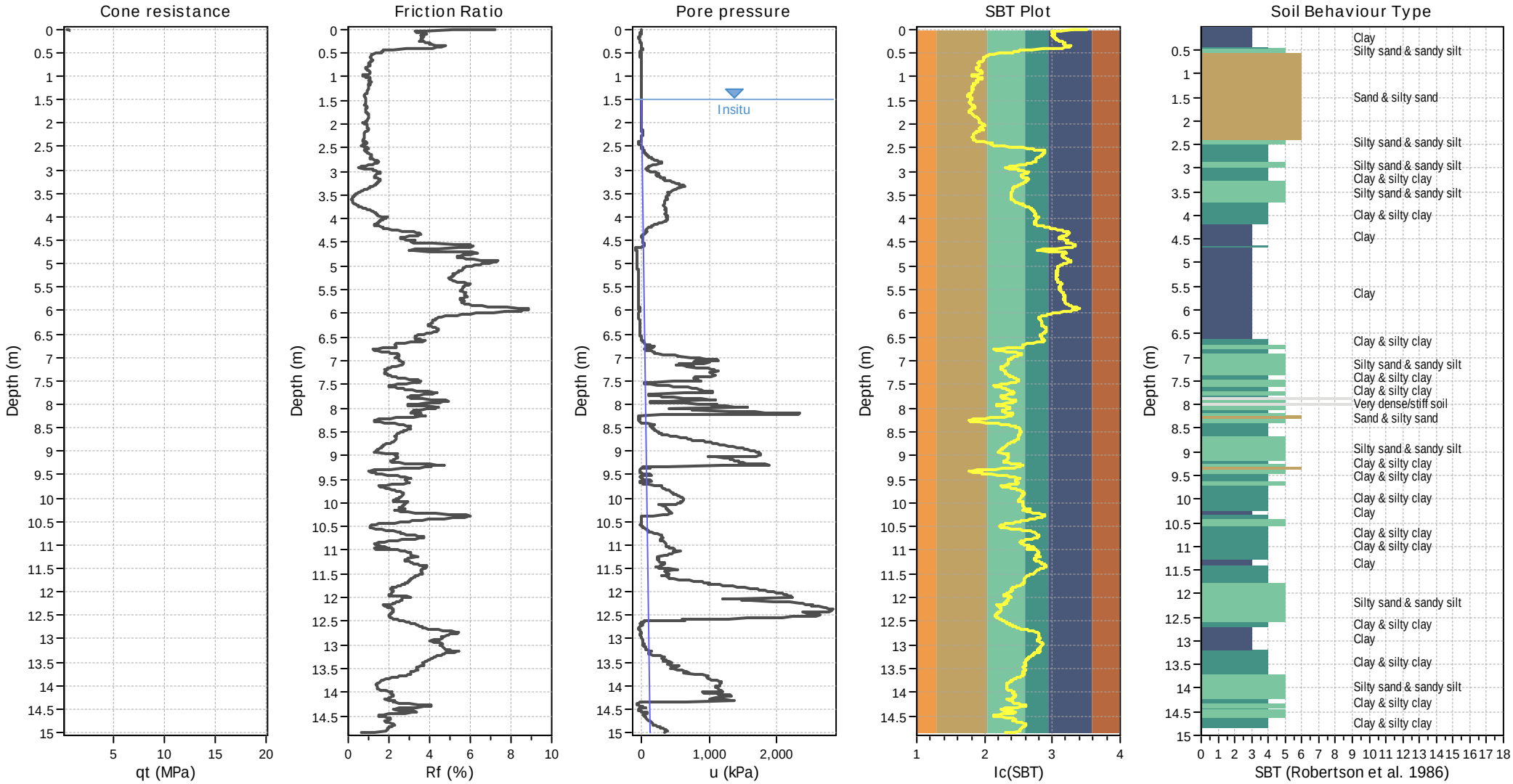
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LPI color scheme
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- High risk
- Low risk

CPT basic interpretation plots



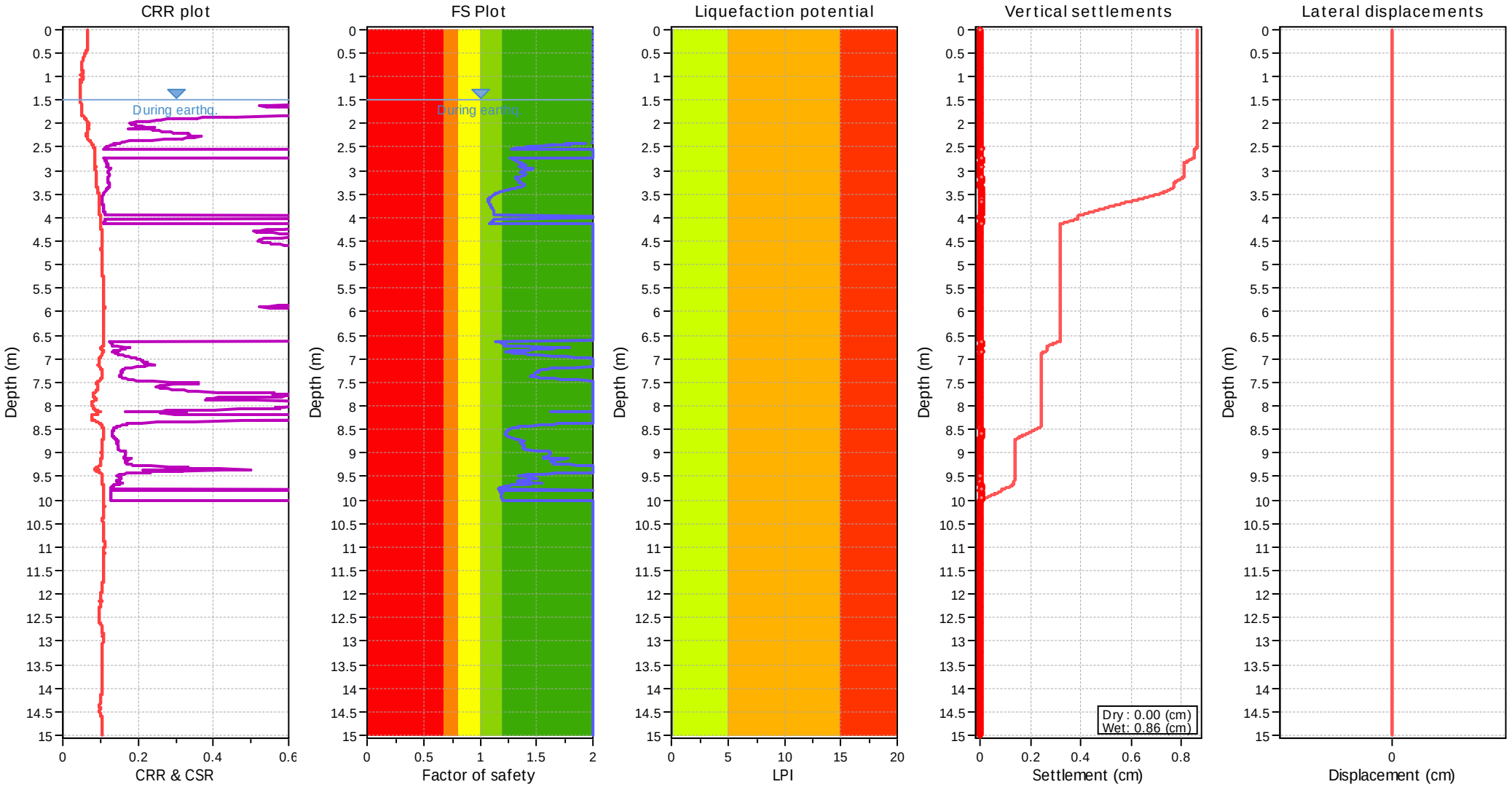
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SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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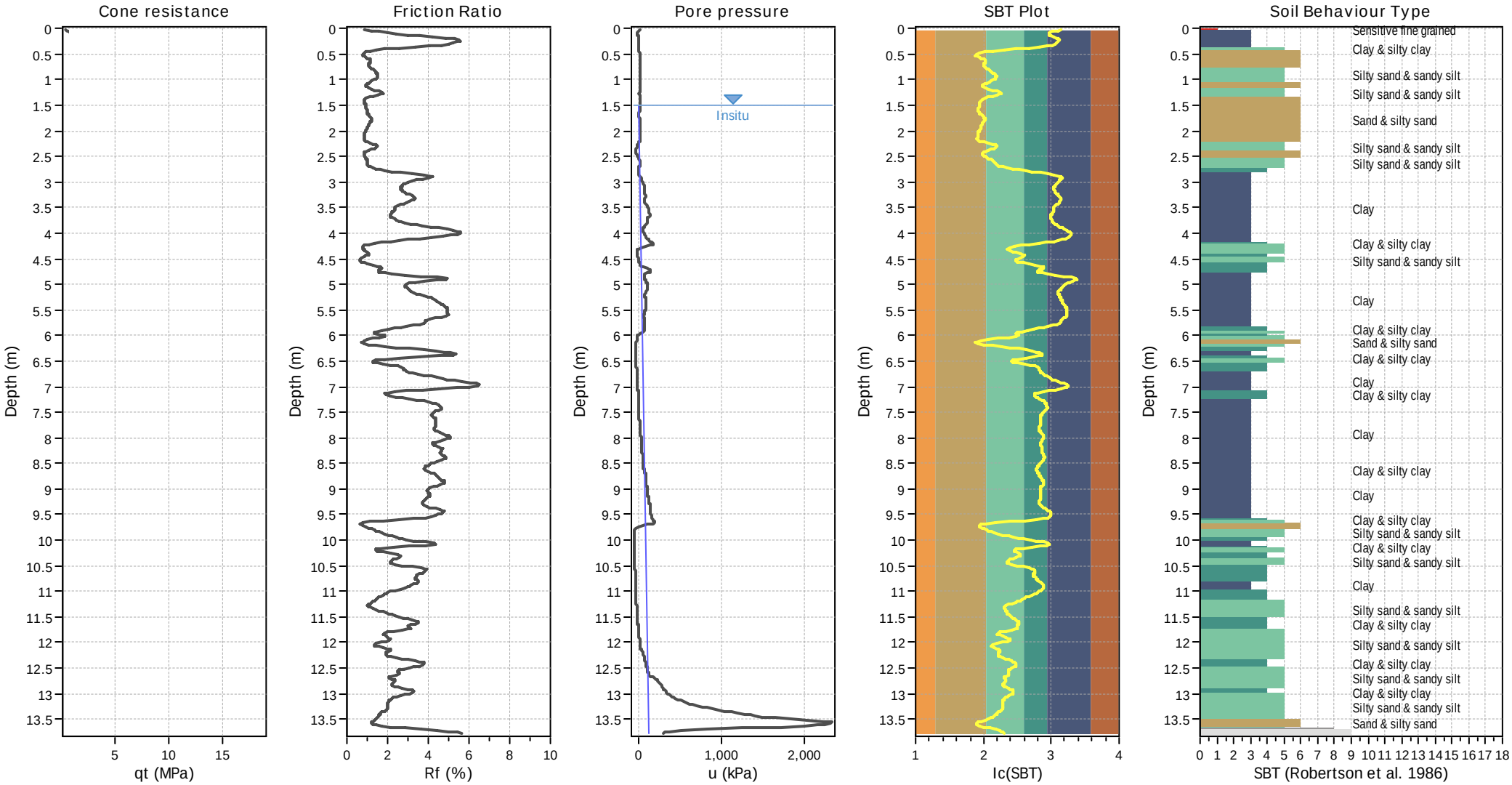
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LPI color scheme

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- Low risk

CPT basic interpretation plots



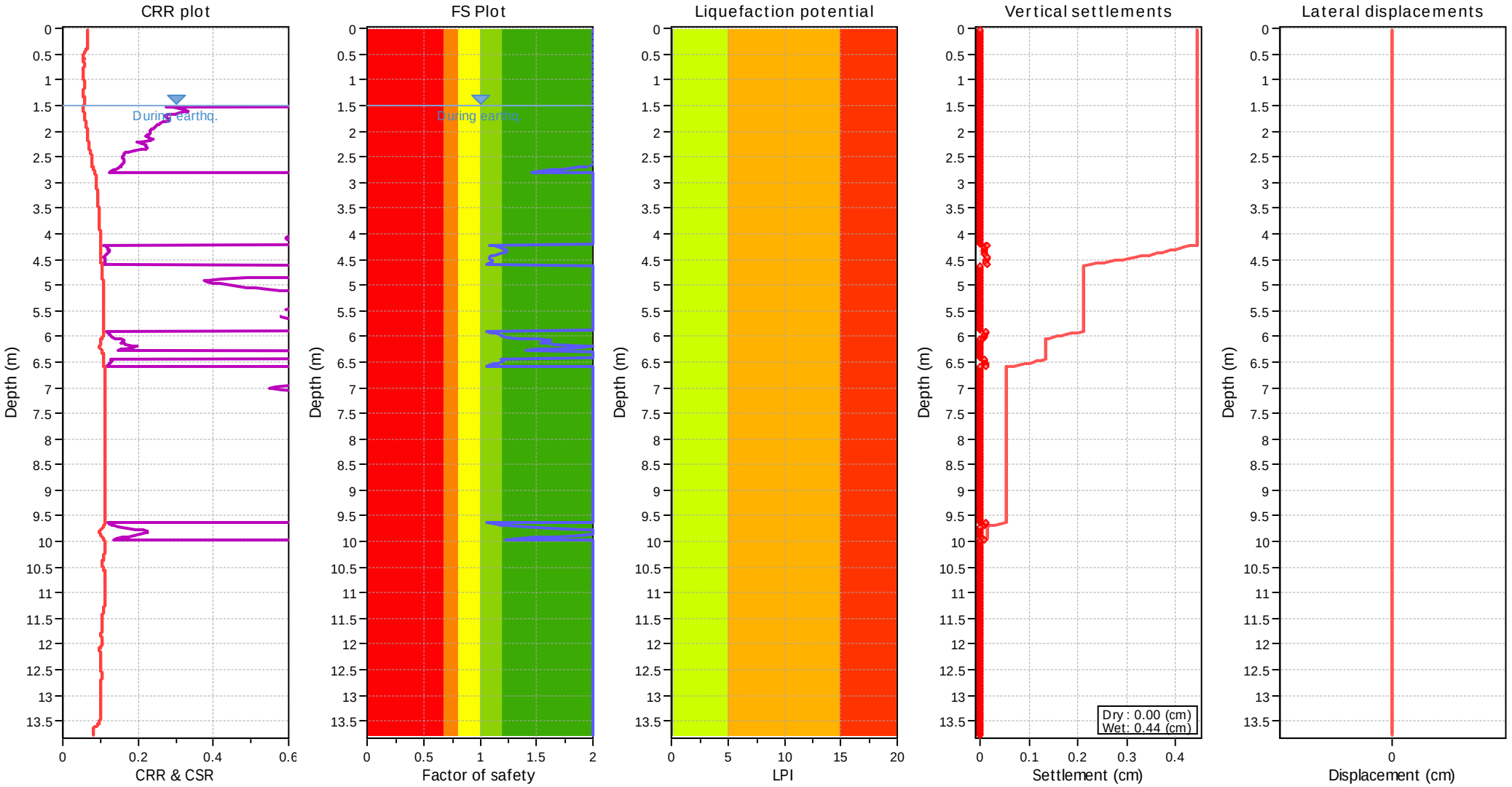
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7. Gravely sand to sand
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9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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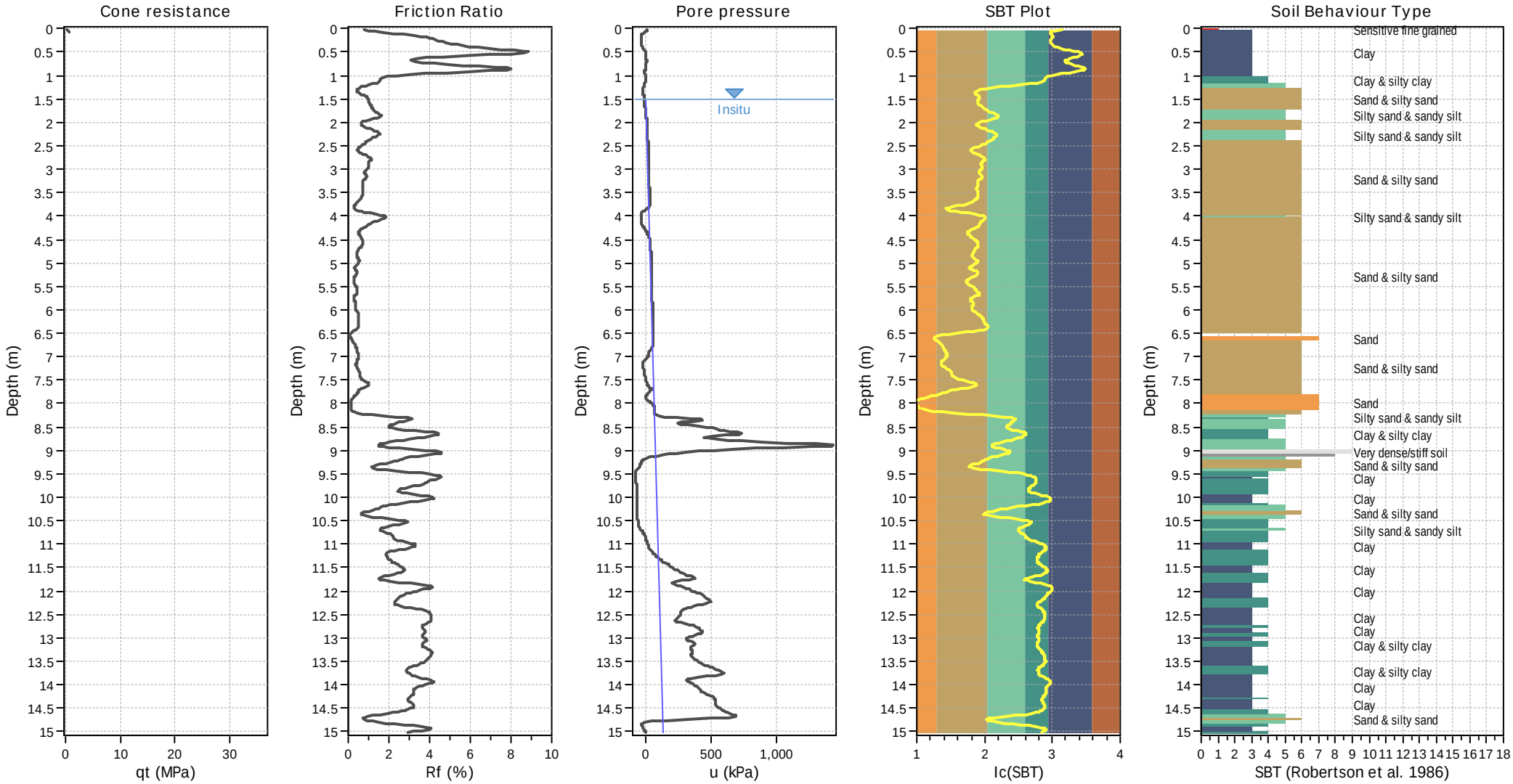
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LPI color scheme

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CPT basic interpretation plots



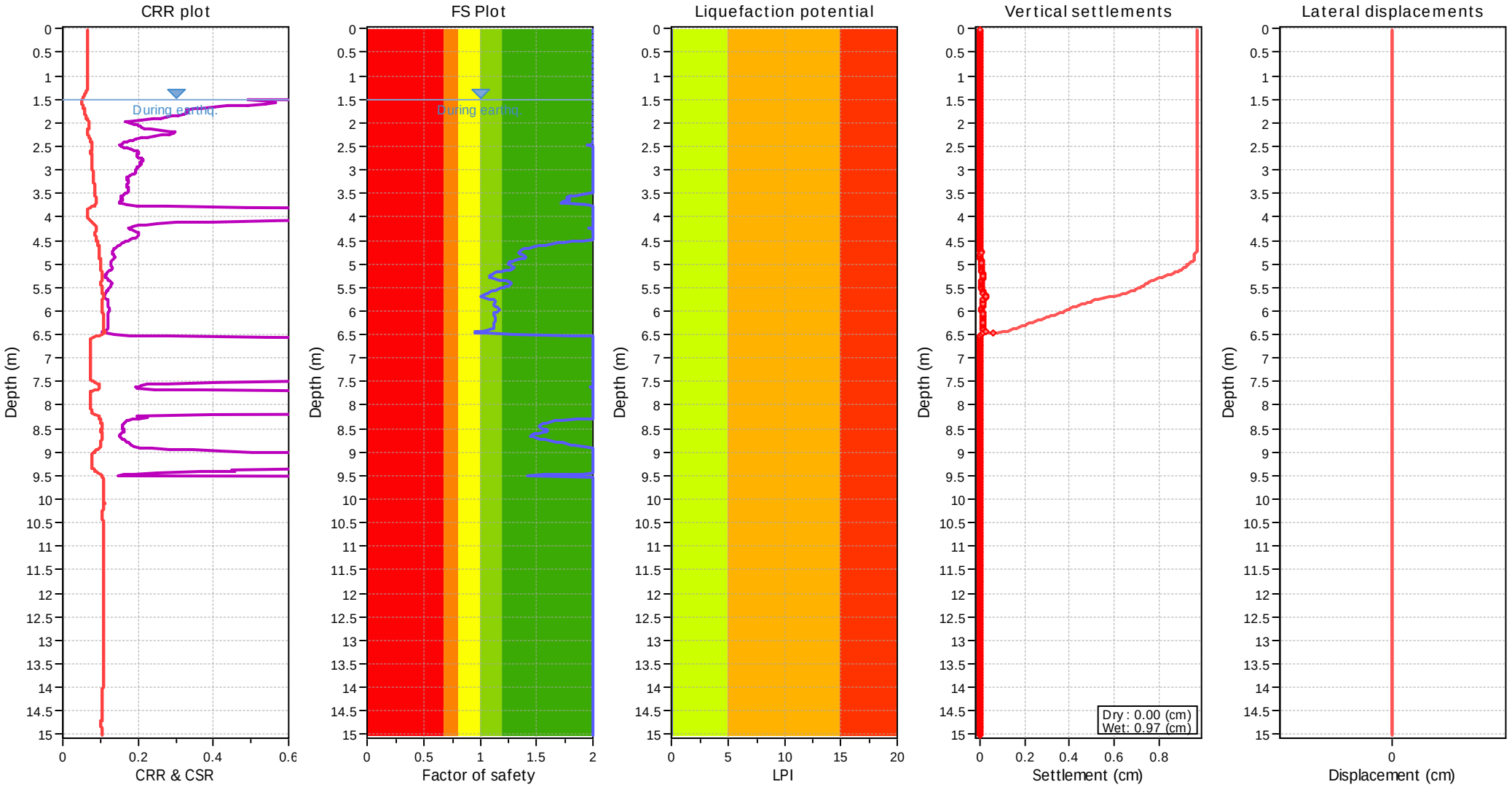
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Liquefaction analysis overall plots



Input parameters and analysis data

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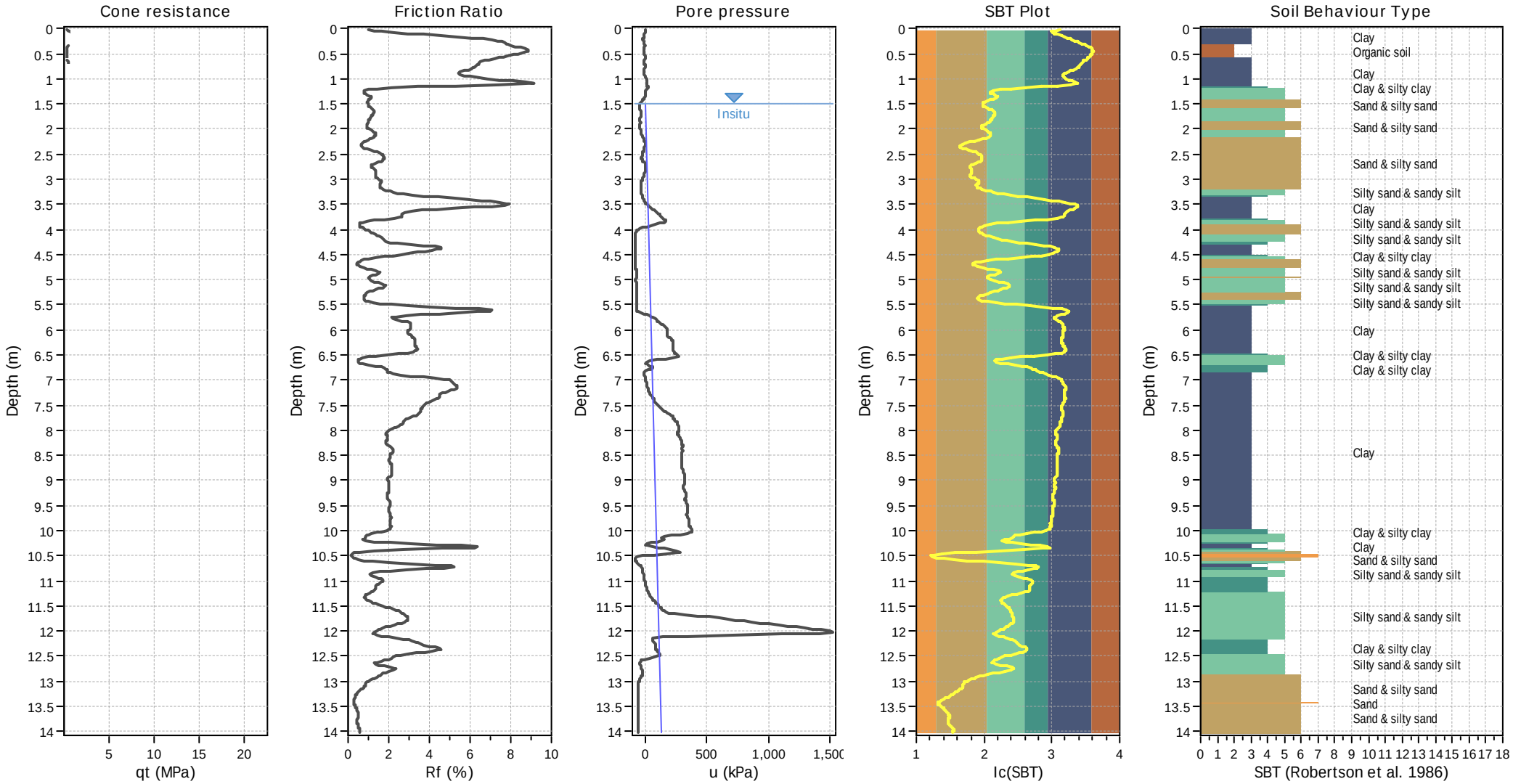
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LPI color scheme

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CPT basic interpretation plots



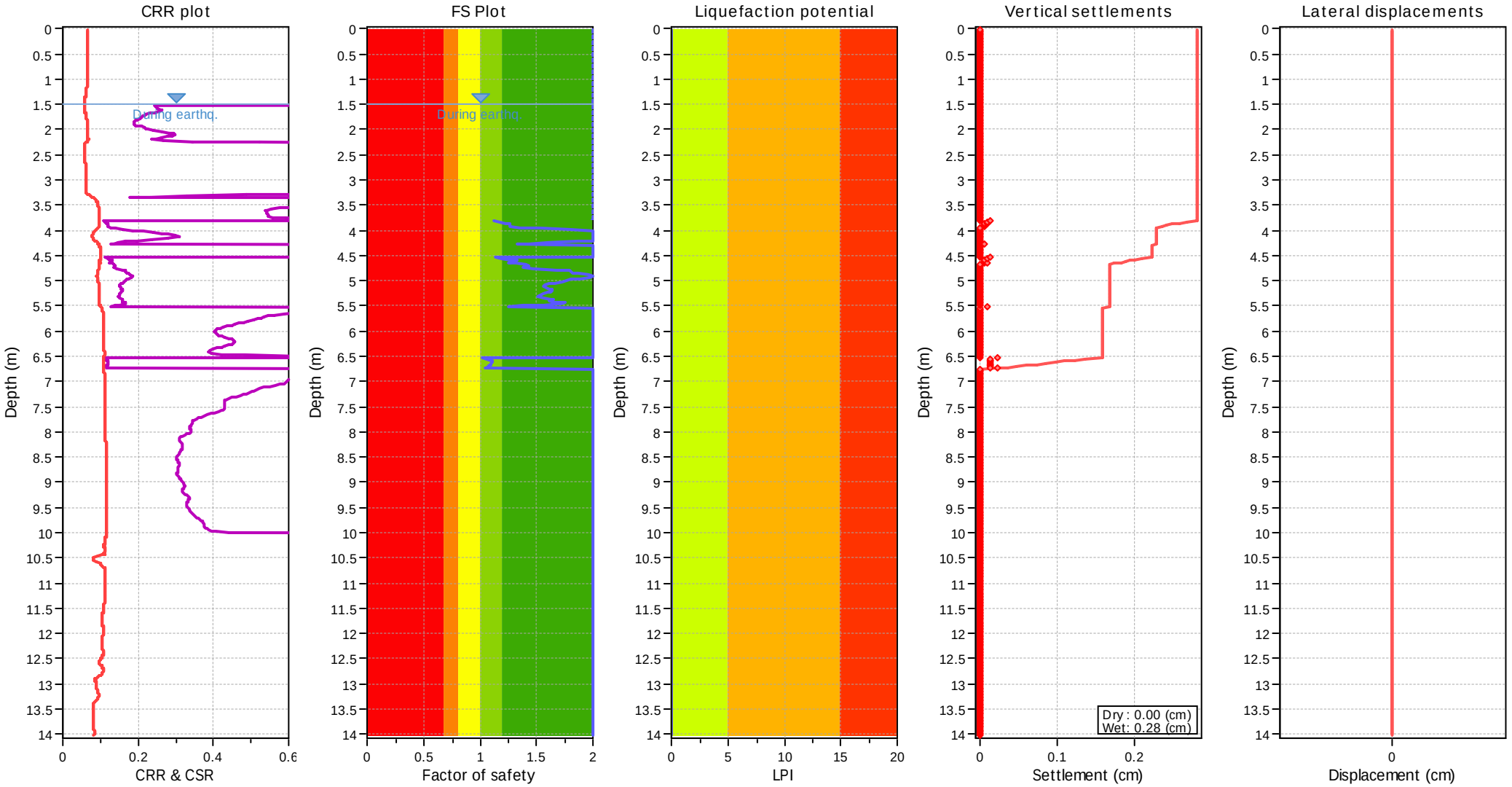
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9. Very stiff fine grained

Liquefaction analysis overall plots



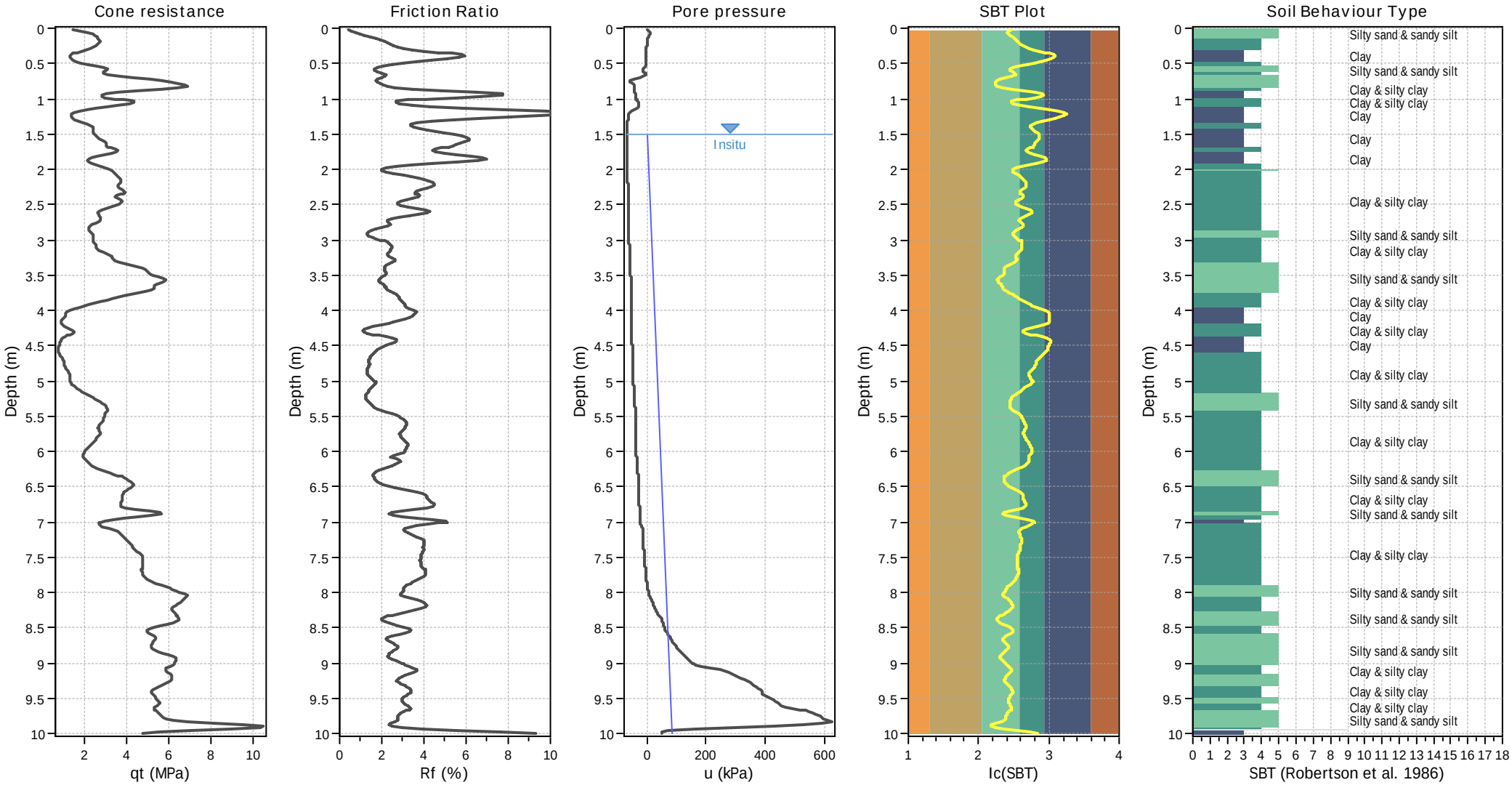
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LPI color scheme
- Very high risk
- High risk
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CPT basic interpretation plots



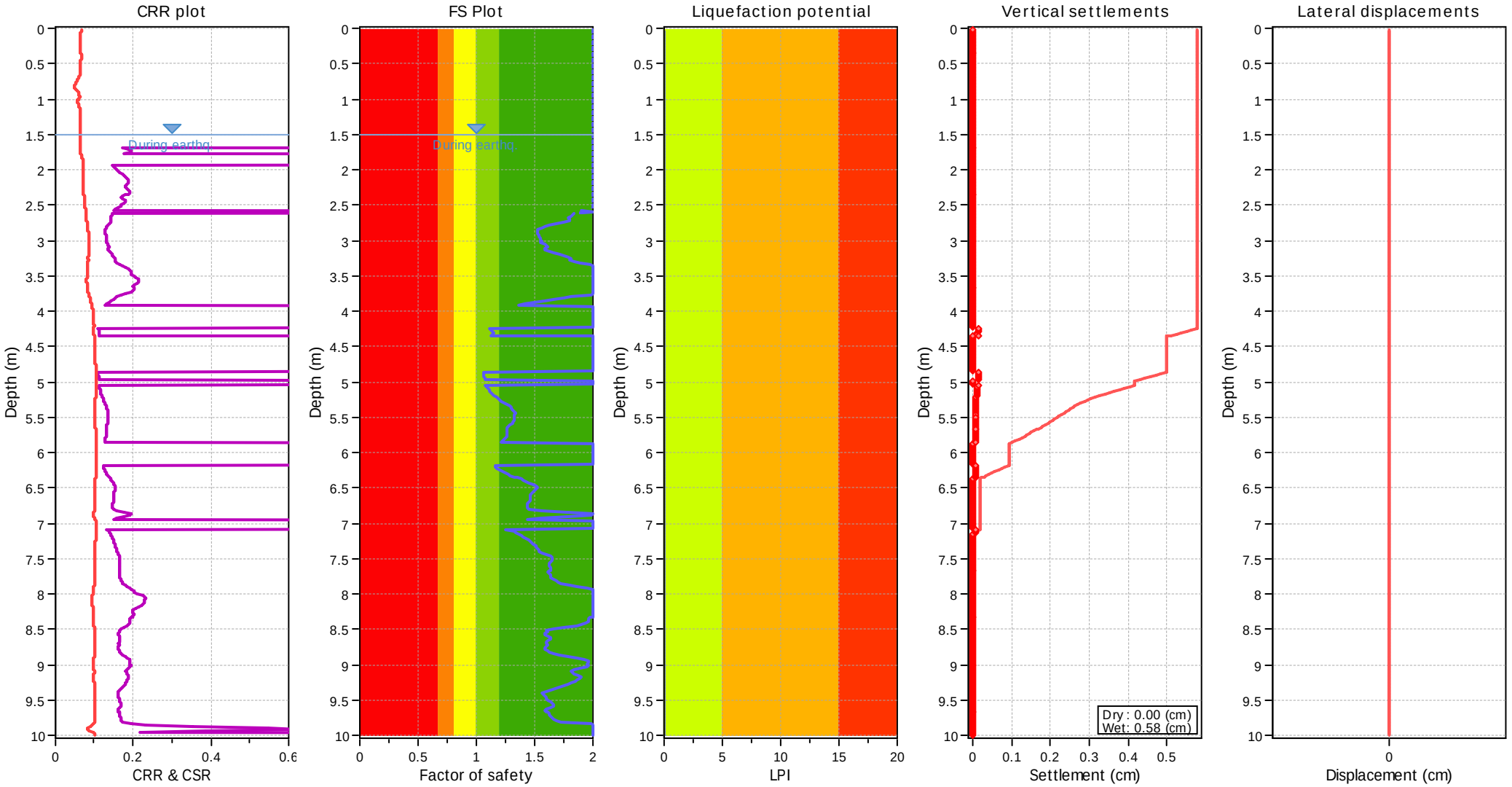
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Liquefaction analysis overall plots



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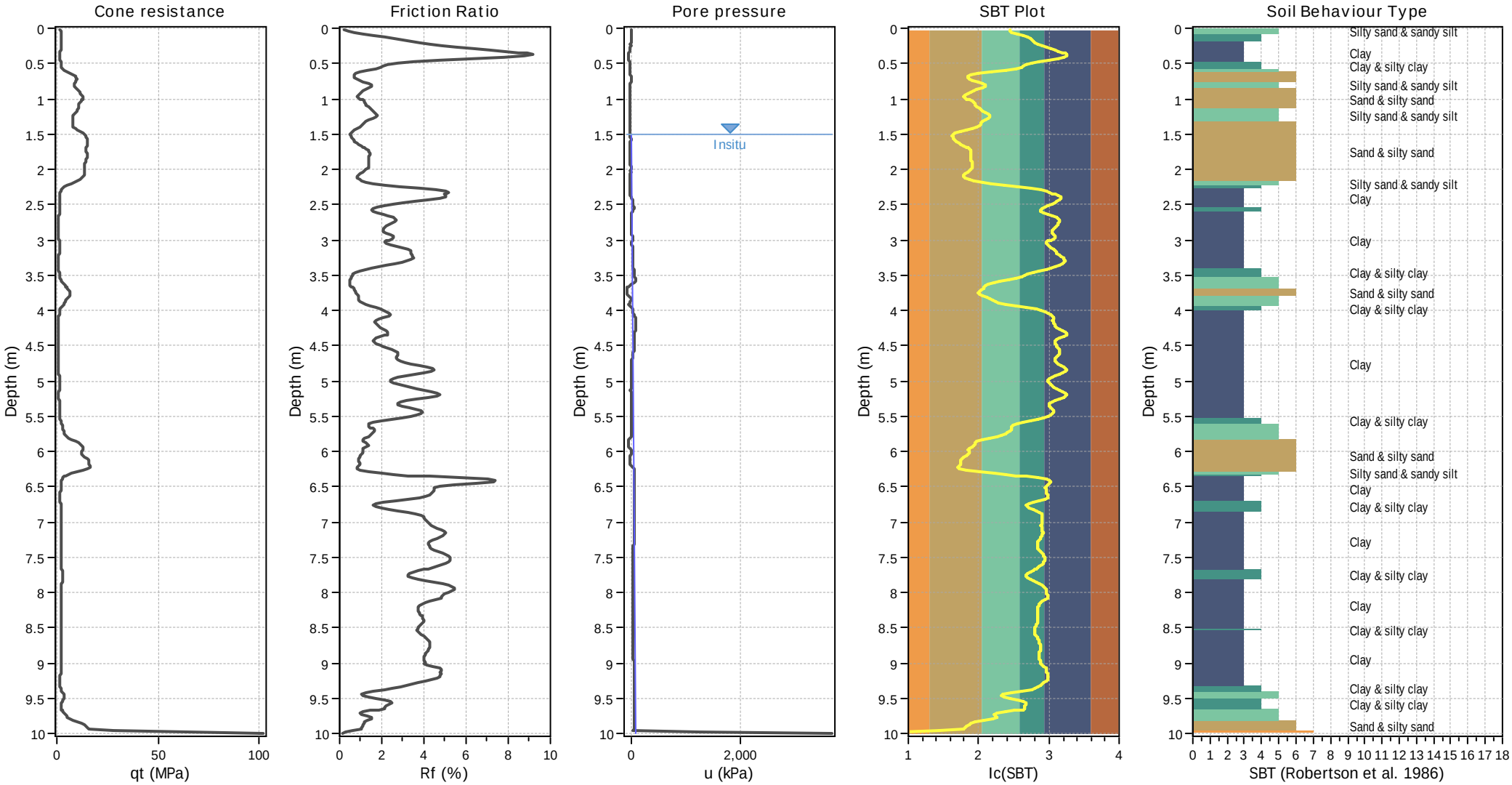
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LPI color scheme

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CPT basic interpretation plots



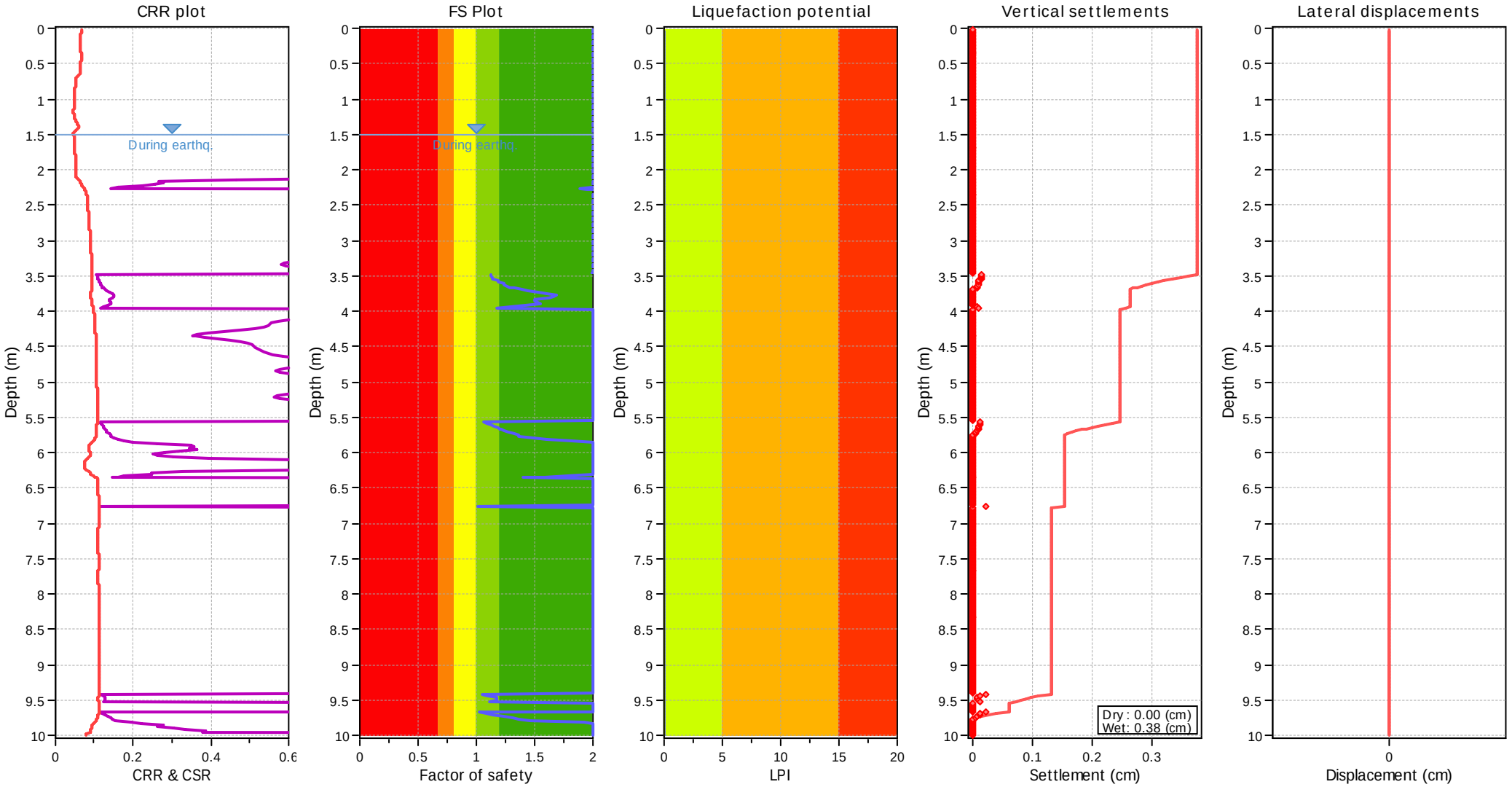
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Liquefaction analysis overall plots



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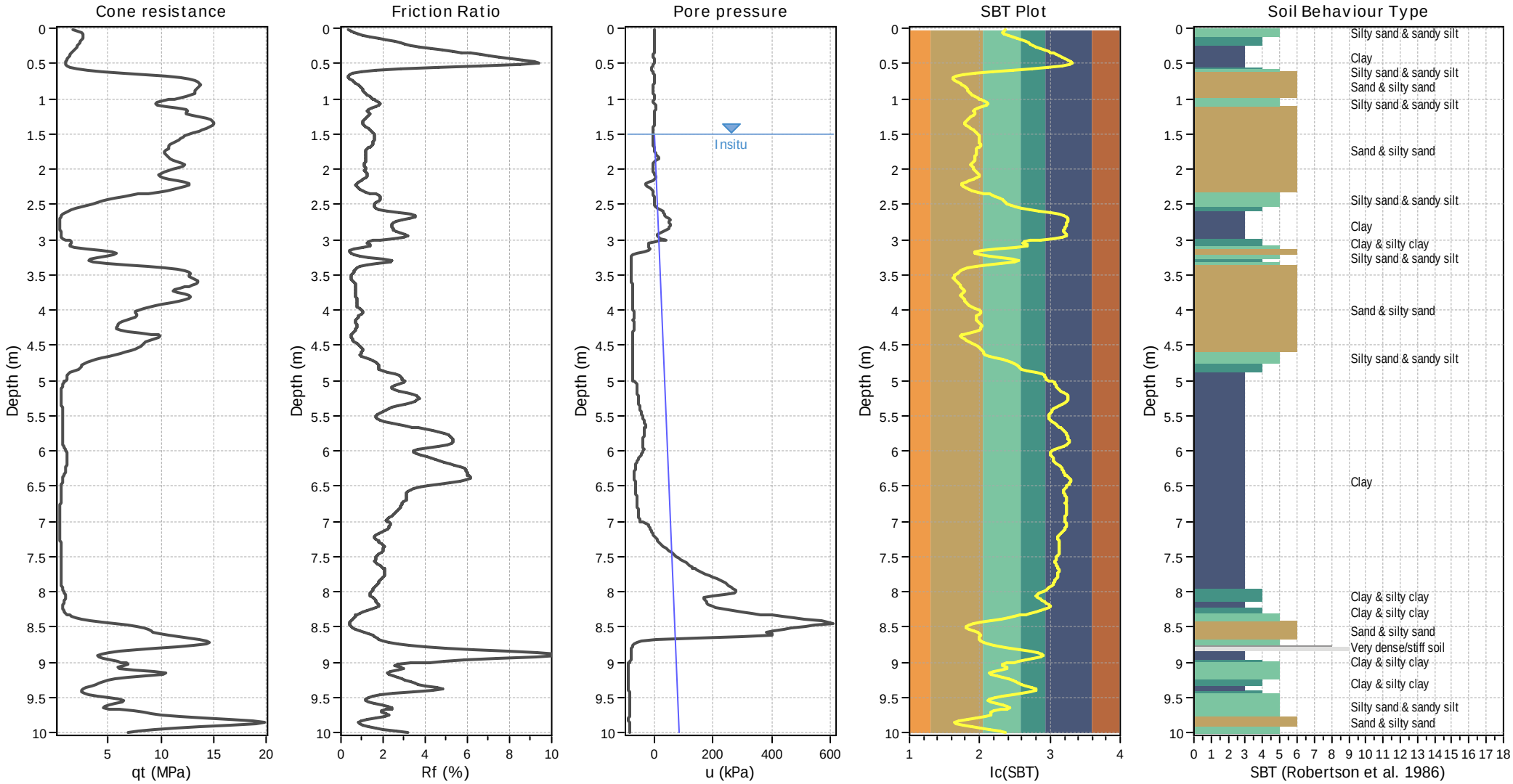
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CPT basic interpretation plots



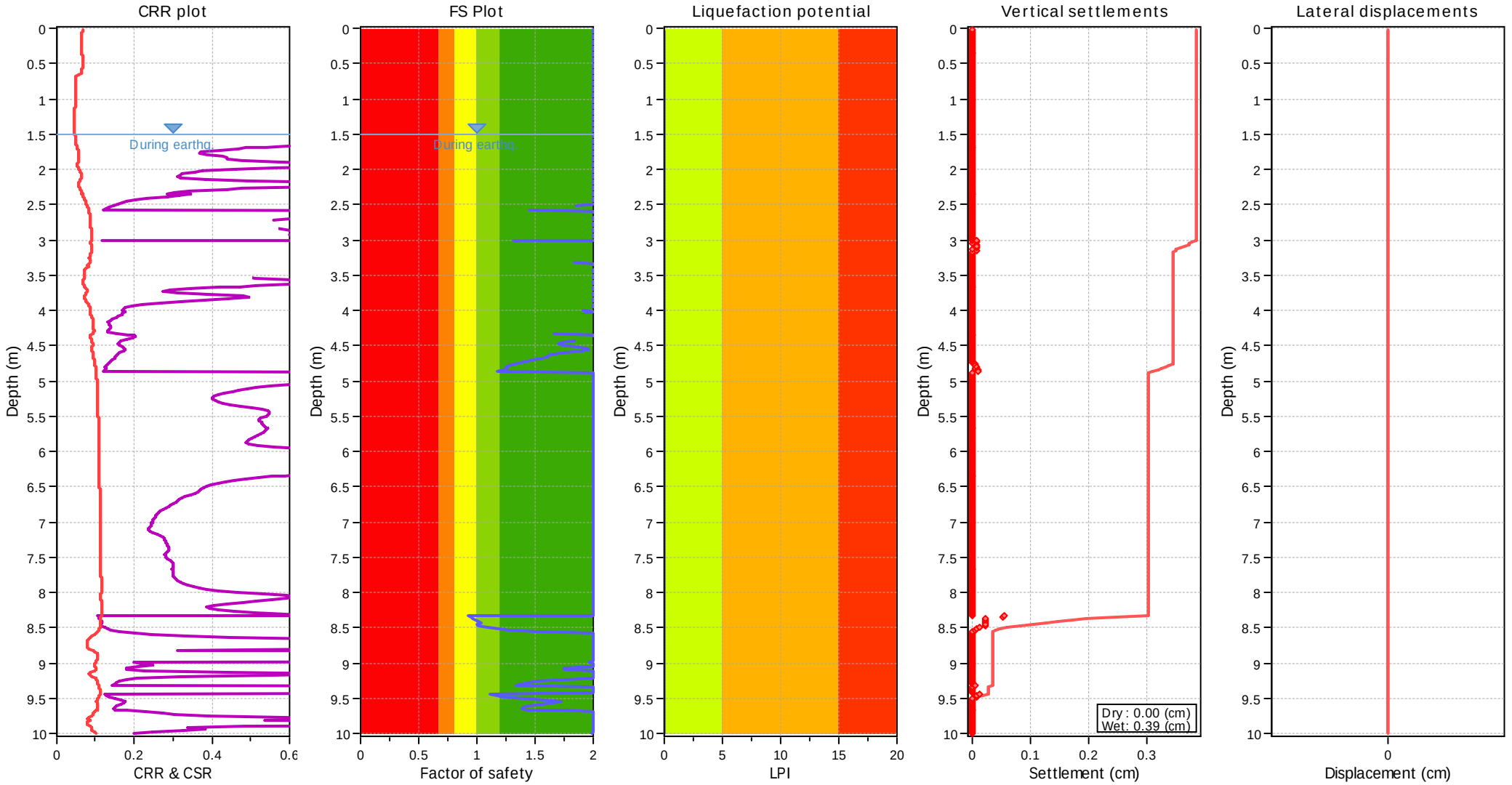
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Liquefaction analysis overall plots



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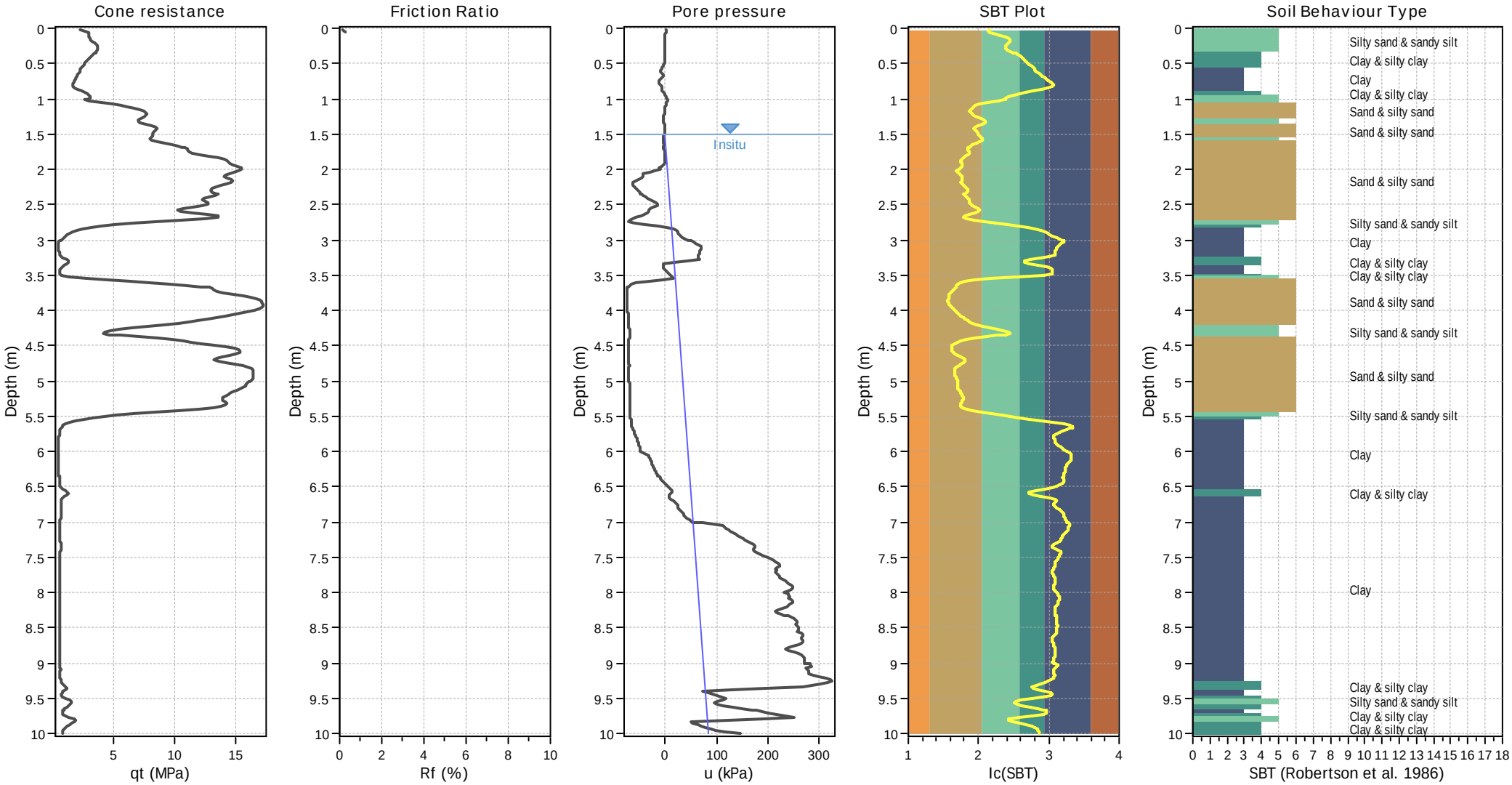
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CPT basic interpretation plots



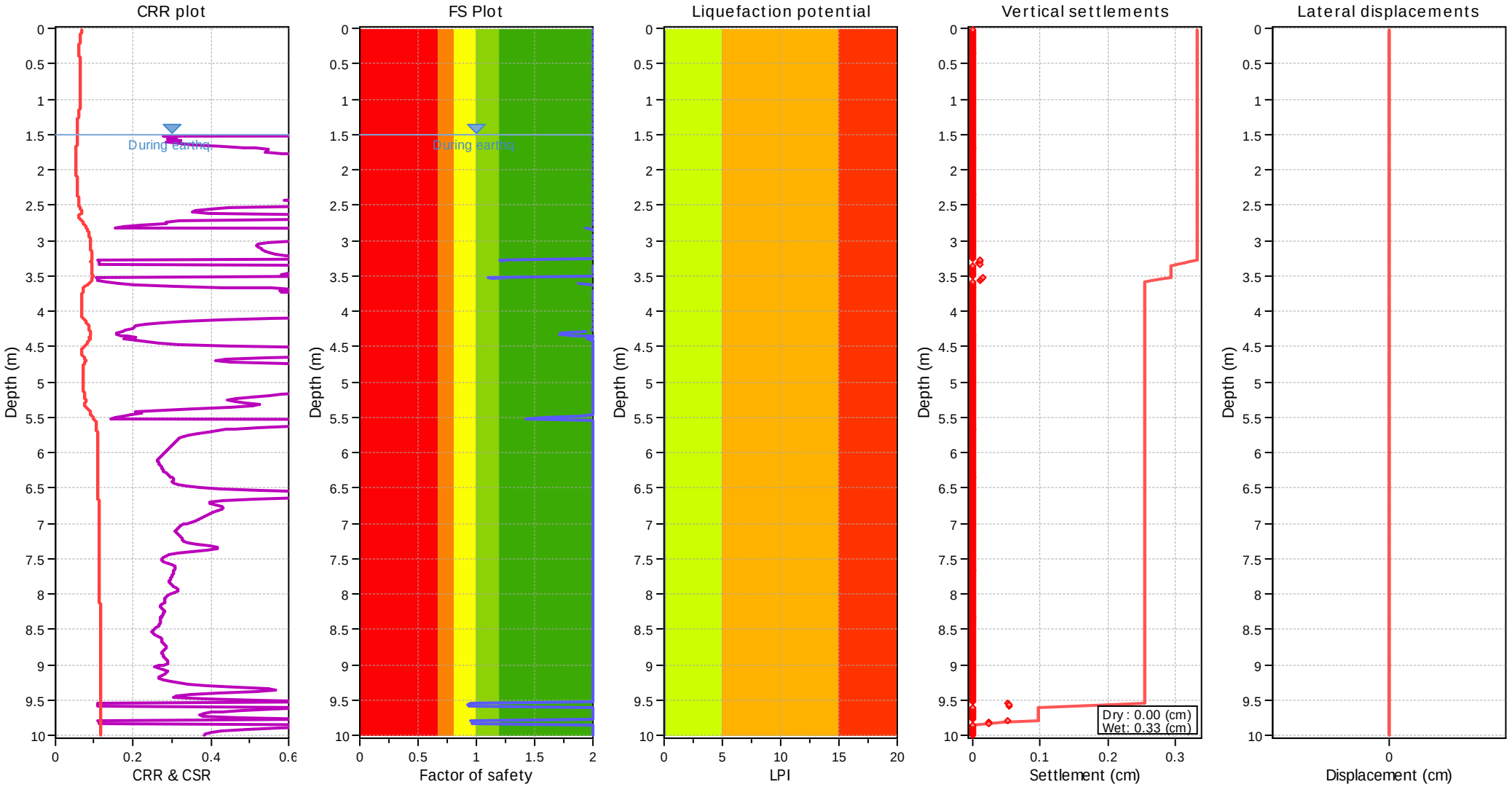
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Liquefaction analysis overall plots



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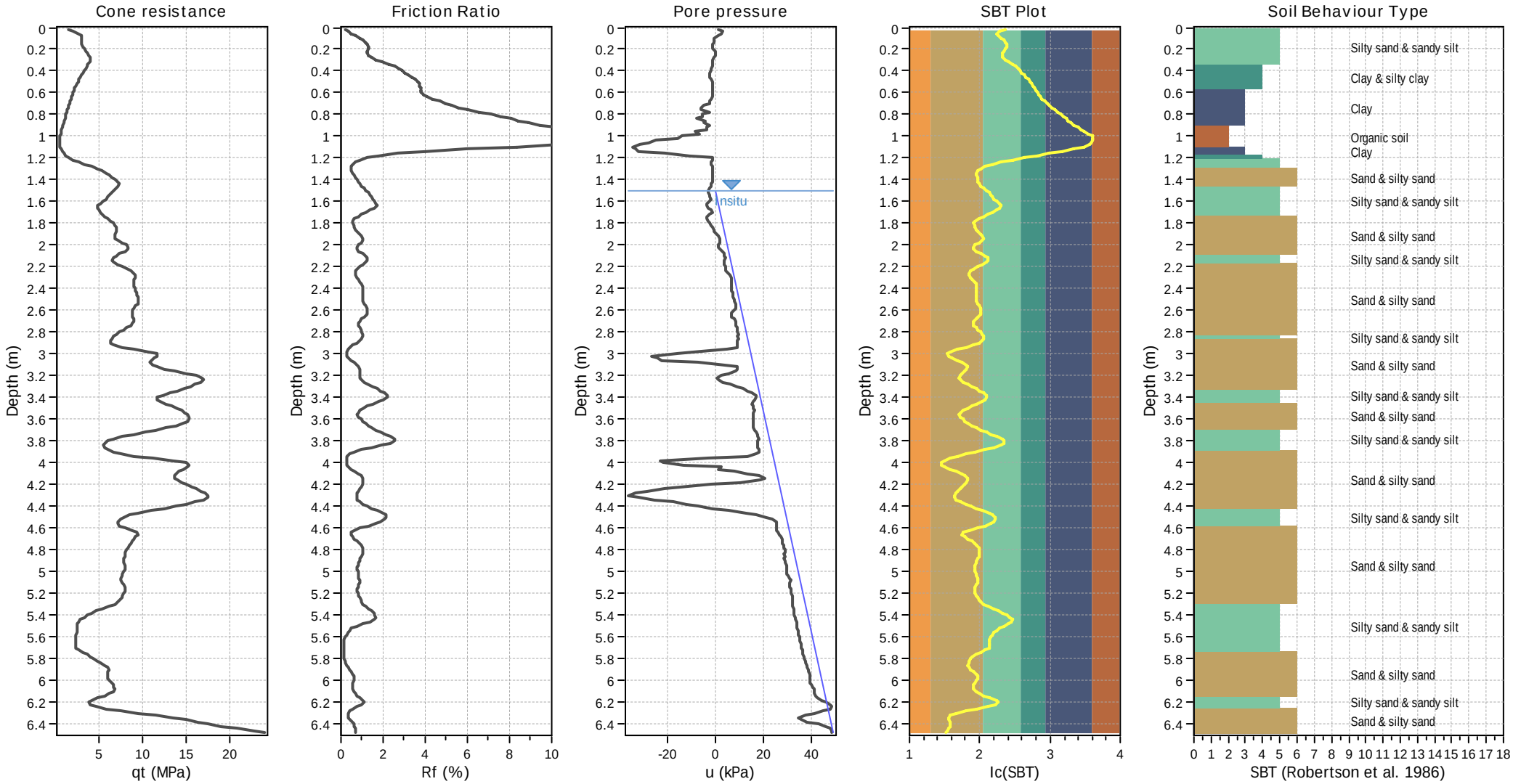
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- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



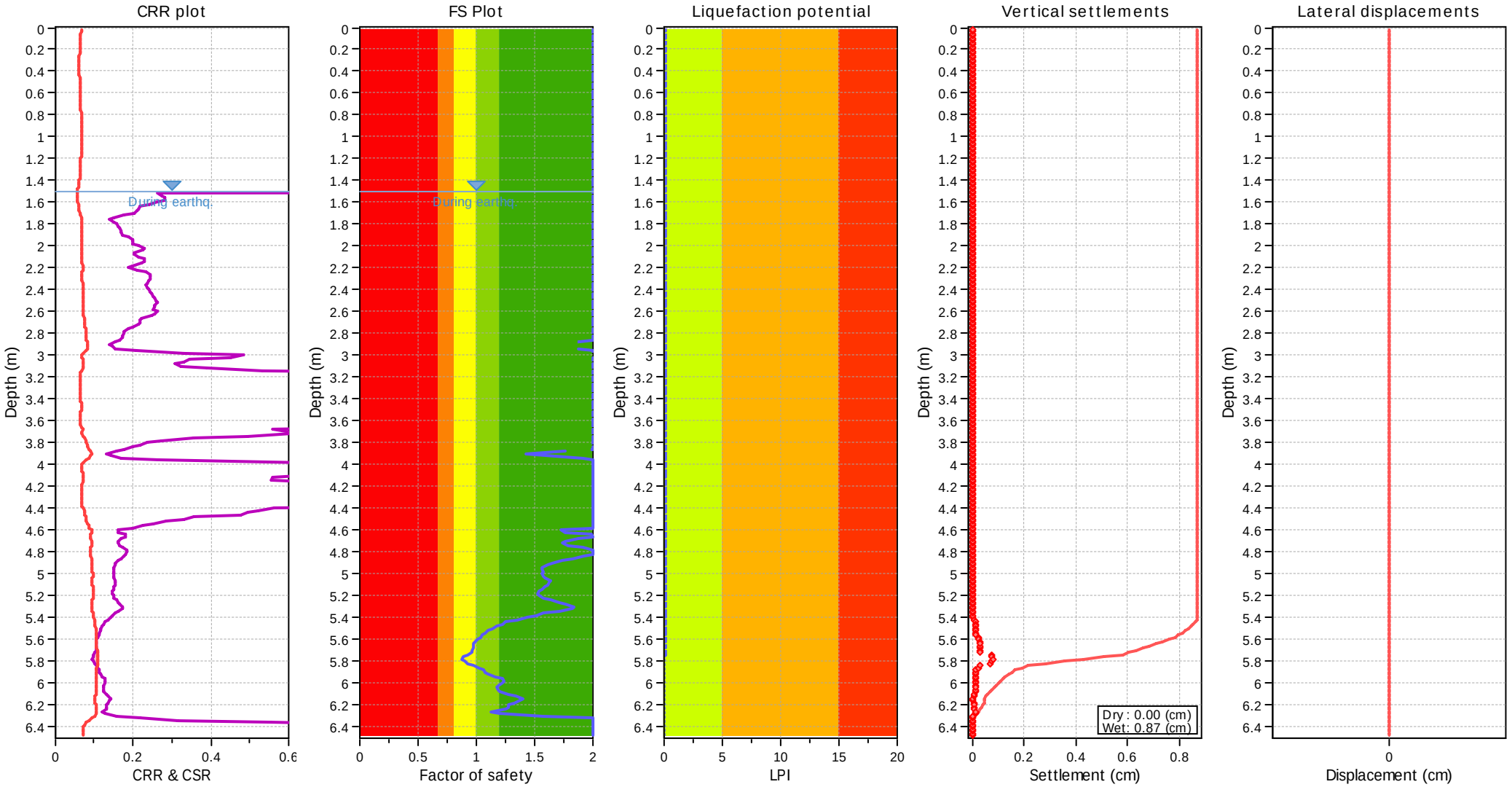
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.40	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
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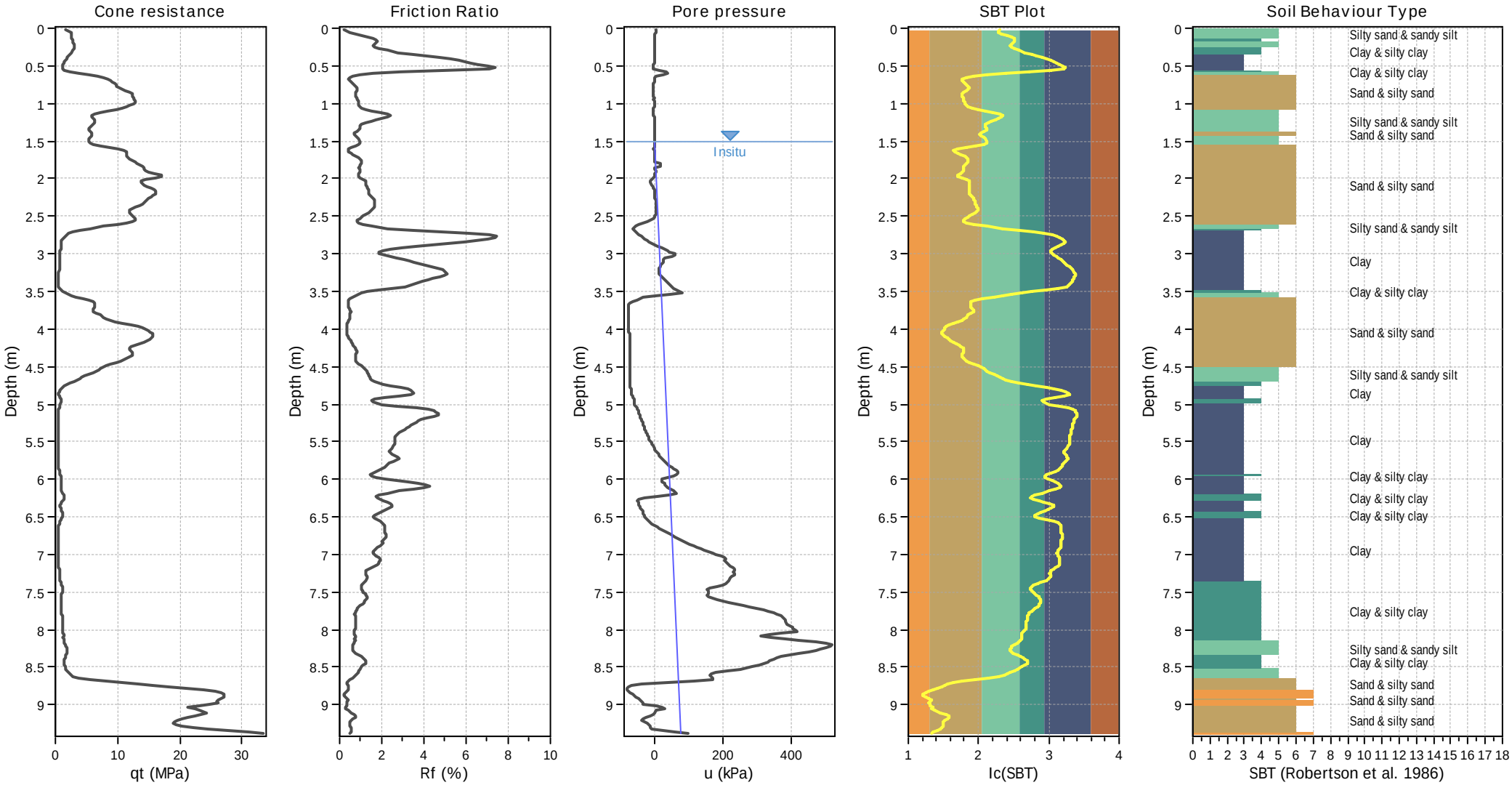
F.S. color scheme

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LPI color scheme

- Very high risk
- High risk
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CPT basic interpretation plots



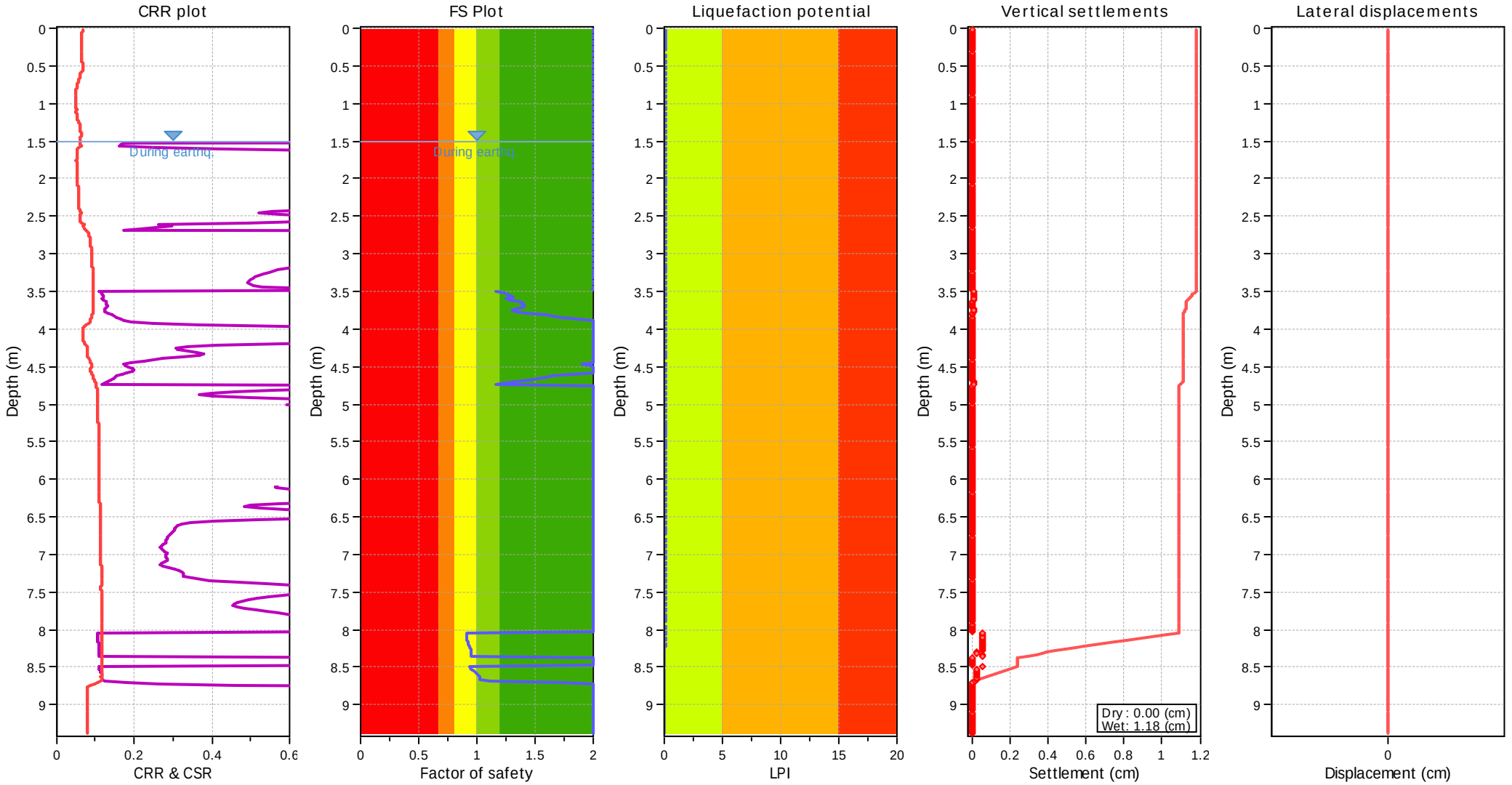
Input parameters and analysis data

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Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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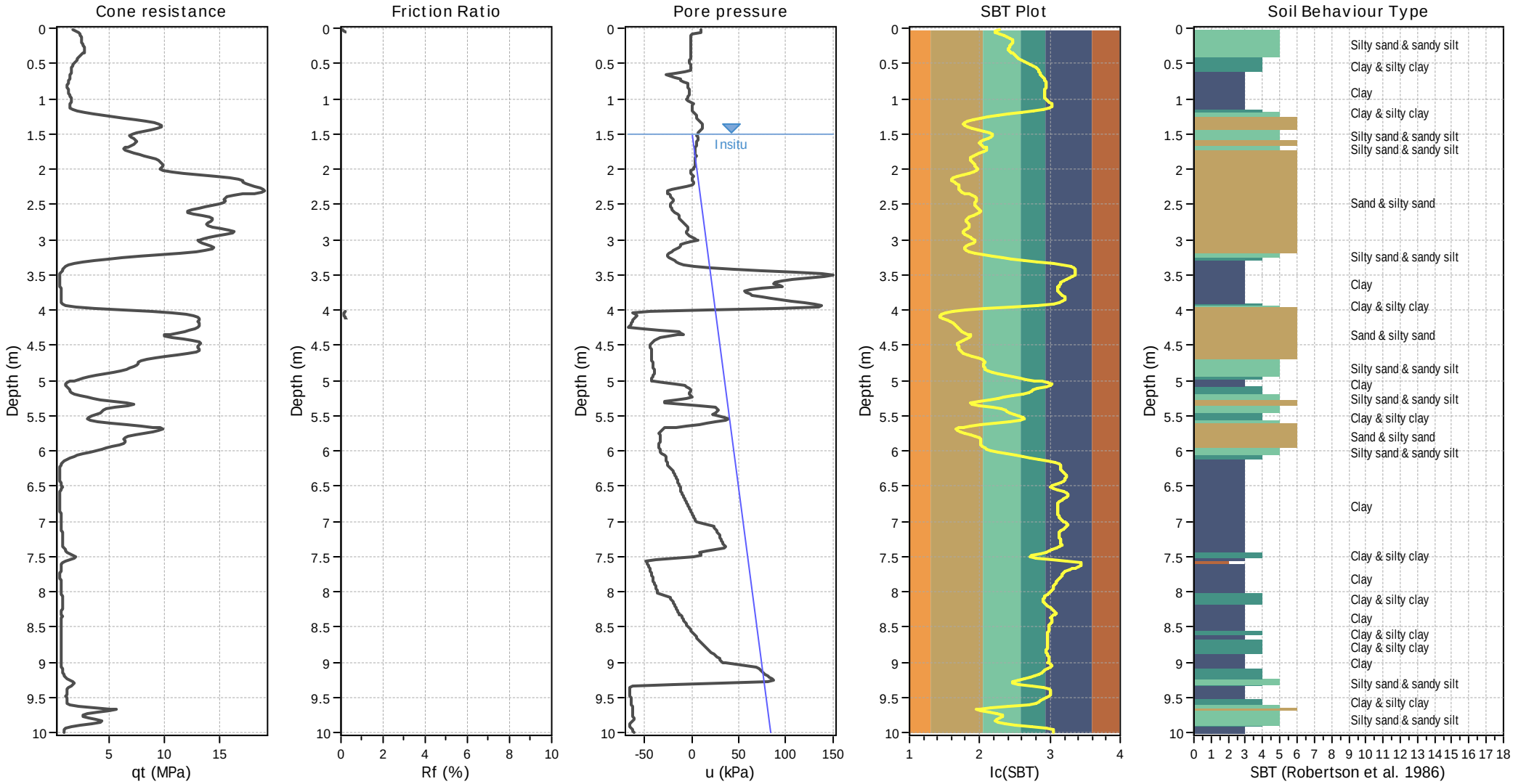
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LPI color scheme

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CPT basic interpretation plots



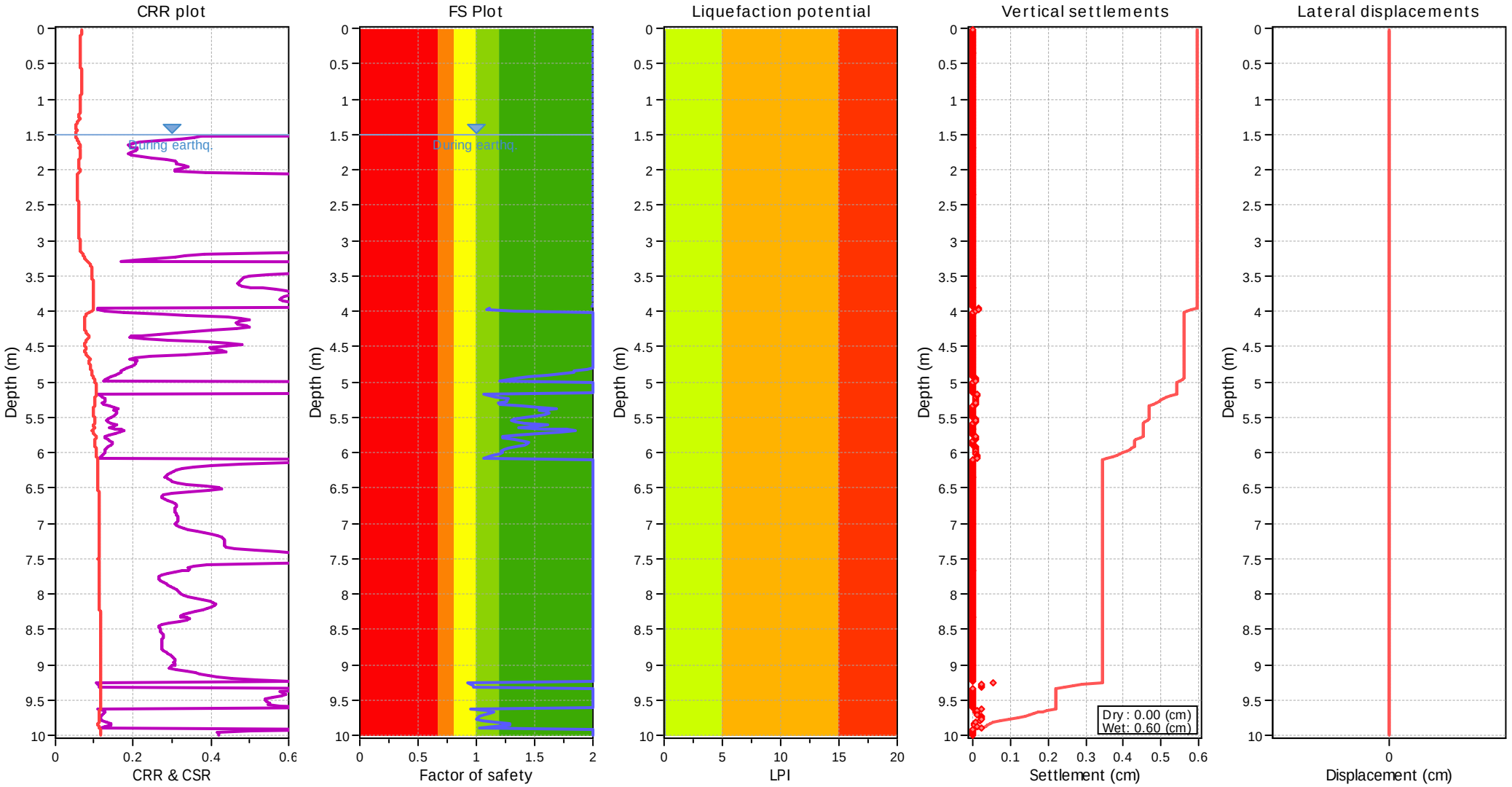
Input parameters and analysis data

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SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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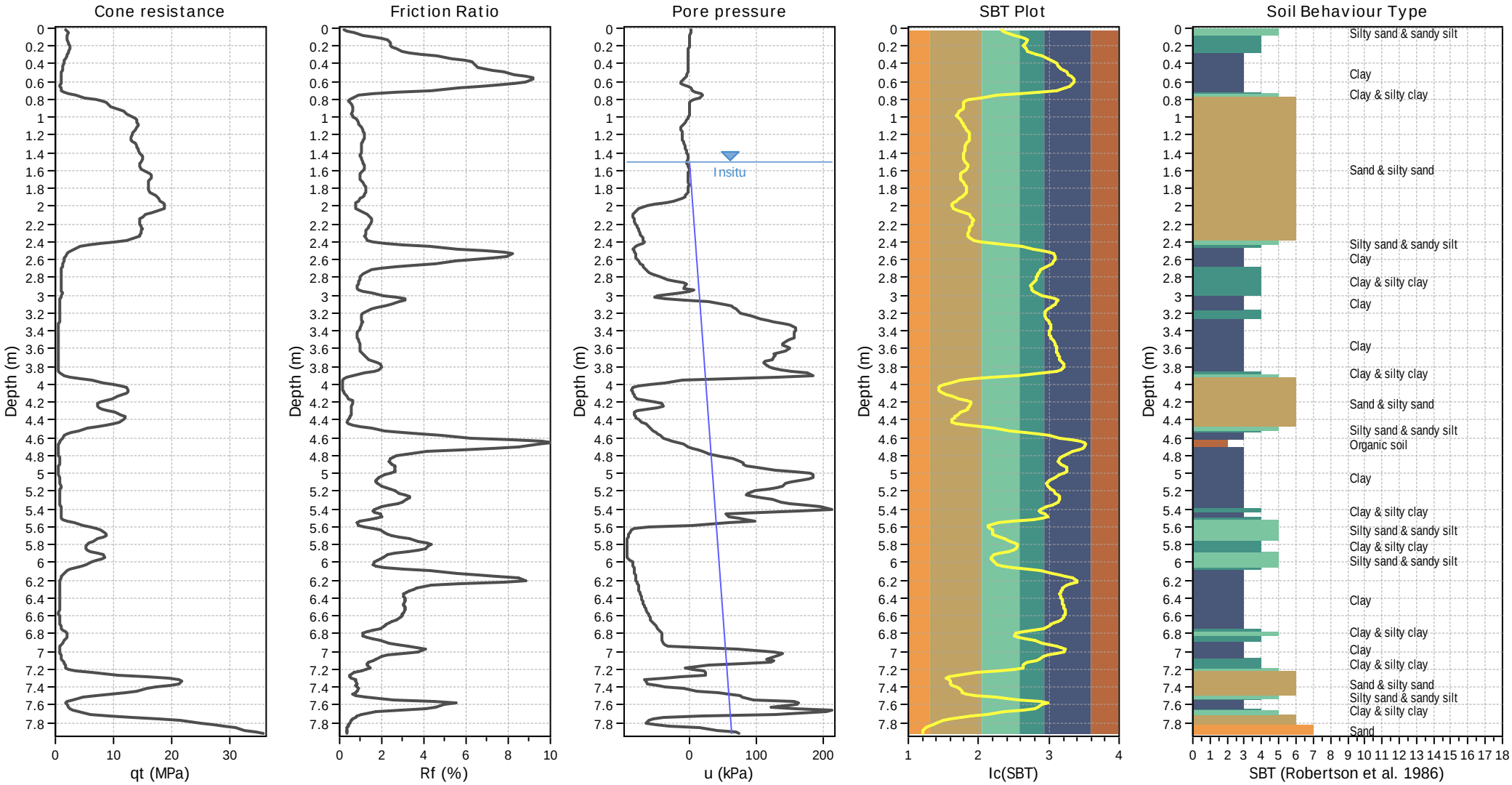
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CPT basic interpretation plots



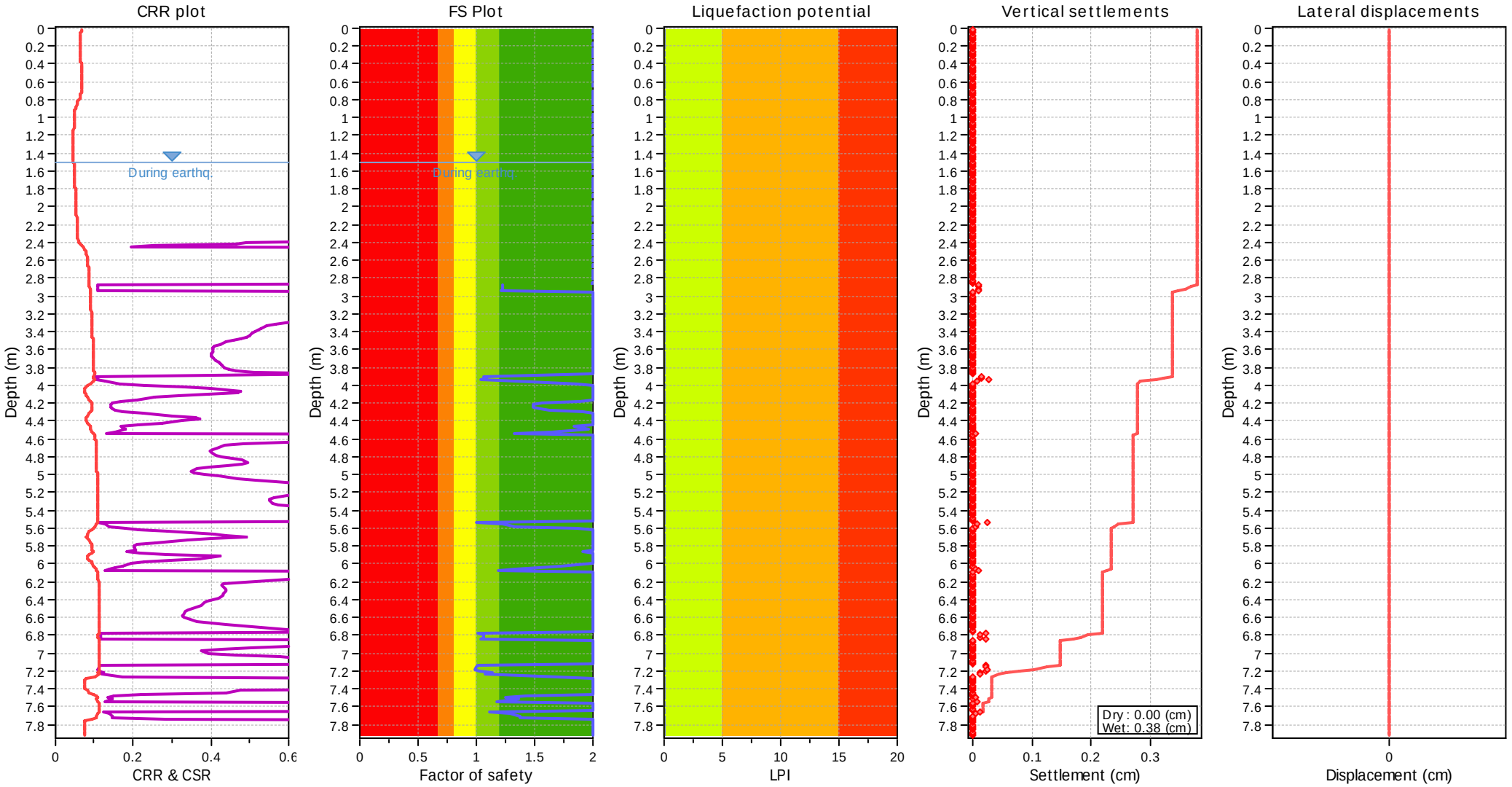
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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7. Gravely sand to sand
8. Very stiff sand to
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Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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Peak ground acceleration:	0.12	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

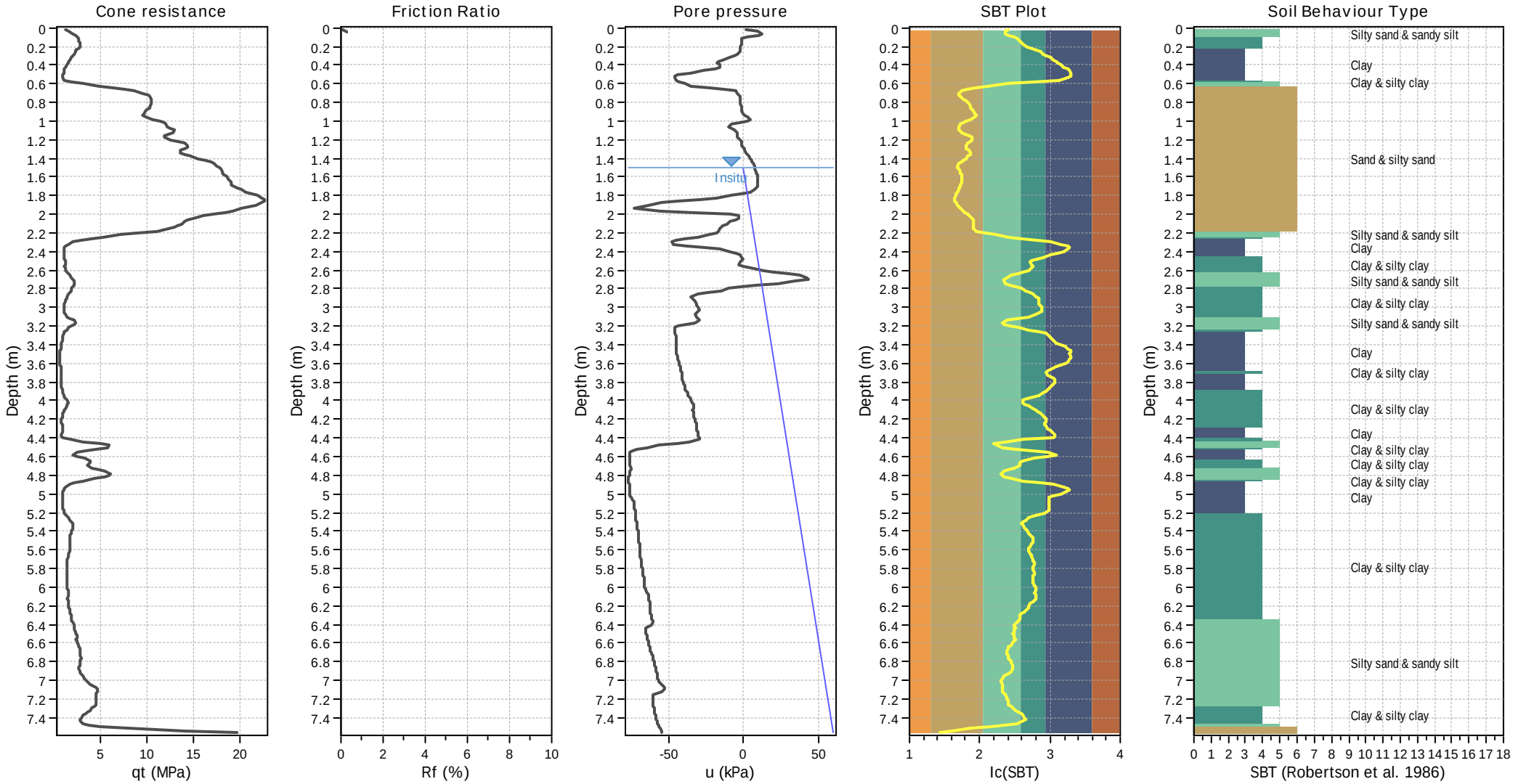
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LPI color scheme

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CPT basic interpretation plots



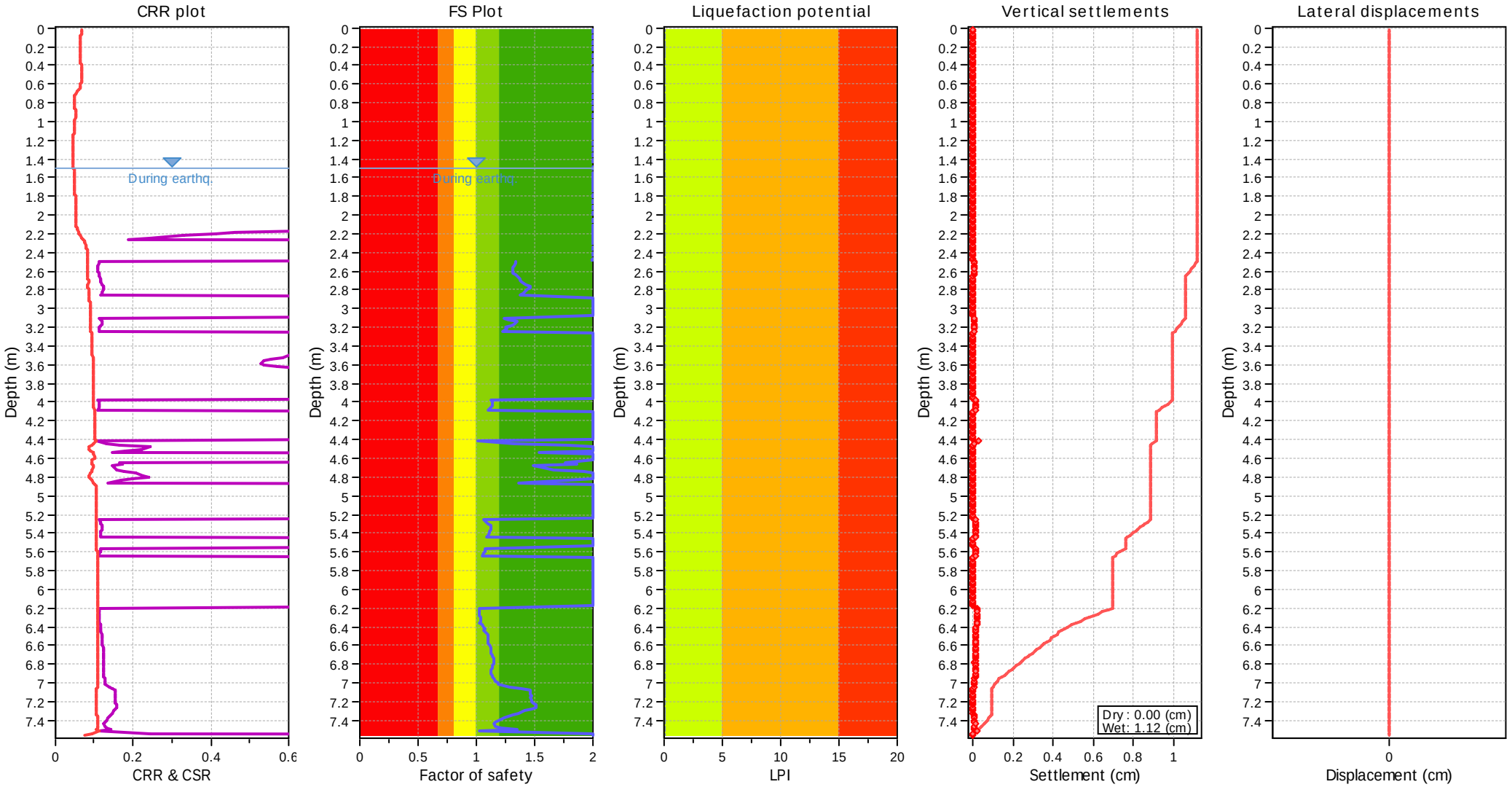
Input parameters and analysis data

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Liquefaction analysis overall plots



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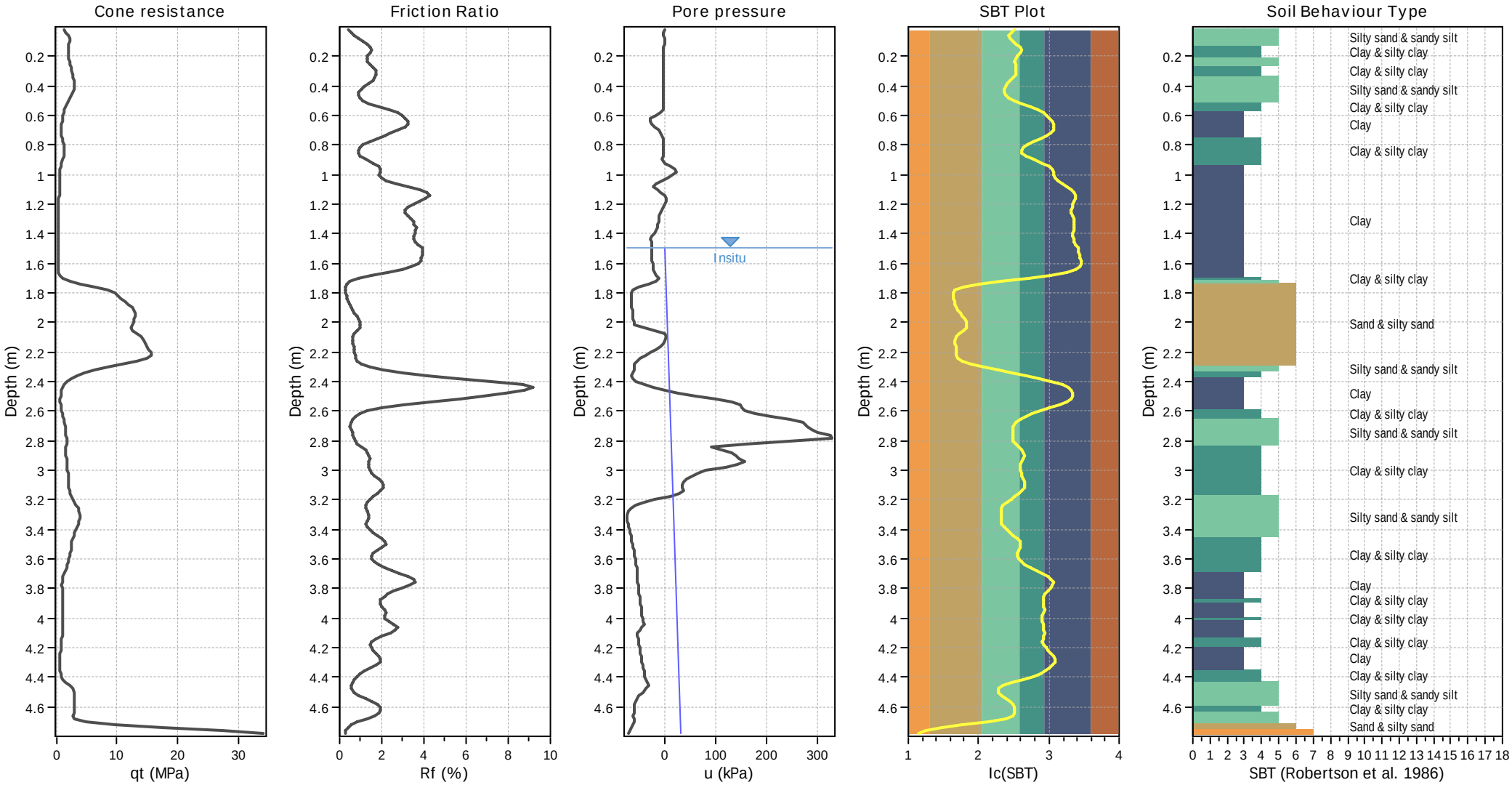
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LPI color scheme

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CPT basic interpretation plots



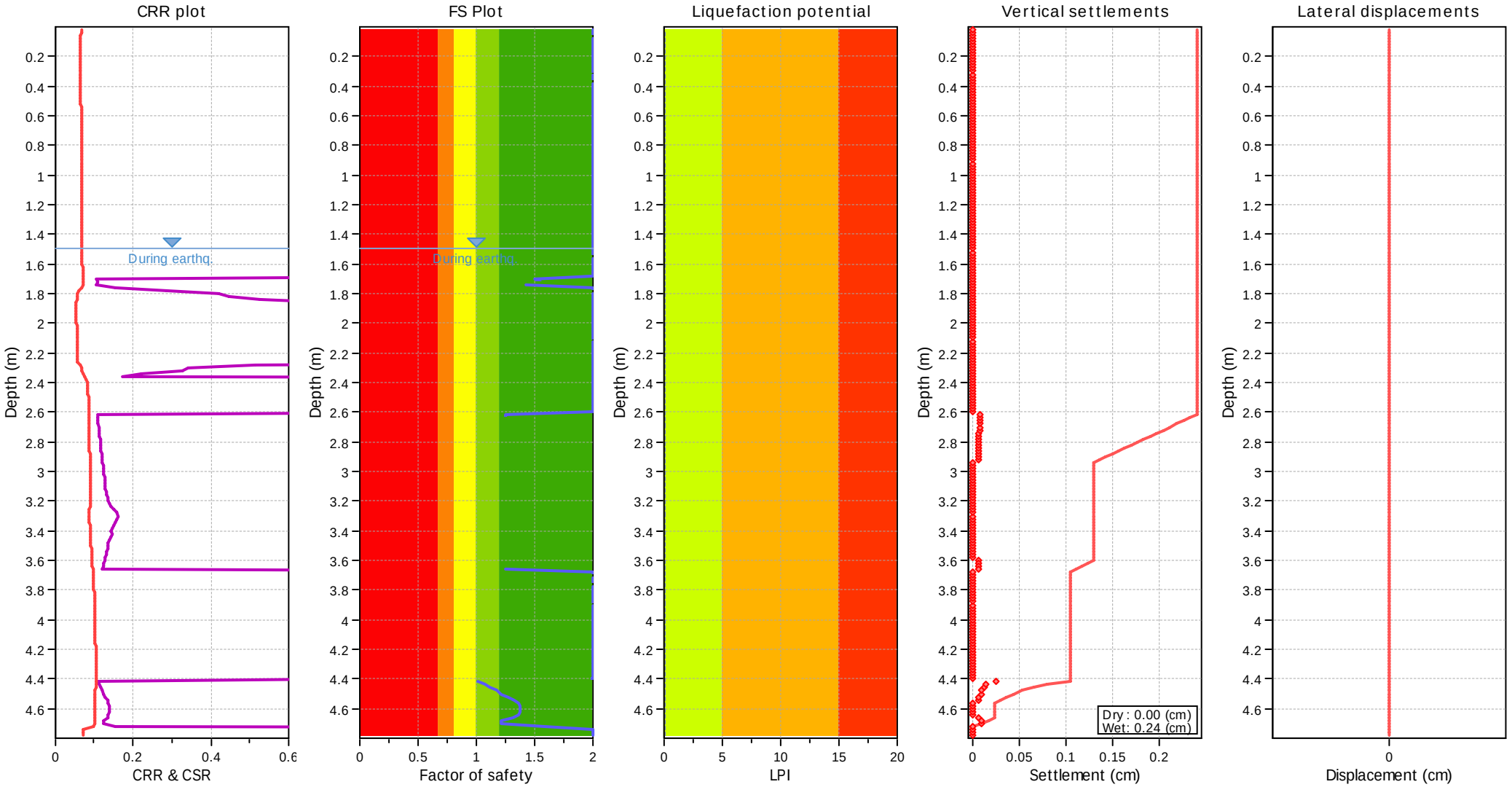
Input parameters and analysis data

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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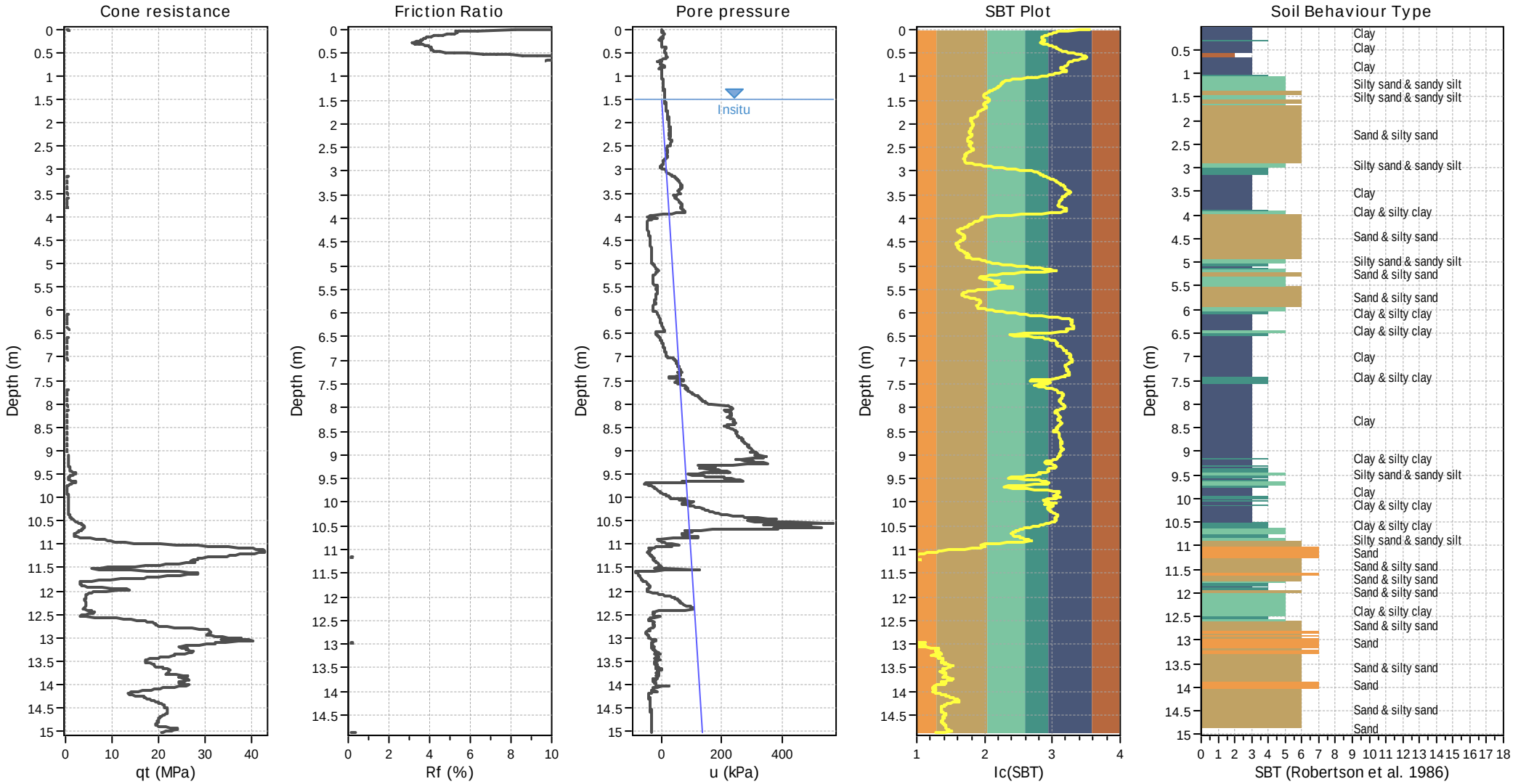
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LPI color scheme

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CPT basic interpretation plots



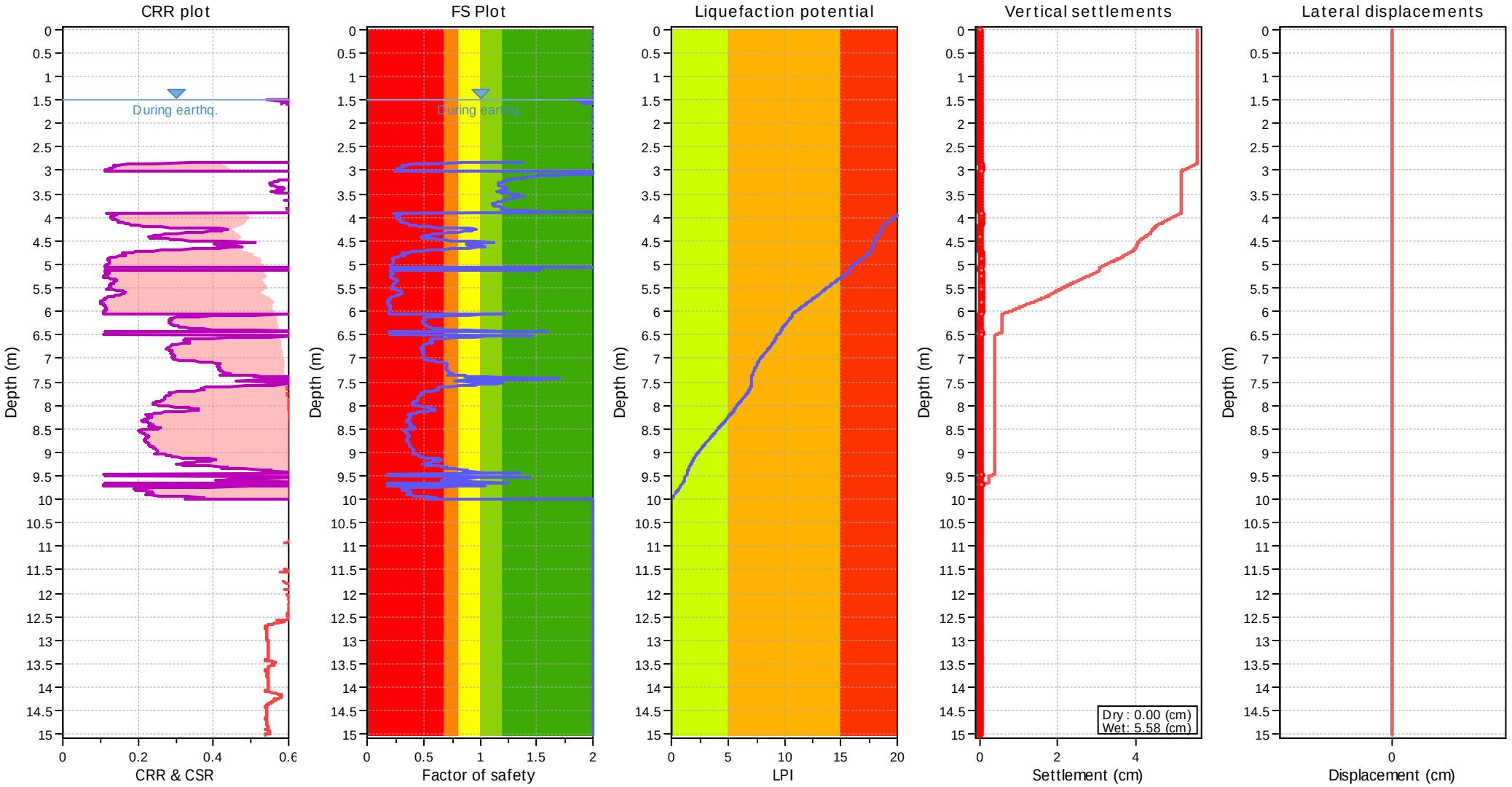
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

1. Sensitive fine grained
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4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
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Liquefaction analysis overall plots



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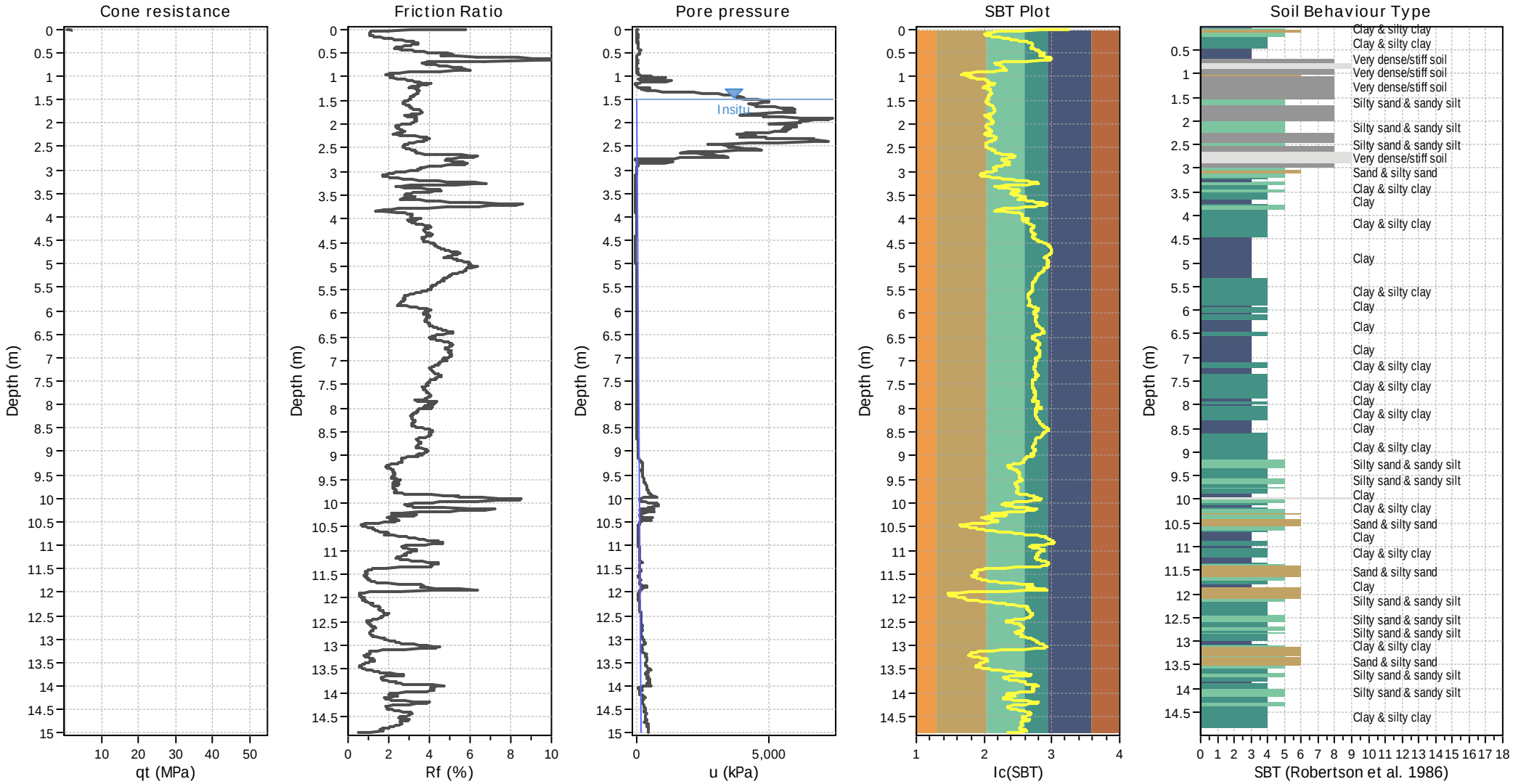
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LPI color scheme

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CPT basic interpretation plots



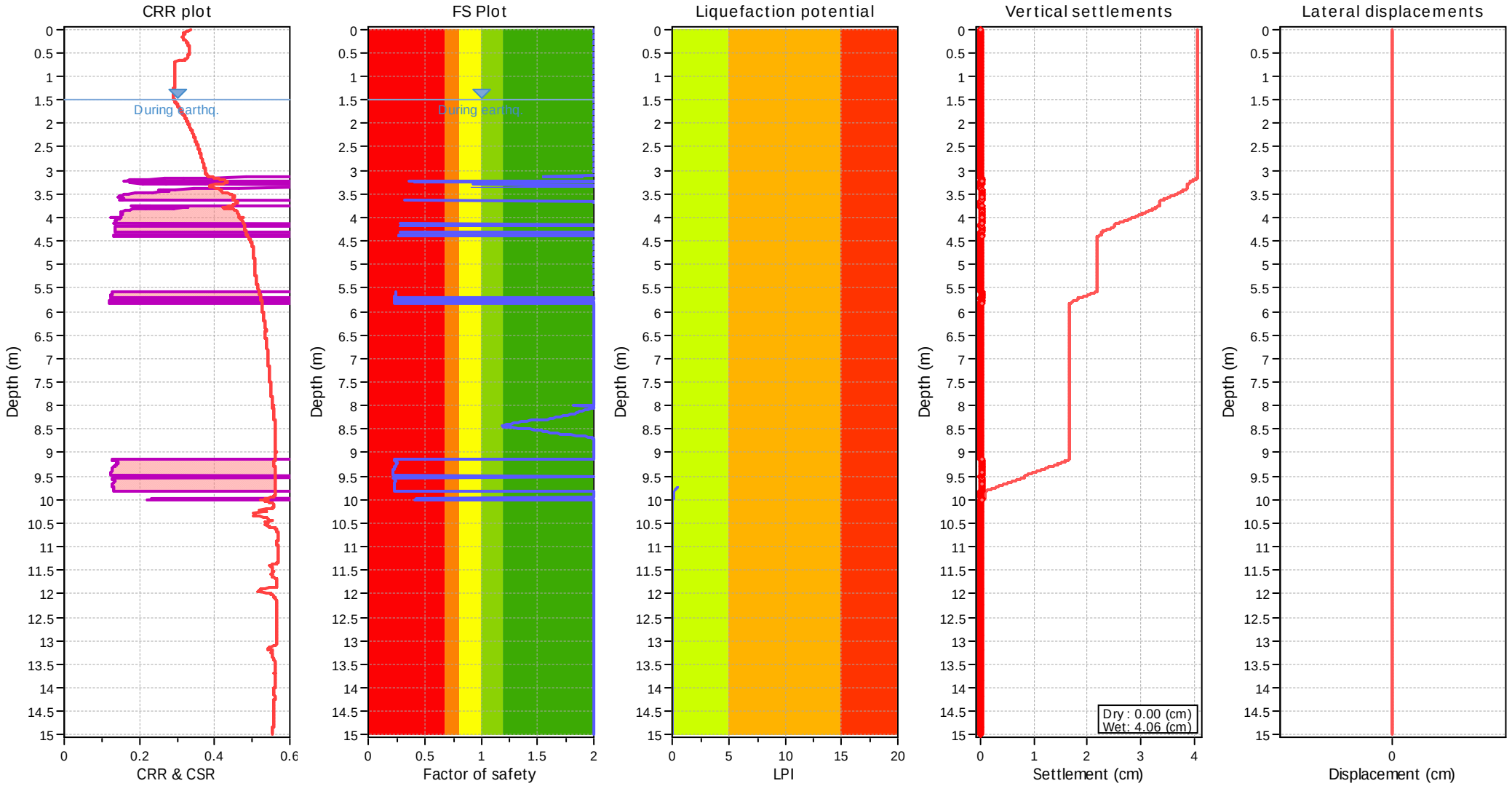
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Liquefaction analysis overall plots



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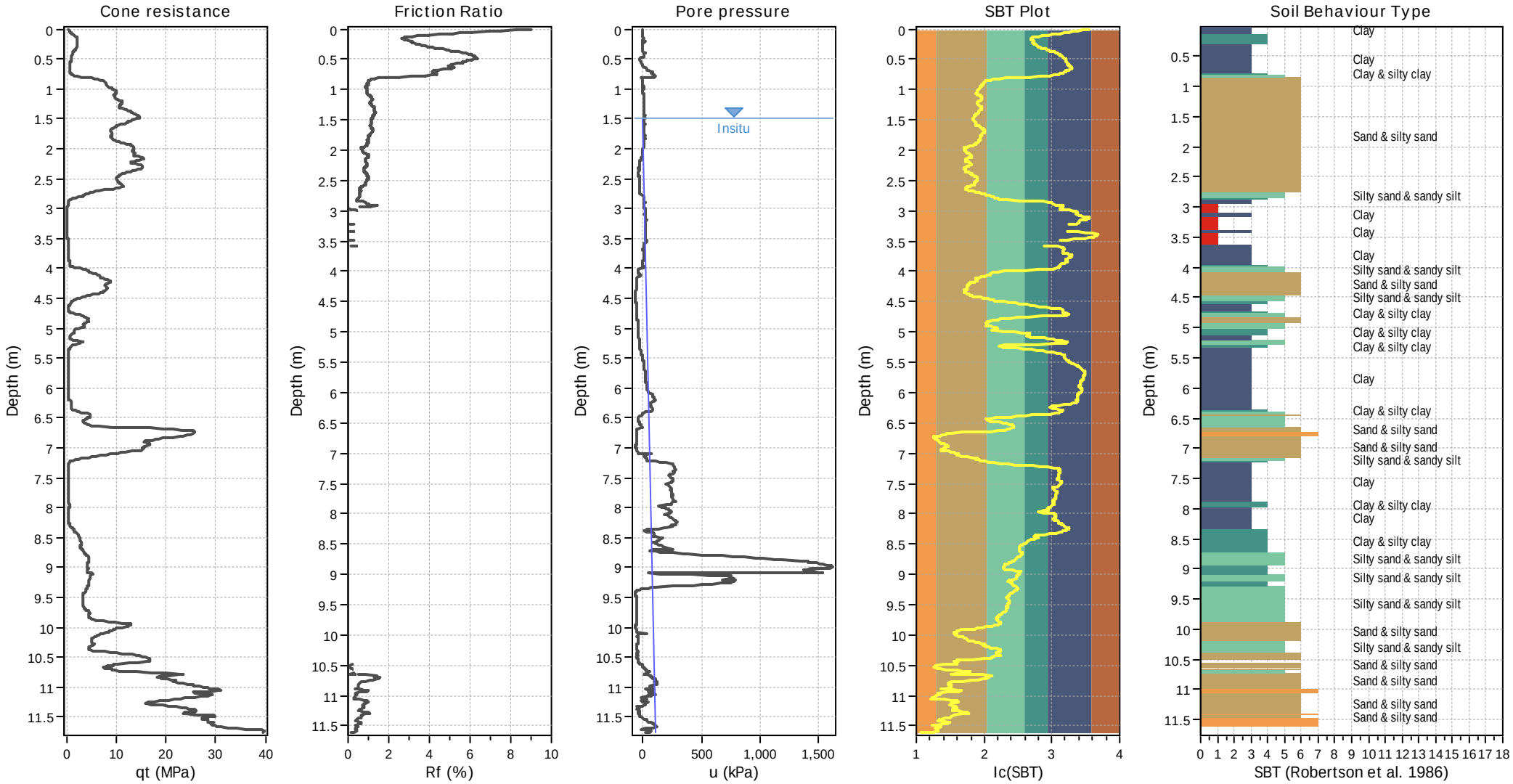
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CPT basic interpretation plots



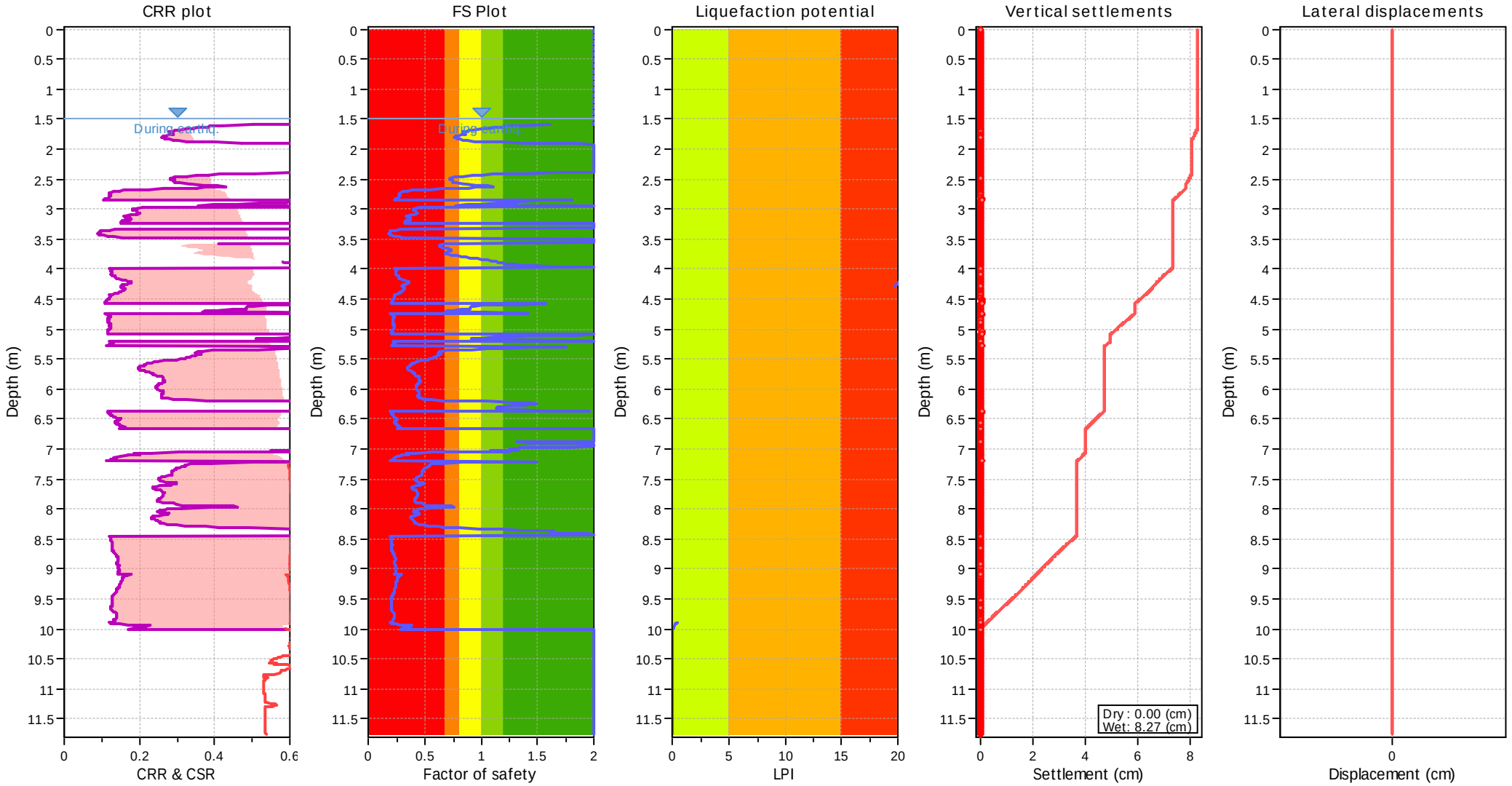
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Liquefaction analysis overall plots



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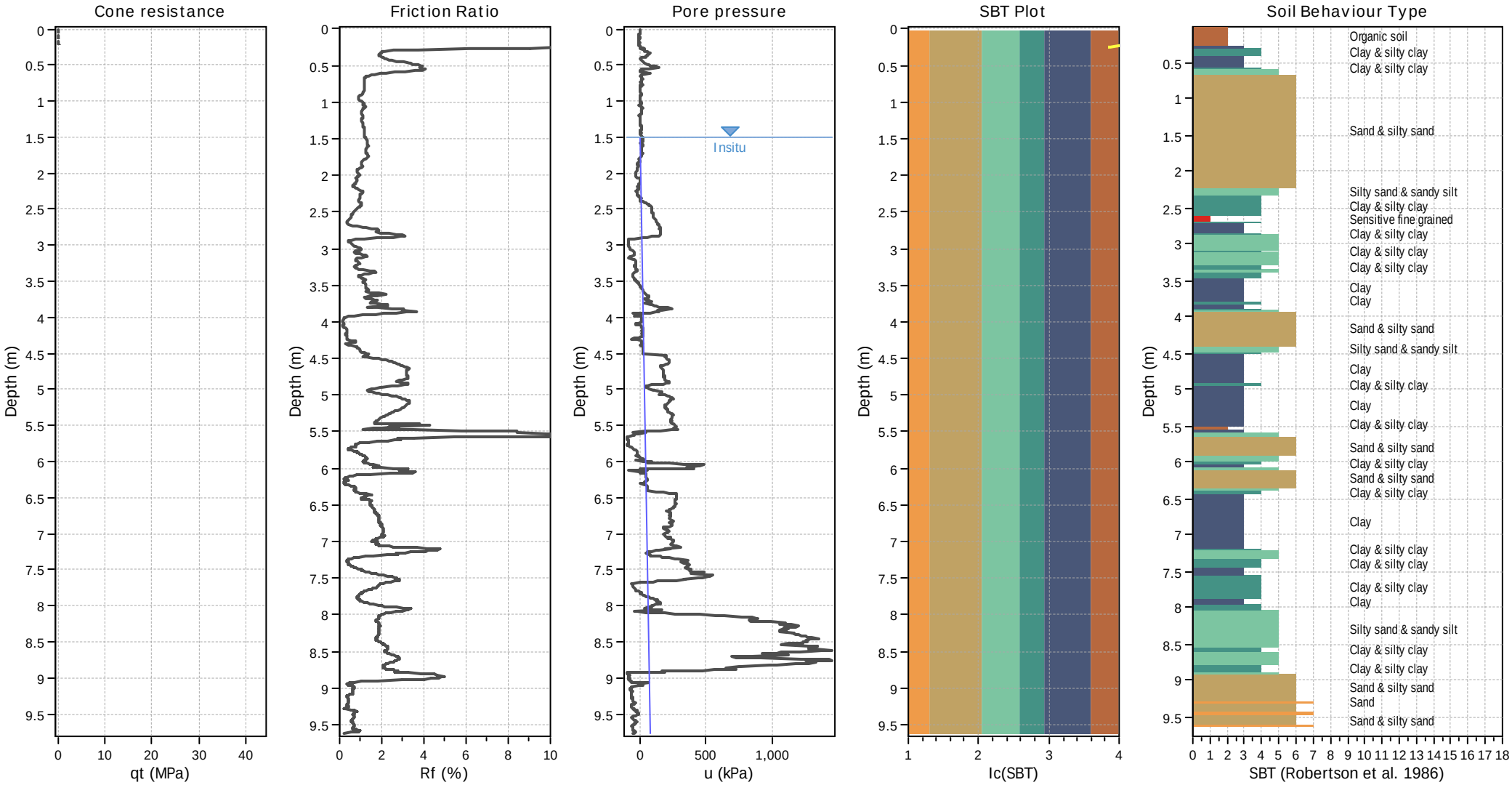
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CPT basic interpretation plots



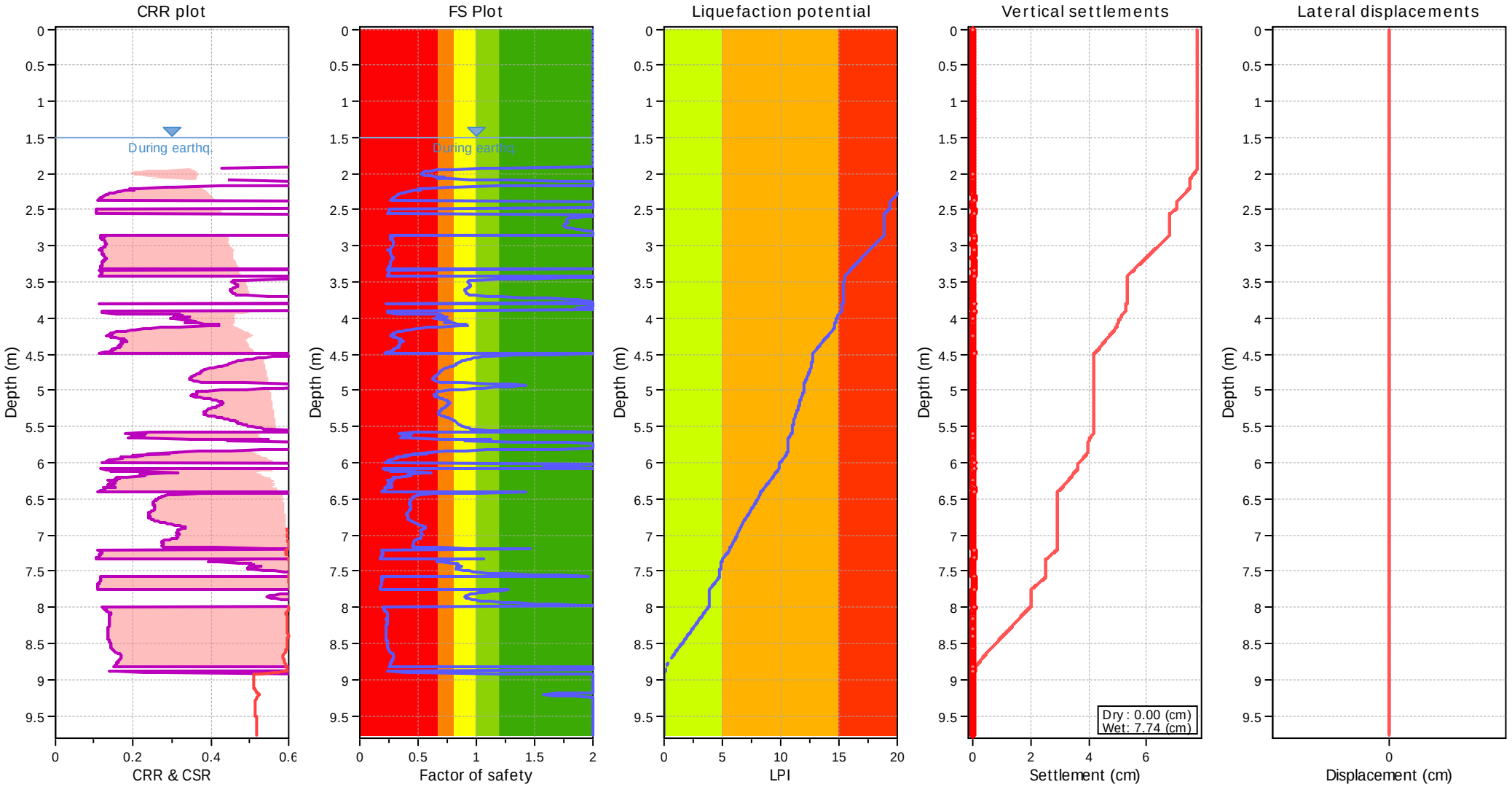
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Liquefaction analysis overall plots



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Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

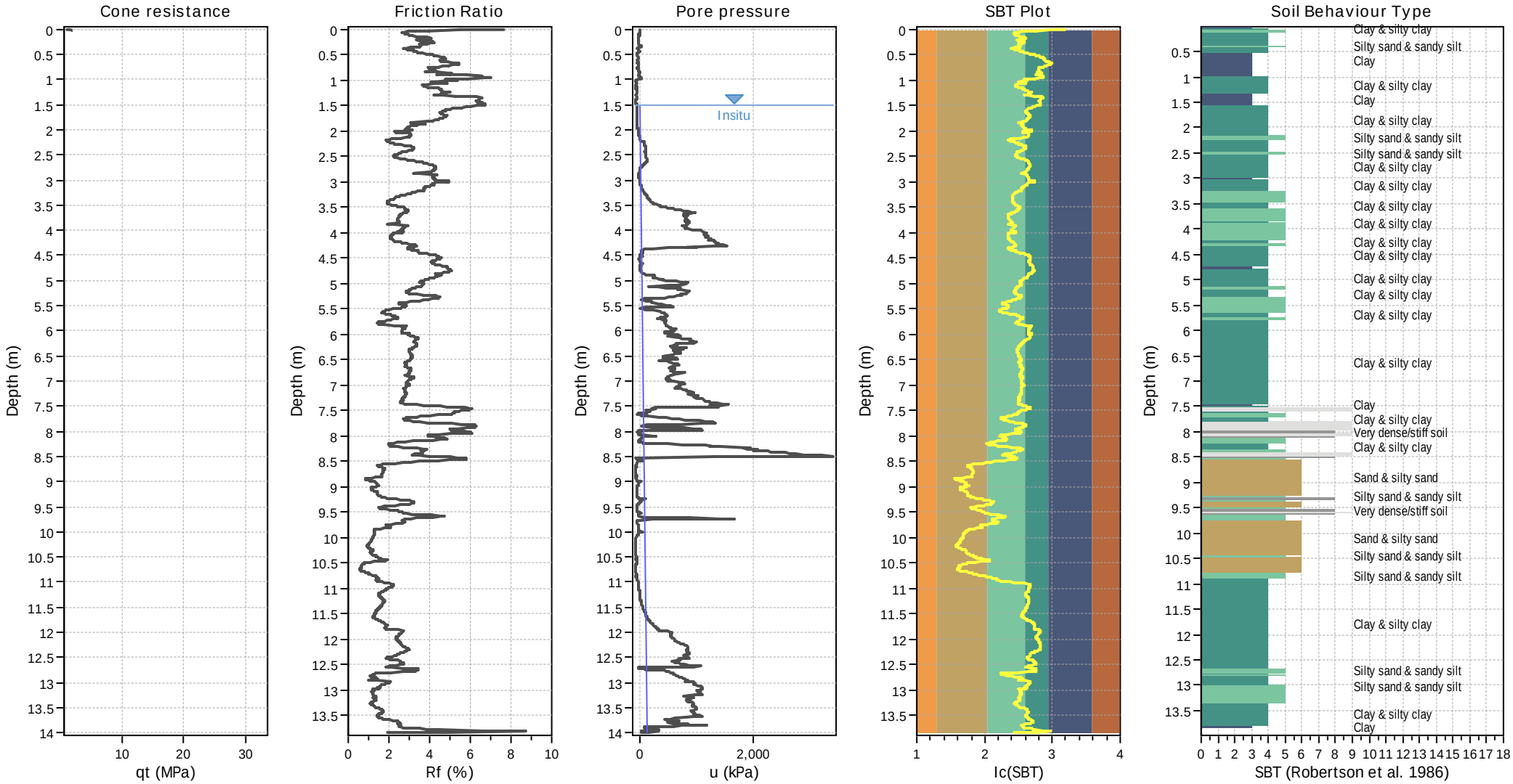
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



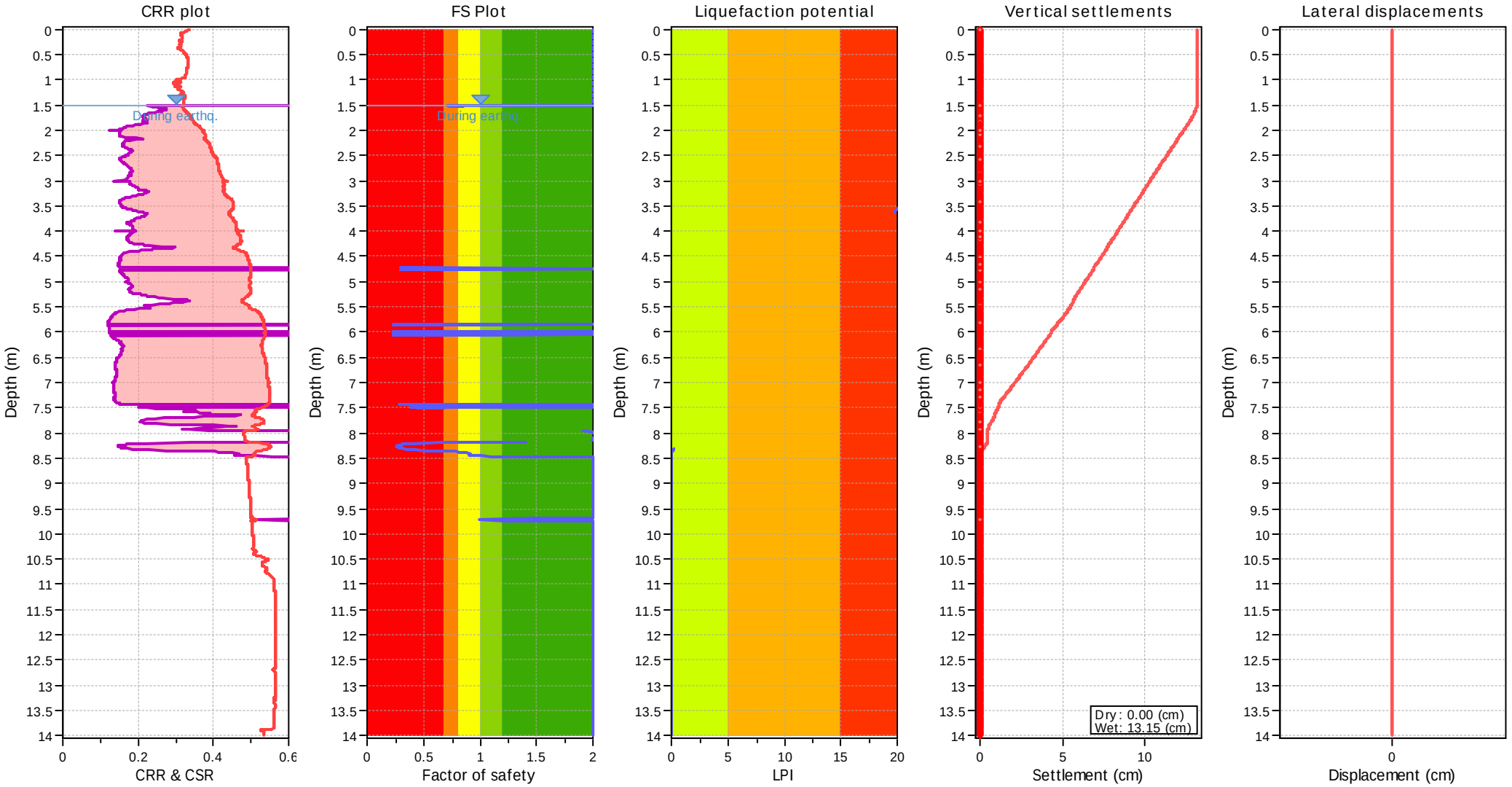
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
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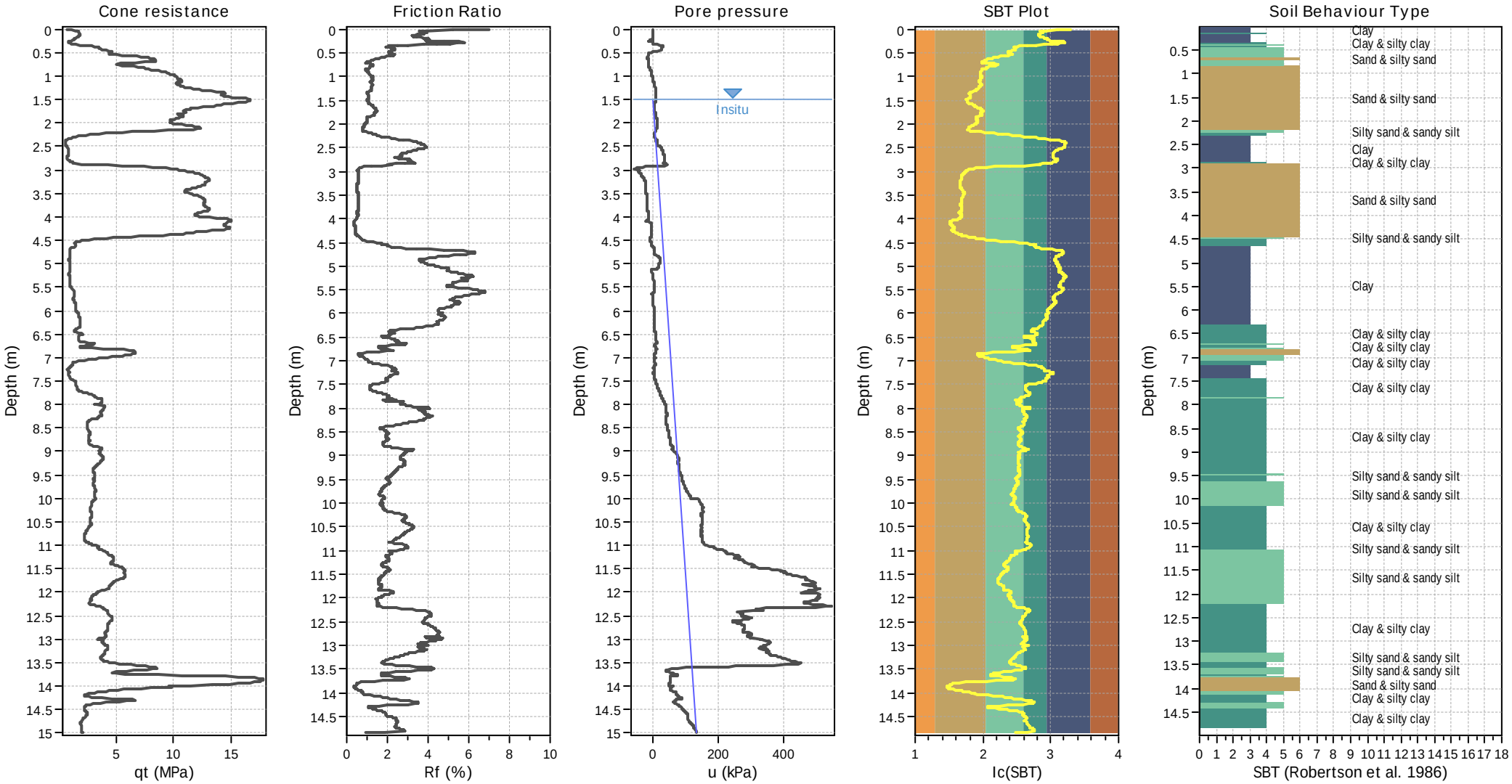
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LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



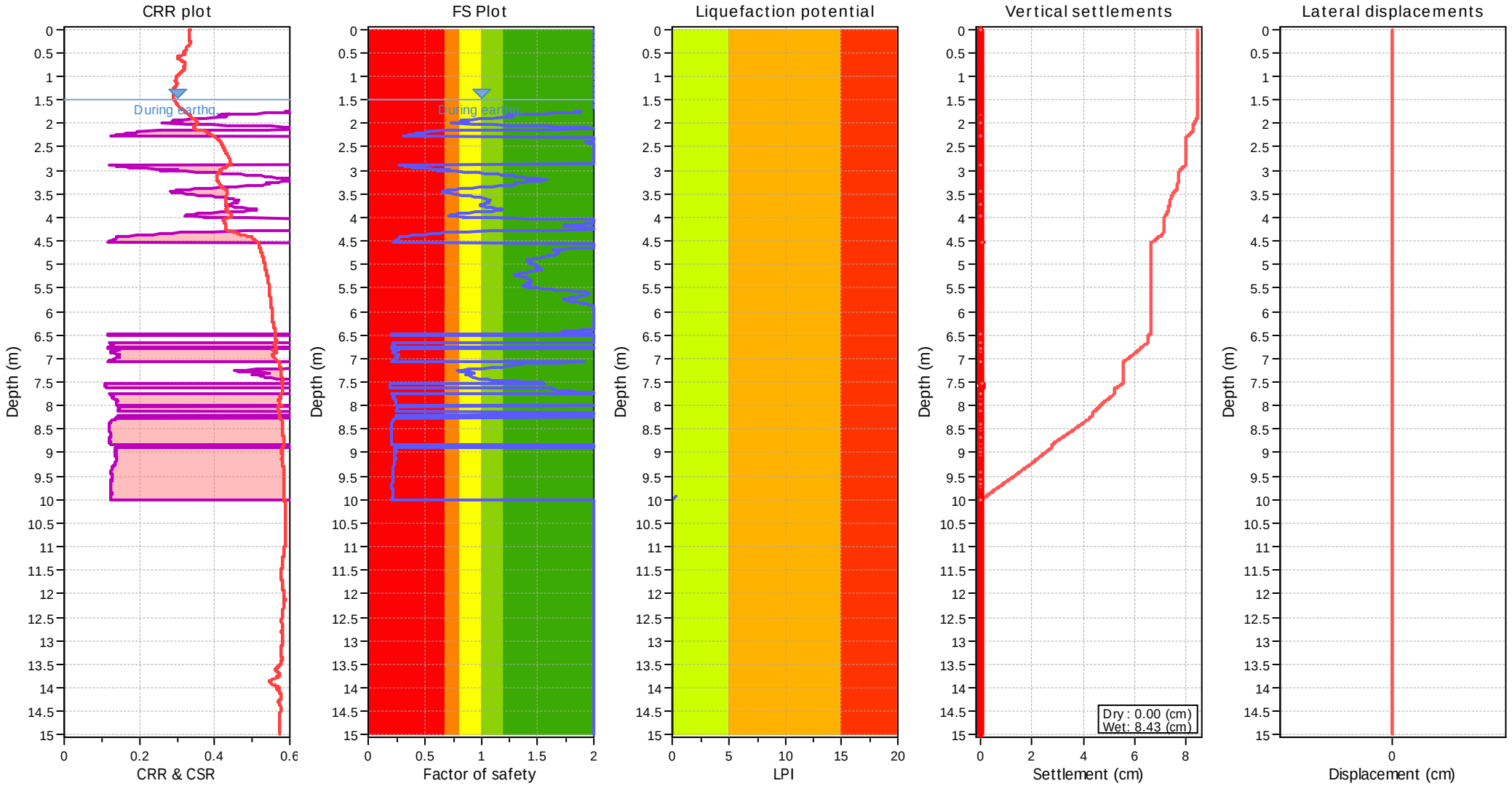
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Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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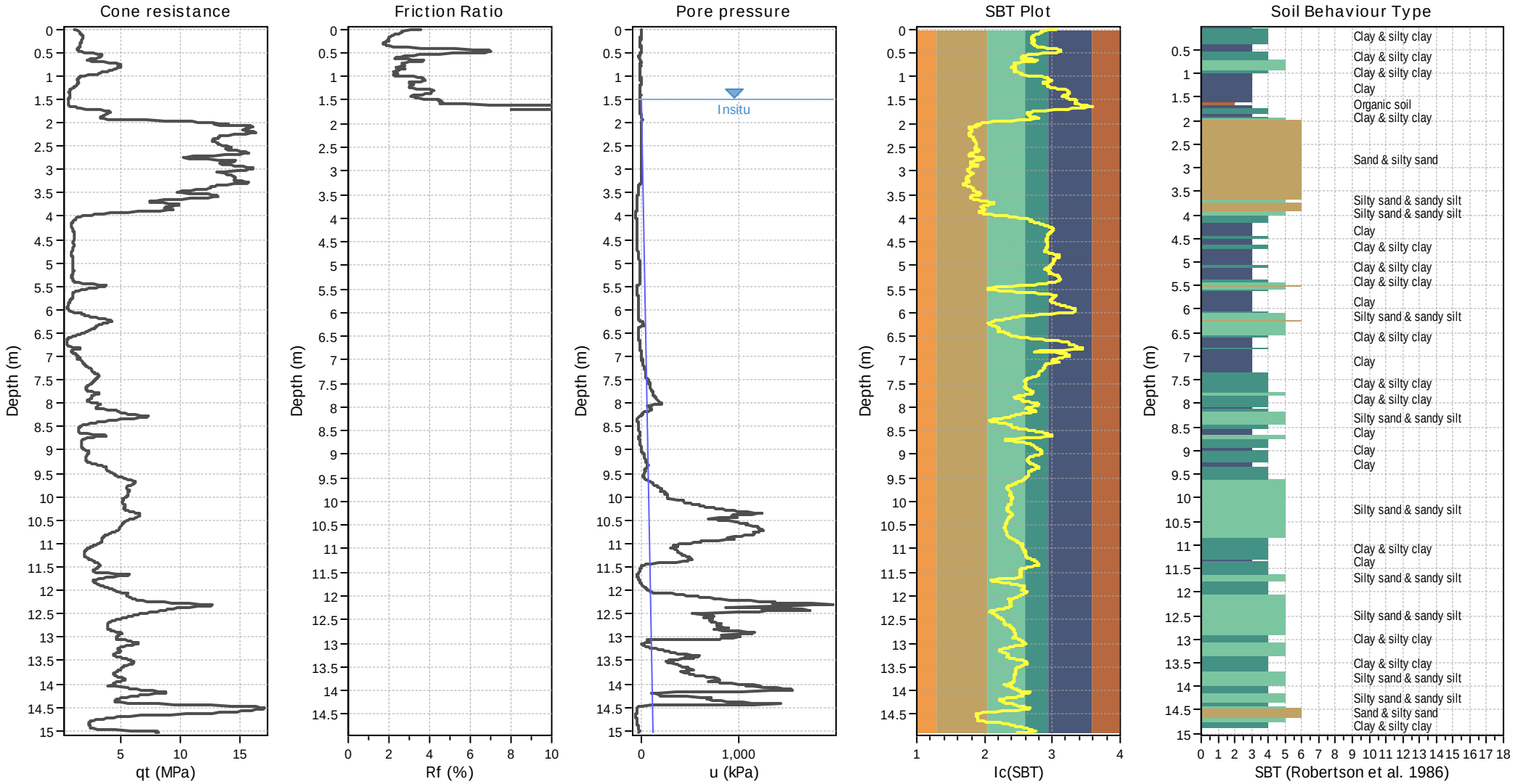
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LPI color scheme

- Very high risk
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CPT basic interpretation plots



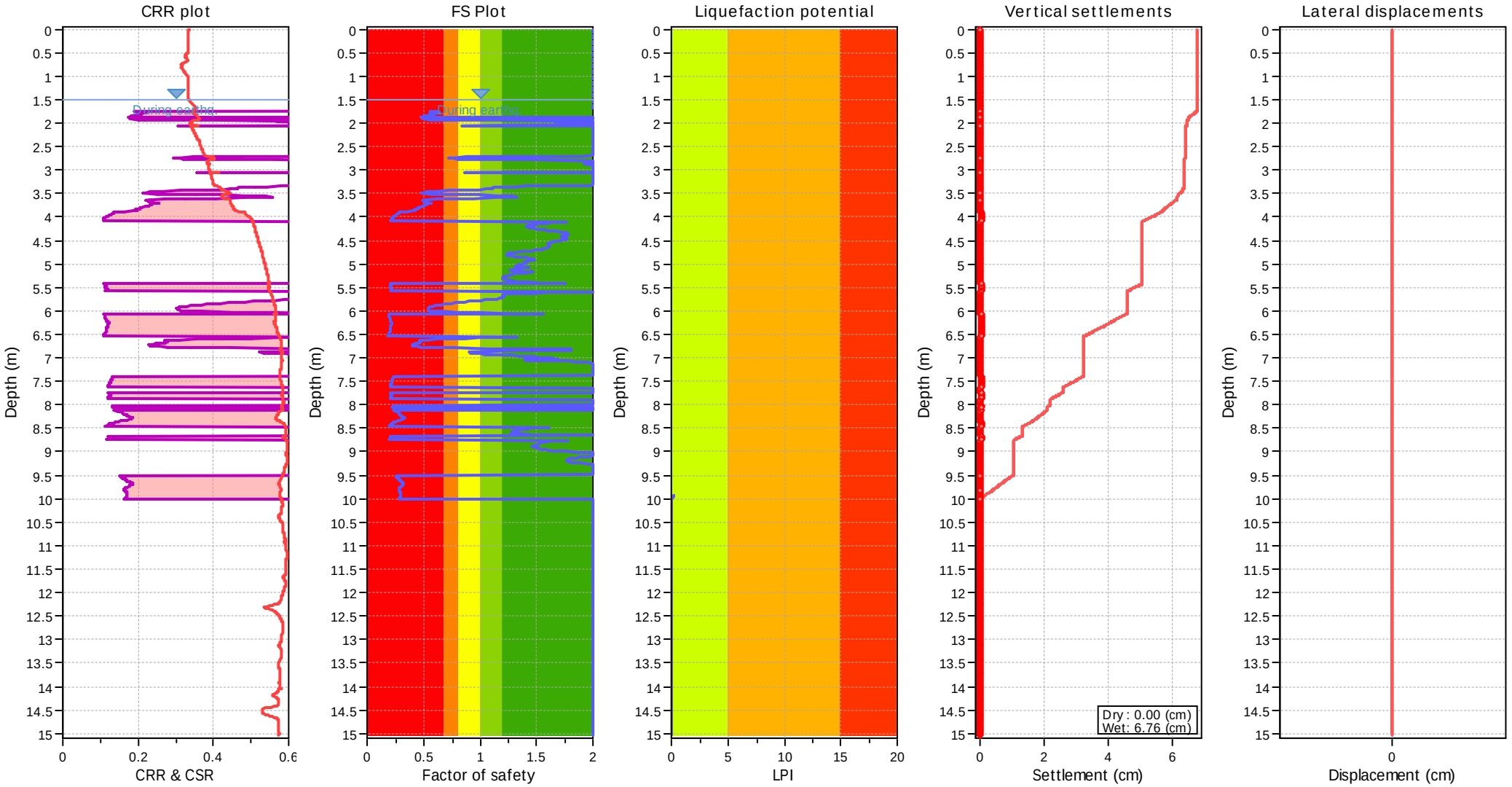
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
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Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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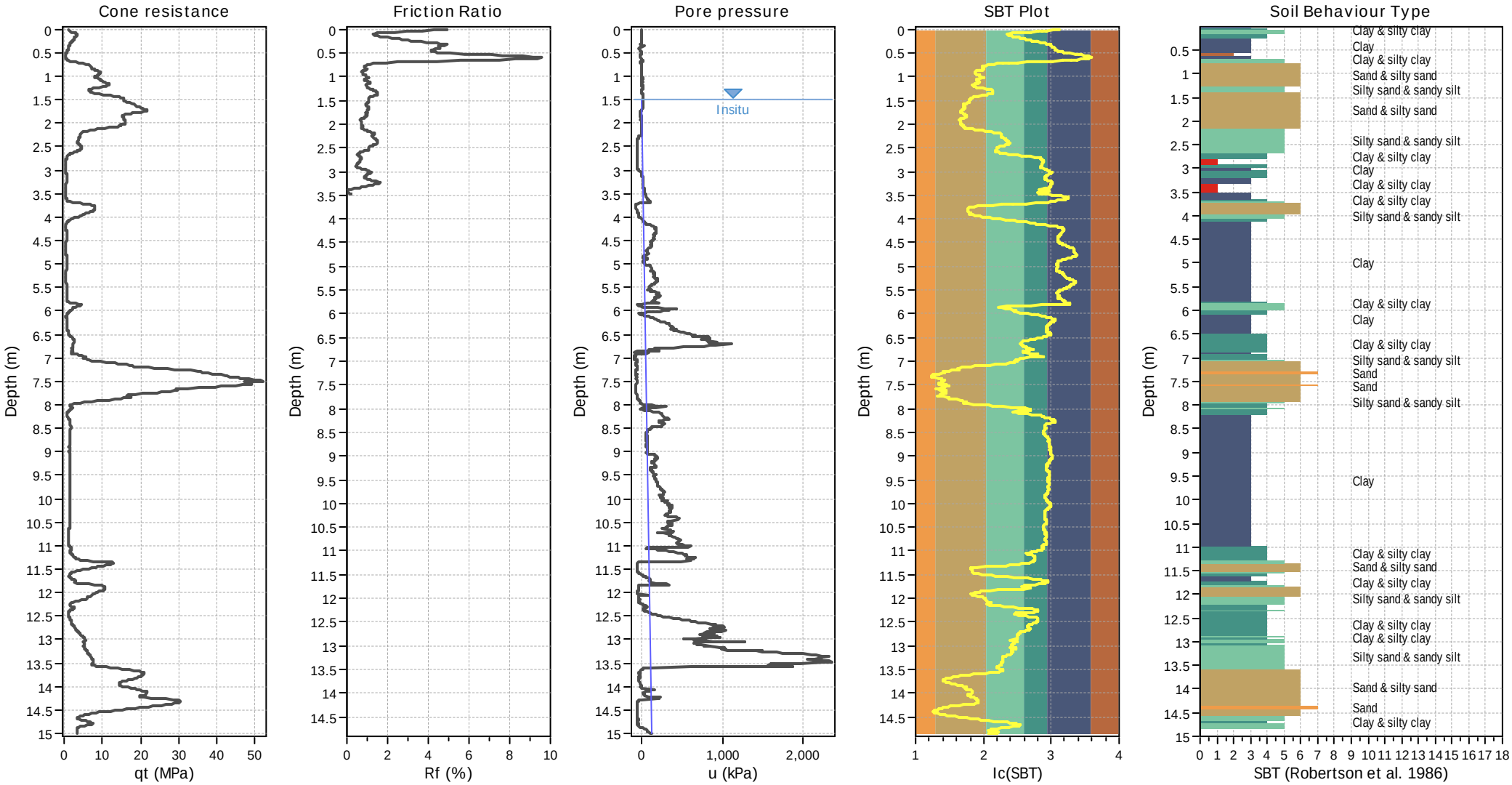
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LPI color scheme

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CPT basic interpretation plots



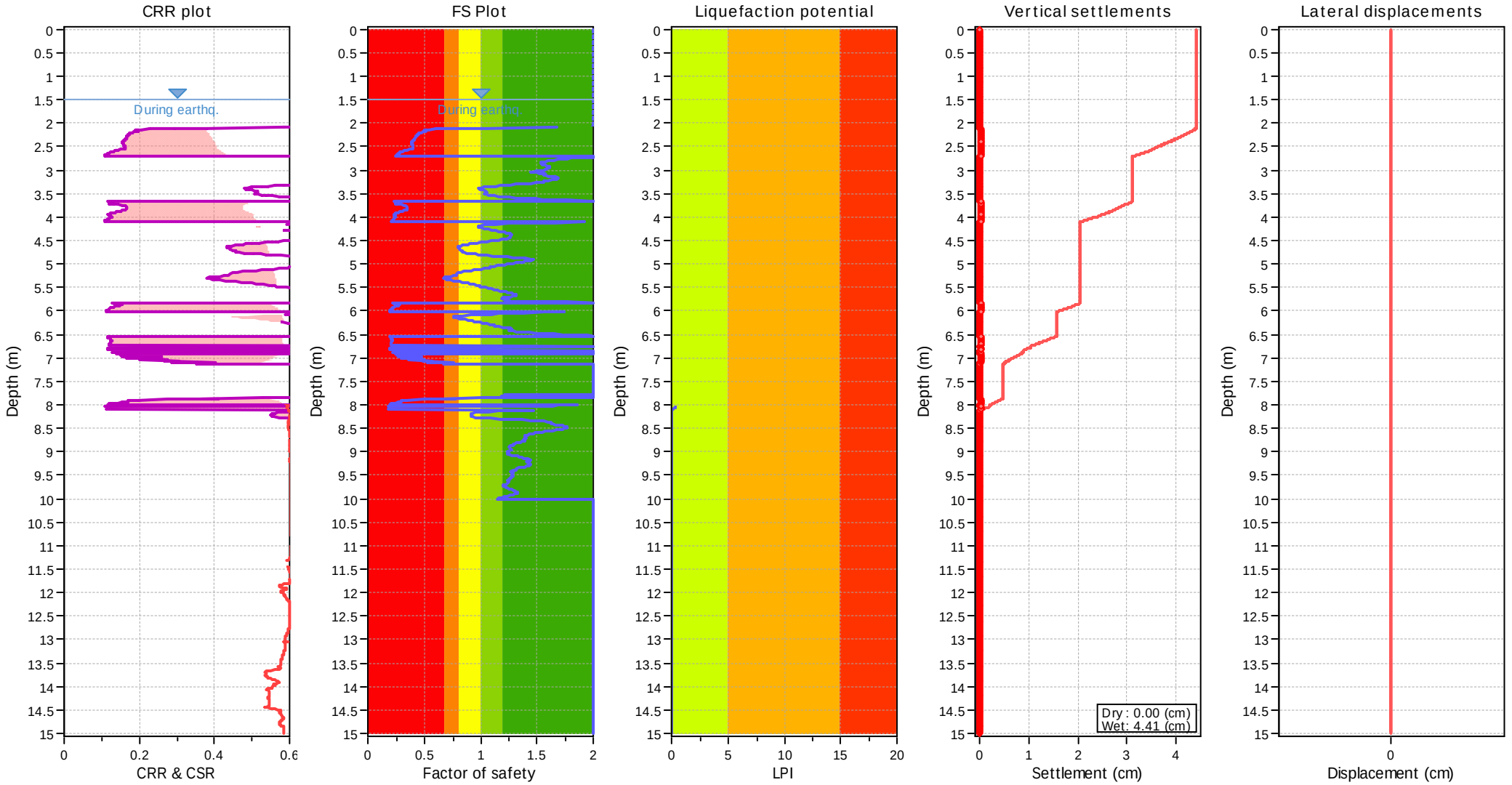
Input parameters and analysis data

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Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
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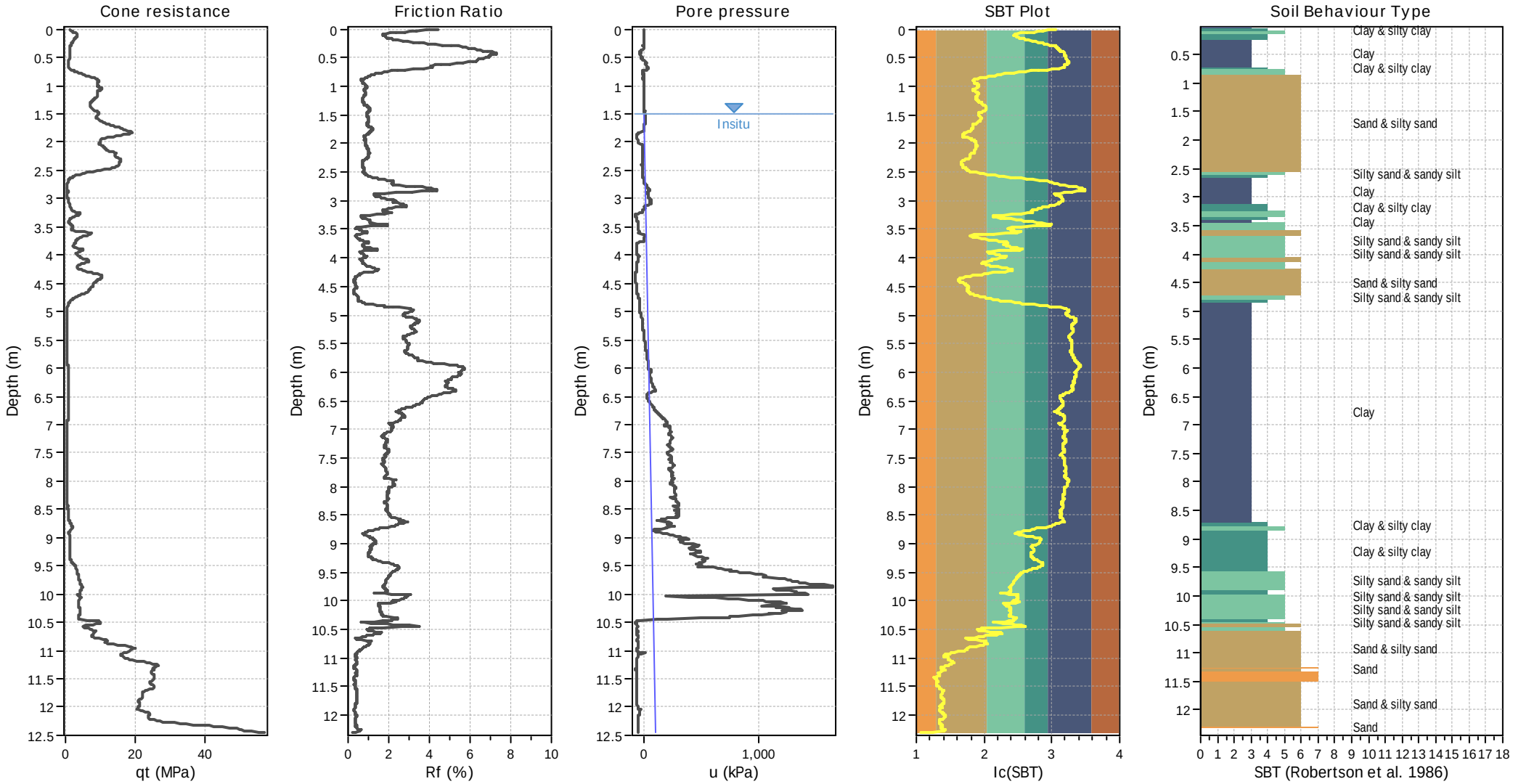
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LPI color scheme

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CPT basic interpretation plots



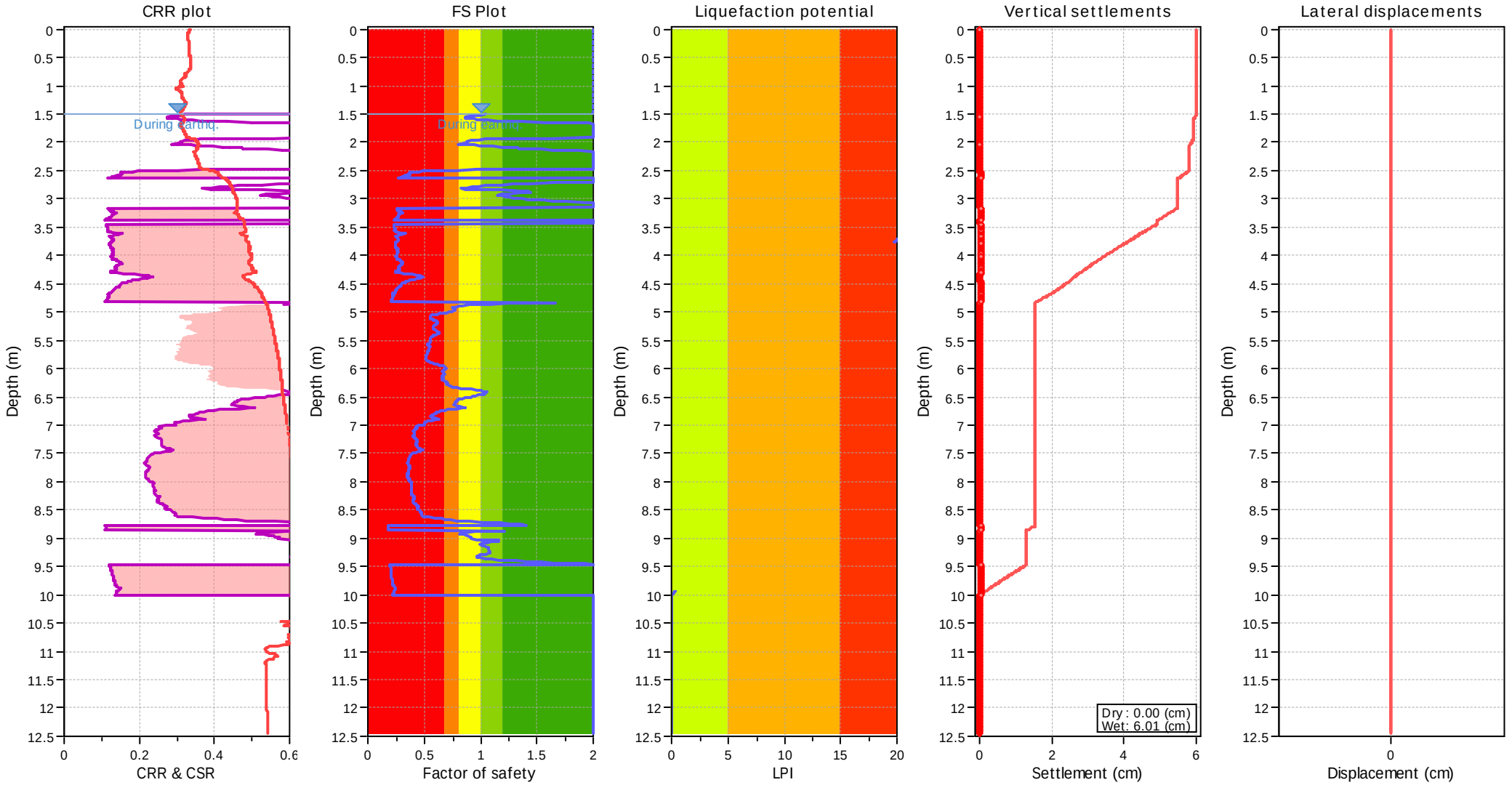
Input parameters and analysis data

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8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



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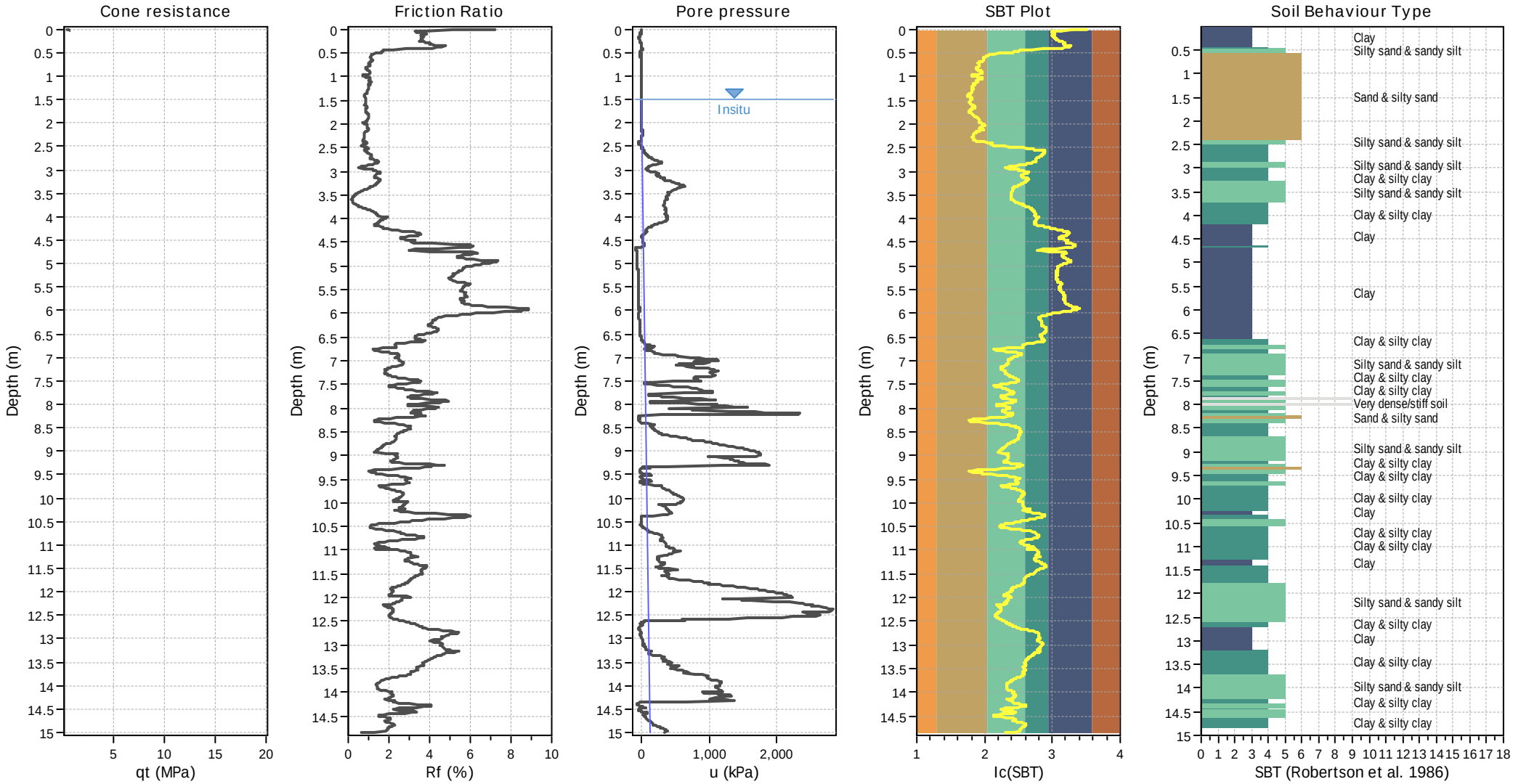
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LPI color scheme

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CPT basic interpretation plots



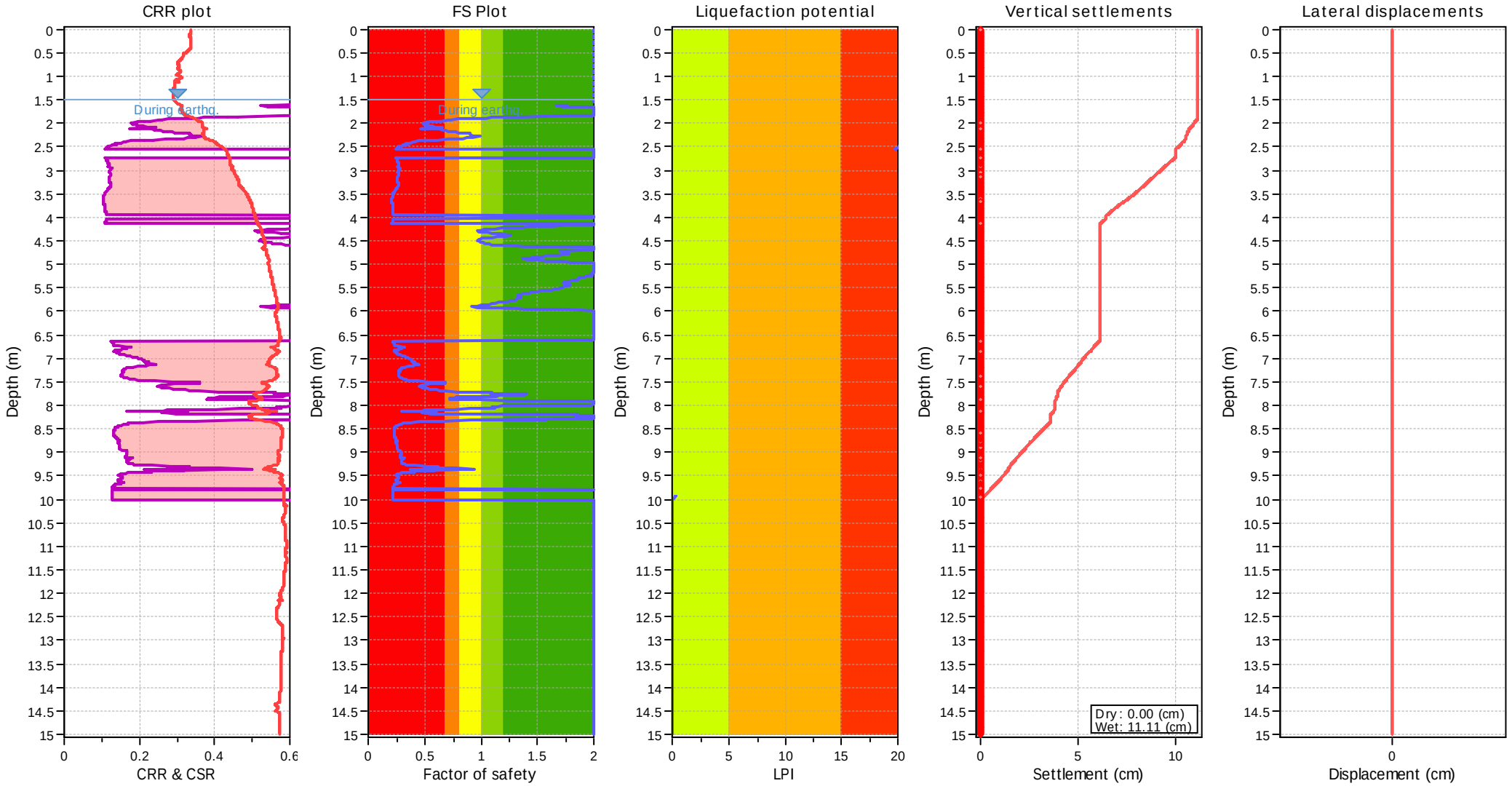
Input parameters and analysis data

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8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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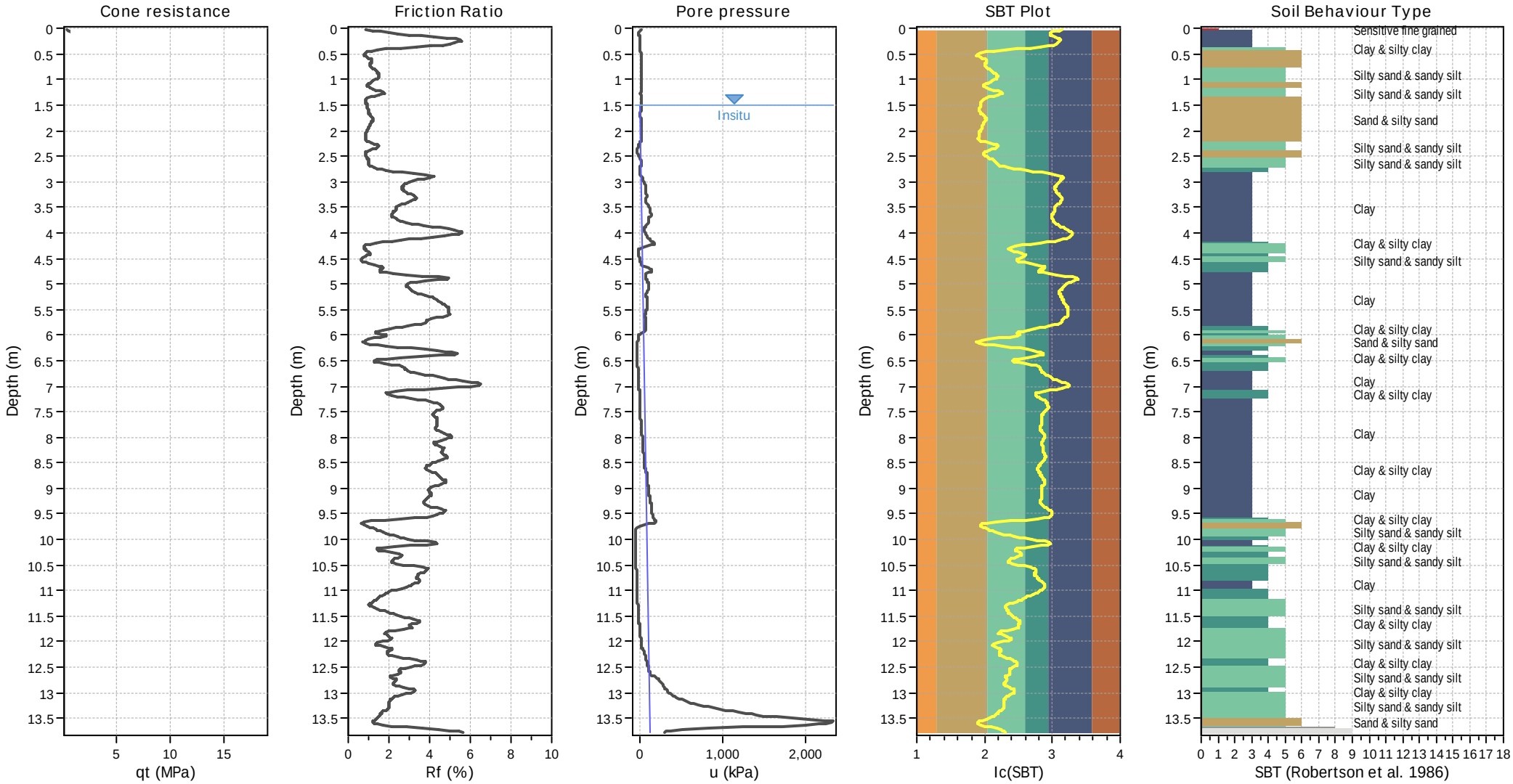
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LPI color scheme

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CPT basic interpretation plots



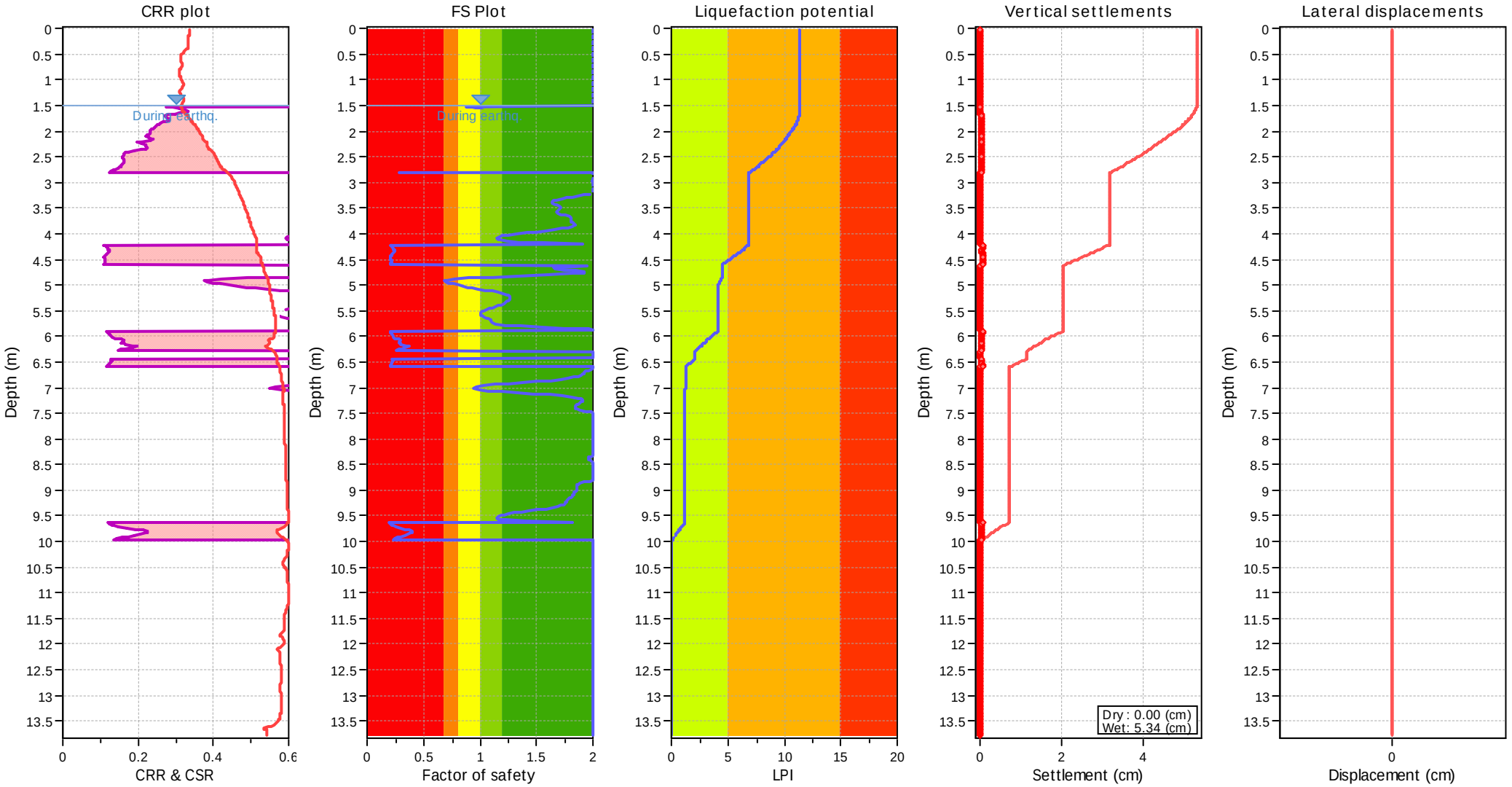
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Liquefaction analysis overall plots



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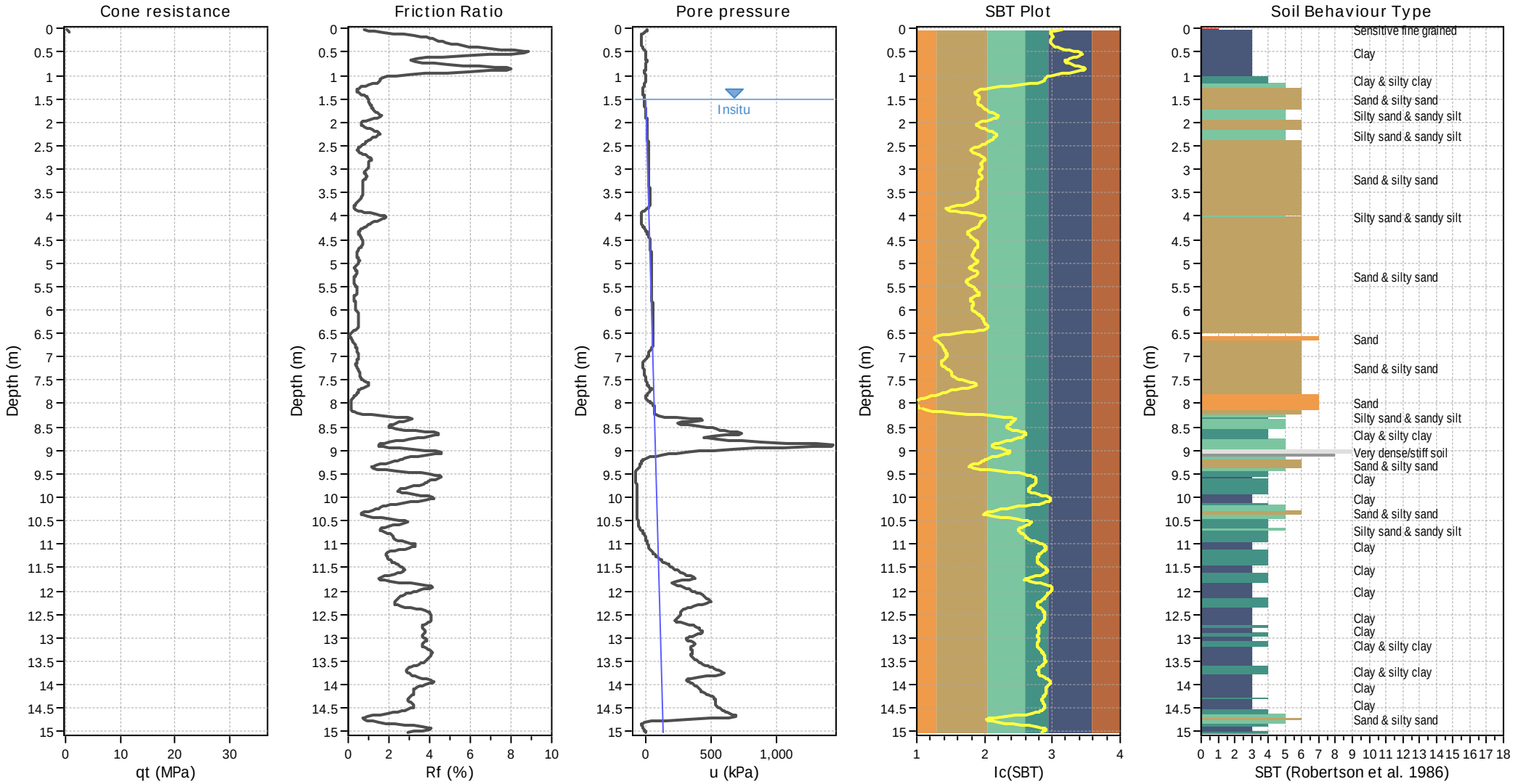
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LPI color scheme

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CPT basic interpretation plots



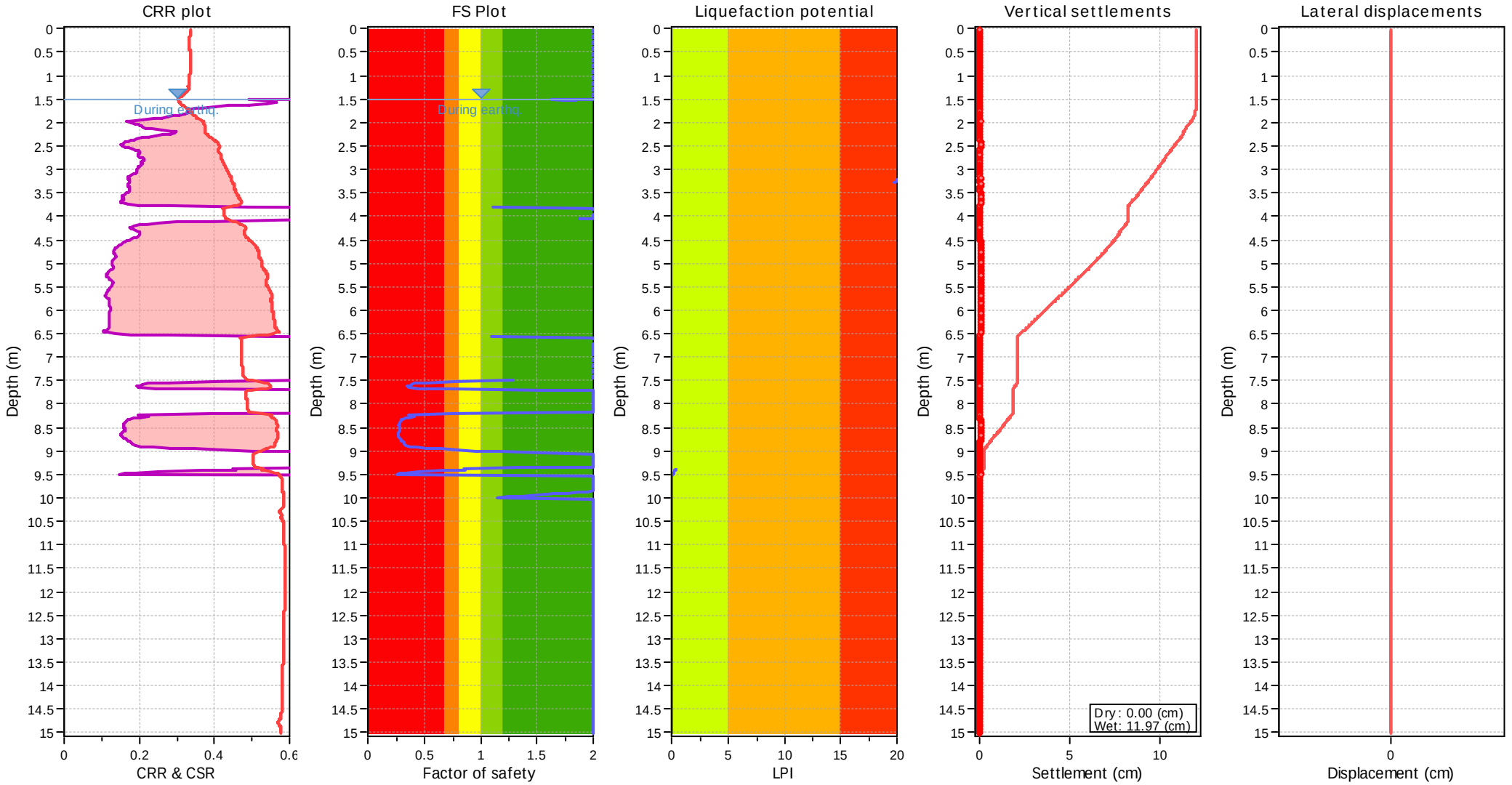
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Liquefaction analysis overall plots



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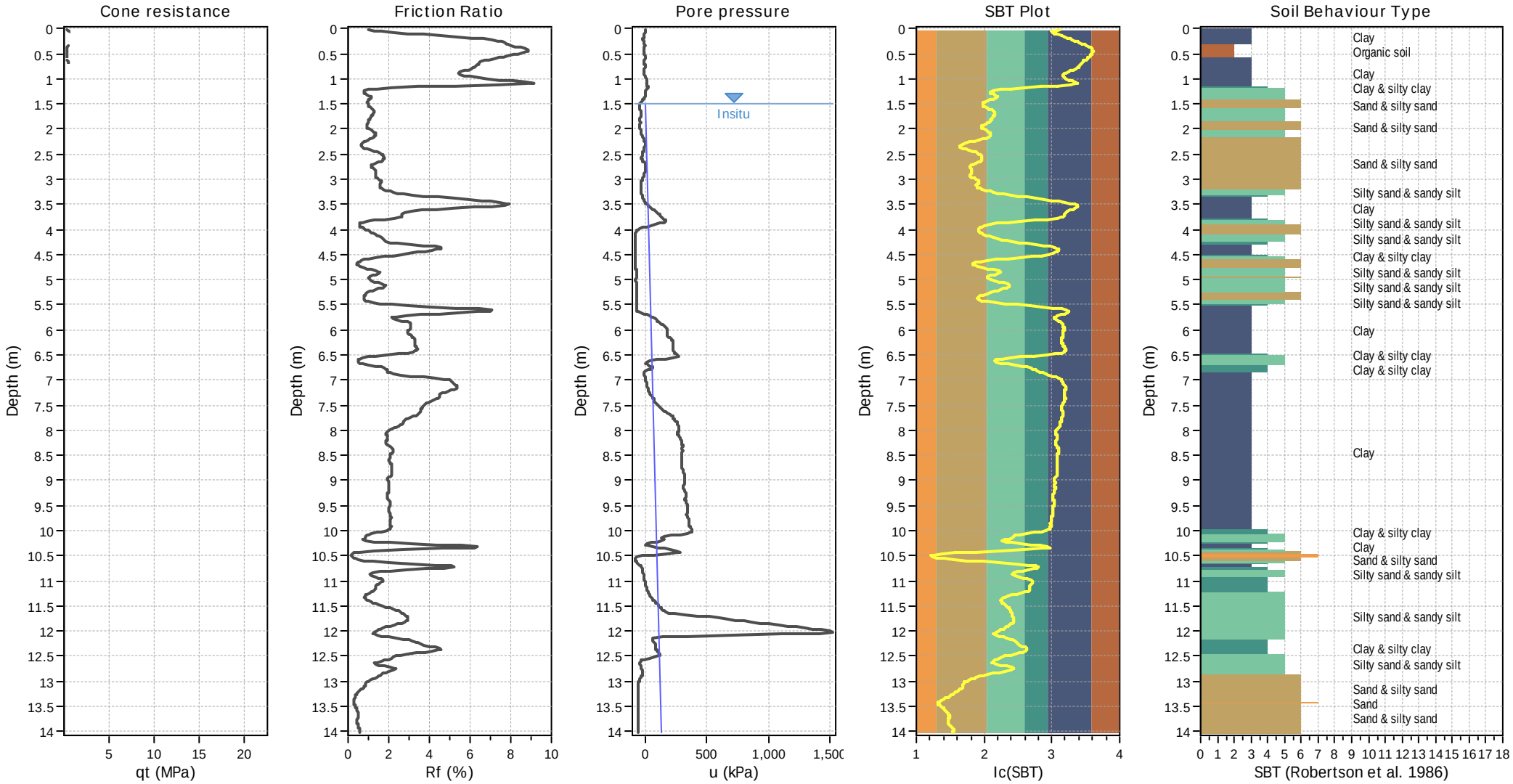
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CPT basic interpretation plots



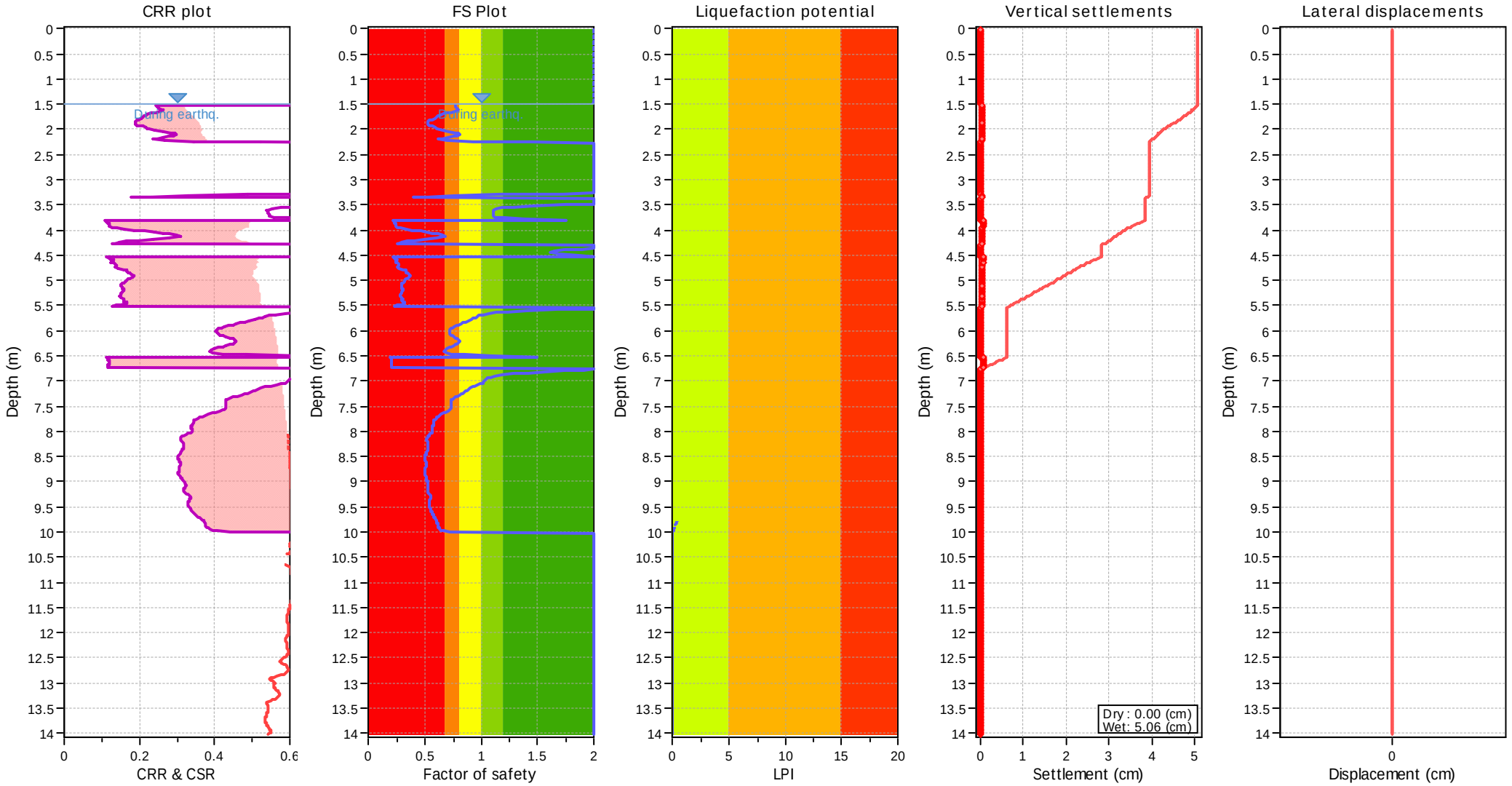
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Liquefaction analysis overall plots



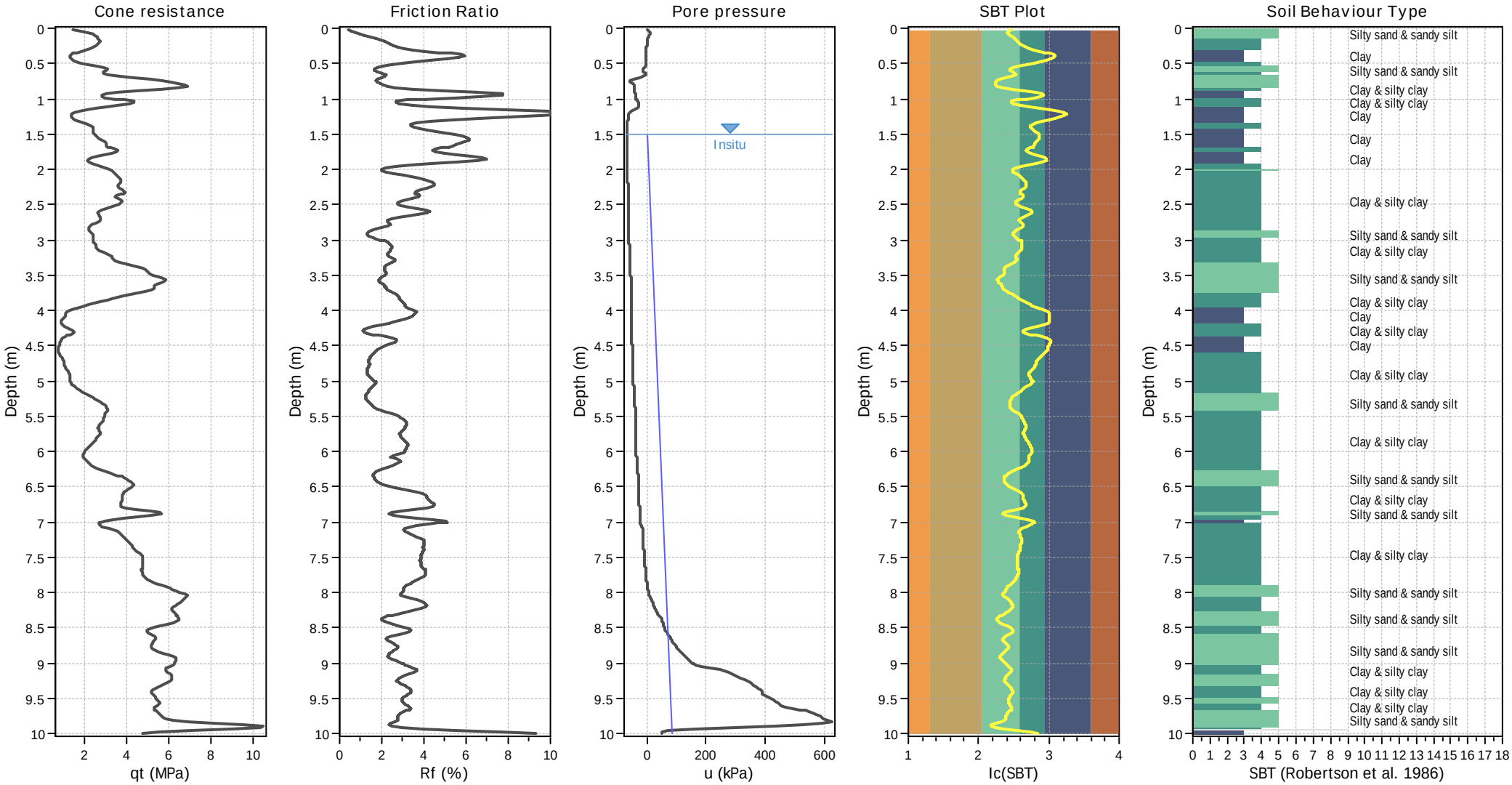
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LPI color scheme
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CPT basic interpretation plots



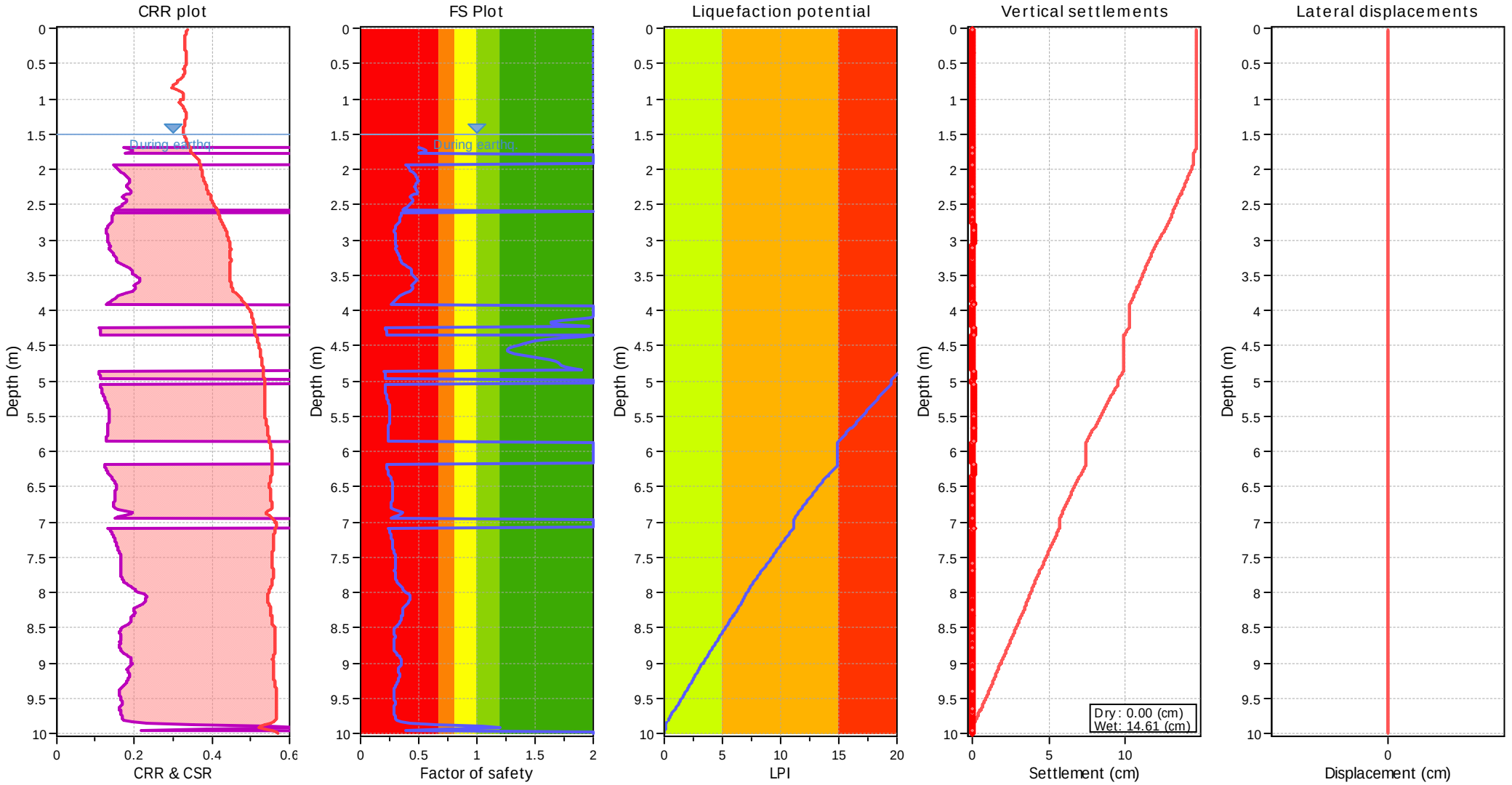
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1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

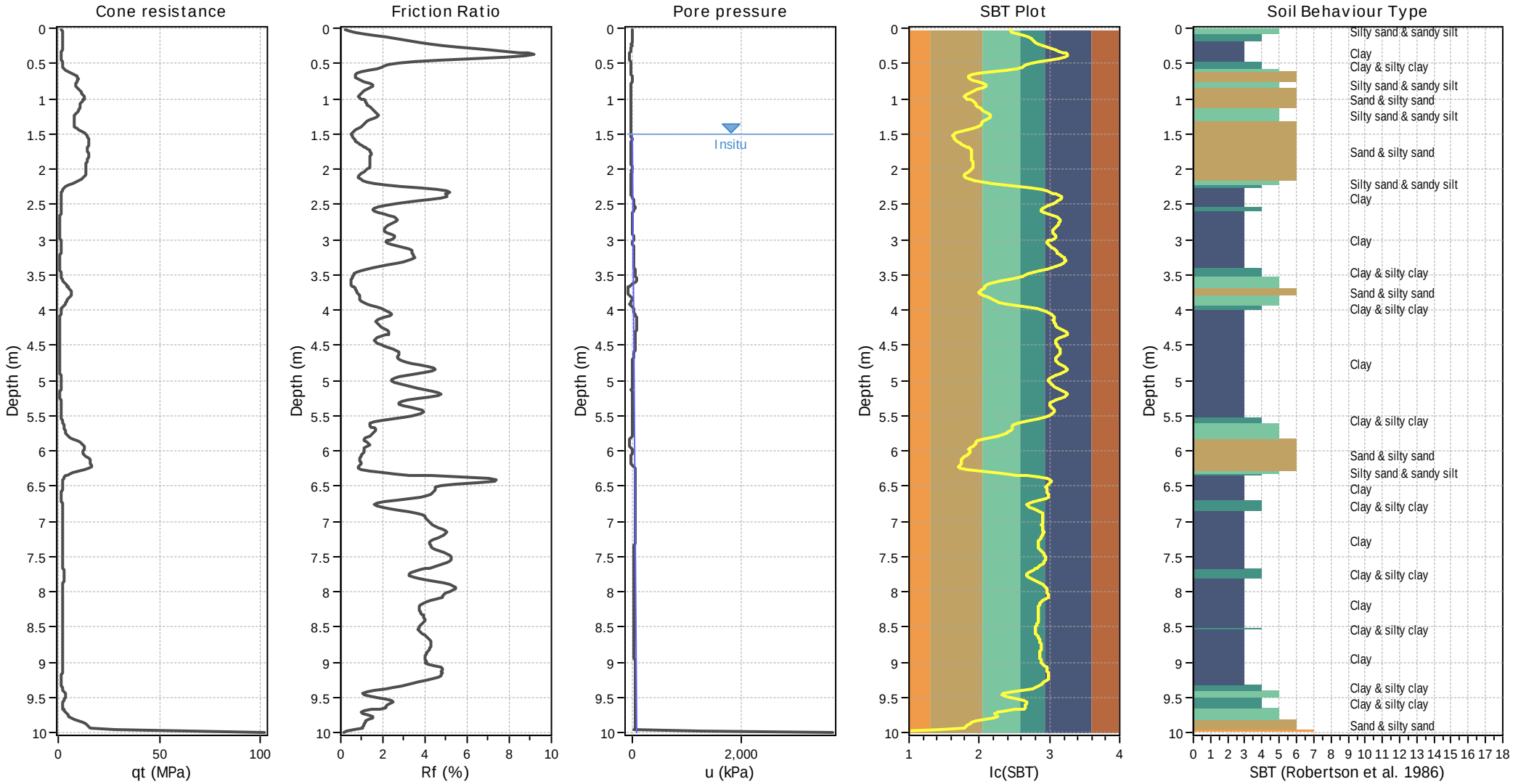
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

CPT basic interpretation plots



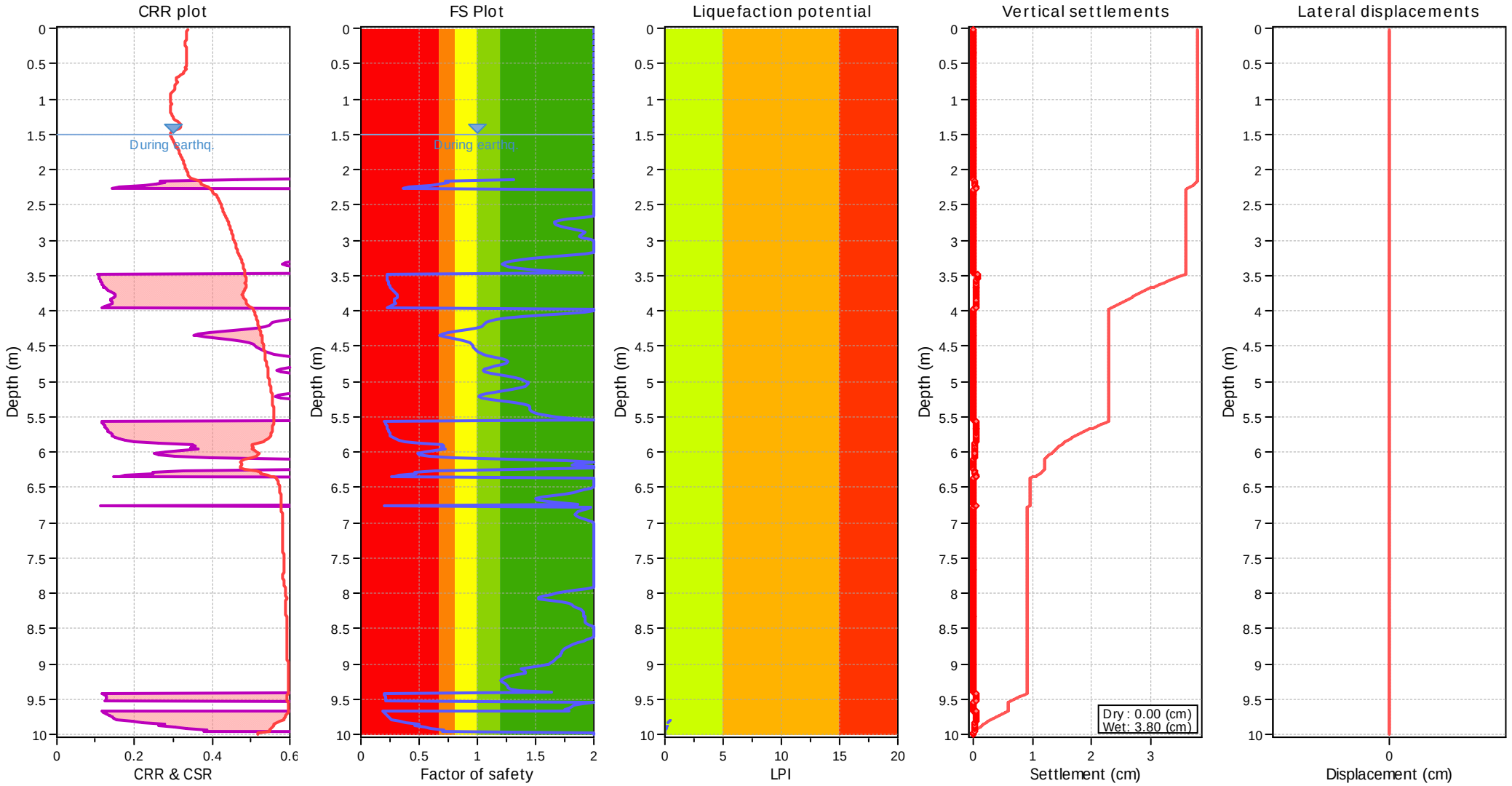
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

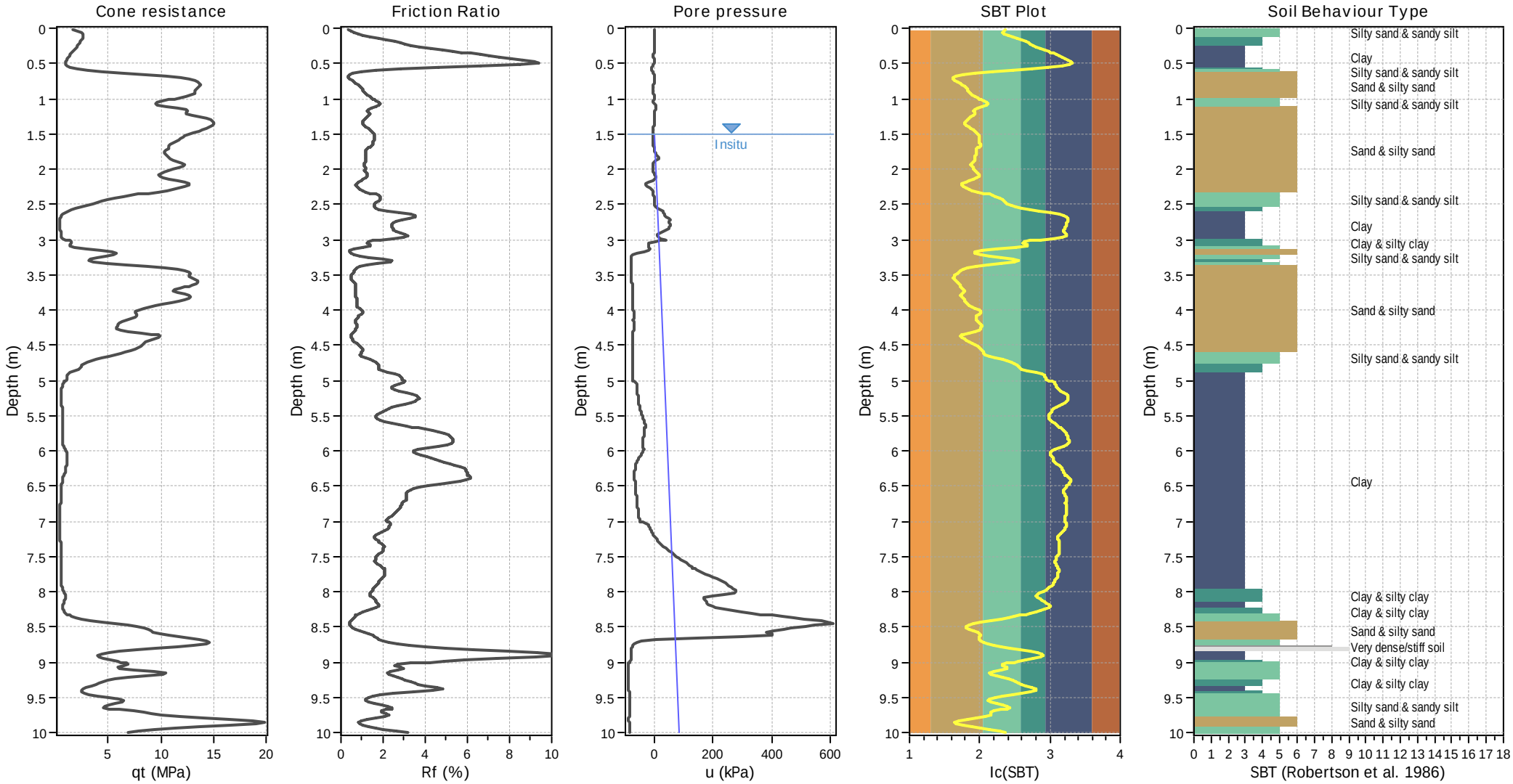
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LPI color scheme

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CPT basic interpretation plots



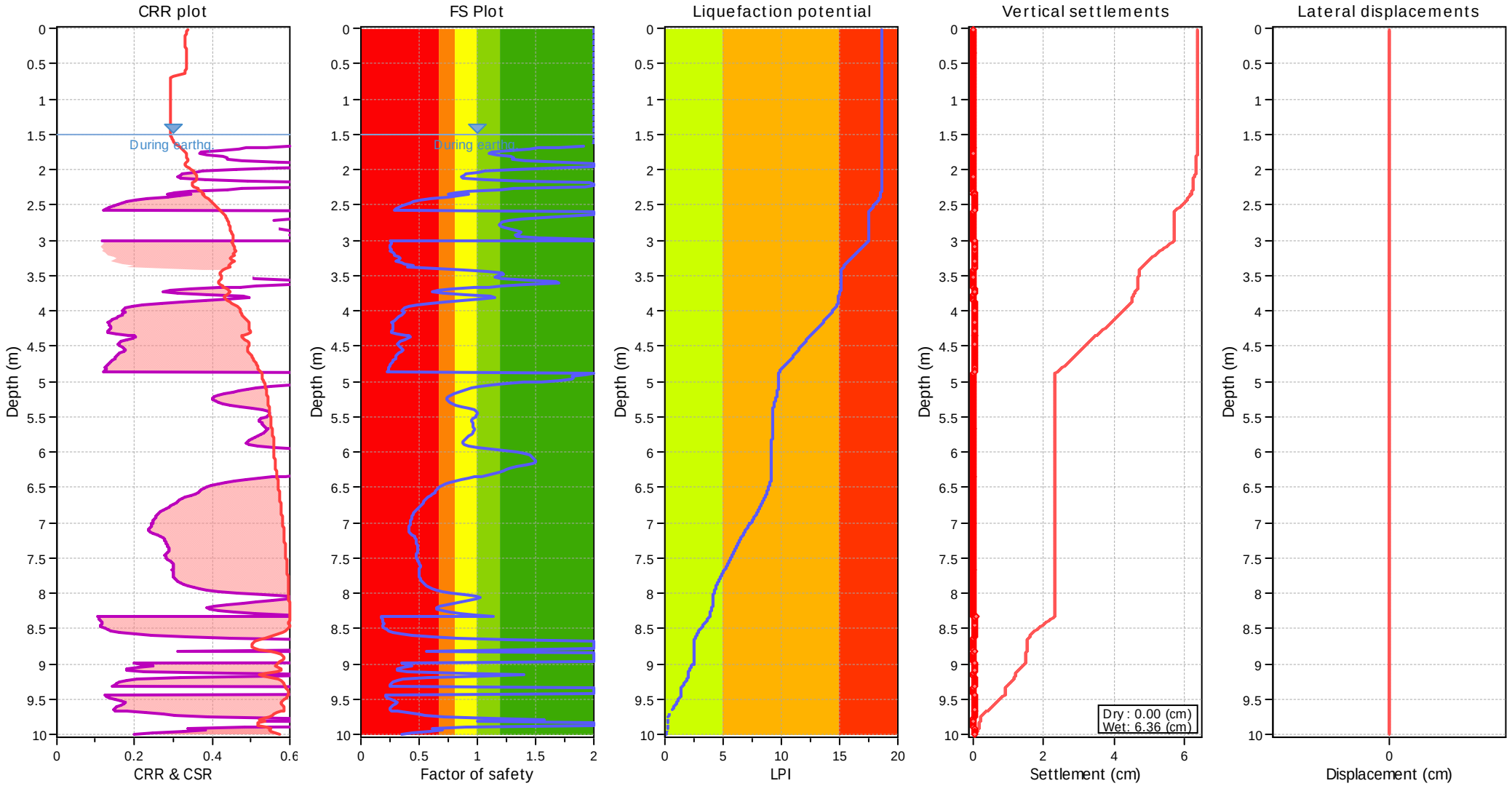
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	1.50 m	Fill height:	N/A	Limit depth:	10.00 m

SBT legend

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5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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Peak ground acceleration:	0.58	Use fill:	No	Limit depth applied:	Yes
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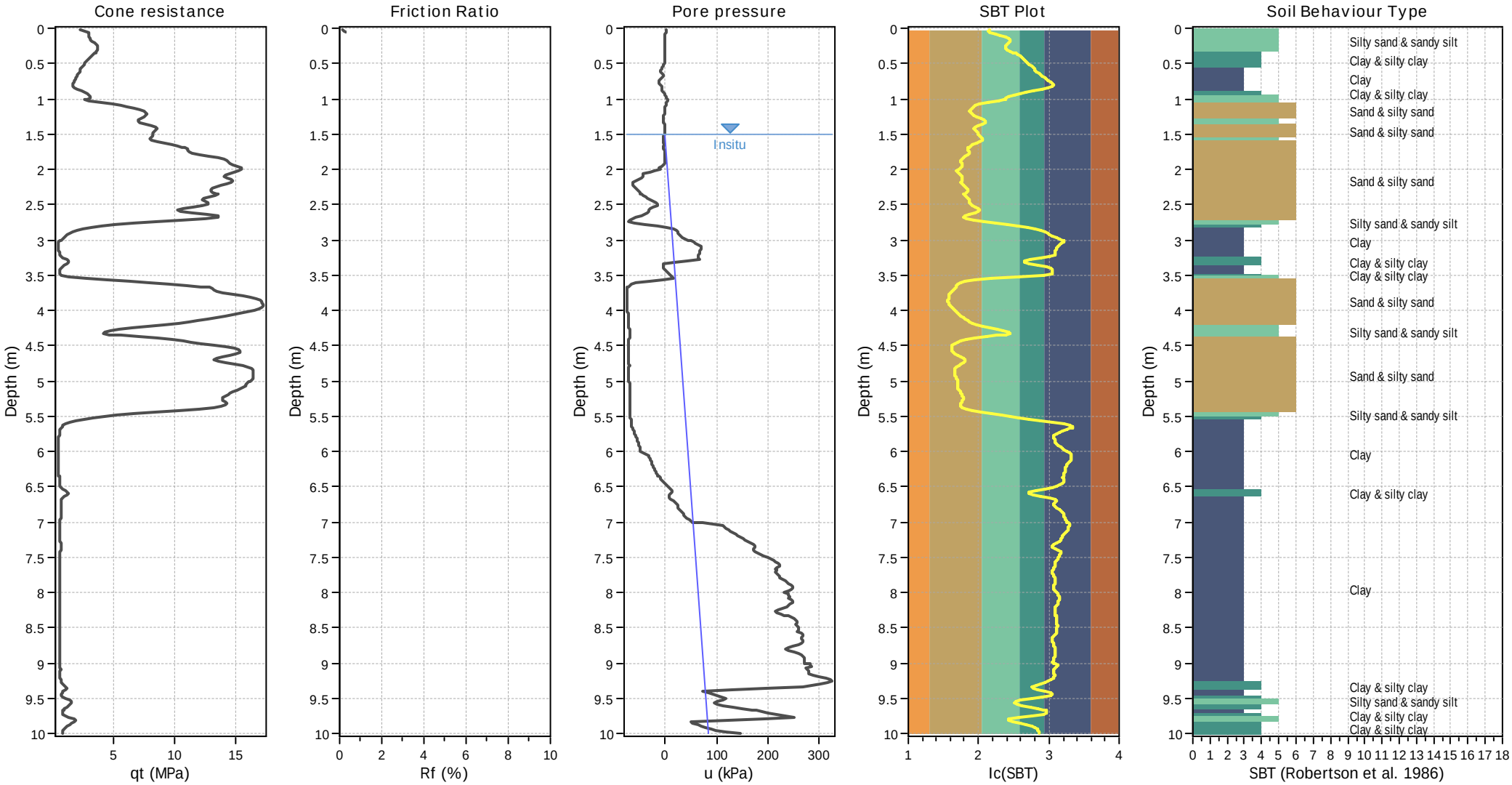
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LPI color scheme

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CPT basic interpretation plots



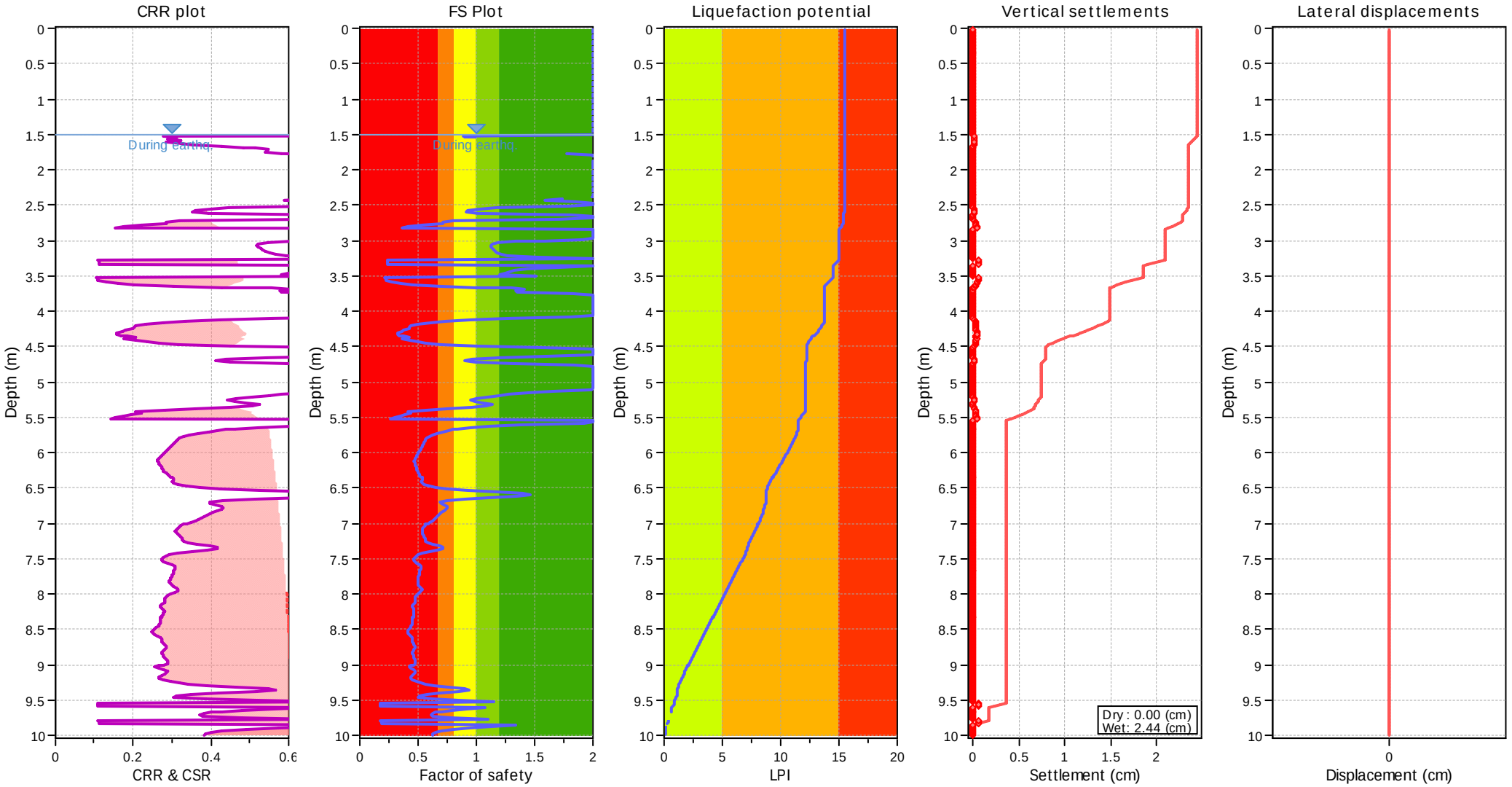
Input parameters and analysis data

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9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

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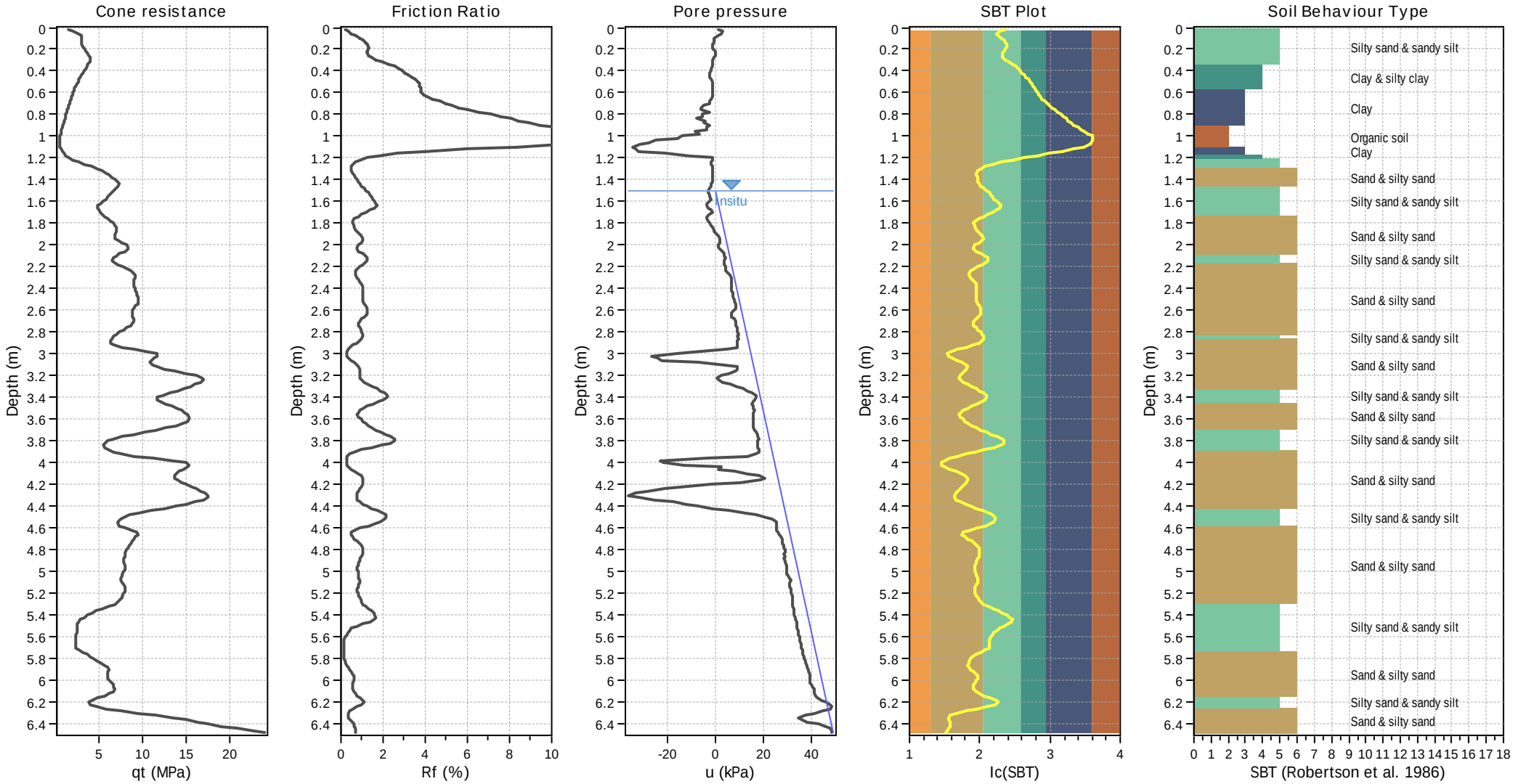
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LPI color scheme

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CPT basic interpretation plots



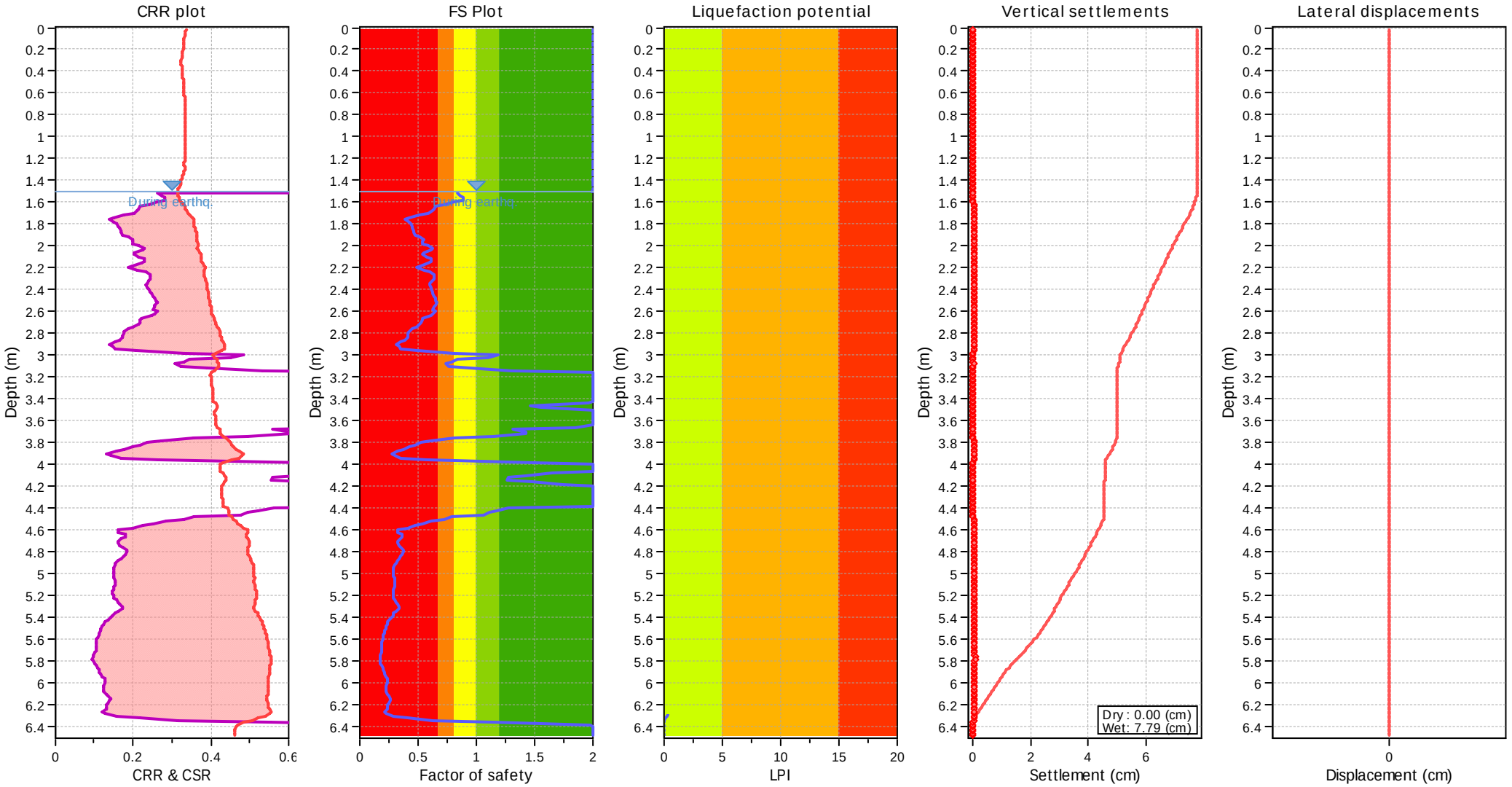
Input parameters and analysis data

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Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.10	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sand & Clay
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Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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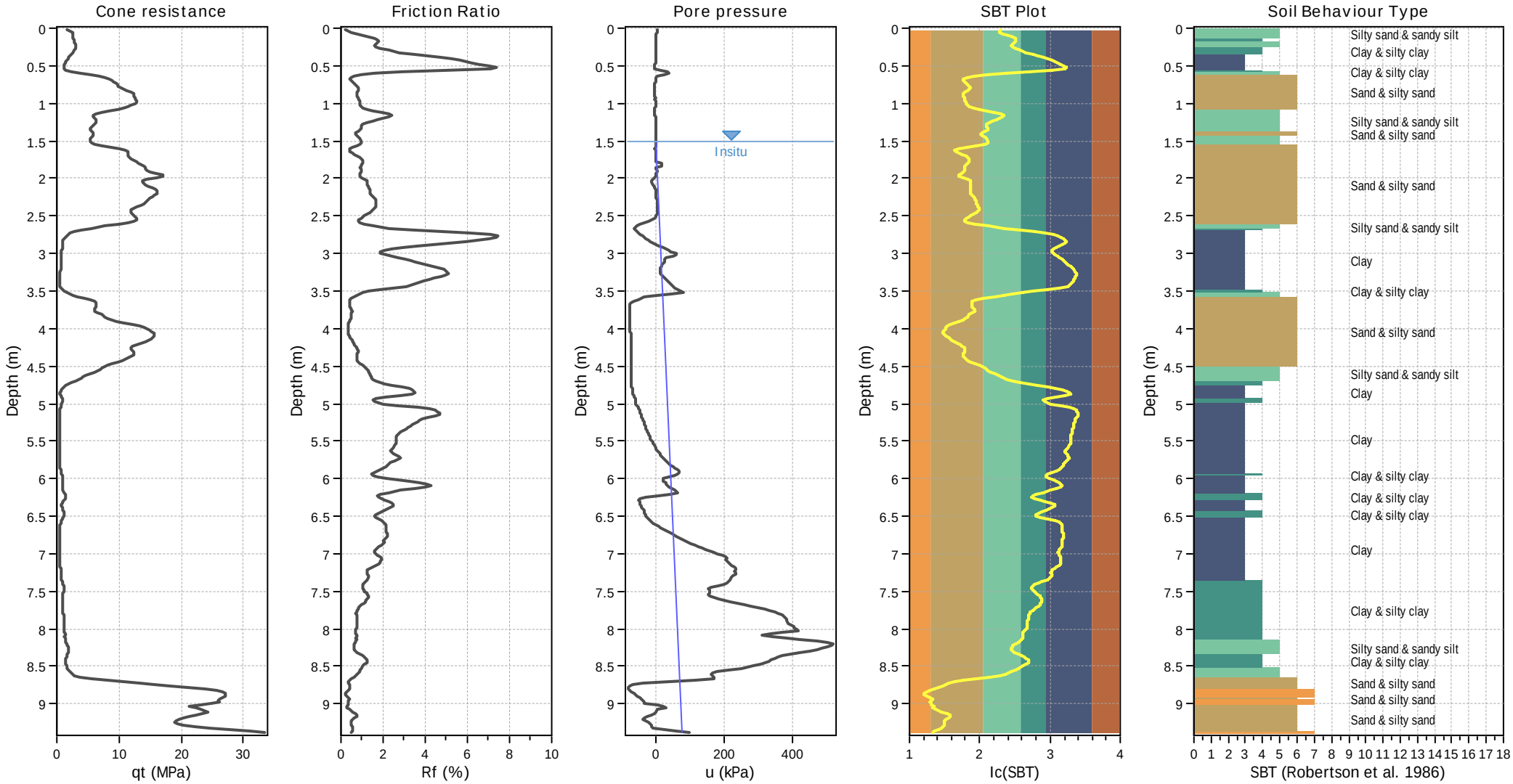
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LPI color scheme

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CPT basic interpretation plots



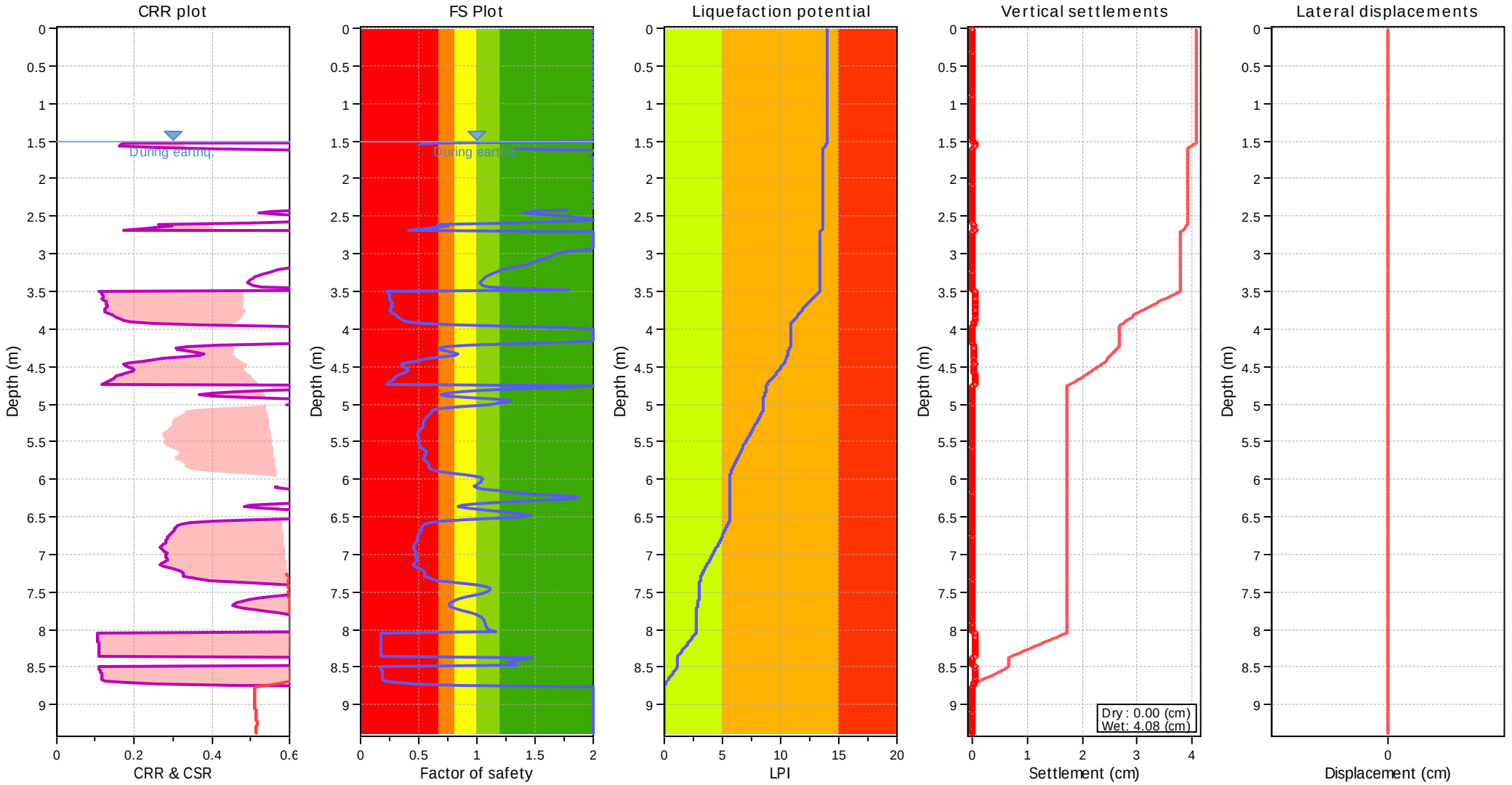
Input parameters and analysis data

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Liquefaction analysis overall plots



Input parameters and analysis data

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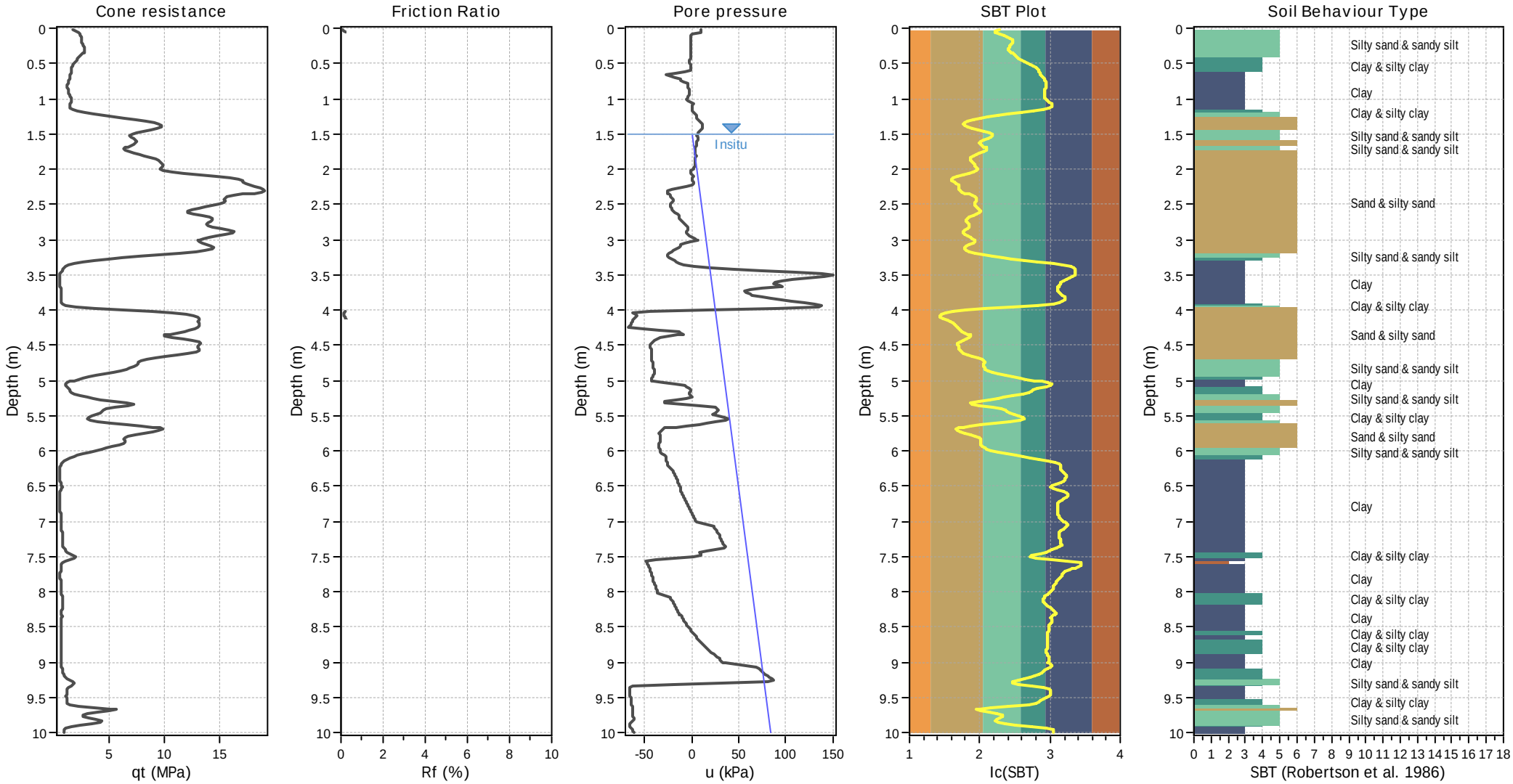
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LPI color scheme

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CPT basic interpretation plots



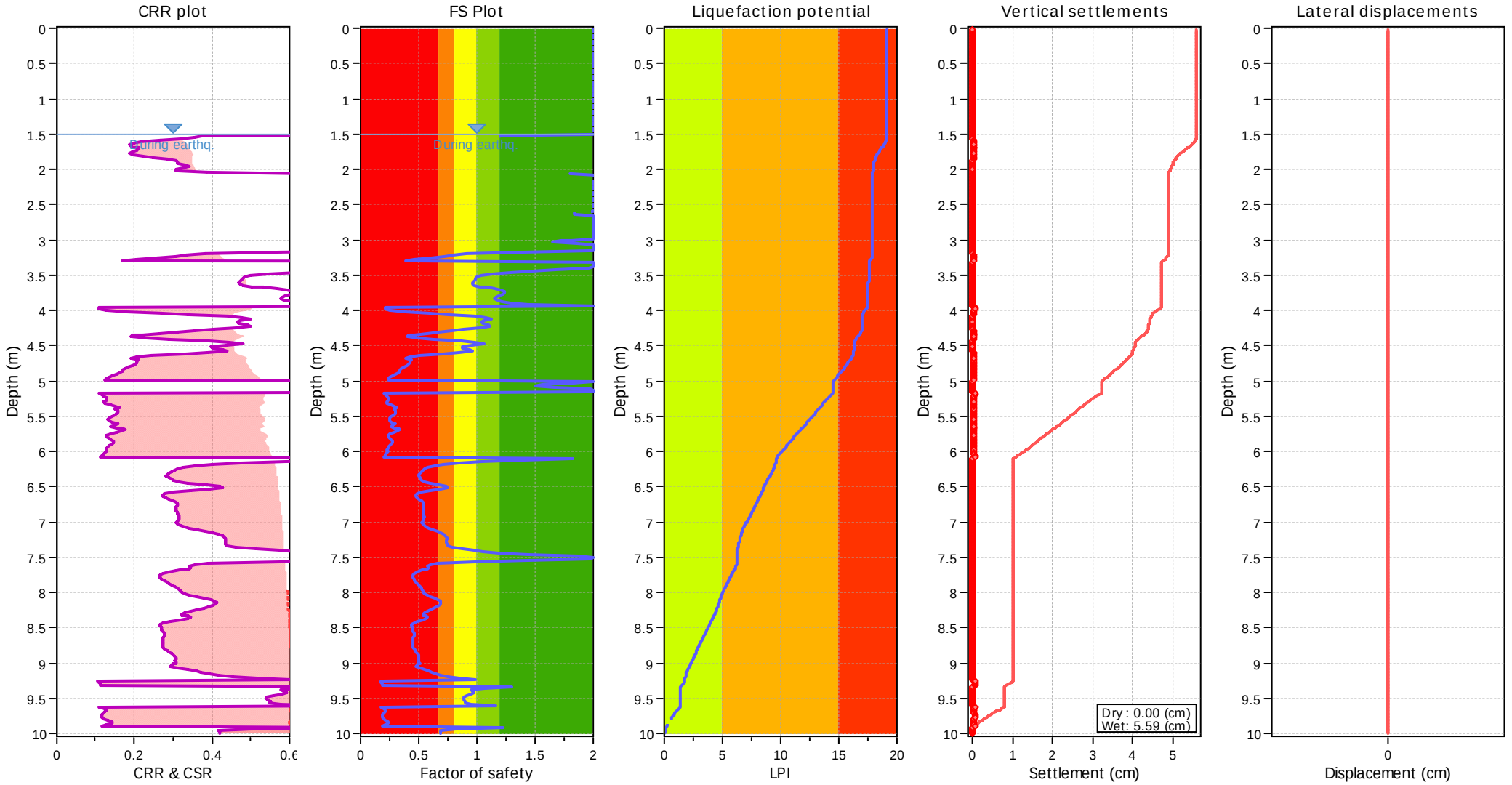
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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SBT legend

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6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
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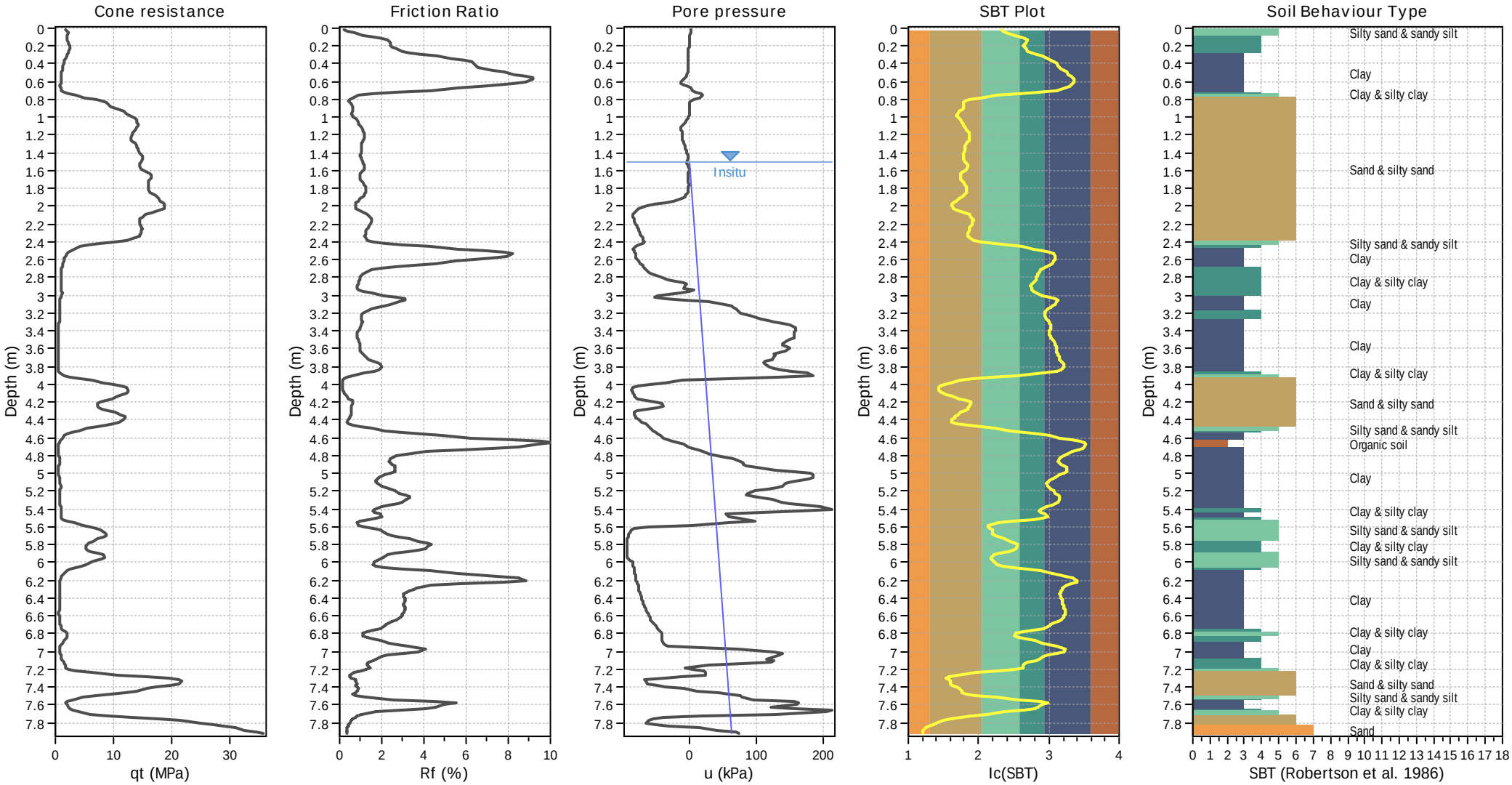
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LPI color scheme

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CPT basic interpretation plots



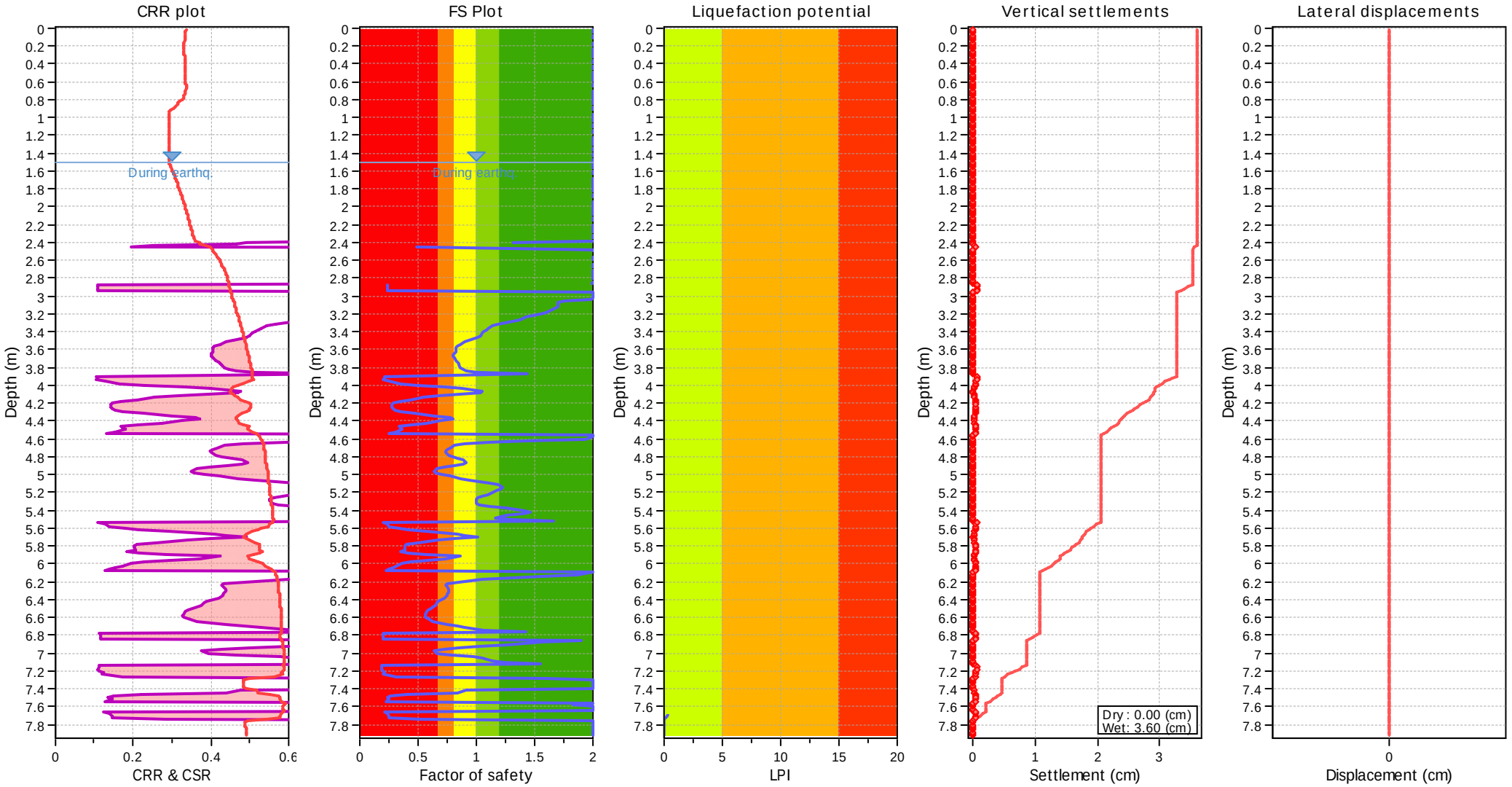
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	1.50 m	Fill weight:	N/A
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Liquefaction analysis overall plots



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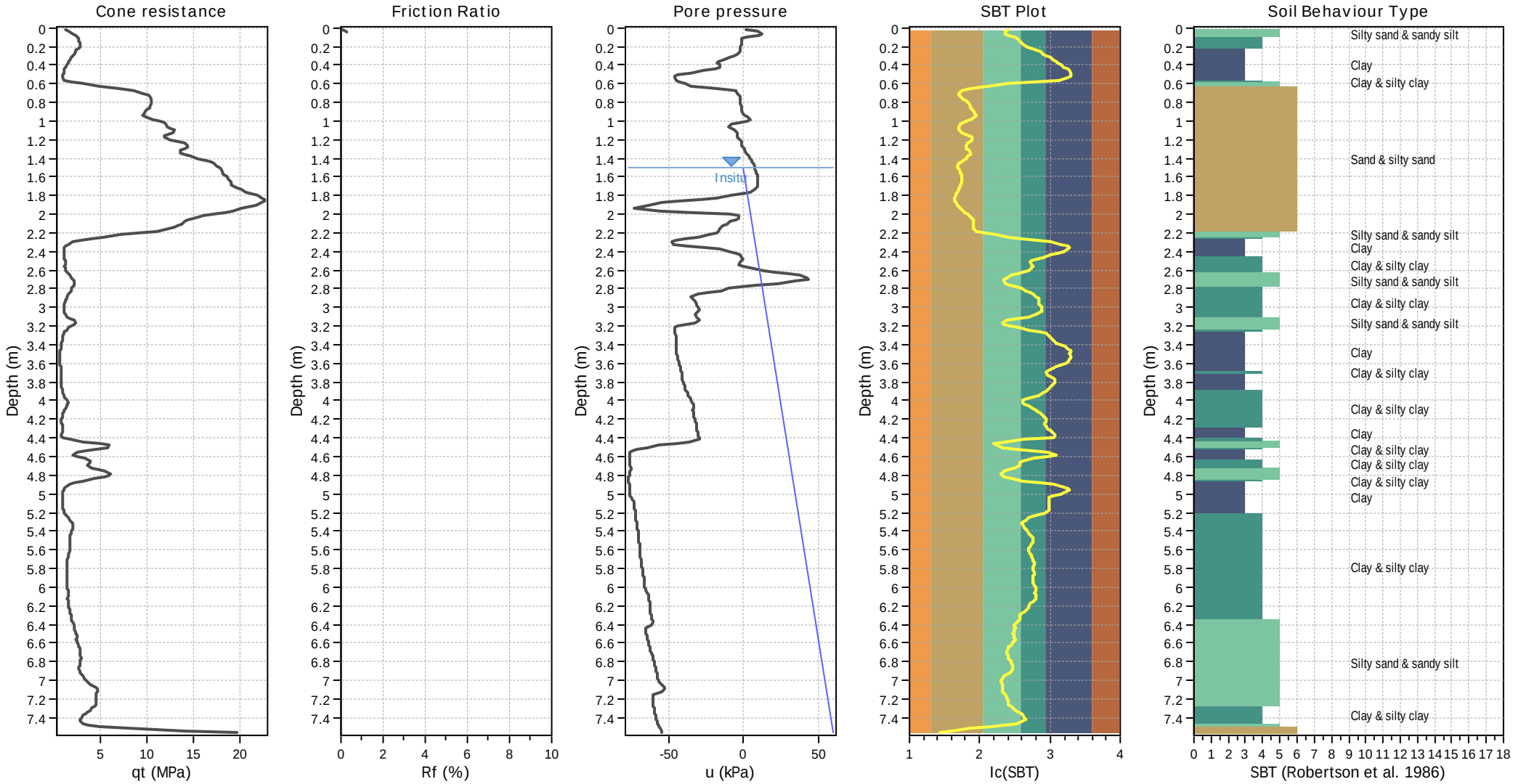
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LPI color scheme

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CPT basic interpretation plots



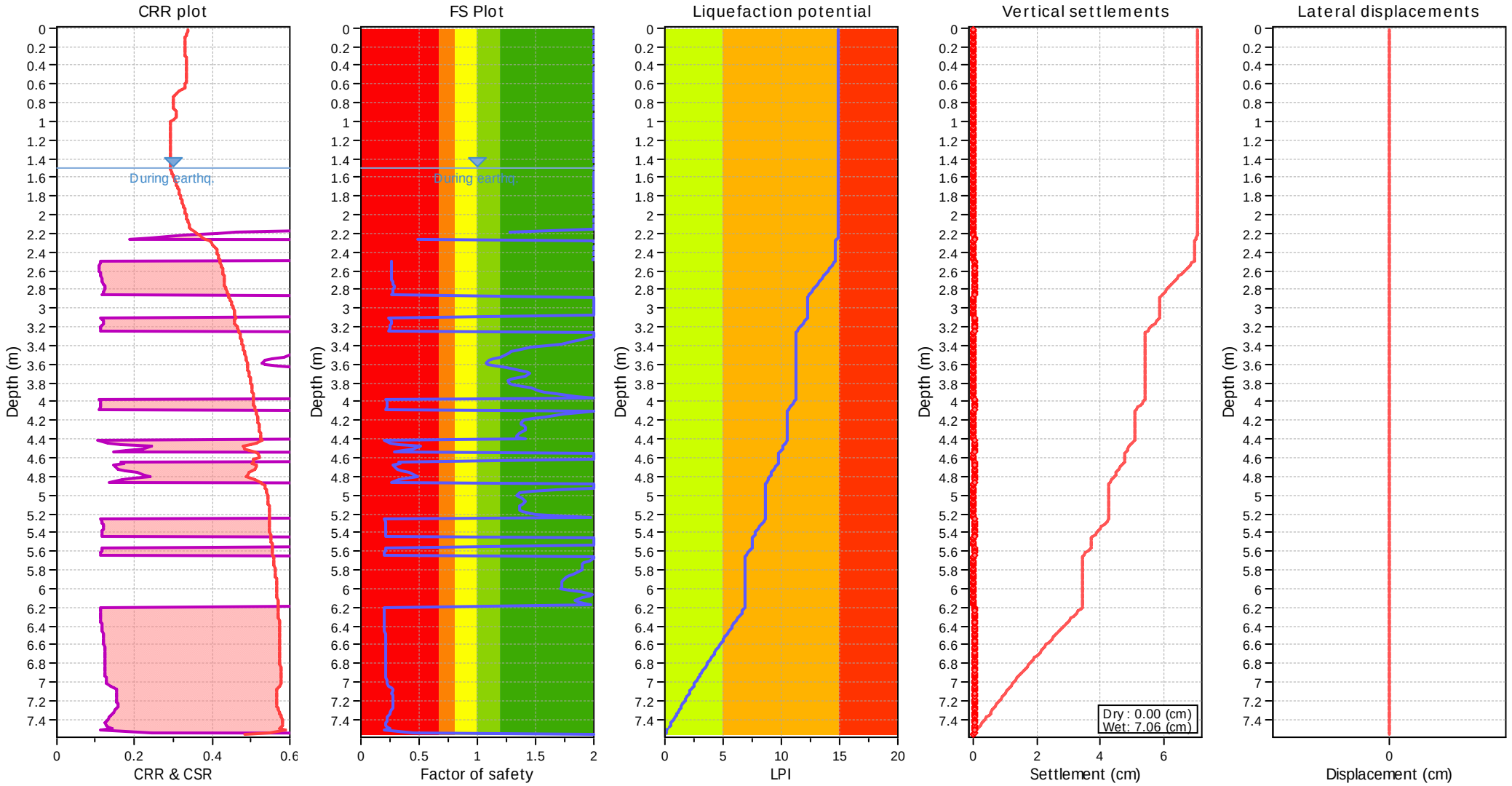
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Liquefaction analysis overall plots



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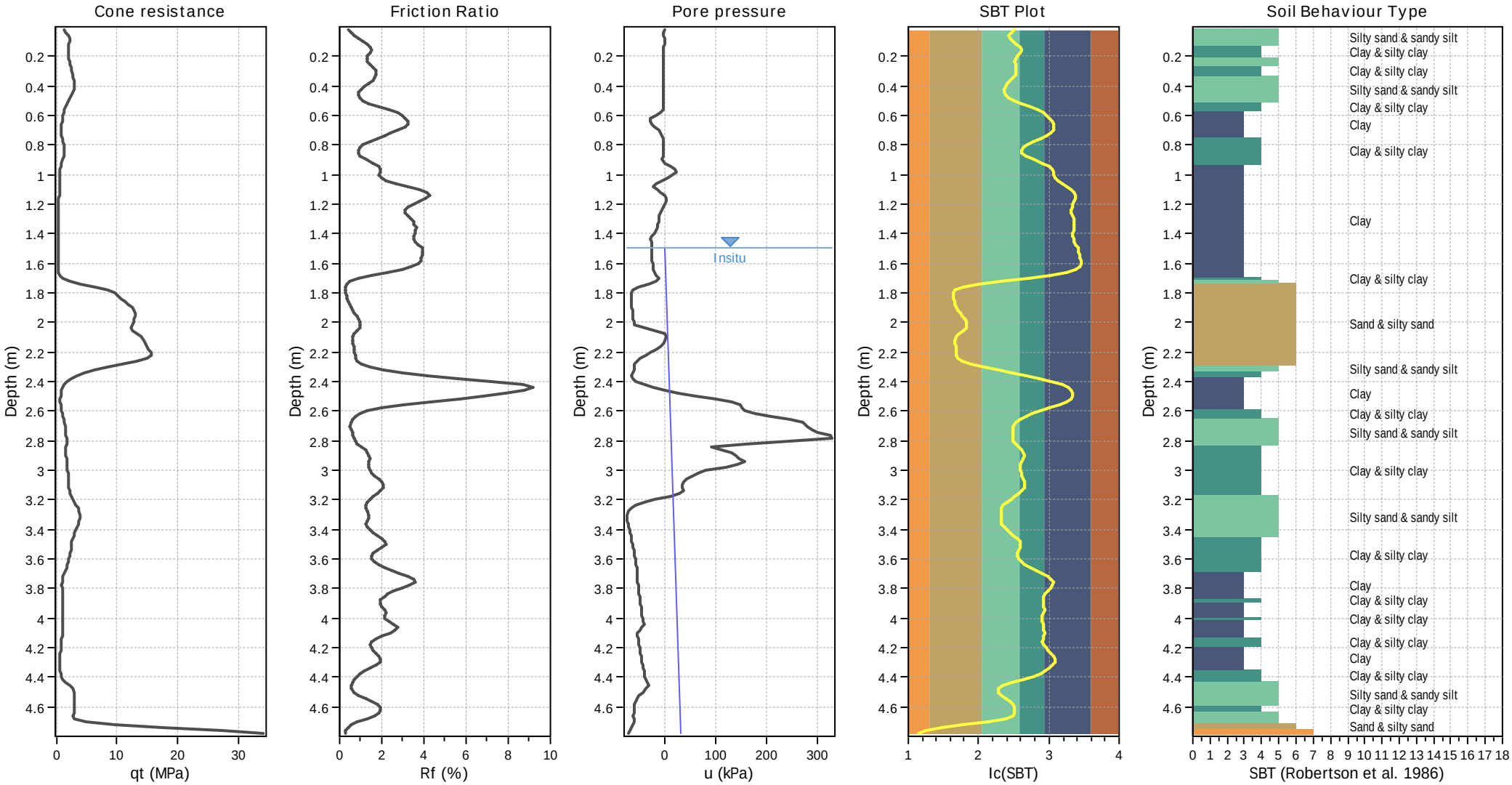
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CPT basic interpretation plots



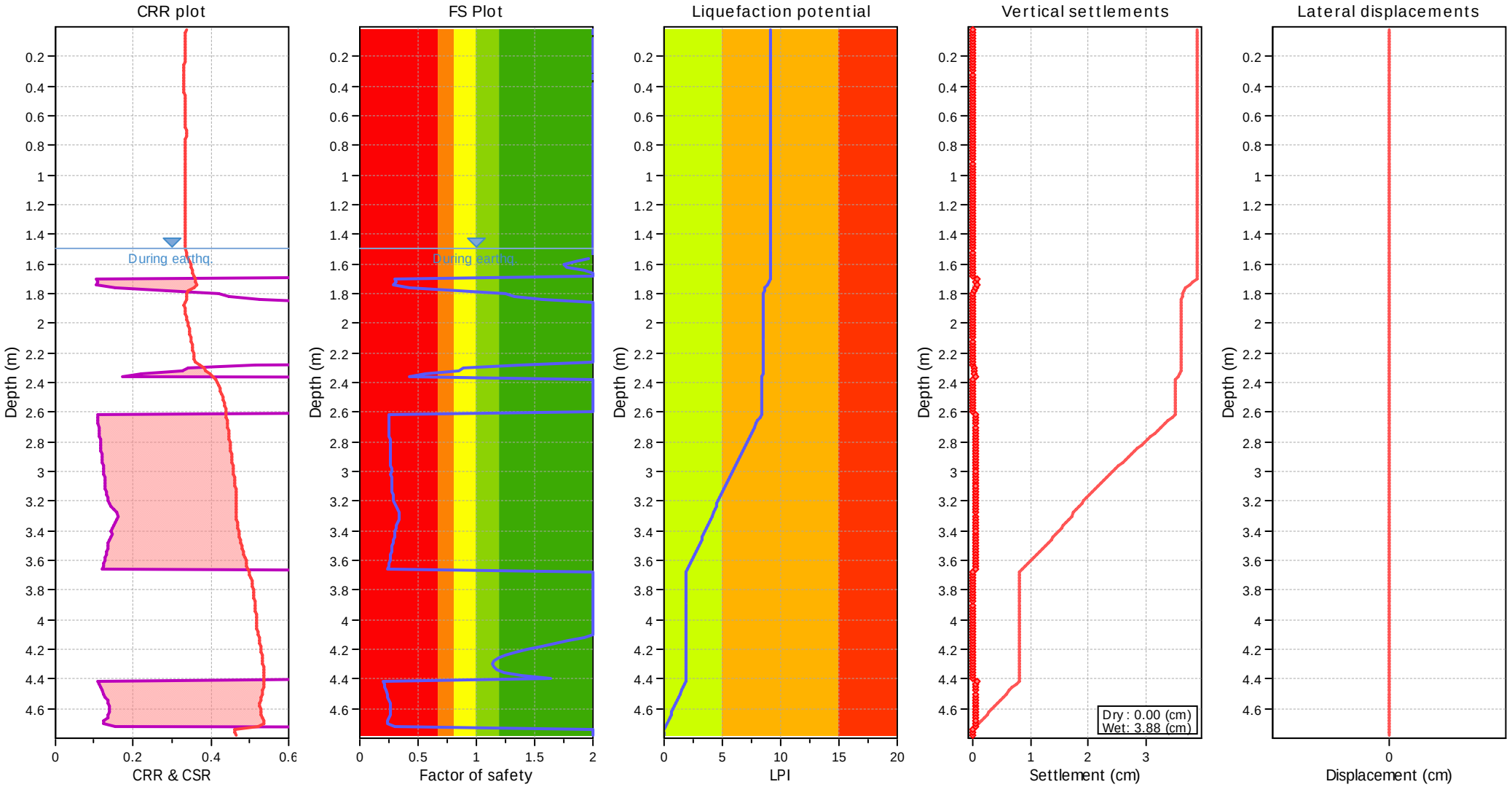
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Liquefaction analysis overall plots



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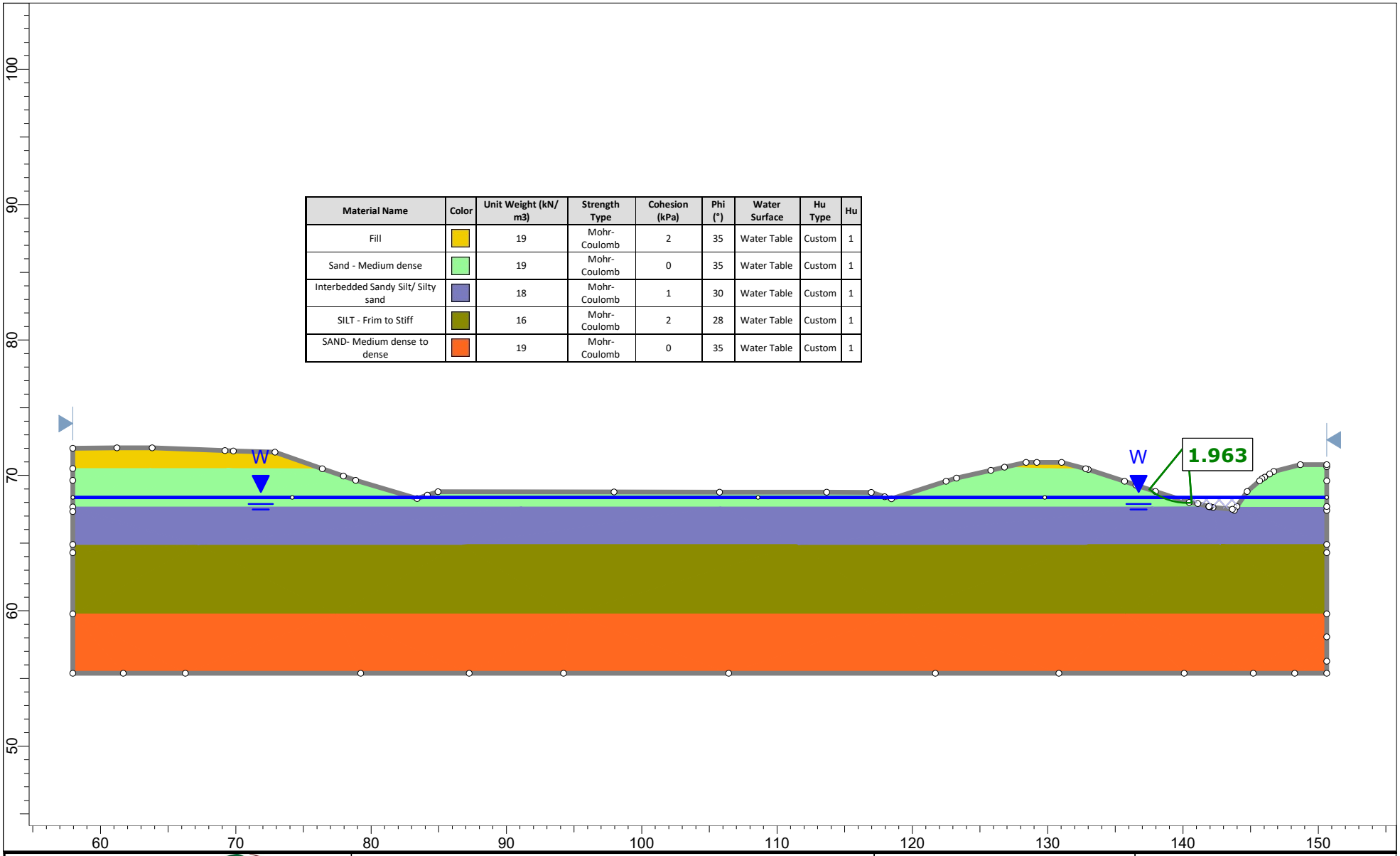
LPI color scheme

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APPENDIX G
Slope Stability Analysis

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Fill		19	Mohr-Coulomb	2	35	Water Table	Custom	1
Sand - Medium dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1
Interbedded Sandy Silt/ Silty sand		18	Mohr-Coulomb	1	30	Water Table	Custom	1
SILT - Frim to Stiff		16	Mohr-Coulomb	2	28	Water Table	Custom	1
SAND- Medium dense to dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1

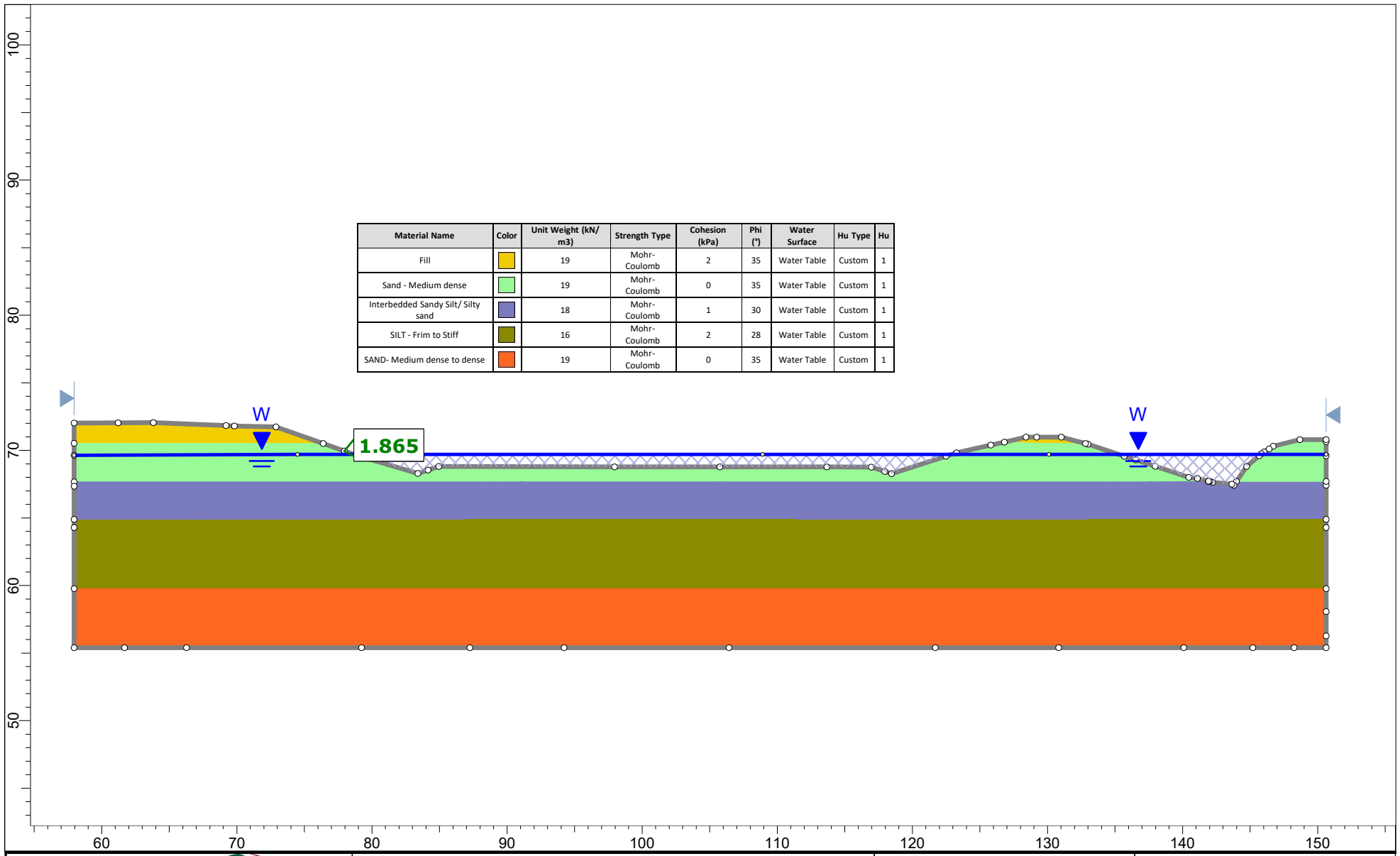


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SLIDEINTERPRET 9.044

CLIENT: CDL Land Ltd.		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: NAP2025-0024 - Middle Road Subdivision		CHECKED: XX	DRAWING: XX
		REVISION: 0	SCALE: 1:397
TITLE: Section A		DATE: 11/08/2026	SHEET: A4 L

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Fill		19	Mohr-Coulomb	2	35	Water Table	Custom	1
Sand - Medium dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1
Interbedded Sandy Silt/ Silty sand		18	Mohr-Coulomb	1	30	Water Table	Custom	1
SILT - Frim to Stiff		16	Mohr-Coulomb	2	28	Water Table	Custom	1
SAND- Medium dense to dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1

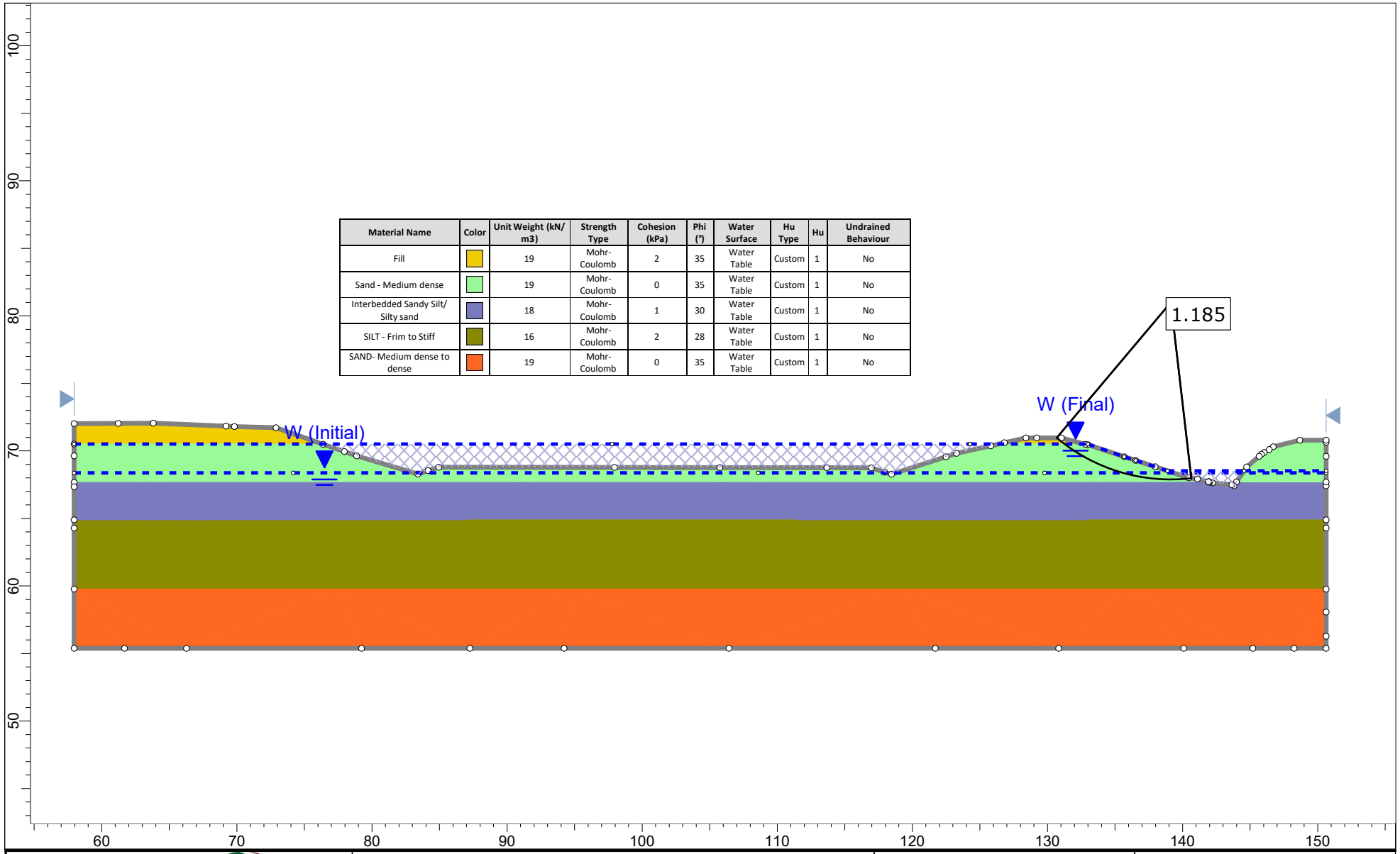


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SLIDEINTERPRET 9.044

CLIENT: **CDL Land Ltd.**		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: **NAP2025-0024 - Middle Road Subdivision**		CHECKED: XX	DRAWING: XX
		REVISION: 0	SCALE: 1:397
TITLE: **Section A**		DATE: 11/08/2026	SHEET: A4 L

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu	Undrained Behaviour
Fill		19	Mohr-Coulomb	2	35	Water Table	Custom	1	No
Sand - Medium dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1	No
Interbedded Sandy Silt/ Silty sand		18	Mohr-Coulomb	1	30	Water Table	Custom	1	No
SILT - Frim to Stiff		16	Mohr-Coulomb	2	28	Water Table	Custom	1	No
SAND- Medium dense to dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1	No

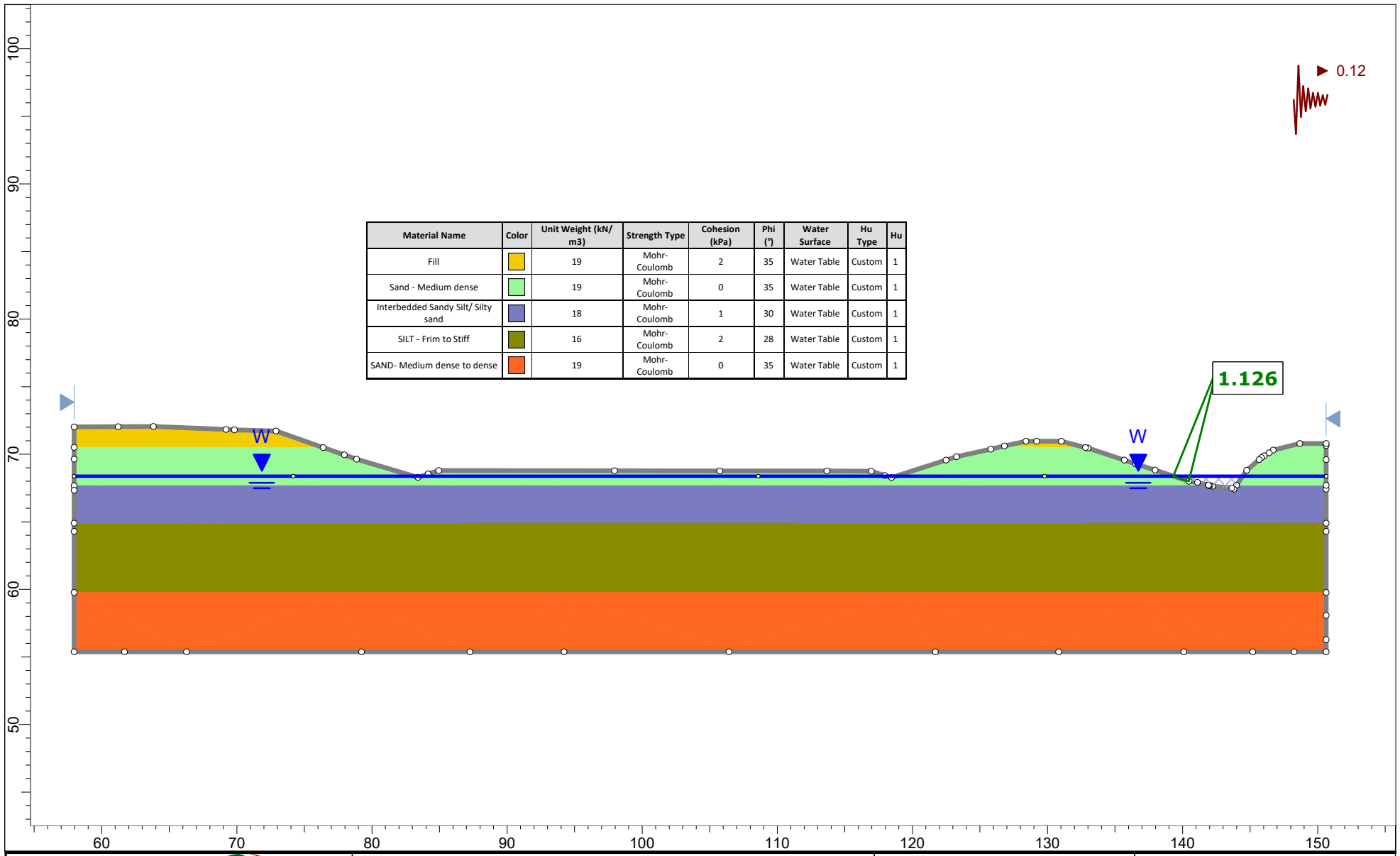


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CLIENT: CDL Land Ltd.		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: NAP2025-0024 - Middle Road Subdivision		CHECKED: XX	DRAWING: XX
		REVISION: 0	SCALE: 1:397
TITLE: Section A		DATE: 11/08/2026	SHEET: A4 L

SLIDEINTERPRET 9.014

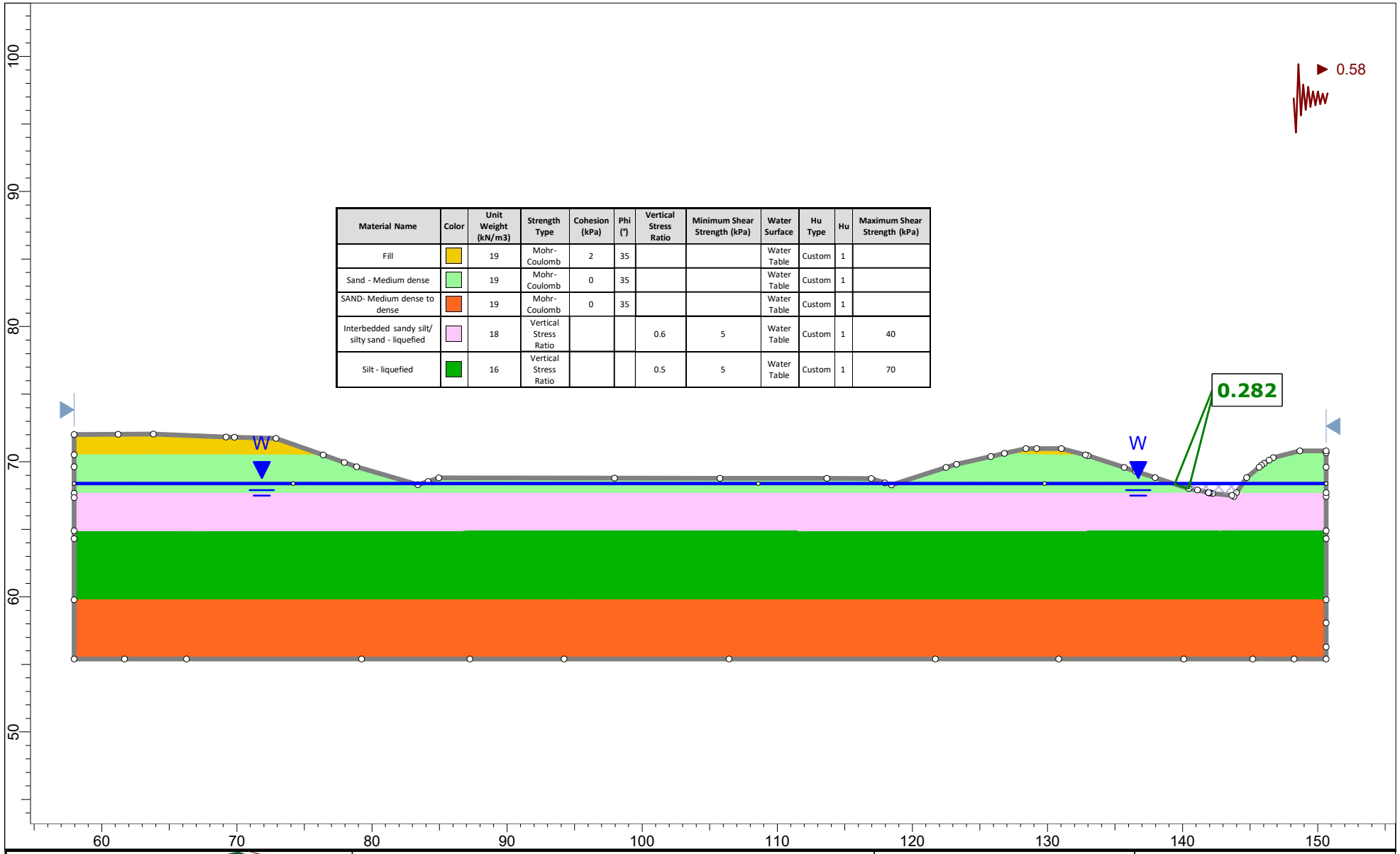
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Fill		19	Mohr-Coulomb	2	35	Water Table	Custom	1
Sand - Medium dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1
Interbedded Sandy Silt/ Silty sand		18	Mohr-Coulomb	1	30	Water Table	Custom	1
SILT - Frim to Stiff		16	Mohr-Coulomb	2	28	Water Table	Custom	1
SAND- Medium dense to dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1



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SLIDEINTERPRET 9.044

CLIENT: CDL Land Ltd.		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: NAP2025-0024 - Middle Road Subdivision		CHECKED: XX	DRAWING: XX
		REVISION: 0	SCALE: 1:397
TITLE: Section A		DATE: 11/08/2026	SHEET: A4 L



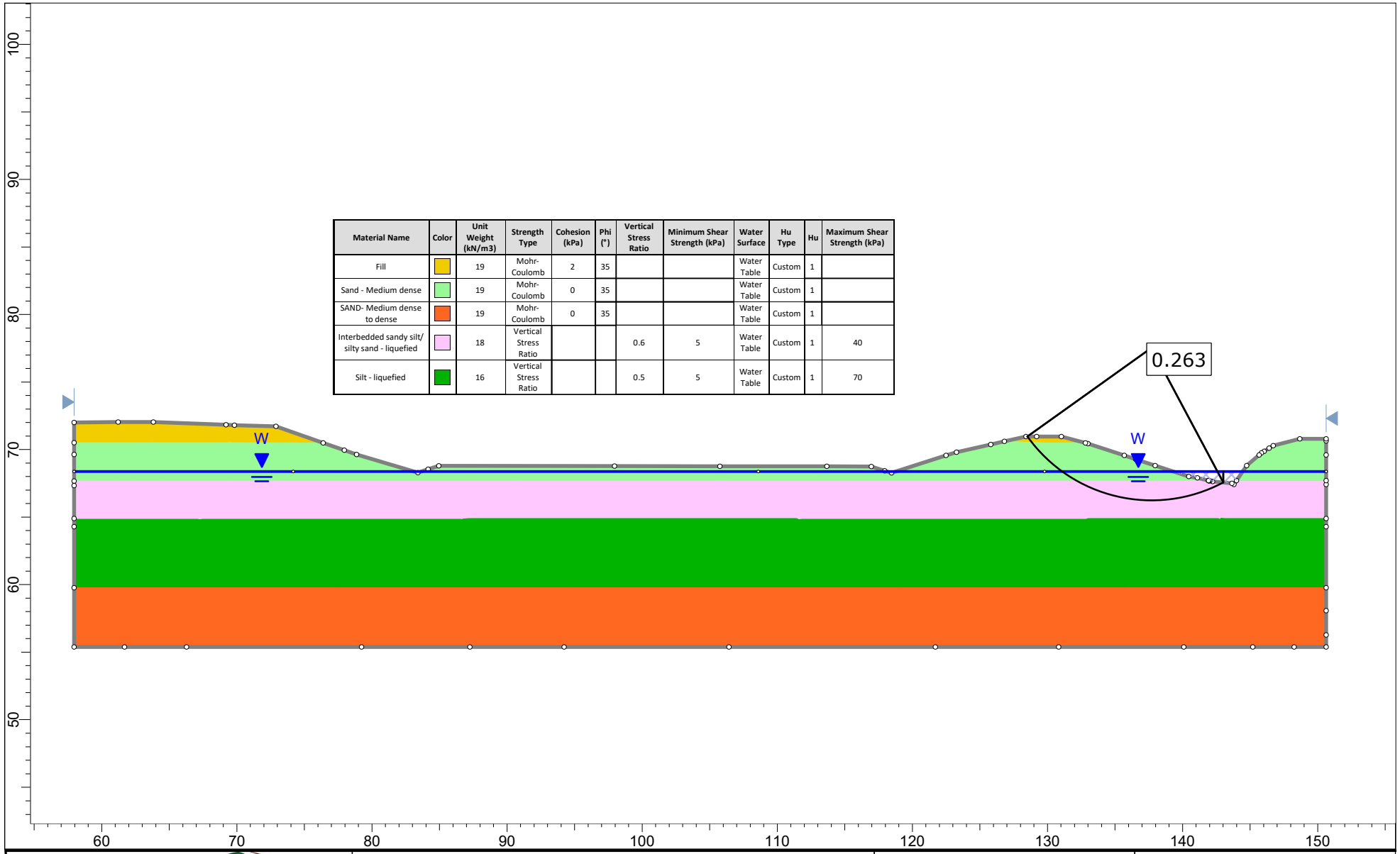
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Vertical Stress Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu Type	Hu	Maximum Shear Strength (kPa)
Fill		19	Mohr-Coulomb	2	35			Water Table	Custom	1	
Sand - Medium dense		19	Mohr-Coulomb	0	35			Water Table	Custom	1	
SAND- Medium dense to dense		19	Mohr-Coulomb	0	35			Water Table	Custom	1	
Interbedded sandy silt/ silty sand - liquefied		18	Vertical Stress Ratio			0.6	5	Water Table	Custom	1	40
Silt - liquefied		16	Vertical Stress Ratio			0.5	5	Water Table	Custom	1	70

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SLIDEINTERPRET 9.044

CLIENT: **CDL Land Ltd.**		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: **NAP2025-0024 - Middle Road Subdivision**		CHECKED: XX	DRAWING: XX
		REVISION: 0	SCALE: 1:397
TITLE: **Section A**		DATE: 11/08/2026	SHEET: A4 L

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Vertical Stress Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu Type	Hu	Maximum Shear Strength (kPa)
Fill		19	Mohr-Coulomb	2	35			Water Table	Custom	1	
Sand - Medium dense		19	Mohr-Coulomb	0	35			Water Table	Custom	1	
SAND- Medium dense to dense		19	Mohr-Coulomb	0	35			Water Table	Custom	1	
Interbedded sandy silt/ silty sand - liquefied		18	Vertical Stress Ratio			0.6	5	Water Table	Custom	1	40
Silt - liquefied		16	Vertical Stress Ratio			0.5	5	Water Table	Custom	1	70



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SLIDEINTERPRET 9.044

CLIENT: **CDL Land Ltd.**		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: **NAP2025-0024 - Middle Road Subdivision**		CHECKED: XX	DRAWING: XX
		REVISION: 0	SCALE: 1:397
TITLE: **Section A**		DATE: 11/08/2026	SHEET: A4 L

CMW Geosciences Great People | Practical Solutions	CLIENT: CDL Land Ltd	DESIGNER:	IA
	PROJECT: Middle Road Subdivision - Section A	CHECKED:	TB
		REVISION:	8
	TITLE: COSEISMIC DISPLACEMENTS - FLEXIBLE SLIDING MASS	DATE:	28/07/2026
		PROJECT:	20XX-XXXX

WHEN TO USE THIS SHEET:
Use this sheet when calculating the coseismic displacements of a block assuming a flexible sliding mass mechanism.

1. CALCULATE THE PERIOD OF THE SLIDING MASS (T_s)

1D or 2D?	1D		*Generally 1D, but see guidance tab for details*
H	3.6	m	*Maximum height of the sliding mass, measured from within the sliding mass*
V_s	225	m/s	*Average shear wave velocity of the sliding mass*
T_s	0.0640	s	

2. SEISMIC PARAMETERS

Case	Ordinary Ground Motions		*Only applicable to Bray and Macedo (2019). Almost always ordinary ground motions, see guidance tab re pulses*
Yield Coefficient (a_c)	0.262	g	
Magnitude (M_w)	7.1		
PGA	0.58	g	
PGA	0.58	g	
$S_a(1.3T_s)$	1.04	g	*Required for Bray (2019) and Macedo (2023)*
$S_a(1.5T_s)$	1.04	g	*Required for Bray (2007)*
PGV	60.99	cm/s	*Required for Rathje & Antonakos (2011) and Bray (2019) pulses.*
T_m	0.53		*Only required for Rathje & Antonakos (2011)*
CALS?	☐		*Multiplies $S_a(1.3T_s)$, $S_a(1.5T_s)$ and PGA by 1.5, in accordance with BM v3.4*

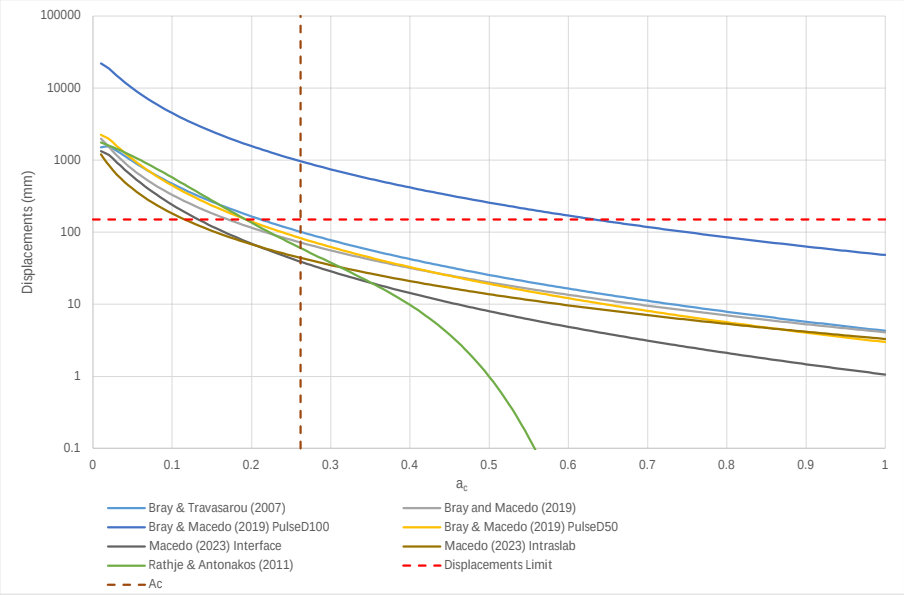
Seismic Demand Parameters:
Hastings
Class D
1/500

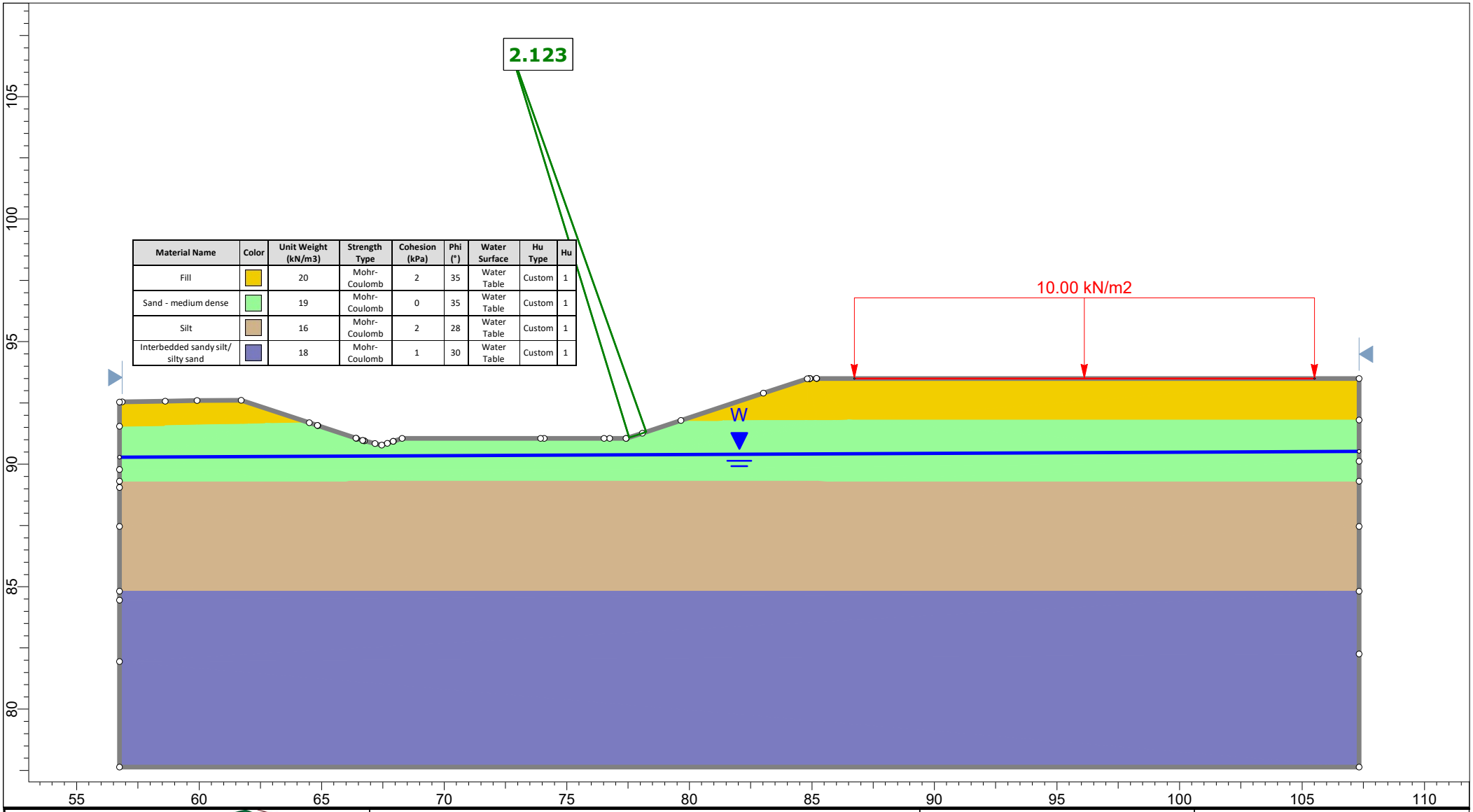
3. RESULTS

Probability of Exceedence:	Bray & Travasarou (2007)	Rathje & Antonakos (2011)	Bray and Macedo (2019)	Macedo et al. (2023)	Macedo et al. (2023)
Probability of Negligible Displacement	0%		6%	3%	3%
50%	101 mm	60 mm	68 mm	39 mm	44 mm
16%	194 mm	102 mm	143 mm	83 mm	82 mm
5%	299 mm	143 mm	230 mm	136 mm	123 mm
2.5%	368 mm	169 mm	289 mm	173 mm	150 mm
0.5%	552 mm	234 mm	452 mm	275 mm	220 mm
Applicable Seismic Source	*Shallow Crustal*	*Shallow Crustal*	*Shallow Crustal*	*Subduction Interface*	*Subduction Intraslab*

4. CHART OPTIONS

Displacements Limit	150





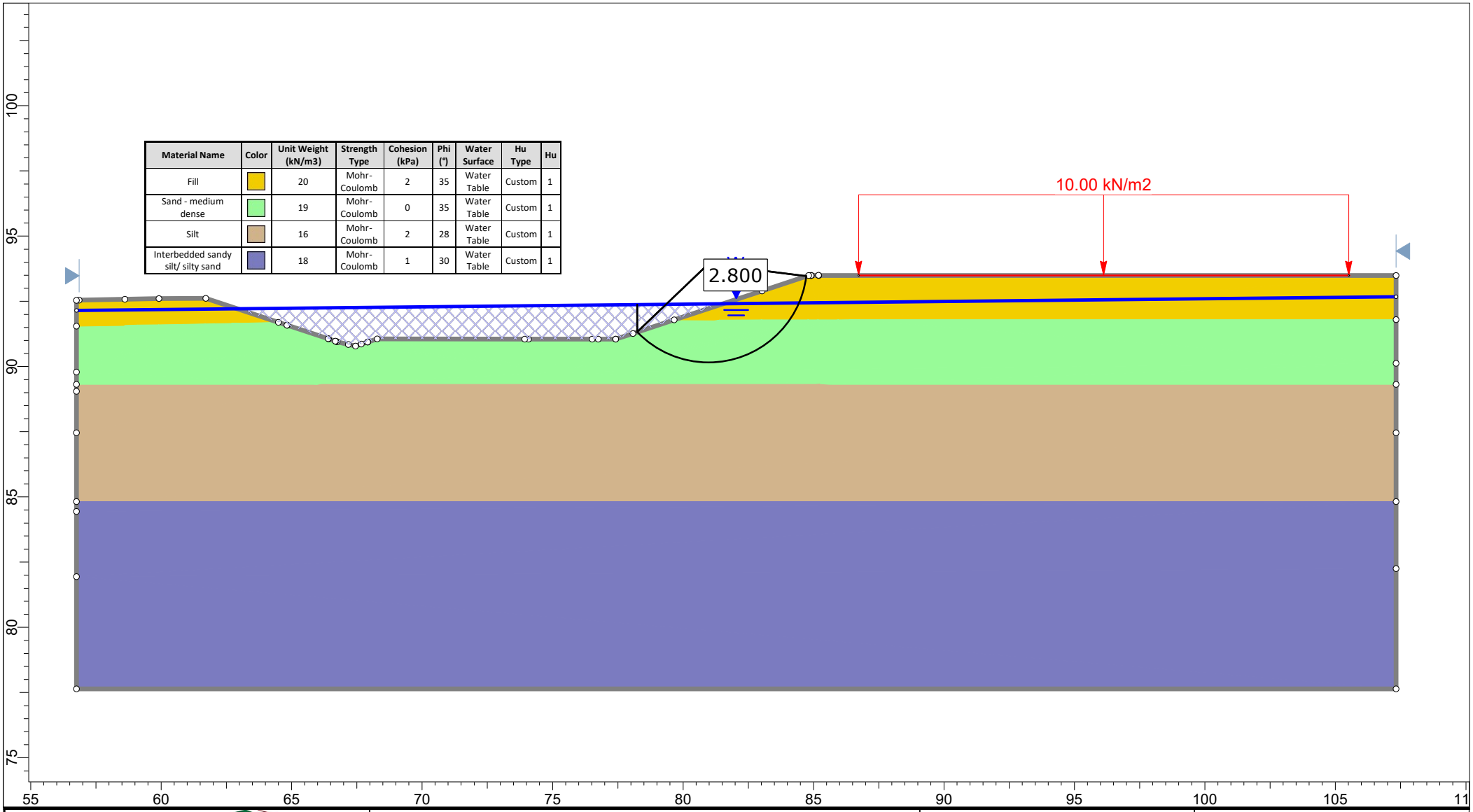
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Fill		20	Mohr-Coulomb	2	35	Water Table	Custom	1
Sand - medium dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1
Silt		16	Mohr-Coulomb	2	28	Water Table	Custom	1
Interbedded sandy silt/ silty sand		18	Mohr-Coulomb	1	30	Water Table	Custom	1

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CLIENT: **CDL Land Ltd**	DRAWN: IA	PROJECT: NAP2025-0024	
PROJECT: **NAP2025-0024 - Middle Road Subdivision**	CHECKED:	DRAWING: XX	
	REVISION: 0	SCALE: 1:216	
TITLE: **Section B**	DATE: 11/08/2026	SHEET: A4 L	

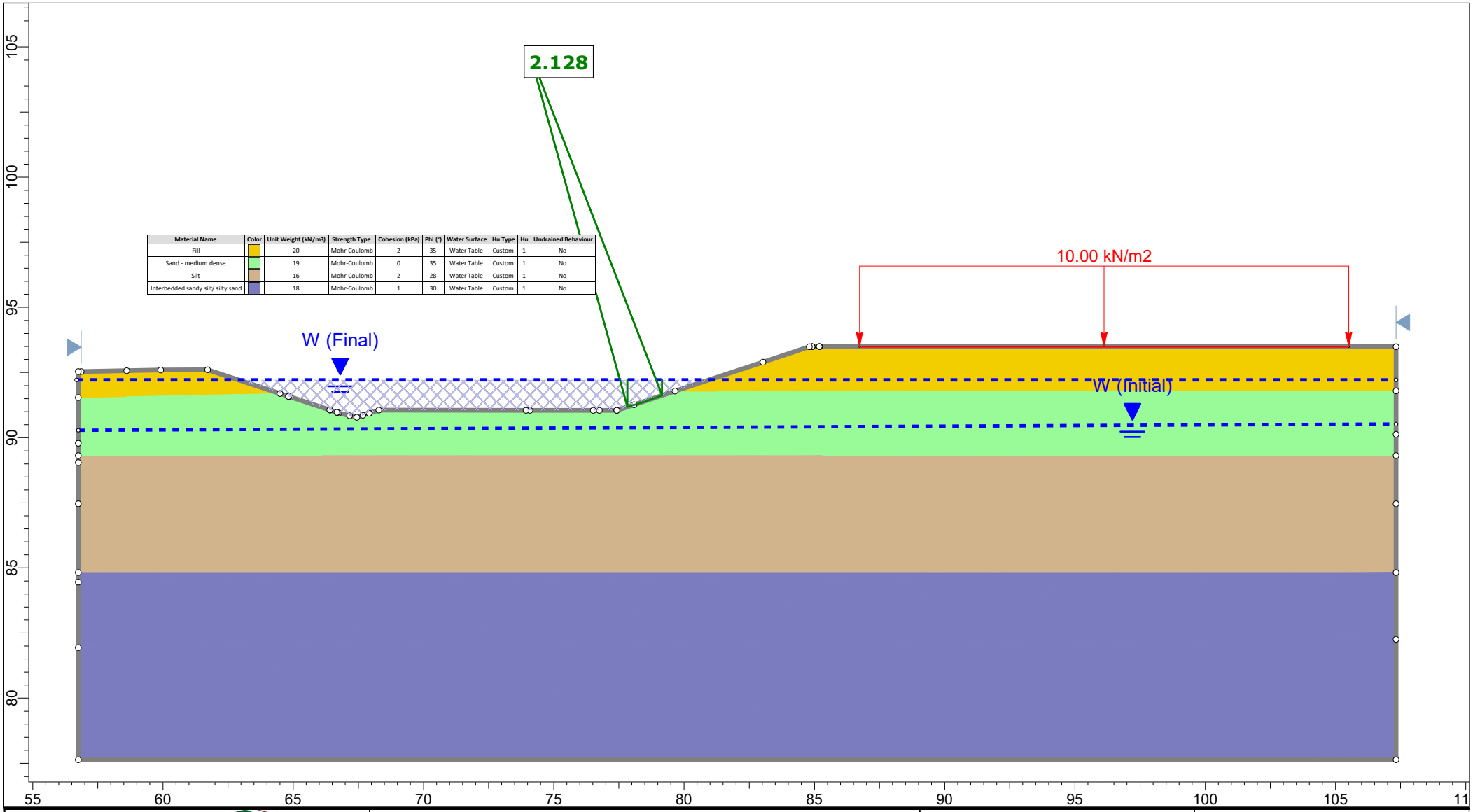
Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Hu Type	Hu
Fill		20	Mohr-Coulomb	2	35	Water Table	Custom	1
Sand - medium dense		19	Mohr-Coulomb	0	35	Water Table	Custom	1
Silt		16	Mohr-Coulomb	2	28	Water Table	Custom	1
Interbedded sandy silt/ silty sand		18	Mohr-Coulomb	1	30	Water Table	Custom	1



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CLIENT: **CDL Land Ltd**	DRAWN: IA	PROJECT: NAP2025-0024	
PROJECT: **NAP2025-0024 - Middle Road Subdivision**	CHECKED:	DRAWING: XX	
	REVISION: 0	SCALE: 1:203	
TITLE: **Section B**	DATE: 11/08/2026	SHEET: A4 L	

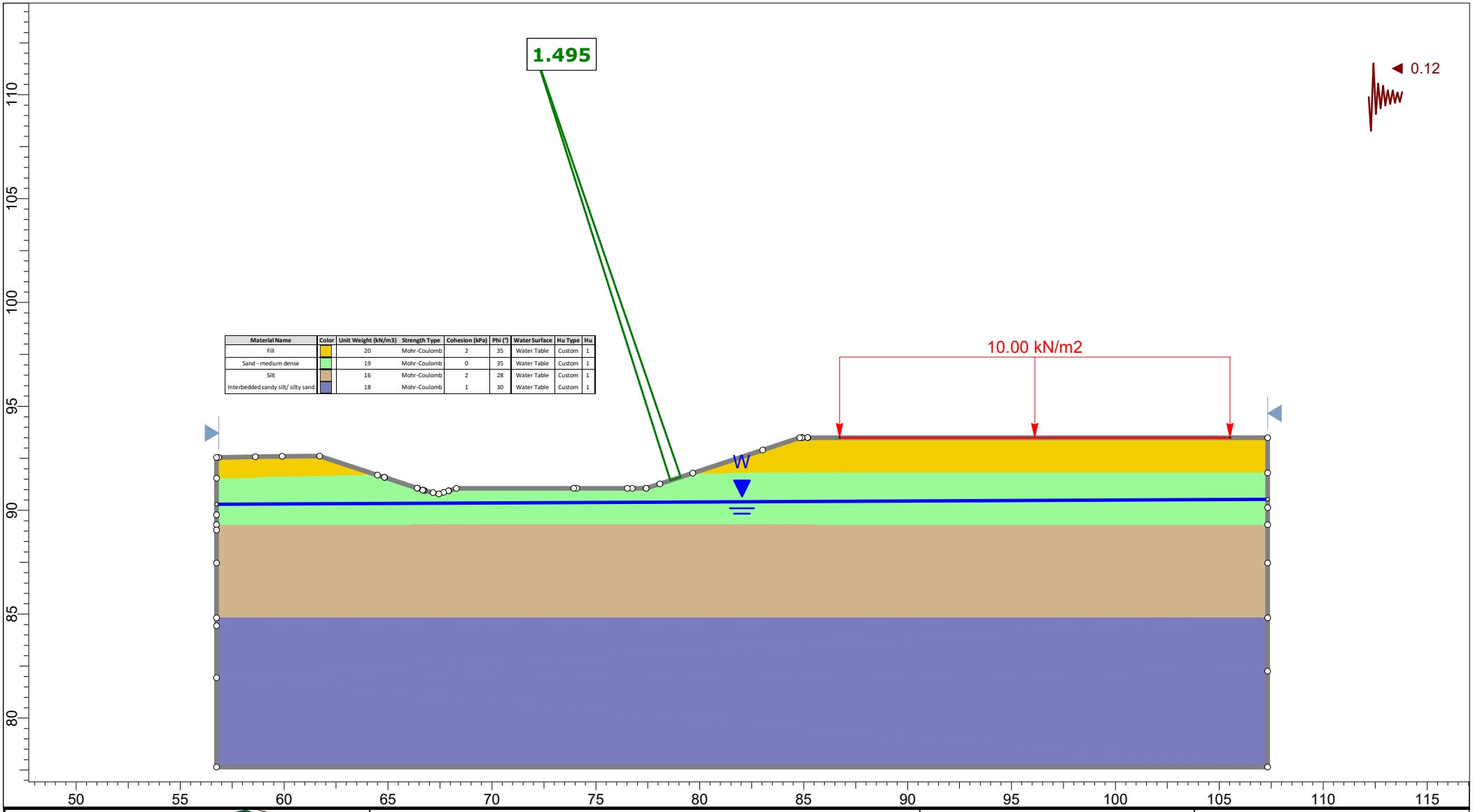
SLIDEINTERPRET 9.044



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SLIDEINTERPRET 9.044

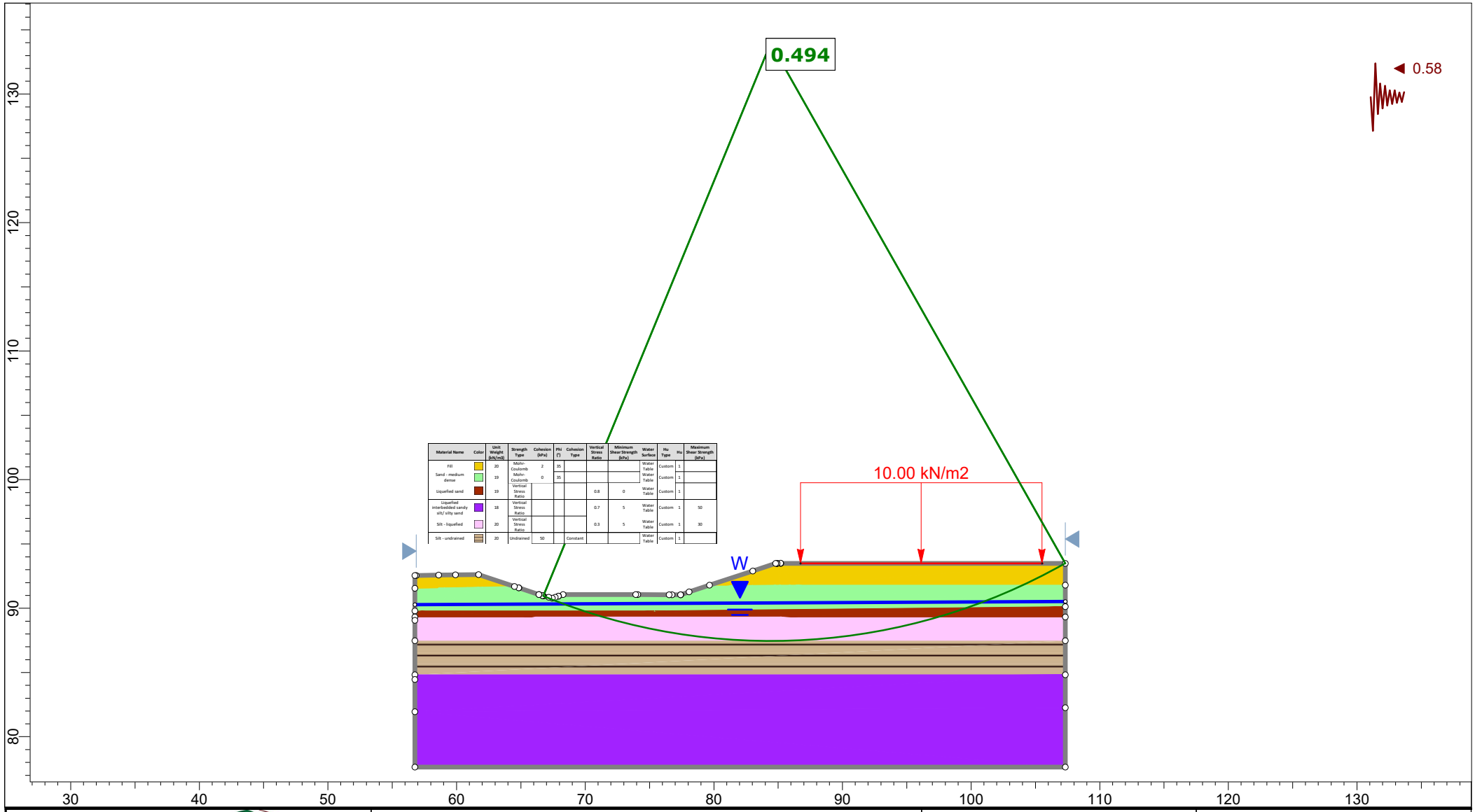
CLIENT: **CDL Land Ltd**	DRAWN: IA	PROJECT: NAP2025-0024	
PROJECT: **NAP2025-0024 - Middle Road Subdivision**	CHECKED:	DRAWING: XX	
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TITLE: **Section B**	DATE: 11/08/2026	SHEET: A4 L	



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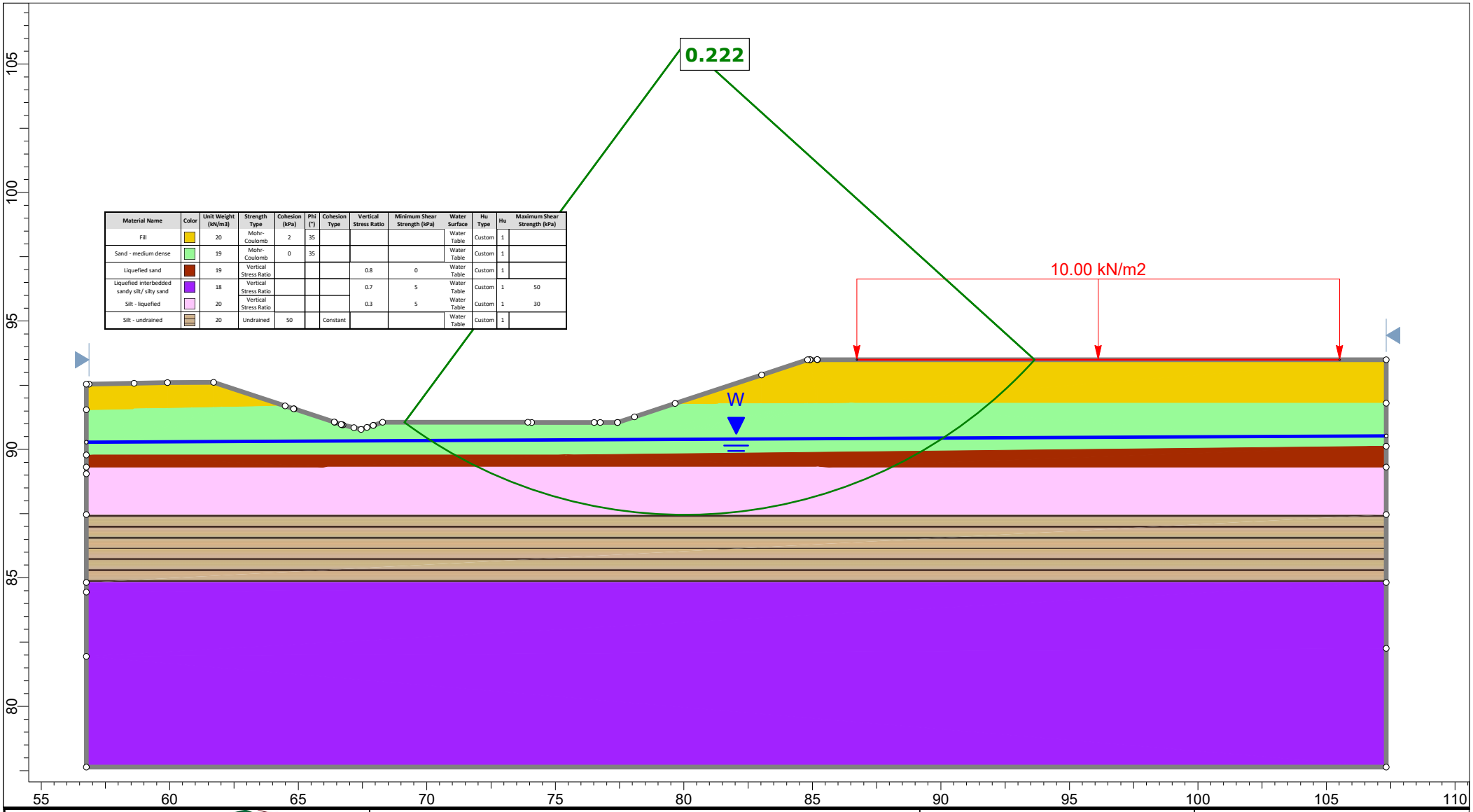
SLIDEINTERPRET 9.044

CLIENT: **CDL Land Ltd**	DRAWN: IA	PROJECT: NAP2025-0024	
PROJECT: **NAP2025-0024 - Middle Road Subdivision**	CHECKED:	DRAWING: XX	
	REVISION: 0	SCALE: 1:255	
TITLE: **Section B**	DATE: 11/08/2026	SHEET: A4 L	



CMW Geosciences Great People | Practical Solutions	CLIENT: **CDL Land Ltd**	DRAWN: IA	PROJECT: NAP2025-0024
	PROJECT: **NAP2025-0024 - Middle Road Subdivision**	CHECKED:	DRAWING: XX
		REVISION: 0	SCALE: 1:412
	TITLE: **Section B**	DATE: 11/08/2026	SHEET: A4 L

SLIDEINTERPRET 9.044



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Cohesion Type	Vertical Stress Ratio	Minimum Shear Strength (kPa)	Water Surface	Hu Type	Hu	Maximum Shear Strength (kPa)
Fill		20	Mohr-Coulomb	2	35				Water Table	Custom	1	
Sand - medium dense		19	Mohr-Coulomb	0	35				Water Table	Custom	1	
Liquefied sand		19	Vertical Stress Ratio				0.8	0	Water Table	Custom	1	
Liquefied interbedded sandy silt/ silty sand		18	Vertical Stress Ratio				0.7	5	Water Table	Custom	1	50
Silt - liquefied		20	Vertical Stress Ratio				0.3	5	Water Table	Custom	1	30
Silt - undrained		20	Undrained	50		Constant			Water Table	Custom	1	

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SLIDEINTERPRET 9.044

CLIENT: **CDL Land Ltd**		DRAWN: IA	PROJECT: NAP2025-0024
PROJECT: **NAP2025-0024 - Middle Road Subdivision**		CHECKED:	DRAWING: XX
		REVISION: 0	SCALE: 1:206
TITLE: **Section B**		DATE: 11/08/2026	SHEET: A4 L

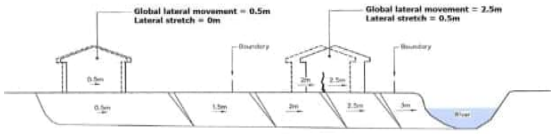
CMW Geosciences Great People | Practical Solutions	CLIENT:	CDL Land Ltd	DESIGNER: IA
	PROJECT:	Middle Road Subdivision - Section B	CHECKED: TB
			REVISION: 8
	TITLE:	COSEISMIC LATERAL STRETCH - FLEXIBLE SLIDING MASS	DATE: 28/07/2026
			PROJECT: NAP2025-0024

WHEN TO USE THIS SHEET:
Use this sheet when calculating the coseismic stretch across a sliding mass using liquefied strengths. Assumes a flexible sliding mass.

1. CALCULATE THE PERIOD OF THE SLIDING MASS (T_s)

1D or 2D?	1D		*Generally 1D, but see guidance tab for details*
H	2.4	m	*Maximum height of the sliding mass, measured from within the sliding mass*
V_s	225	m/s	*Average shear wave velocity of the sliding mass*
T_s	0.0427	s	

Figure 12.1: Simplified cross-section showing components of lateral ground movement (values illustrative only)



2. SEISMIC PARAMETERS

Magnitude (M_w)	7.1		
PGA	0.58	g	
$S_a(1.3T_s)$	1.05	g	*Required for Bray (2019)*
$S_a(1.5T_s)$	1.05	g	*Required for Bray (2007) and Bray (2018)*
PGV	61		
T_m	0.53		

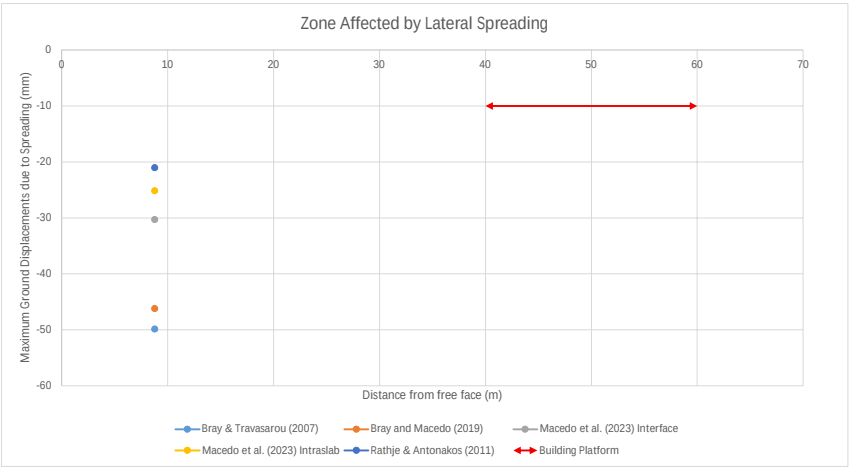
Seismic Demand Parameters:
Hastings
Class D
1/500

3. RESULTS

Distance from Crest of Slope (m):	a_c (liq)	Bray & Travasarou (2007)		Rathje & Antonakos (2011)		Bray and Macedo (2019)		Macedo et al. (2023) Interface		Macedo et al. (2023) Intraslab	
		Displacement (mm)	Stretch (mm)	Displacement (mm)	Stretch (mm)	Displacement (mm)	Stretch (mm)	Displacement (mm)	Stretch (mm)	Displacement (mm)	Stretch (mm)
0	0.28	86		46		72		41		48	
9	0.22	136	-50	99	-53	118	-46	71	-30	73	-25
		<10	#VALUE!	1851	-1751	<5	#VALUE!	<5	#VALUE!	<5	#VALUE!
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		<10	#VALUE!	1851	0	<5	#VALUE!	<5	#VALUE!	<5	#VALUE!
		<10	#VALUE!	1851	0	<5	#VALUE!	<5	#VALUE!	<5	#VALUE!
Seismic Source		*Shallow Crustal*		*Shallow Crustal*		*Shallow Crustal*		*Subduction Interface*		*Subduction Intraslab*	

4. CHART OPTIONS

Building platform edge (closest to slope crest)	40
Building platform edge (furthest from slope crest)	60



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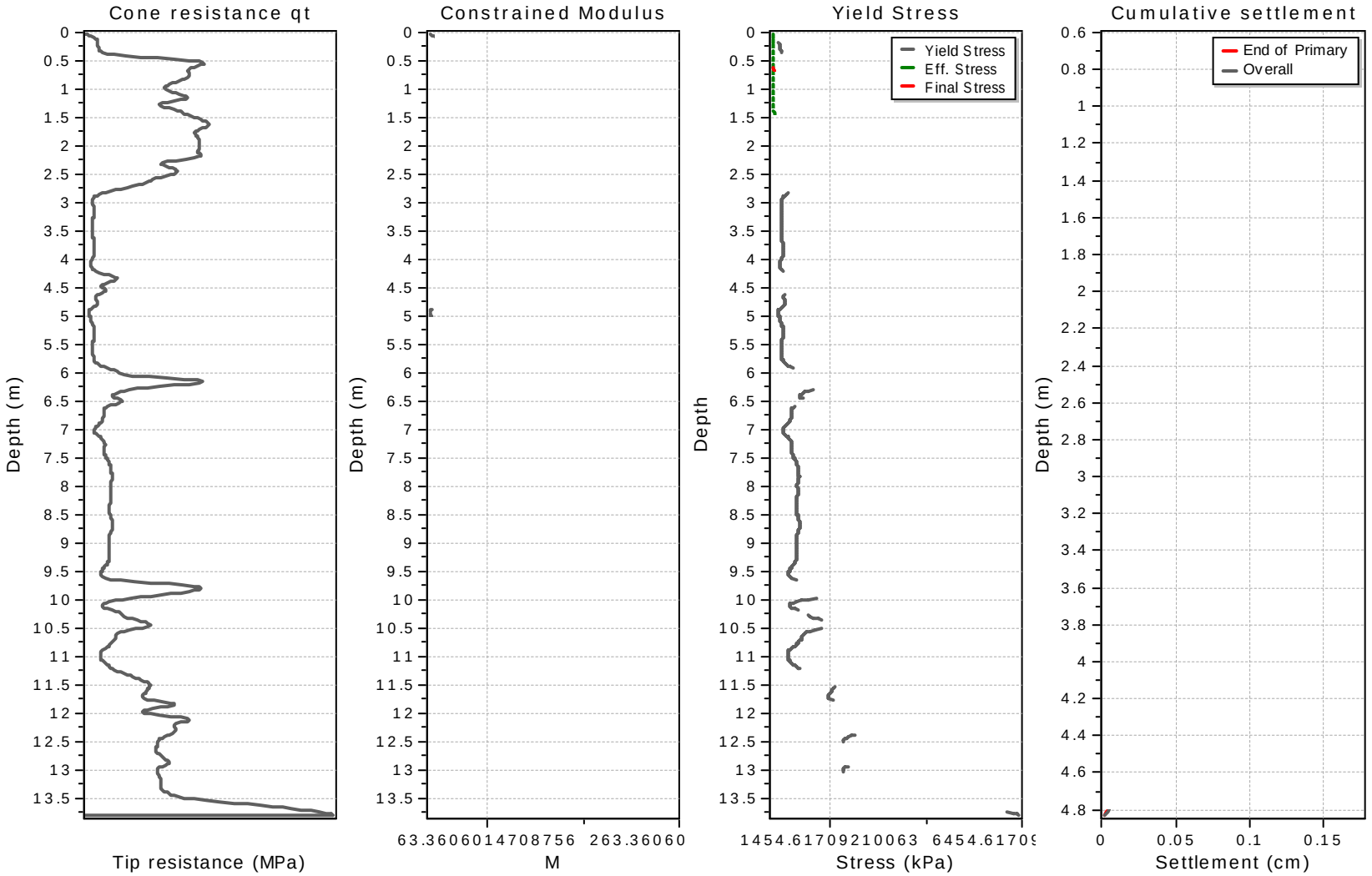
APPENDIX H
Settlement Analysis

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT01, 139 Te Aute Road, Havelo
Total depth: 13.78 m, Date: 16/07/2024
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

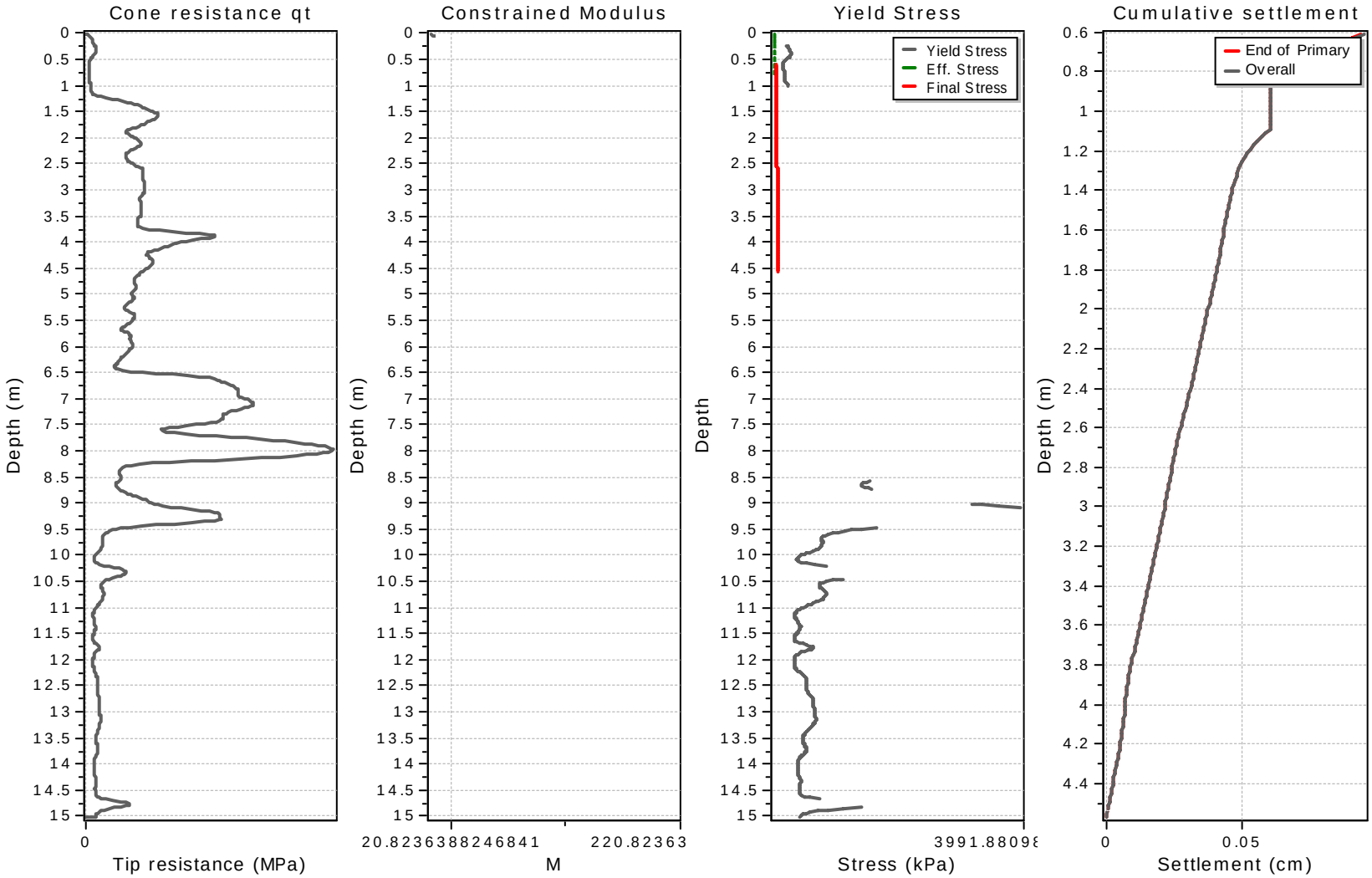
where t_p is the duration of primary consolidation

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

CPT: CPT02, 139 Te Aute Road, Havelo
Total depth: 15.02 m, Date: 16/07/2024
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

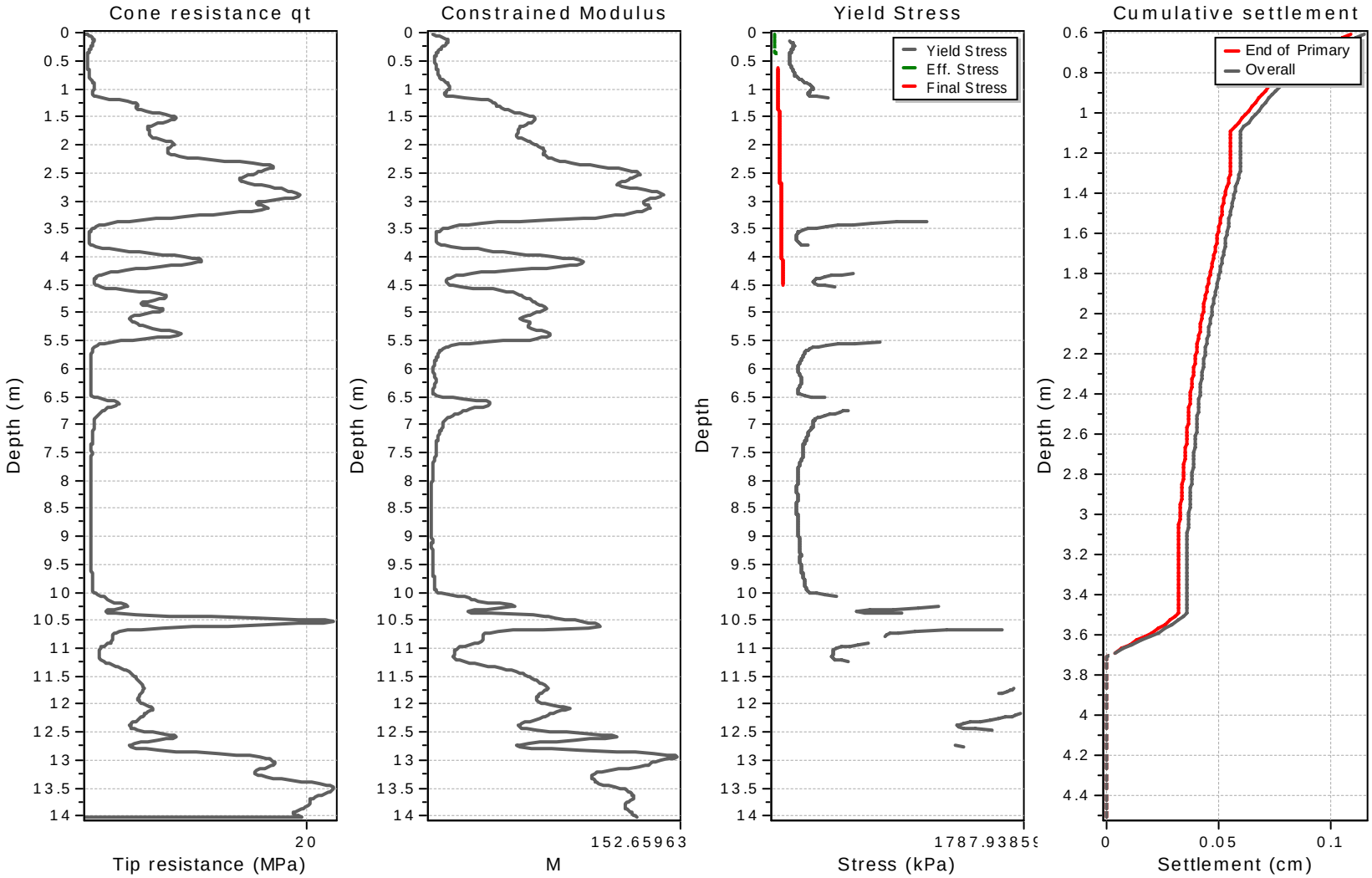
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

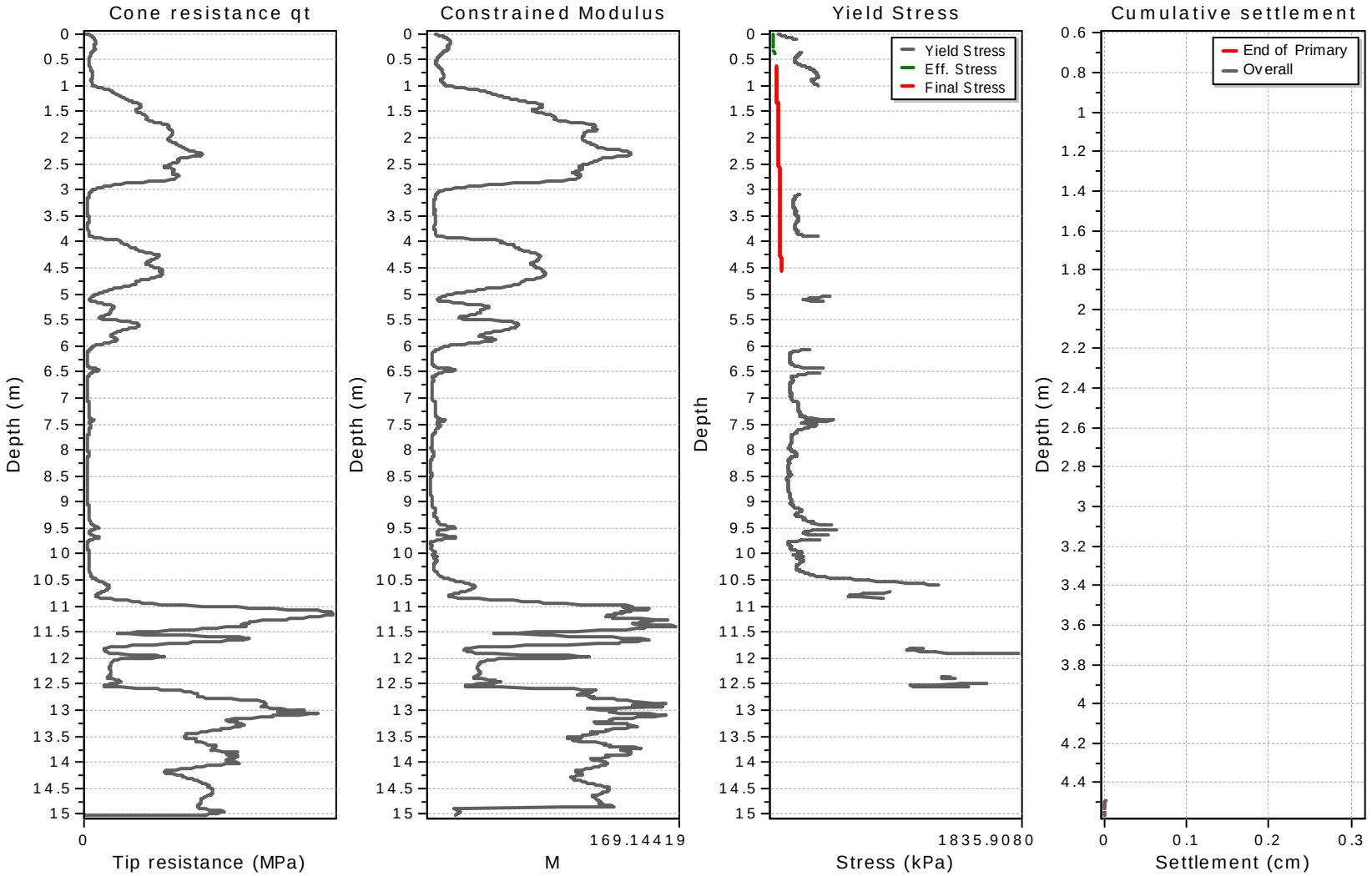
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

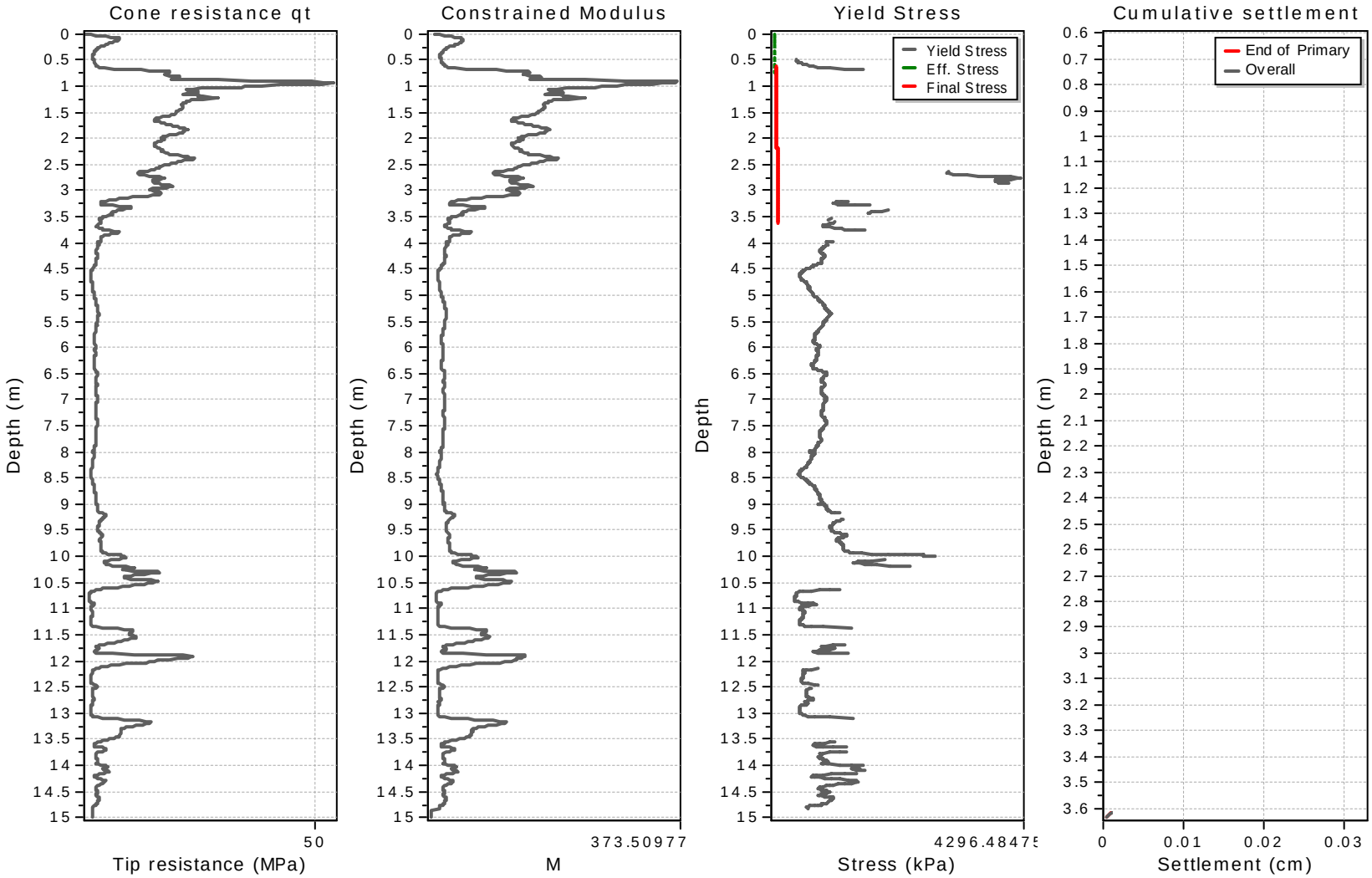
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

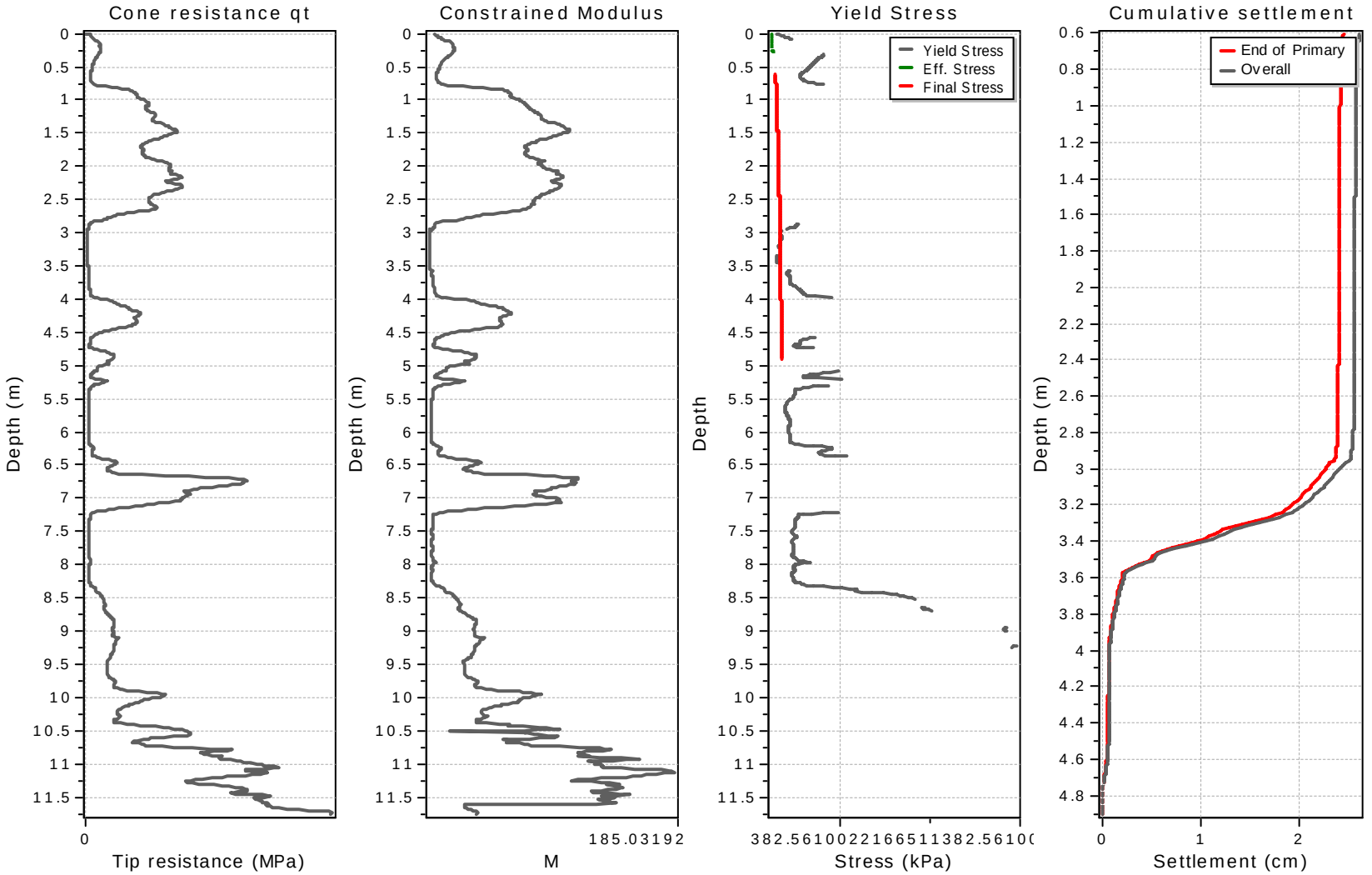
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

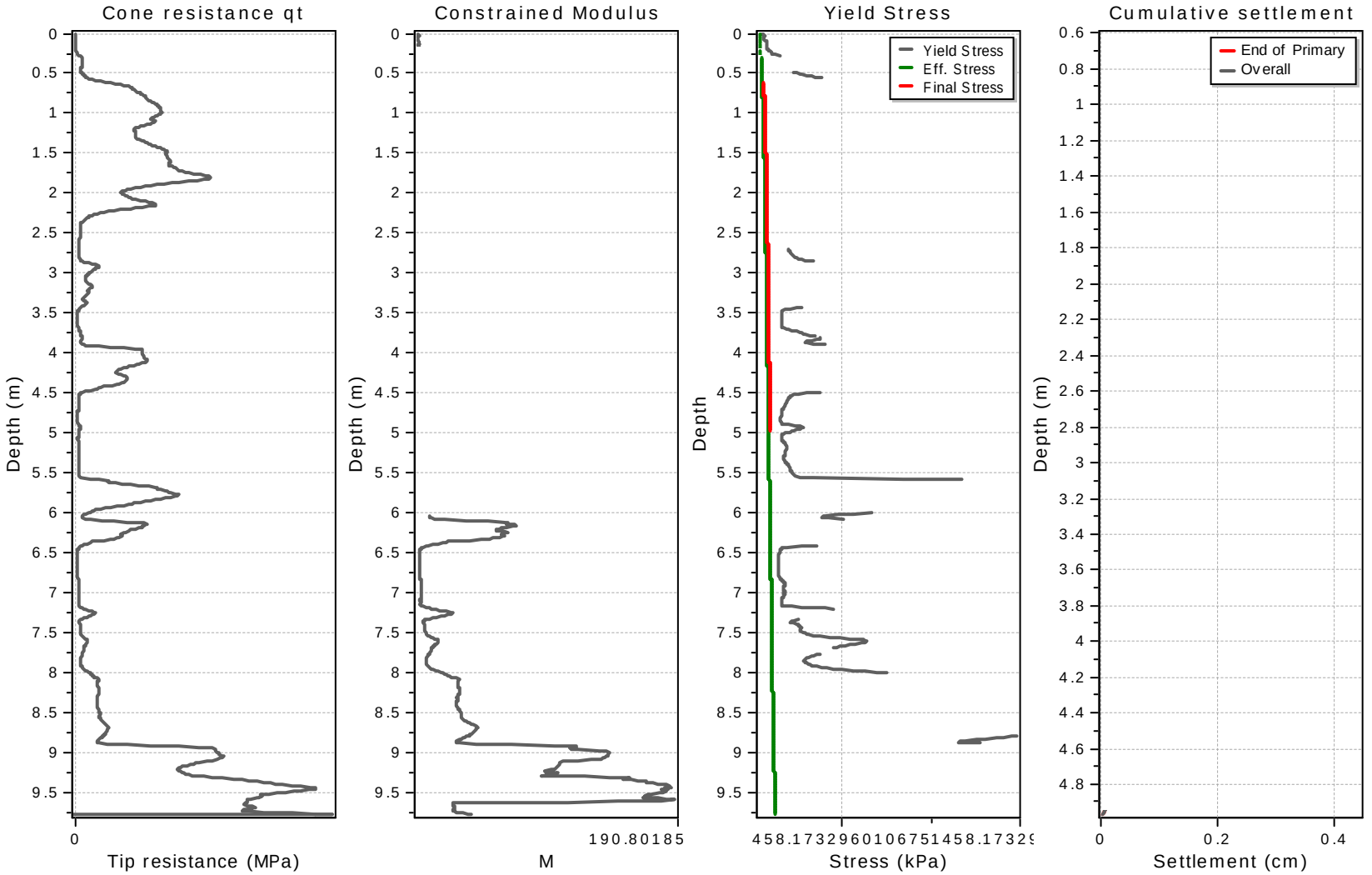
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

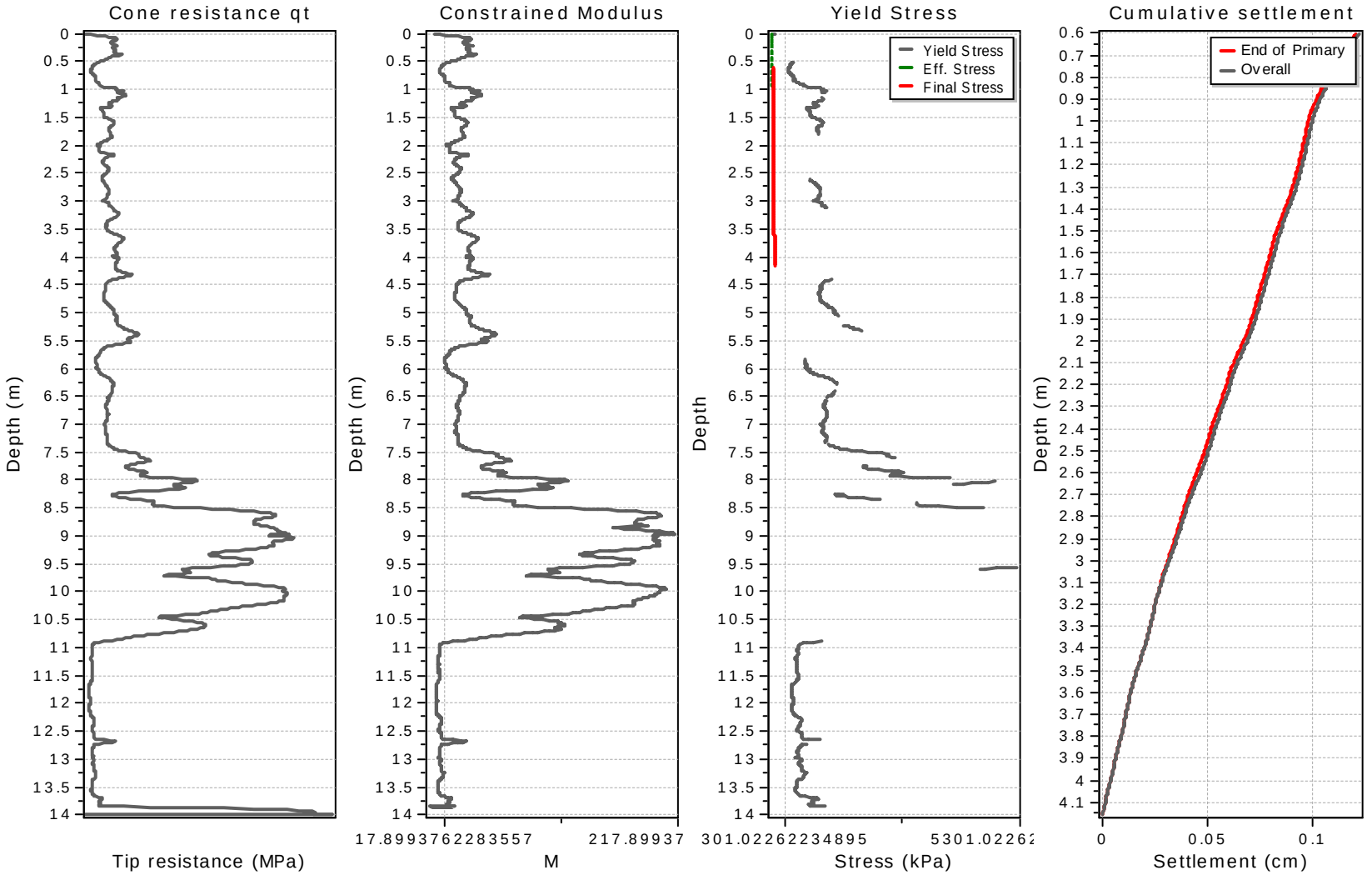
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

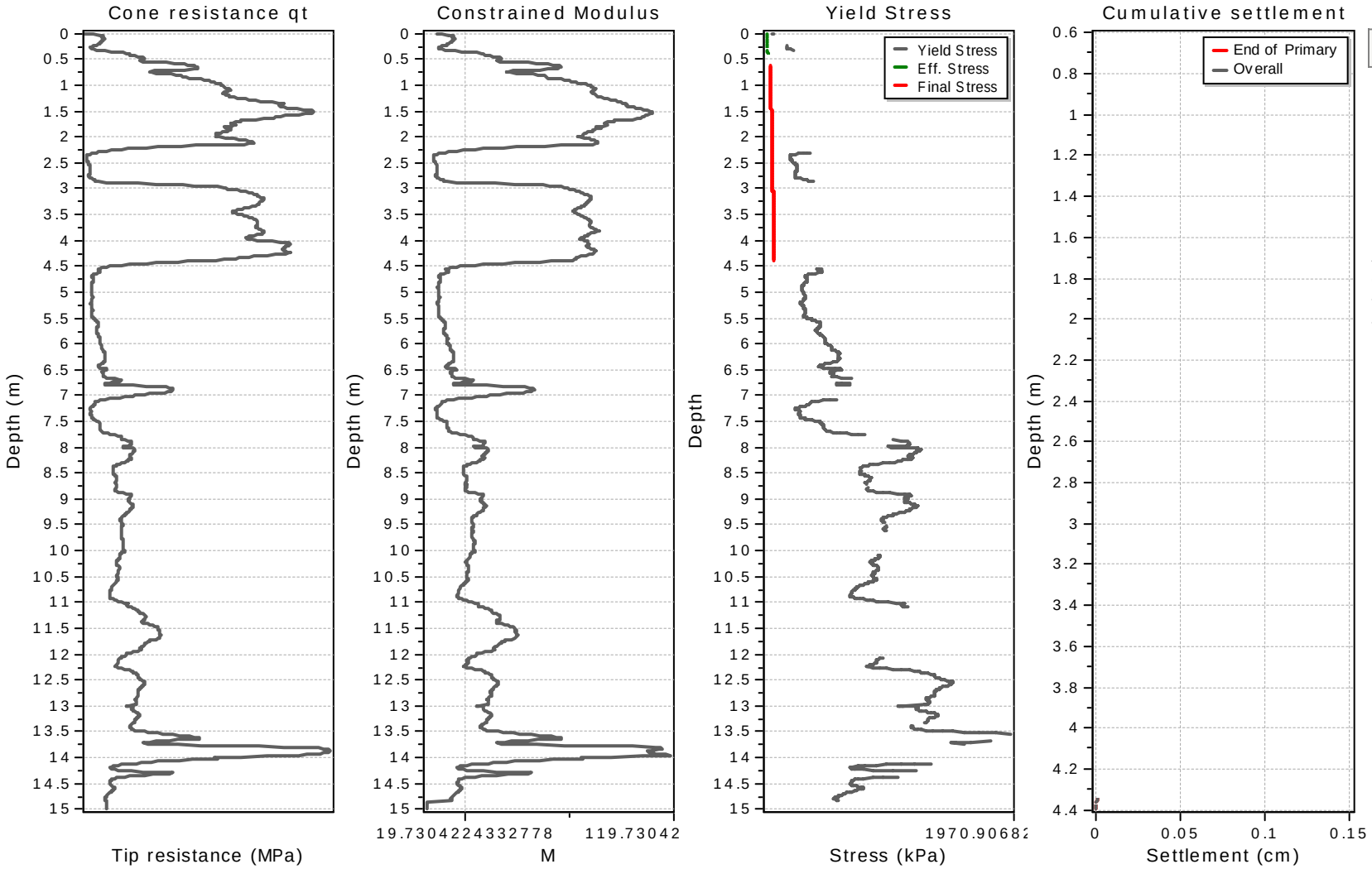
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

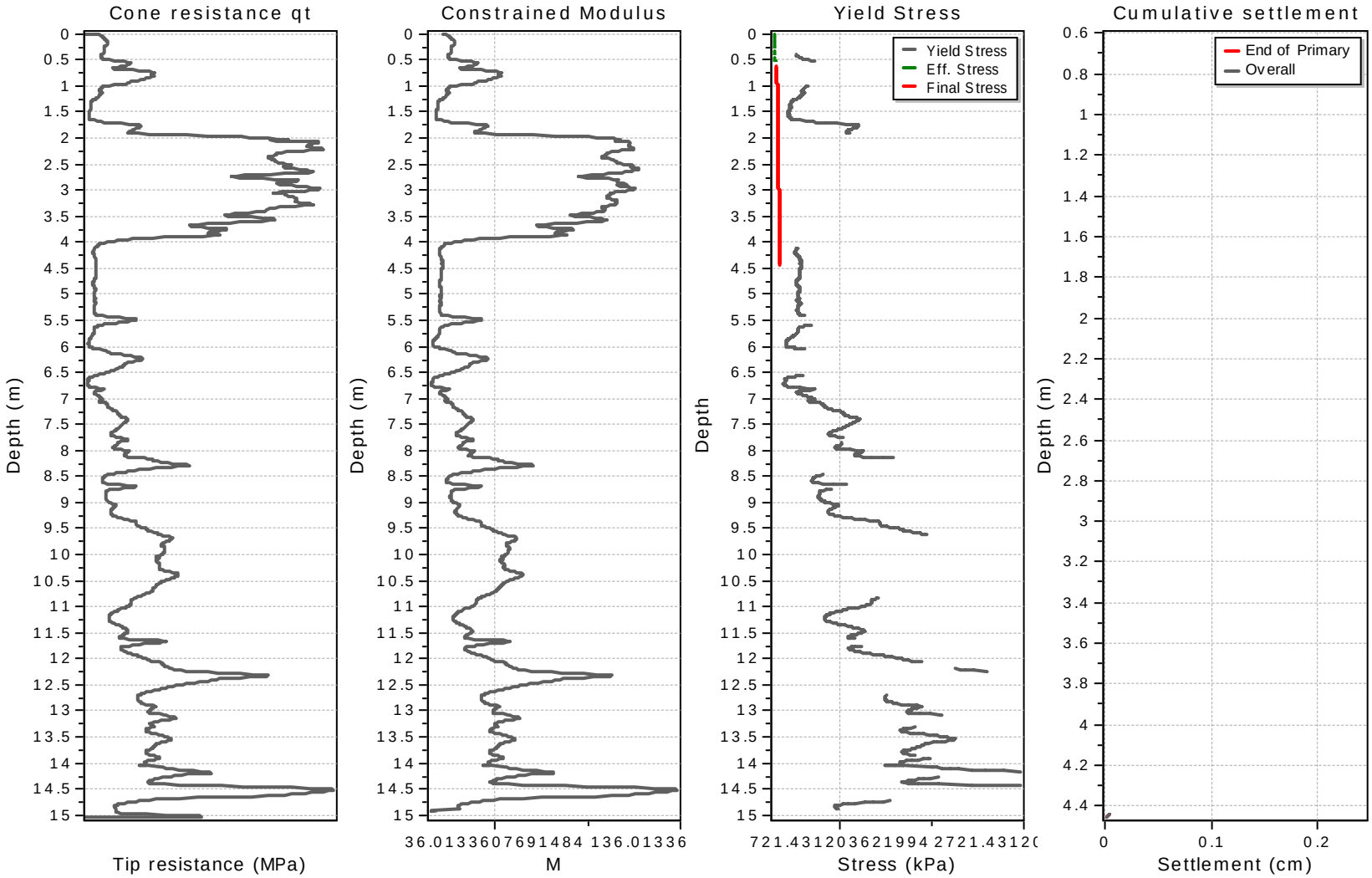
where t_p is the duration of primary consolidation

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CPT: CPT-07
Total depth: 15.04 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

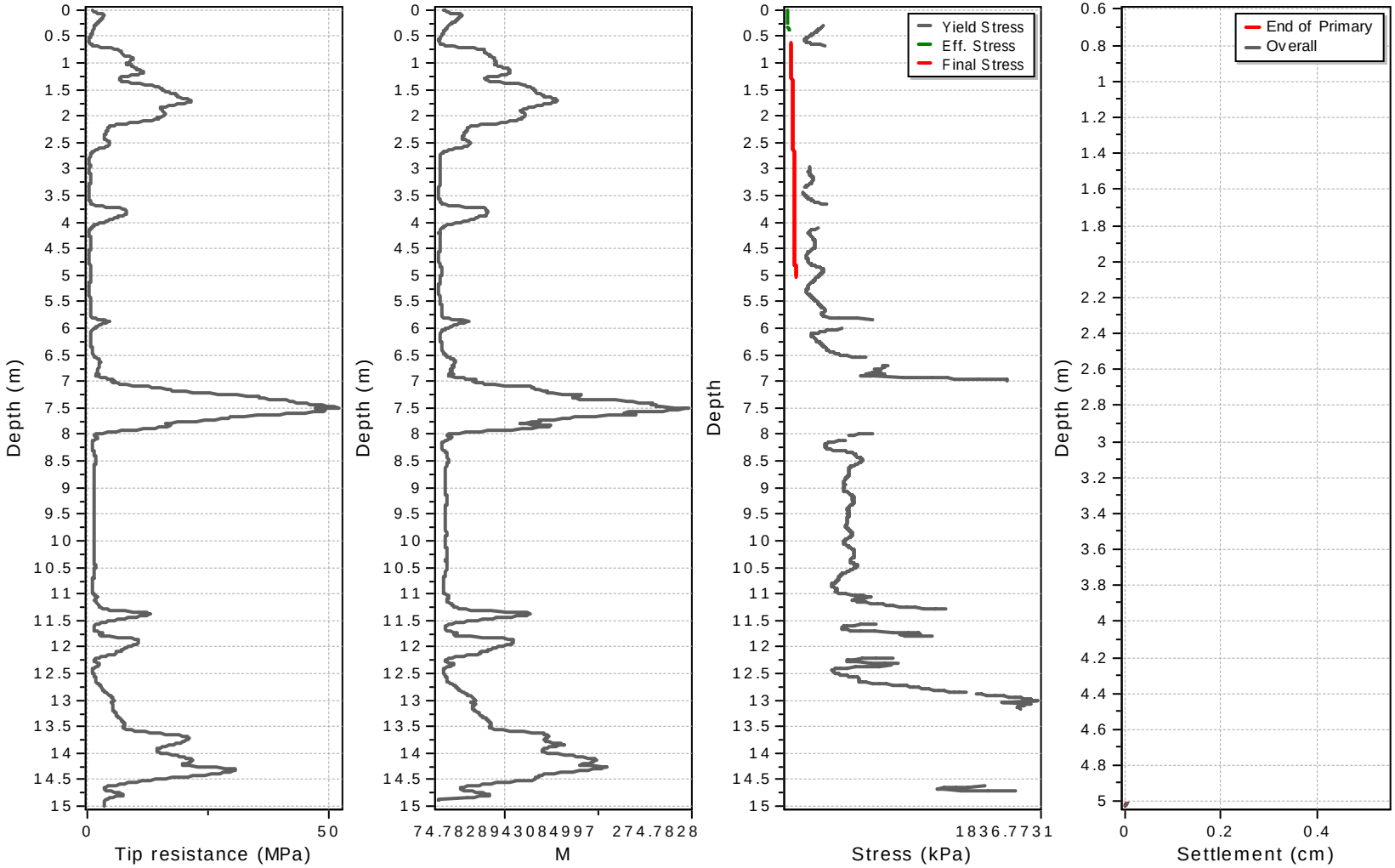
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

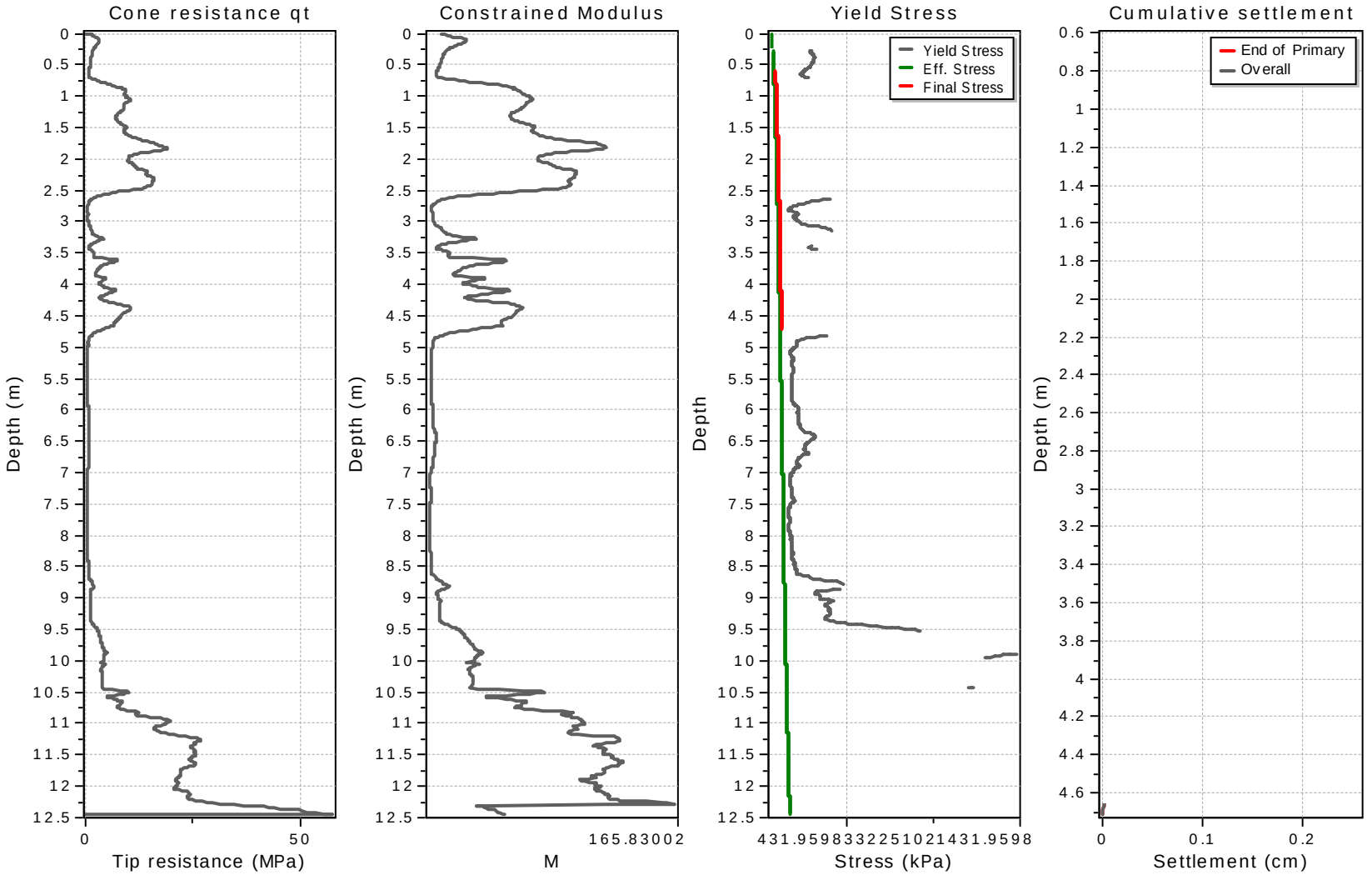
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

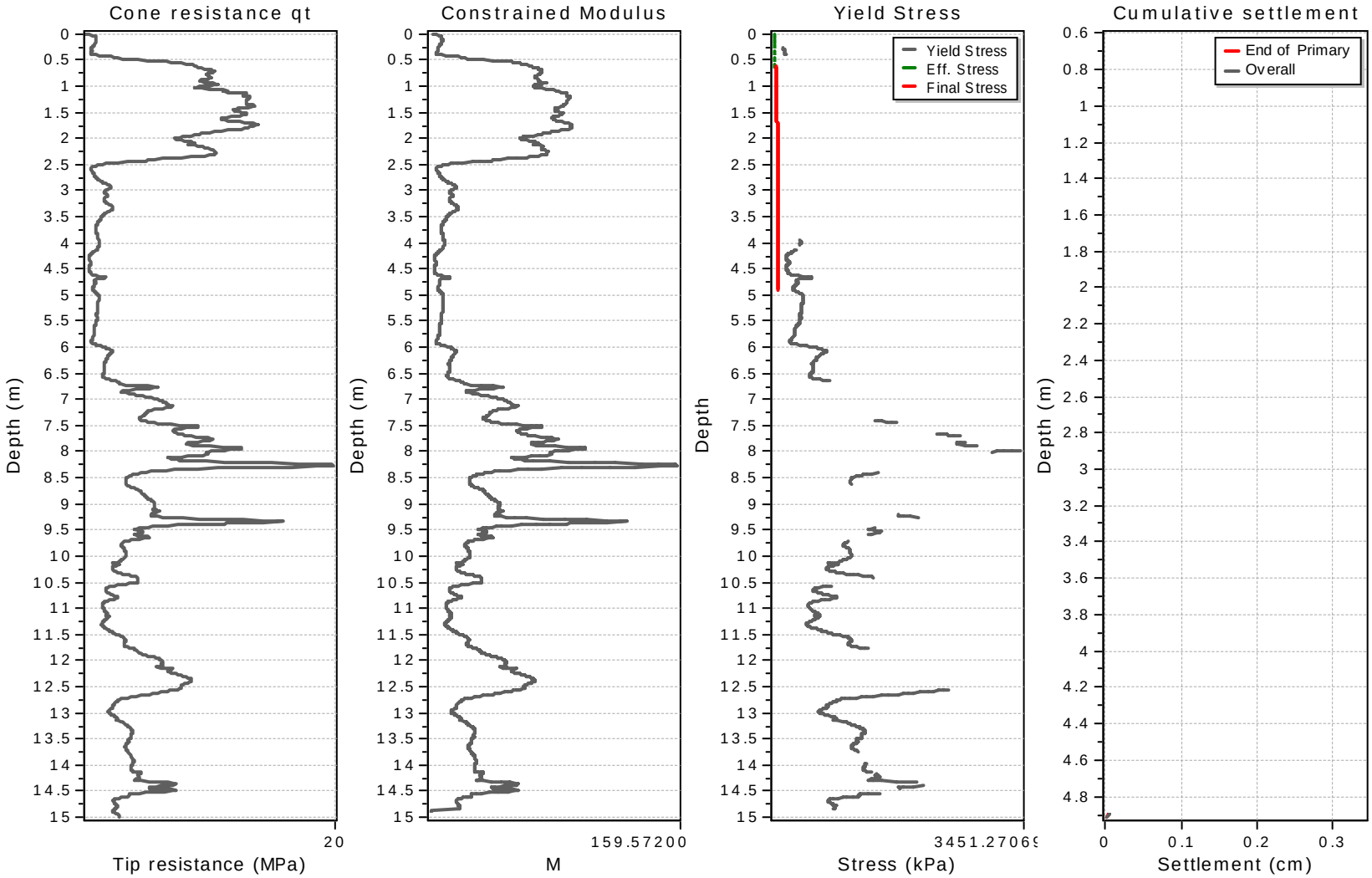
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

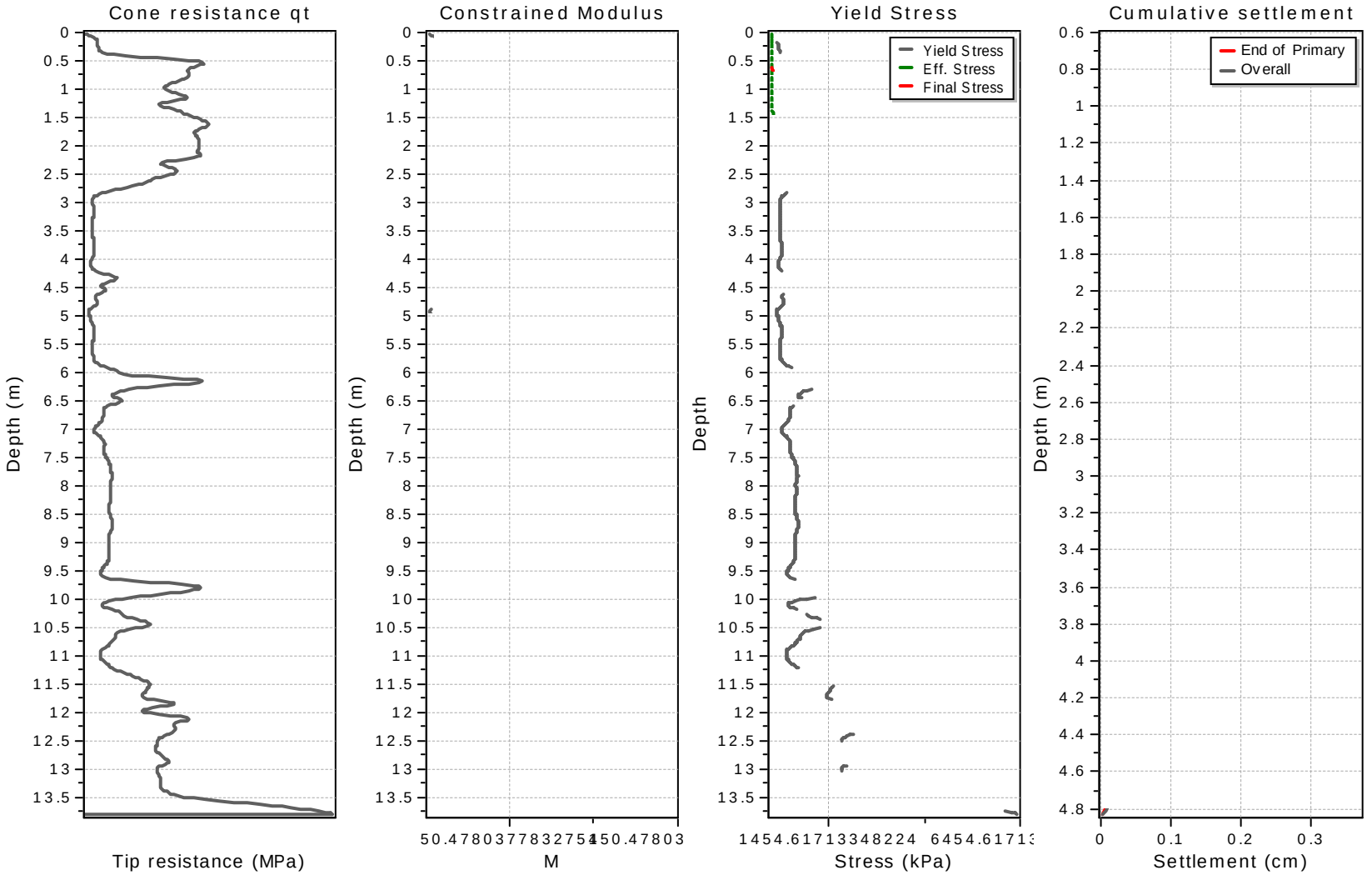
where t_p is the duration of primary consolidation

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CPT: CPT01, 139 Te Aute Road, Havelo copy
Total depth: 13.78 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

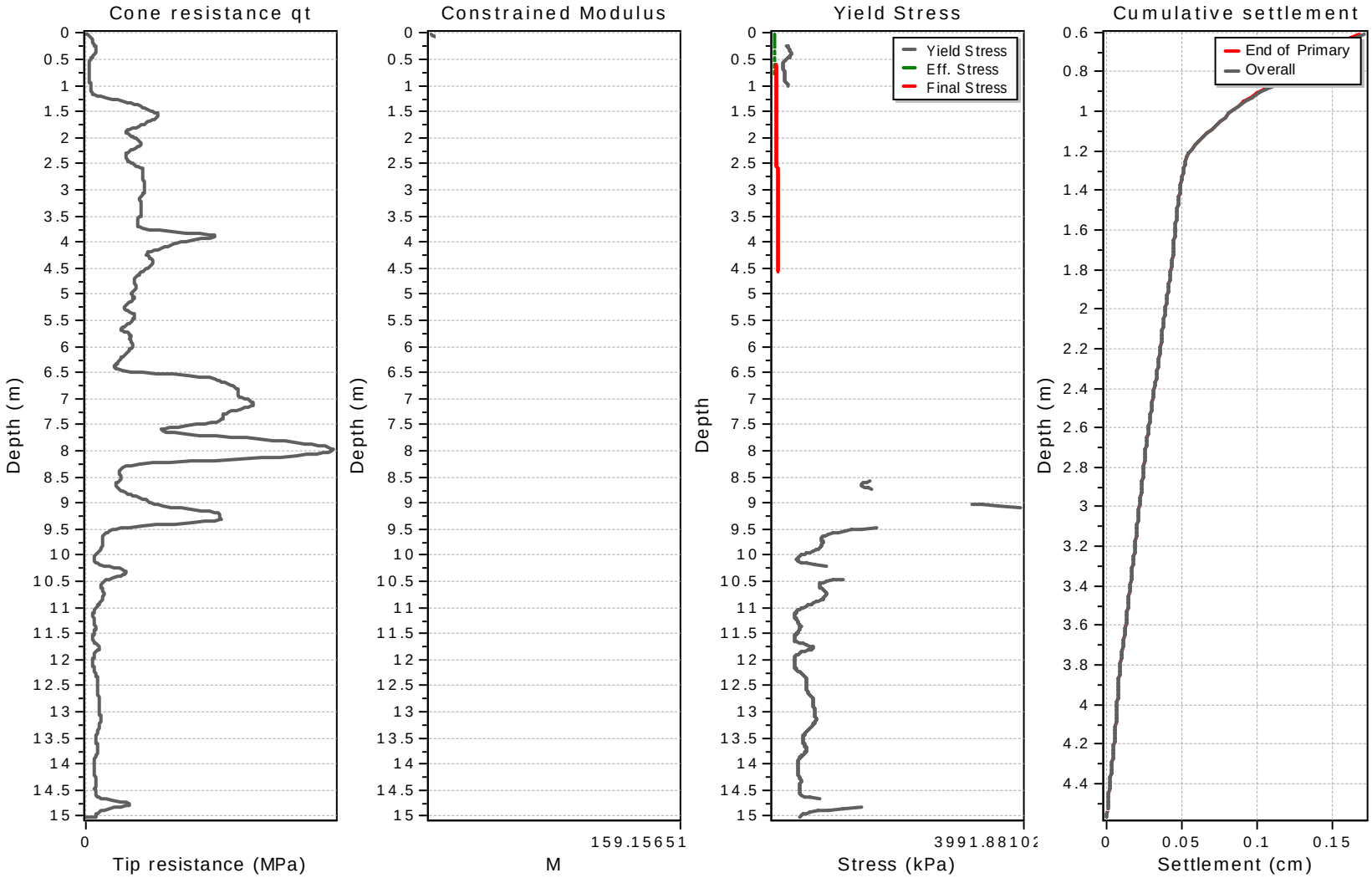
where t_p is the duration of primary consolidation

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CPT: CPT02, 139 Te Aute Road, Havelo copy
Total depth: 15.02 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

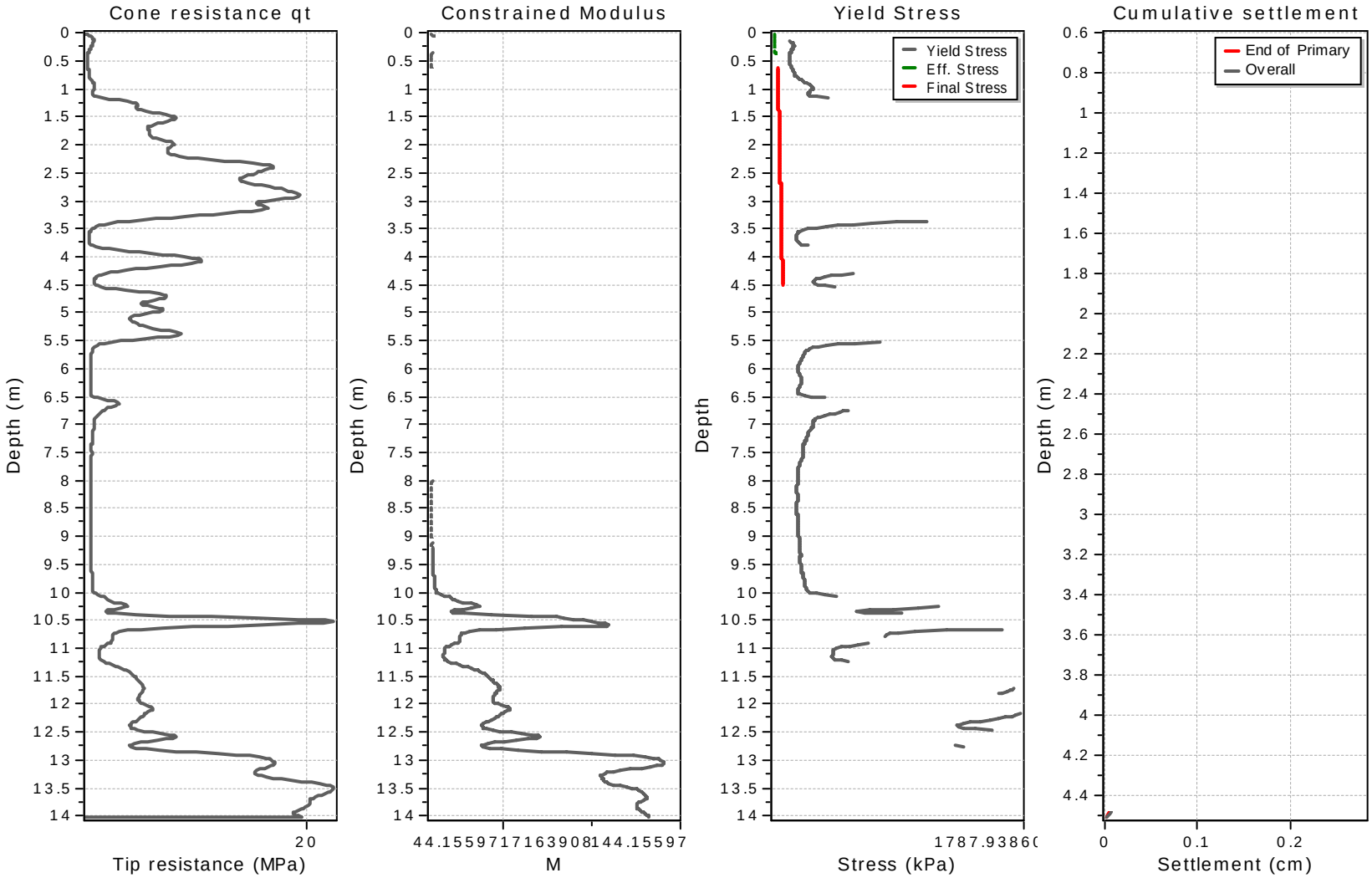
where t_p is the duration of primary consolidation

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CPT: CPT03, 139 Te Aute Road, Havelo copy
Total depth: 14.02 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

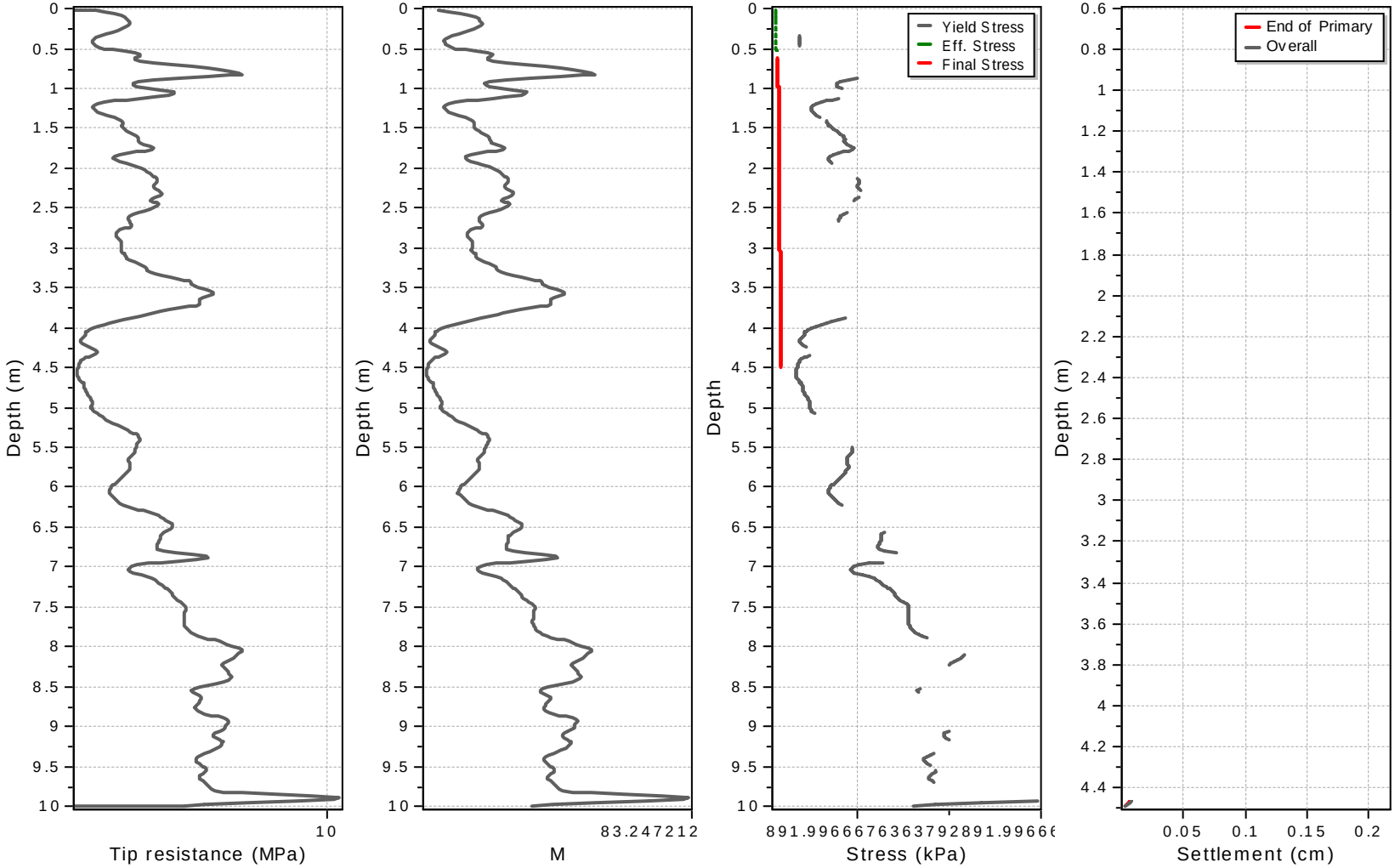
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

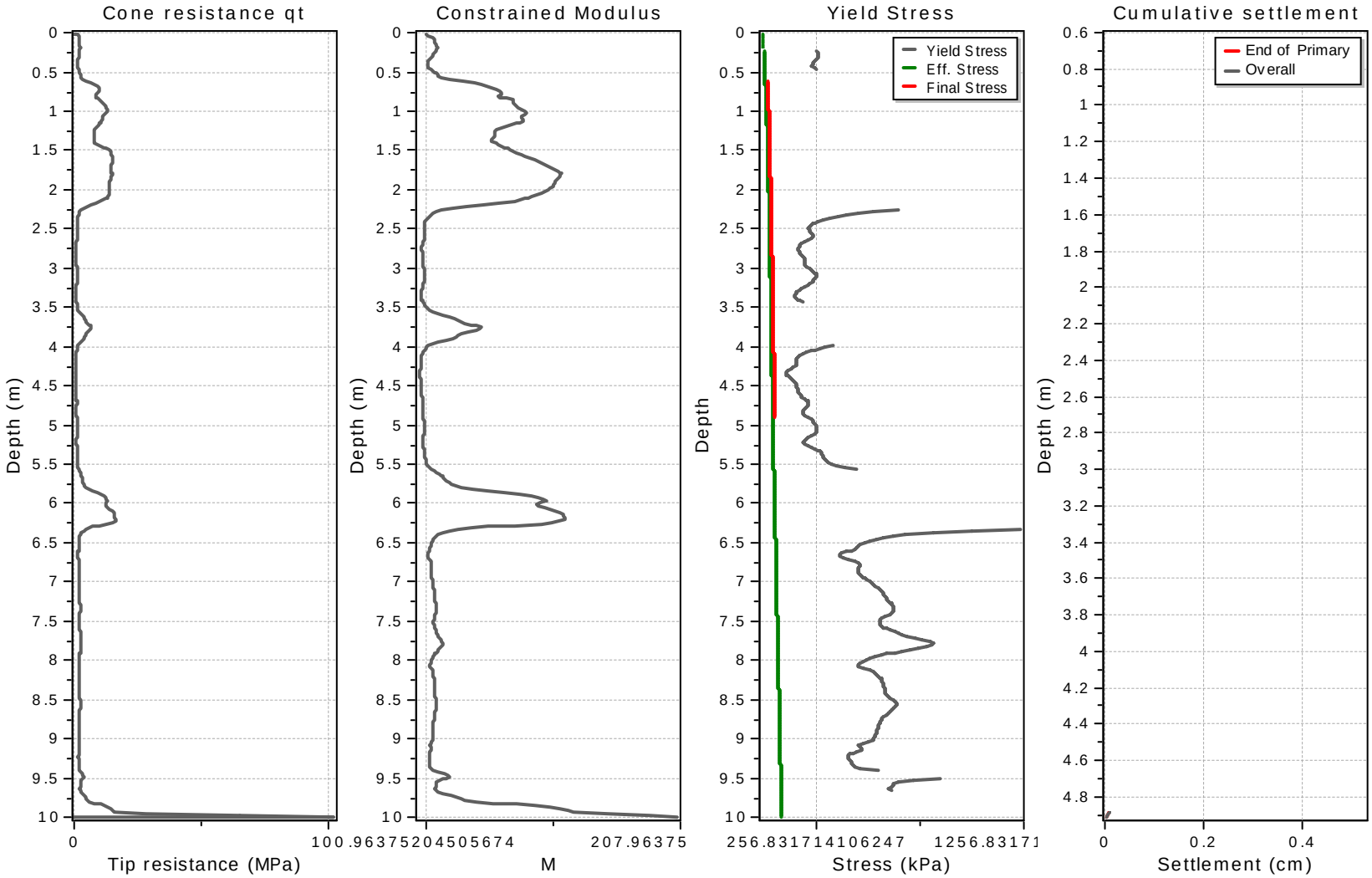
$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

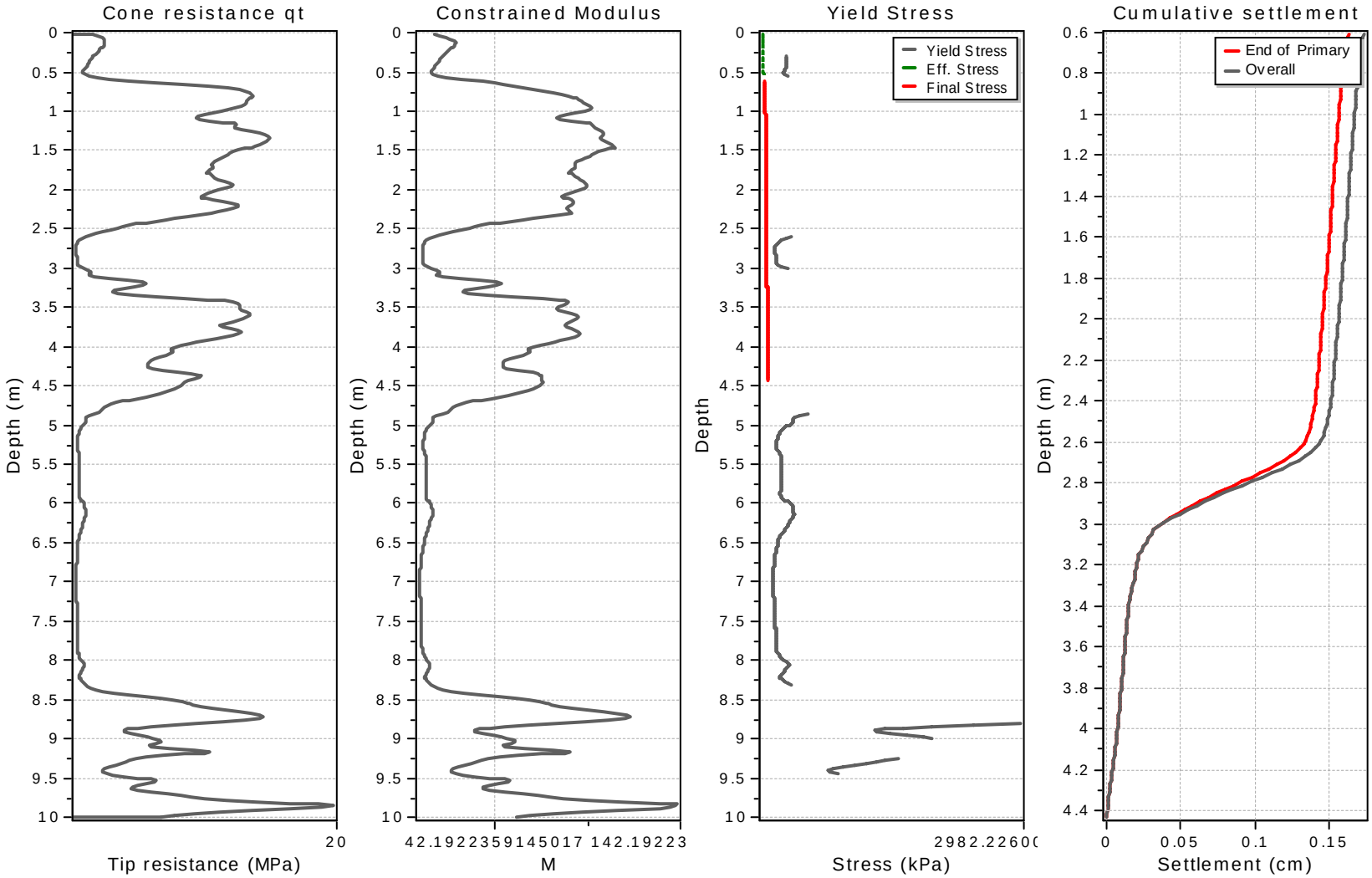
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

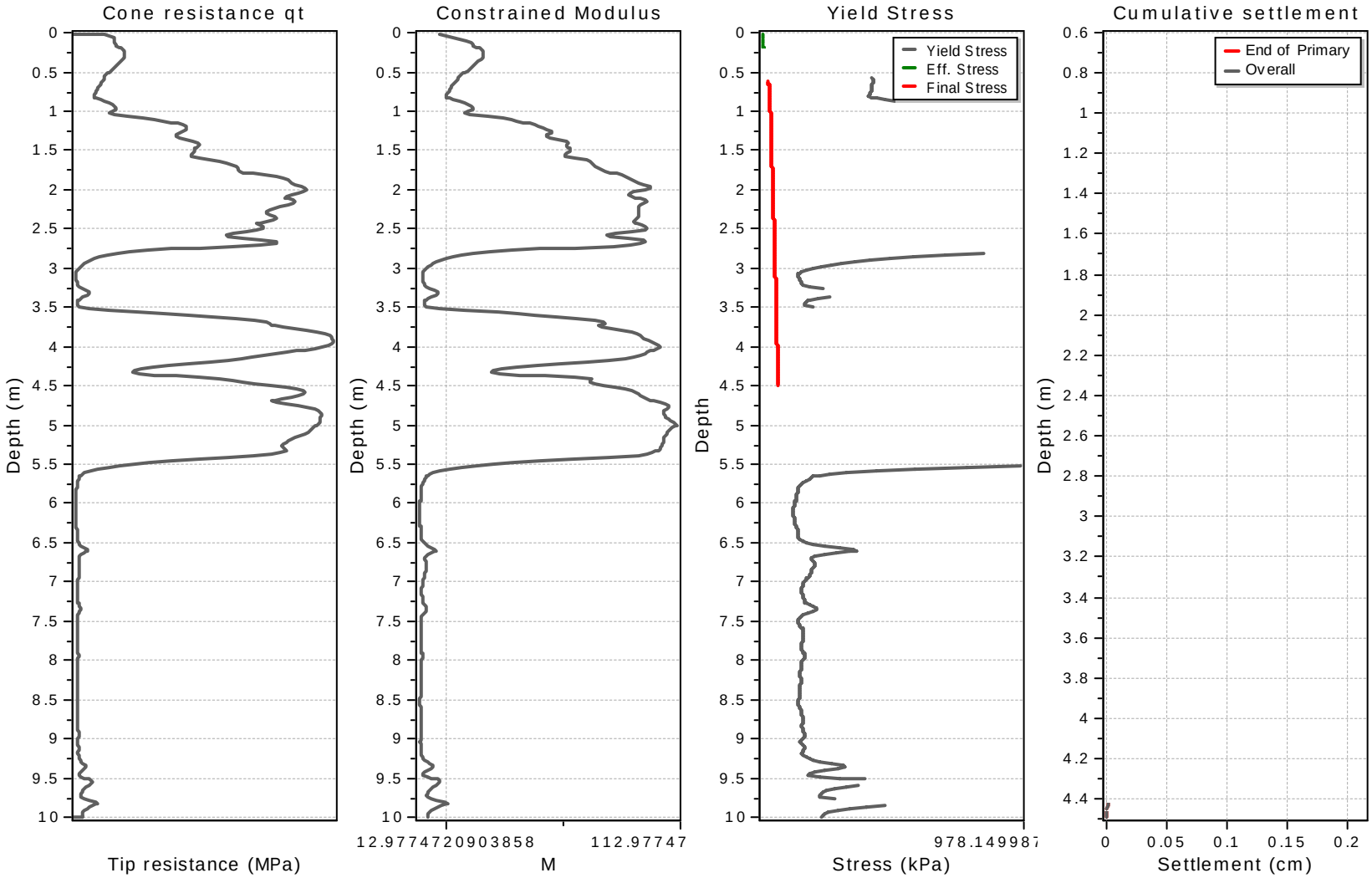
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

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$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

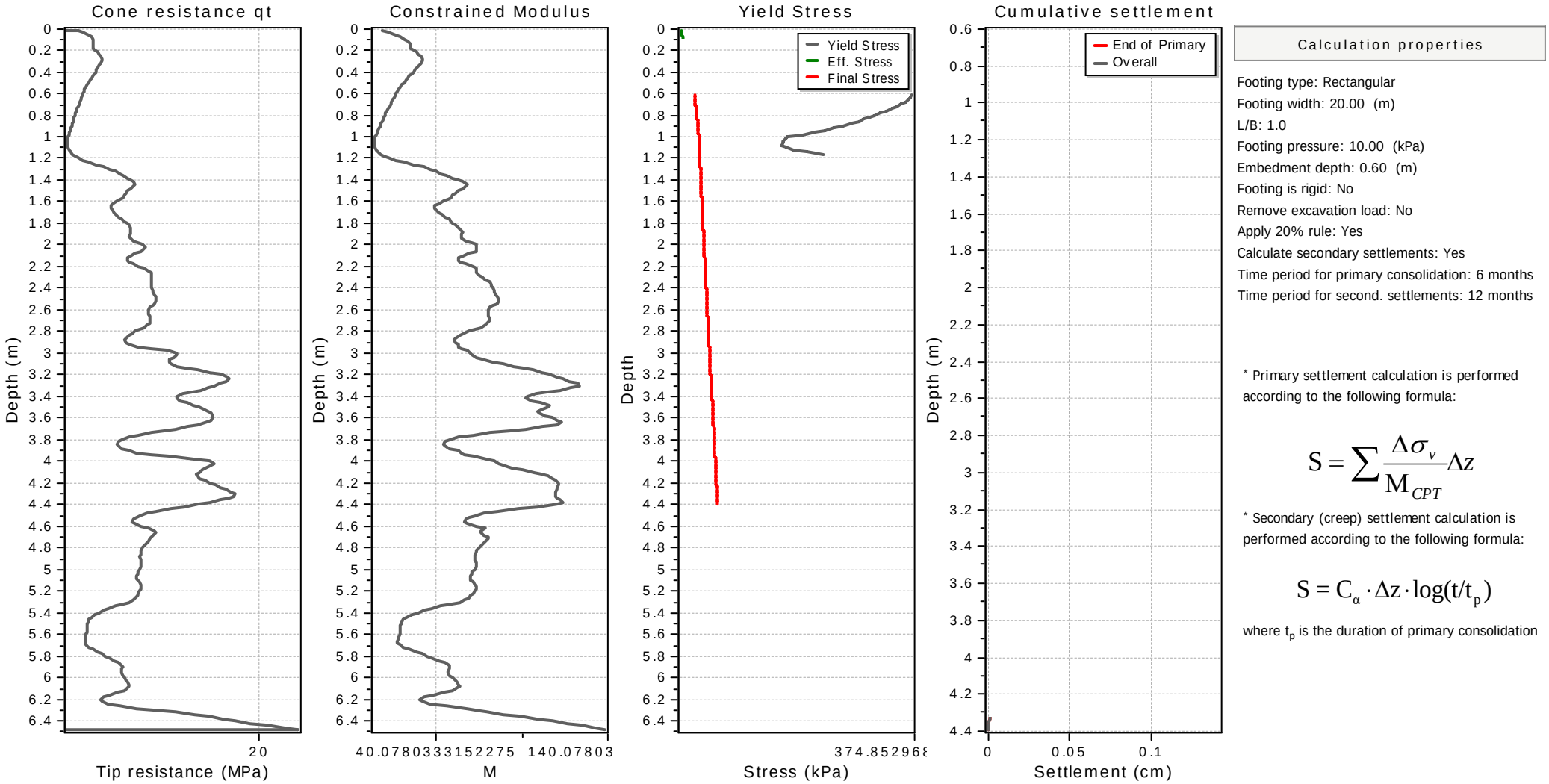
where t_p is the duration of primary consolidation

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CPT: WSP_CPT13 copy
Total depth: 6.48 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

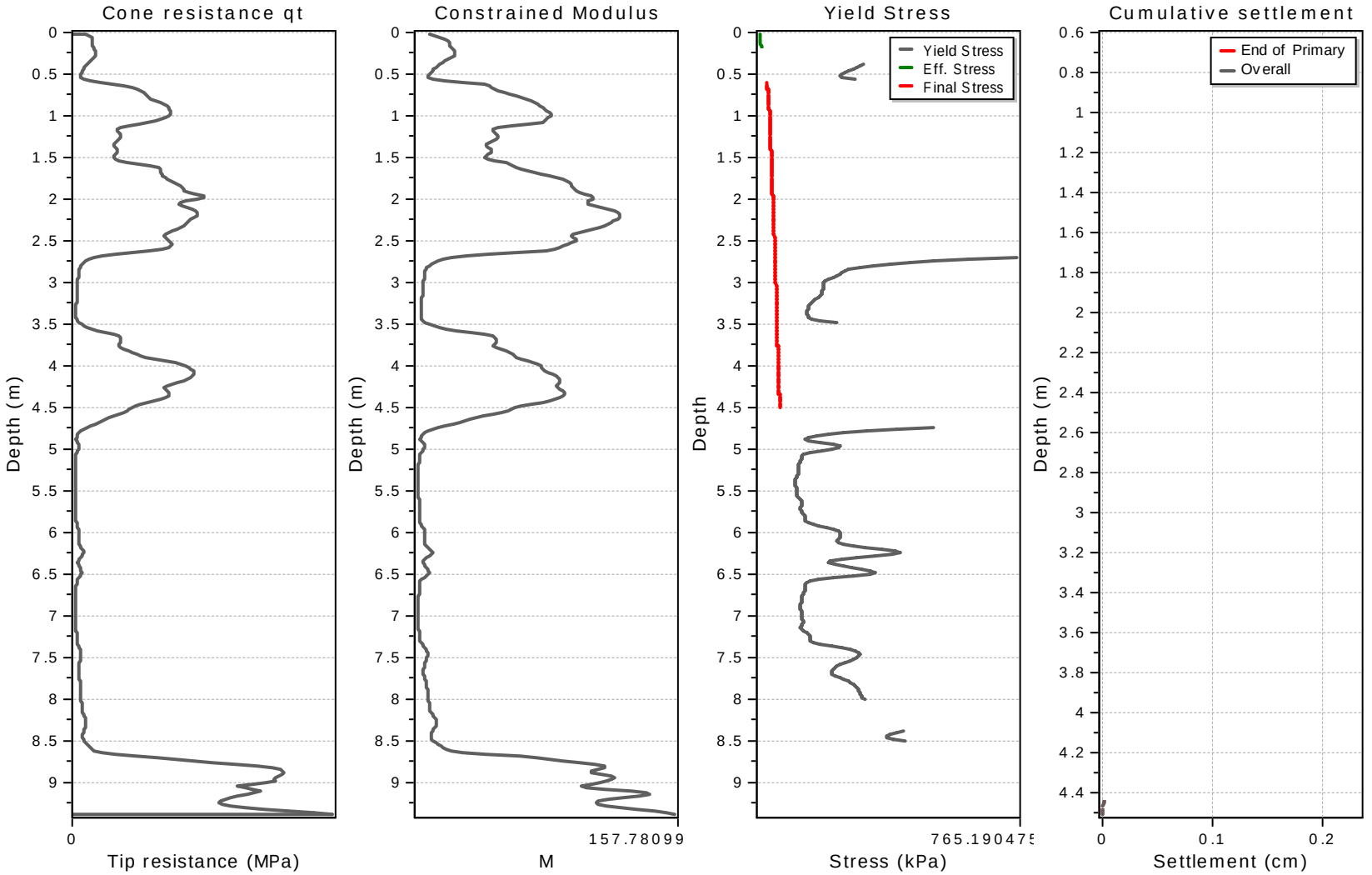
where t_p is the duration of primary consolidation

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CPT: WSP_CPT14 copy
Total depth: 9.38 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

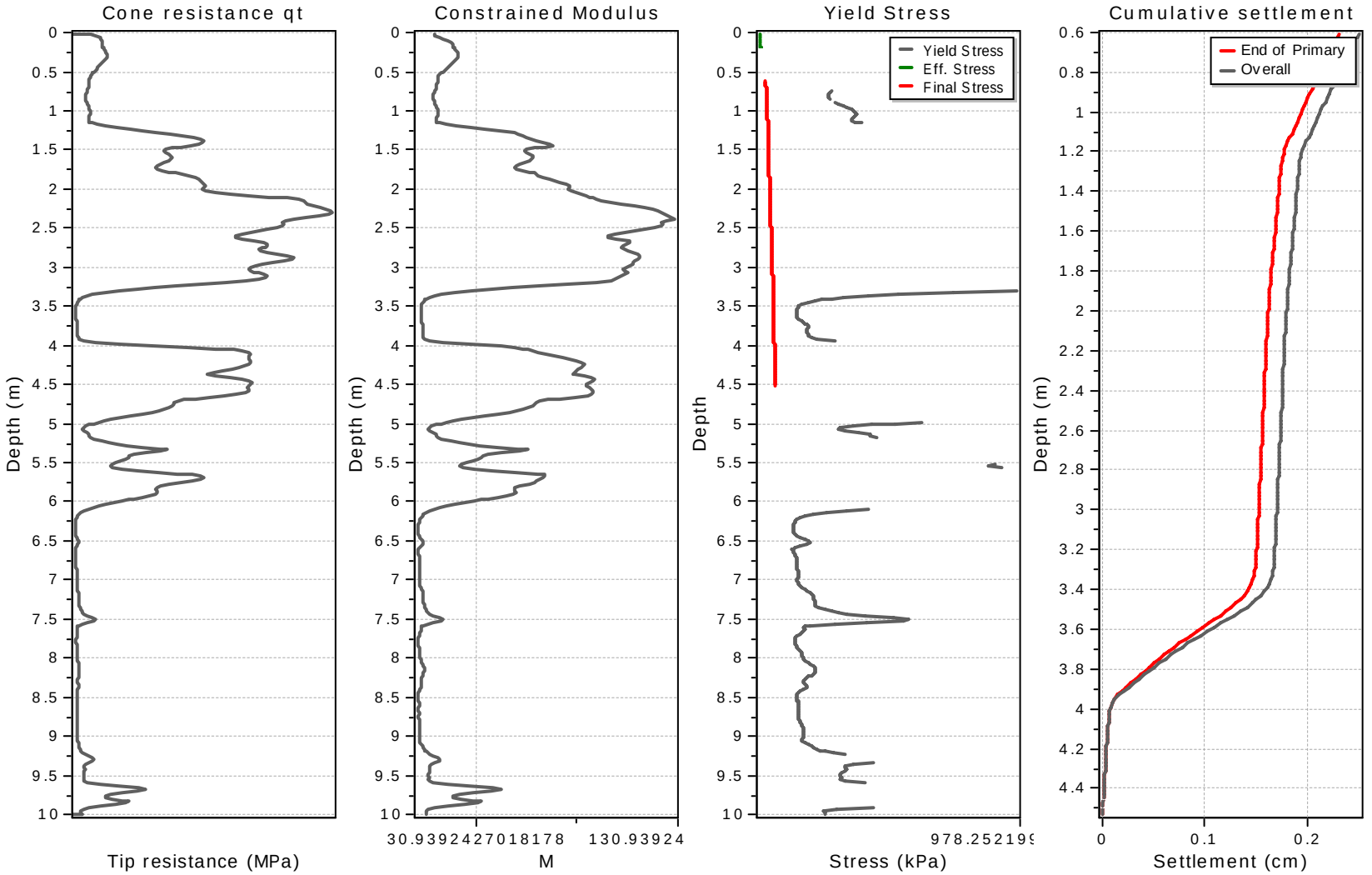
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

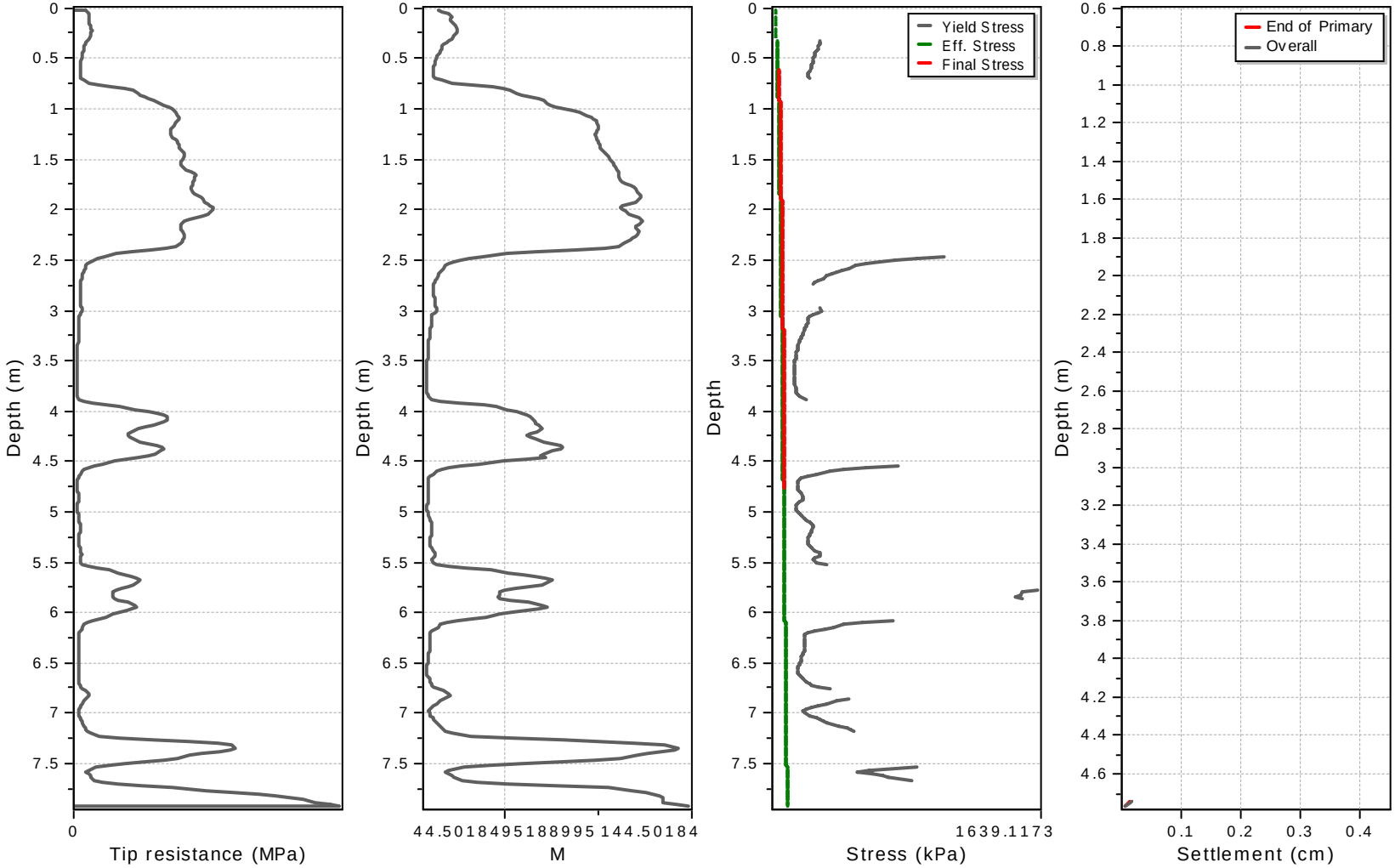
$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

where t_p is the duration of primary consolidation

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta \sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

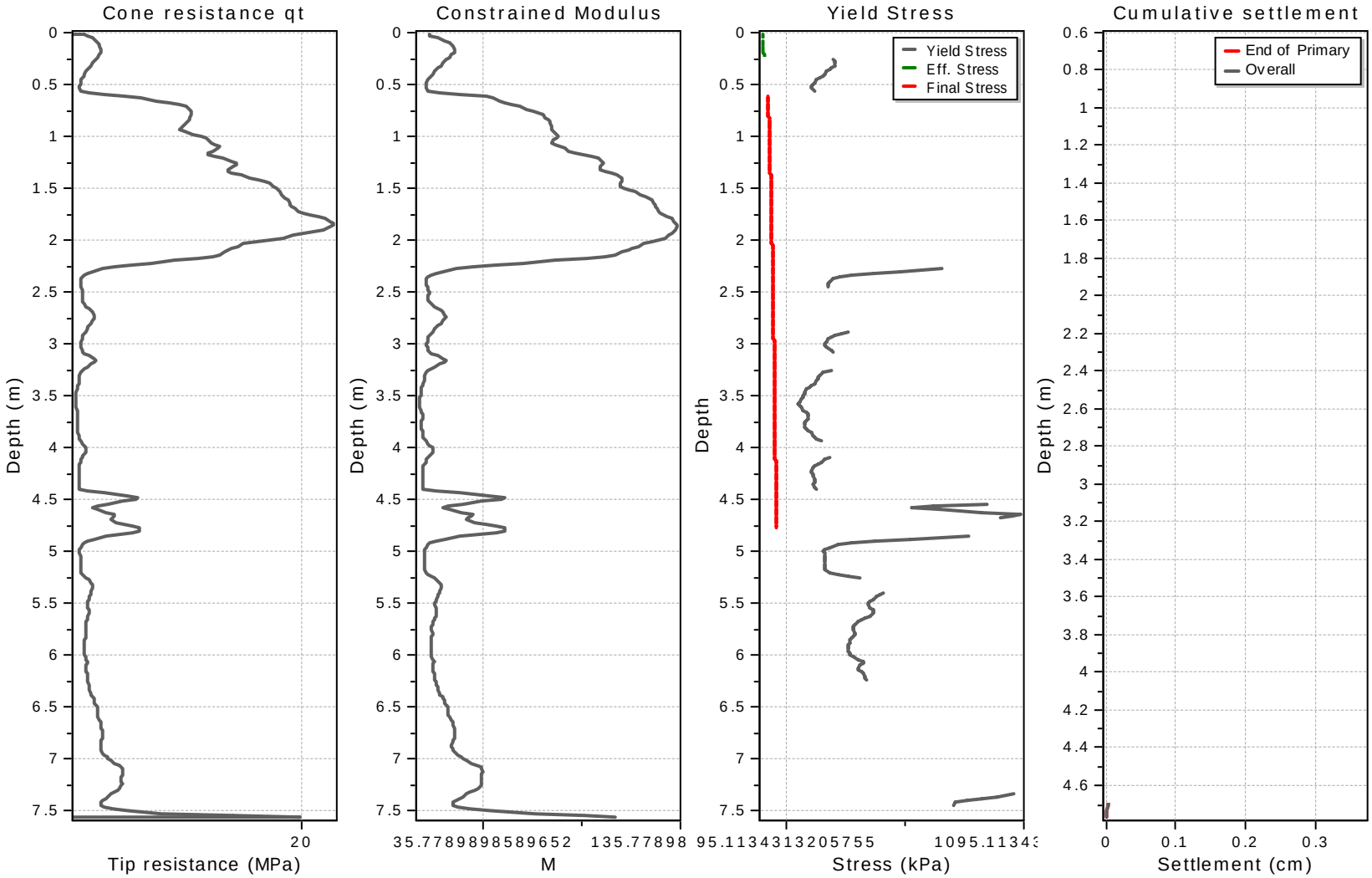
where t_p is the duration of primary consolidation

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CPT: WSP_CPT17 copy
Total depth: 7.56 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 20.00 (m)
L/B: 1.0
Footing pressure: 10.00 (kPa)
Embedment depth: 0.60 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 12 months

* Primary settlement calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlement calculation is performed according to the following formula:

$$S = C_\alpha \cdot \Delta z \cdot \log(t/t_p)$$

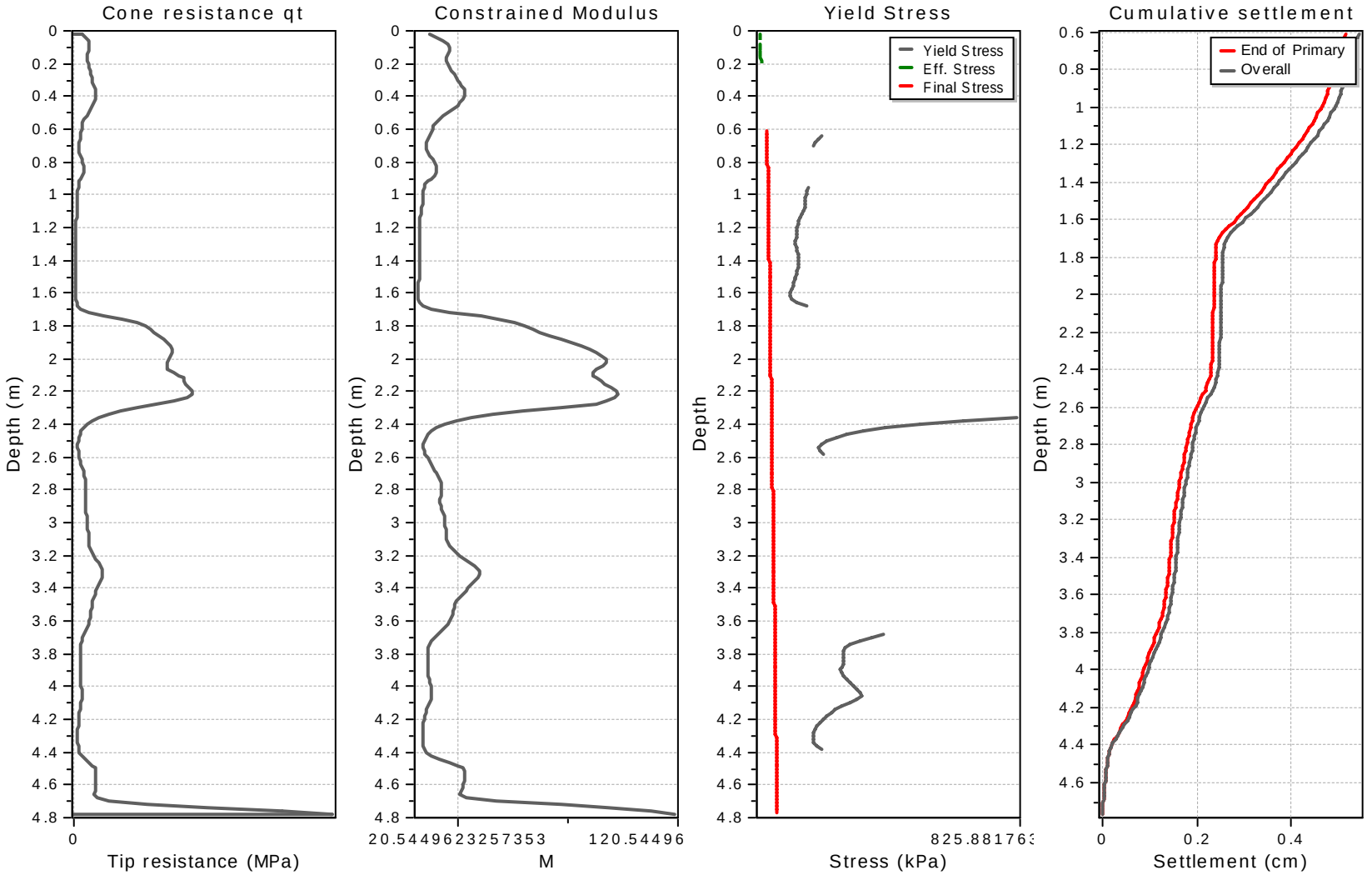
where t_p is the duration of primary consolidation

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CPT: WSP_CPT18 copy
Total depth: 4.78 m, Date: 20/07/2026
Surface Elevation: 0.00 m, Est. GWL: 1.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
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