INITIA

GEOTECHNICAL SPECIALISTS

GREENSTONE LAND DEVELOPMENTS LTD

KENNY ROAD SUBDIVISION DEVELOPMENT, TE AWA, NAPIER

GEOTECHNICAL INVESTIGATION AND COMPLETION REPORT FOR LOTS 25-48

INITIA REF P-000821 REV A

AUGUST 2020

Contents

1. Introduction

1.1 Purpose and scope

Initia Ltd (Initia) was engaged by Greenstone Land Developments Ltd to provide geotechnical services in relation to the proposed residential subdivision at a site off Kenny Road, Te Awa, Napier. This report presents a summary of the works undertaken and provides relevant geotechnical recommendations for the proposed development. Initia were commissioned part way through the earthworks to provide certification of the site for residential housing.

This report and subsequent recommendations only relate to Lots 25 to 48 (Stage 1).

The following works have been undertaken in accordance with our proposal dated 30 April 2020[1]:

- A review of local geology (published geological maps).
- A site inspection by a geotechnical engineer.
- A review of historic investigations carried out by Resource Development Consultants Limited (RDCL)
- Site specific geotechnical investigations comprising:
    - 2 No. machine drilled boreholes to depths of between 13.05m and 15.37m below ground level (bgl);
    - 23 No. Cone Penetration Tests (CPT) to depths of between 11.02m and 13.92m bgl.
- An assessment of site subsoil class in accordance with NZS 1170.5:2004[2].
- An assessment of seismic hazard using CPT data.
- An assessment of geotechnical considerations associated with the foundation design.
- An assessment of geotechnical considerations associated with the pavement design.
- Preparation of this report.

1.2 Proposed Development

The proposed development comprises a 48-lot subdivision with an existing house being retained in the southern area of the site adjacent to Kenny Road (Lot 1). The majority of the site has been raised due to the Napier City Council (NCC) flood levels in the area. A retaining wall is to be constructed along the western boundary of the site with the retained height up to 1.2m. The Earthworks plan by Strata Group[3] attached in Appendix A indicates up to 1.5m of engineered fill has been placed across the site.

Access to the subdivision is proposed to be via two roads, one off Kenny Road to the south of the site and from Waimakariri Drive to the north.

A Resource Consent (RMS19069) has already been granted for this project based on previous investigations from other consultants (RDCL).

1 Initia Ltd (30 April 2020). Proposal for Geotechnical Consultancy Services – Kenny Rd Subdivision, Te Awa, Napier.
2 New Zealand Standard (2004). Structural Design Actions – Earthquake Actions – New Zealand.
3 Strata Group Consulting Engineers Ltd (26 June 2019), Earthworks Plan – Te Awa, Kenny Road, Napier. Ref J5174.

2. Site Conditions and Geology

2.1 Site Description and Location

The site of interest (legally named Lot 2 DP 532863) is located off Kenny Road in Te Awa, Napier. The site is 540m west of the Napier coastline. The site was previously used as a lifestyle farming block and contains well established trees in the southern and eastern parts of the site. The site appears to be on a former flood plain and is therefore typically flat, sitting at an elevation of approximately RL 11m – 12m. The site is bounded by developed residential property to the north, east and west of the site, with Kenny Road to the south of the site. Refer to Figure 2-1 below:

Figure 2-1 - Site Overview with highlighted boundaries

We note there is a stormwater overland flow drain along the eastern boundary of the site that has been infilled as part of this development.

2.2 Geological setting

The geological Map of the Hawke's Bay Area[4] shows the site to be underlain by Holocene aged Alluvial Deposits comprising gravel, sand and silt and clay, forming the Heretaunga Plains. Refer to Figure 2-2 below:

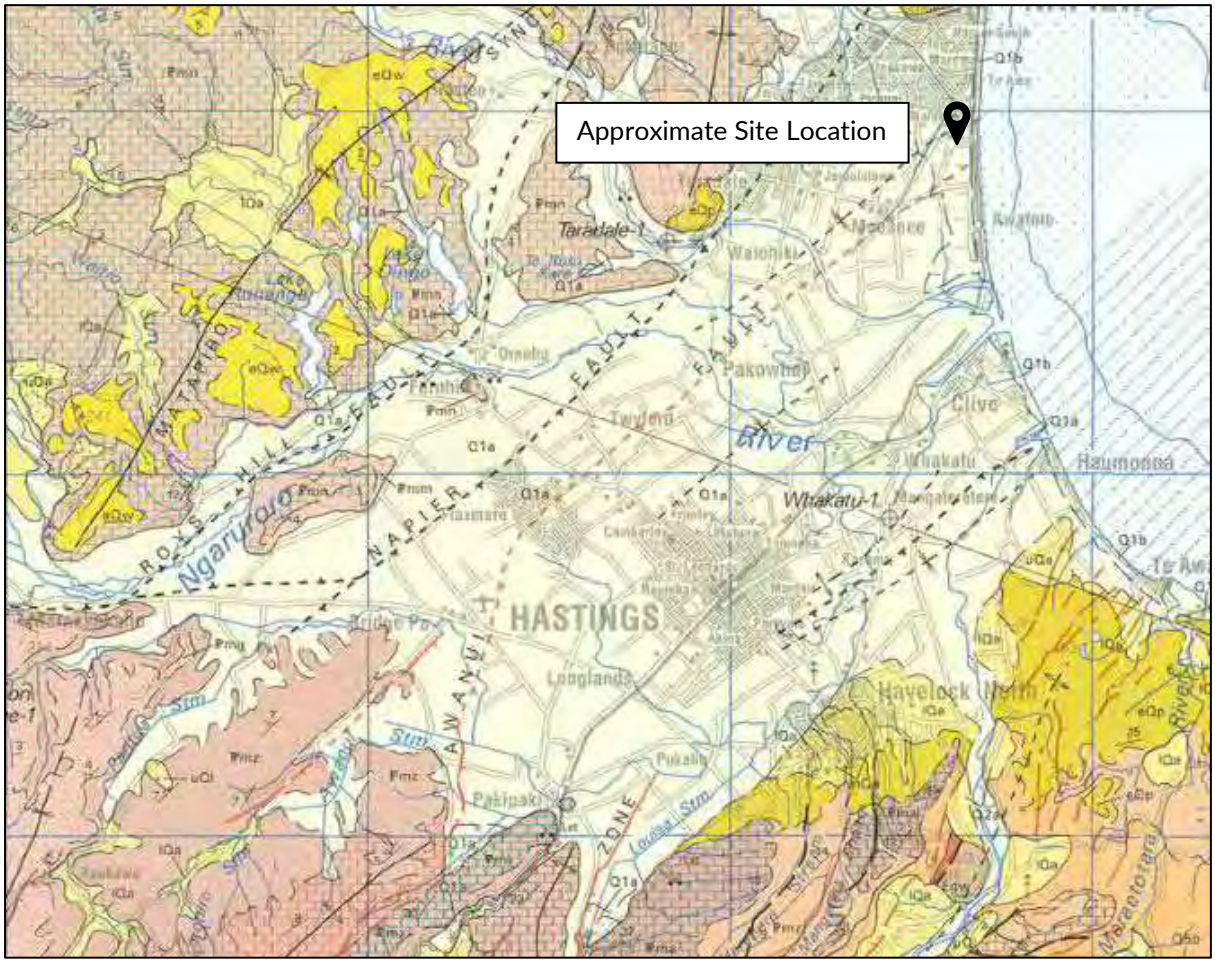

Figure 2-2 - Geological Map of the Hawkes Bay Area showing site area.

[4] Lee, J.M.; Townsend, D.; Bland, K.; Kamp, P.J.J. (compilers) 2011: Geology of the Hawke's Bay area: scale 1:250,000. Lower Hutt: Institute of Geological & Nuclear Sciences Limited. Institute of Geological & Nuclear Sciences 1:250,000 geological map 8. 86 p. + 1 folded map

3. Geotechnical Investigations

3.1 Previous investigations (RDCL, 2019)

Resource Development Consultants Limited (RDCL) have previously carried out a site investigation comprising 8 No. Test Pits, 8 No. Dynamic Cone Penetrometers (DCP's) and 10 Cone Penetration Tests (CPT's) and produced a geotechnical report in July 2019. The DCP's were undertaken adjacent to the test pits. Refer to Table 3-1 below for the co-ordinates and depth of each test:

Table 3-1 - RDCL's site investigation

ID	Coordinates (NZTM)[1]		Depth (mbgl)
	Easting (m)	Northing (m)	
CPT01	1936382.6	5617594.6	10.34
CPT02	1936322.1	5617550.5	11.52
CPT03	1936283.9	5617592.0	12.48
CPT04	1936245.4	5617524.5	12.70
CPT05	1936275.9	5617476.4	12.34
CPT06	1936234.5	5617434.2	13.42
CPT07	1936309.6	5617431.9	12.46
CPT08	1936317.2	5617508.3	11.90
CPT09	1936381.1	5617508.3	10.70
CPT10	1936379.1	5617438.4	11.46
TP01	1936290.9	5617592.8	3.40
TP02	1936233.9	5617527.7	3.30
TP03	1936251.7	5617440.8	3.40
TP04	1936313.4	5617466.2	3.30
TP05	1936317.1	5617529.8	3.20
TP06	1936382.1	5617426.8	3.10
TP07	1936378.0	5617533.71	3.00
TP08	1936377.3	5617602.78	3.20

Note 1: Coordinate system – NZTM2000.

The existing investigation data indicates that the site is typically underlain by weak alluvial deposits comprising silts and sands, A dense gravel layer in identified at approximately 12m below ground level.

Some main findings of the RDCL report were:

- The site comprises loose unconsolidated alluvial deposits, highly susceptible to liquefaction.
- The site has a very high risk of liquefaction with vertical settlements of 300mm anticipated for a ULS event.
- The site is prone to flood levels for a 50-year return period. Earthworks may be required to elevate ground levels above flood levels.
- Foundations will require TC3 type in accordance with MBIE Part C Technical Guidance which in Hawkes Bay practically means a 1.2m undercut with the construction of a reinforced gravel raft.

Refer to Appendix B for the RDCL report and investigation logs.

3.2 Current investigation (Initia, 2020)

On 20 to 22 May 2020, a site investigation comprising 2 No. Machine Boreholes (BHs) and 23 No. Cone Penetration Tests (CPTs) was carried out by Geotech Drilling Ltd under the supervision of a Geotechnical Engineer from Initia. The boreholes were logged in accordance with the New Zealand Geotechnical Society (NZGS) 'Field description of Soil and Rock' guidelines. The recent Initia investigation plan and logs are attached in Appendix C. Refer to Table 3-2 below for the location co-ordinates and depth of each test:

Table 3-2 – Initia site investigations

ID	Coordinates (NZTM)[1]		Depth (mbgl)
	Easting (m)	Northing (m)	
BH01	1936225.3	5617434.0	15.37
BH02	1936384.3	5617602.9	13.05
CPT01	1936230.7	5617458.3	13.86
CPT02	1936229.5	5617490.6	13.60
CPT03	1936230.7	5617517.2	13.50
CPT04	1936277.9	5617571.9	13.46
CPT05	1936291.7	5617612.5	13.40
CPT06	1936335.4	5617608.3	12.24
CPT07	1936392.2	5617606.9	11.02
CPT08	1936392.6	5617575.7	11.42
CPT09	1936391.1	5617541.4	11.72
CPT10	1936389.4	5617502.5	12.02
CPT11	1936356.4	5617456.1	11.92
CPT12	1936352.9	5617494.1	12.14
CPT13	1936323.2	5617505.4	12.76
CPT14	1936297.8	5617514.3	13.16
CPT15	1936273.4	5617509.8	13.72
CPT16	1936305.4	5617451.7	12.36
CPT17	1936308.2	5617417.1	12.54
CPT18	1936266.8	5617417.7	13.40
CPT19	1936262.5	5617456.9	13.24
CPT20	1936342.2	5617545.7	12.28
CPT21	1936323.1	5617581.1	12.90
CPT22	1936297.3	5617543.2	12.80
CPT23	1936229.4	5617429.4	13.92

Note 1: Coordinate system – NZTM2000 (measured by handheld GPS).

3.3 Groundwater

The groundwater levels recorded at the machine boreholes after testing were 1.6m bgl at BH01 and 2.3m bgl at BH02. Groundwater depths across the site varied from site-specific locations typically ranging from 0.8m bgl – 3.4m bgl inferred from the CPT testing. This was measured during May 2020 (end of autumn) and ground water levels are expected to be shallower during wet winter months.

A piezometer standpipe was installed at BH01 to monitor the groundwater levels which are likely to be higher in the upcoming winter period.

3.4 Laboratory Testing

3.4.1 Sampling

Soil samples were extracted from the two boreholes during the investigation. 3 No. samples were taken from the site per borehole for testing.

3.4.2 Laboratory Test Scheduling

A total of 6 laboratory tests were chosen to be carried out from the two machine boreholes. These tests included:

- 6 No. Atterberg Limit tests to test the soils for their Liquid Limit, Plastic Limit and Plasticity Index.

This type of testing assists with the liquefaction classification for the soils at the site.

3.4.3 Laboratory Testing and Results

Geotechnical testing of soil samples was undertaken by Babbage Geotechnical Laboratory. The laboratory testing results is presented in Appendix D.

Testing was carried out in accordance with the following specifications:

- Atterberg Limits
  ASTM D4318 – 10e1: Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

4. Site stratigraphy

The results of the most recent geotechnical investigations carried by Initia (2020) indicates that the site is underlain by the following soil units:

- Unit 1: Firm sandy SILT and SAND with trace clayey lenses; overlying
- Unit 2: Soft silty CLAY and Clayey SILT; overlying
- Unit 3: Firm sandy SILT and SAND; overlying
- Unit 4: Soft silty CLAY and SILT; overlying
- Unit 5: Loose Silty SAND and SAND interbedded with soft to firm SILT/CLAY; overlying
- Unit 6: Soft Clayey SILT and Silty CLAY with some thin sandy lenses; overlying
- Unit 7: Dense Gravelly SAND to very dense GRAVEL

This geological sequence is typical of the Heretaunga Plains which comprise alluvial soils of the Holocene age, based on our previous experience. The nature and continuity of the subsoils away from the investigation locations is inferred and it must be appreciated that actual conditions may vary from the assumed model.

4.1.1 Unit 1: Firm sandy SILT and SAND with trace clayey lenses

The very upper soil unit of the site comprises Sandy SILT and SAND, at a thickness of 0.5m – 1.8m. The CPT measured cone tip resistance (q_c) was generally around 4MPa for this layer.

4.1.2 Unit 2: Soft silty CLAY and Clayey SILT

A layer of soft Silty CLAY Clayey SILT underlies the above layer, at a thickness of approximately 0.5m – 0.6m. The material within this layer is typically highly plastic and moist. The CPT measured cone tip resistance (q_c) was generally low, around 0.5-1MPa for this layer.

4.1.3 Unit 3: Firm sandy SILT and SAND

Below the upper silty clay and clayey silt layer lies a sandy SILT – SAND soil unit approximately 0.8-1.2m thick. This sand in this unit was generally fine to medium grained and was saturated. The CPT measured cone tip resistance (q_c) was generally around 2MPa for this layer.

4.1.4 Unit 4: Soft silty CLAY and SILT

A layer of soft Silty CLAY and SILT follows the upper layers with a thickness of 0.6-1.5m. The material within this layer is typically highly plastic and wet with some traces of shell fragments found throughout the layer. The CPT measured cone tip resistance (q_c) was generally low, around 0.5MPa for this layer.

4.1.5 Unit 5: Loose Silty SAND and SAND interbedded with soft to firm SILT/CLAY

The next soil unit was a silty SAND and SAND unit with interbedded layers of CLAY. This unit has a thickness of 4.0-8.5m. The SAND was generally fine to medium grained. The interbedded layers of cohesive material were generally high in plasticity with trace shell fragments. The CPT measured cone tip resistance (q_c) was generally around 4MPa for this layer.

4.1.6 Unit 6: Soft Clayey SILT and Silty CLAY with some thin sandy lenses

A layer of soft clayey SILT and silty CLAY follows the upper layers with a thickness of 1.6-3.2m. The soil unit was generally highly plastic, soft in nature and wet to saturated. The CPT measured cone tip resistance (q_c) was generally low, around 0.5MPa for this layer.

4.1.7 Unit 7: Dense Gravelly SAND to very dense GRAVEL

This unit is described as gravelly SAND and GRAVEL., Three Standard Penetration Tests (SPT) were performed in this layer with results being 40, 49 and 50+ indicating this layer is dense to very dense. The maximum depth of this soil unit was not proven during these investigations.

The presence of this dense to very dense GRAVEL layer is also evidenced by the recent CPTs which all recorded a significant increase in the cone resistance which resulted in refusal of penetration at similar depths to those identified in the boreholes.

A summary of the site stratigraphy, layer thicknesses and their measured in situ strength test results are presented in the table below:

Table 4-1 - Site Stratigraphy

Geological Unit	Soil description	Depth to top of unit (m)	Layer thickness range (m)	In situ test parameters – range and [typical values]		
				S_u (kPa)	q_c (MPa)	SPT 'N' value
Holocene Alluvium	Unit 1: Sandy SILT and SAND with trace clayey lenses	0.0	0.5-1.8	Not Proven	1-16 [4]	N/A
	Unit 2: Soft silty CLAY and Clayey SILT	0.5-1.8	0.5-0.6	Not Proven	0.5-1 [0.5]	N/A
	Unit 3: sandy SILT and SAND	1.0-2.4	0.8-1.2	N/A	1-6 [2]	N/A
	Unit 4: Soft silty CLAY and SILT	2.0–3.4	0.6-1.5	Not Proven	0.5-1 [0.5]	N/A
	Unit 5: Silty SAND and SAND interbedded with soft to firm SILT/CLAY (up to 2.0m thick layer)	3.0–4.8	4.0-8.5	N/A	0.5-16 [4]	N/A
	Unit 6: Soft Clayey SILT and Silty CLAY with some thin sandy lenses	8.0-11.8	1.6-3.2	Not Proven	0.5-1 [0.5]	N/A
	Unit 7: Dense to very dense gravelly SAND and GRAVEL	10.8-13.7	Not Proven	N/A	Not Proven	40-50+ [45]

5. Fill Certification

5.1 Earthworks

According to the Zorn Surveying fill contour plan, it appears 0.3m–1.5m of engineered fill has been placed across the site. This is essential to bring the level of the site to be above the NCC flood levels in the area.

The site was cleared of vegetation and any topsoil present stripped from the work area. Where practicable, disturbance to vegetation cover outside the extent of the earthworks has been minimised to aid sediment control.

Compaction of any fill material has been in accordance with NZS 4404:2010. The imported granular fill has been placed in 200mm maximum layer thicknesses and compacted to an engineered specification.

River silt was imported to the site for this project and the following preliminary compaction criteria for this material was recommended:

Compaction of Imported River Silt

Dry density – NDM:	Minimum Dry Density	92%
	Average Dry Density	95%

All material used as fill on site was reviewed by the Geotechnical Engineer prior to placement.

5.2 Testing Results

Initia have been provided with all the engineered fill test results that relate to Lots 25 to 48. Typically, all the testing indicated greater than 95% of Maximum Dry Density (MDD). In terms of strength of the engineered fill layer, there is a significant increase in strength shown in the CPT plots where the probe has been pushed through the engineered fill later at the surface.

Some high voids have been noted on the test data received by Initia. We understand that this was due to a delay in the earthworks testing following compaction in warmer summer months.

Copies of all the test data and relevant compaction curves are presented in Appendix D.

6. Geotechnical Considerations

6.1 General

The following geotechnical considerations are relevant to the design and construction of the proposed development and are addressed in the following sections:

- Site seismicity and subsoil class;
- Liquefaction assessment;
- Static Settlement risk;
- Retaining wall design parameters;
- Foundation Options

The interpretations, advice and recommendations presented in this report are based on geotechnical investigations completed by Initia and others at point locations. The nature and continuity of the ground conditions away from the investigation locations is inferred and it must be appreciated that actual conditions could vary from the assumed model.

6.2 Site seismicity and subsoil class

Based on the previous and recent geotechnical investigations at the site and in the adjacent area, we consider that the site subsoil class should be classified as Class D – Deep or Soft Soil Site, in accordance with NZS1170.5 (2004)[5].

For determination of the design Peak Ground Acceleration (PGA), we have assumed an Importance Level 2 and a 50-year design life for the future structures likely to be situated across the subdivision development.

Table 6-1 Design PGA and average magnitude of an earthquake contributing to PGA

Limit States	Return Period	PGA	Average Magnitude
ULS	500 years	0.33g	6.9
SLS	25 years	0.08g	6.2

Note: The design PGAs have been based on an Importance Level 2 structure and a 50-year design life.

6.3 Liquefaction susceptibility & triggering

The liquefaction susceptibility of the underlying material at the proposed subdivision has been assessed using the results of the Initia 2020 Investigations.

A CPT-based liquefaction analysis has been carried out using the computer programme CLiq v.2.3[6] on the recent Initia CPTs (23 No.). The adopted analysis method is based on the study by Boulanger and Idriss (2014).

There is a general agreement that sands, non-plastic silts, and gravels mixtures form soils that are susceptible to liquefaction. Based on the site investigation and the laboratory test results, two of the stratigraphic units identified at the site comprise materials which are considered susceptible to liquefaction, as follows:

- Unit 3: Firm sandy SILT and SAND (approx. 0.8-1.2m thick) and,
- Unit 5: Loose Silty SAND and SAND interbedded with SILT and CLAY (4.0-8.5m thick).

[5] New Zealand Standard NZ 1170.5:2004 Structural Design Actions: Part 5: Earthquake actions – New Zealand.
[6] Geologismiki (2020), CPeT-IT – detailed software package for the interpretation of Cone Penetration Test (CPTu) data.

It is noted that more cohesive layers, locally identified as part of this unit, are not considered susceptible to liquefaction, based on the laboratory Atterberg Limit test results. The Atterberg Limit tests carried out by Babbage Geotechnical Testing Laboratory (refer to Appendix D) show that these more cohesive layers have a Plasticity Index (PI) of over 14 and are therefore considered unlikely to liquefy according to the MBIE – Module 3[7] guidelines.

Should the inferred soil behaviour type (I_c) of the soil layers tested with a PI > 12, shows these soils at the limit between clay-like and sand-like behaviour, the liquefaction analyses have been manually changed by reducing the soil behaviour cut-off value I_c from 2.6 previously adopted to 2.4-2.5, in order to model the non-susceptibility of these soils.

For the soils identified as susceptible to liquefaction, the liquefaction triggering assessment carried out using CLiq indicates the risk of liquefaction under SLS seismic event is low across the site (FoS > 1.0). For the ULS design event, the analysis indicates that liquefaction triggering may occur at various depth and thickness across the site. The liquefaction assessment results based on CPT data are attached in Appendix E and summarised in Table 6-2 below:

Table 6-2: Liquefaction Assessment Summary for ULS seismic event

Unit ID	Material Description	Identified potentially liquefiable zone			LSN	LPI
		Depth from (m)	Depth to (m)	Thickness (m)		
Unit 3	Firm sandy SILT and SAND	1.2-1.6	1.3-2.5	0.1-0.7	15-30	12-25
Unit 5	Loose Silty SAND and SAND interbedded with SILT and CLAY	3.0	10-11.8	0.1-2.5		

The general performance levels for liquefied deposits at the site are estimated in accordance with the MBIE-Module 3 guidelines, based on the review of the liquefaction severity number (LSN) and liquefaction potential (LPI) calculated for each CPT. The review of the LSN and LPI results indicates that the risk of liquefaction affecting the site is classified as 'High'.

According to the MBIE Module 3, liquefaction could result in transient lateral displacements, moderate differential movements and settlements of the ground in the order of 100mm-200mm. This range is in general accordance with the settlements estimated using the Zhang et al (2002) method. However, these settlements should be treated as proxy for damage only and do not reflect a reliable estimate of actual settlements. The predicted liquefaction induced settlement might lead to damage to the future building foundations and slabs. The Structural Engineer should allow for predicted liquefaction induced settlements in the design and/or for future repairs post-earthquake.

Additionally, although earthworks are currently undertaken at the site, to generally raise the overall site level by up to 1.2m, which will result in a non-liquefiable crust thickness varying between 1.5m and 2.0m, we do not recommend to rely on any beneficial effects from the non-liquefiable crust. The thickness of soil overlying potentially liquefiable layers is not considered as sufficiently reliable to mitigate the manifestation and damaging effects of liquefactions. The future buildings should be designed to accommodate for liquefaction damages. Recommended foundations at the site are presented in Section 6.6 of this report.

[7] MBIE (2016), Earthquake Geotechnical Engineering Practise: Module 3: Identification, assessment, and mitigation of liquefaction hazards,

The old open channel located along the eastern site boundary has been infilled. The site finished ground is generally level without any open slope faces, and on this basis, risk of lateral spreading is considered to be negligible.

6.4 Static Settlement

The site is underlain by Holocene Alluvium deposits, which are considered susceptible to consolidation settlement. Settlement analyses have been undertaken to estimate primary consolidation settlements induced either a) by the earthworks fill placement (average 1.0m fill thickness) of b) by floor slab dead and live loads from future residential buildings.

Settlement analyses have been undertaken to estimate primary consolidation settlements from available CPT data using the geotechnical analysis software CPeT-IT. A Boussinesq load distribution has been considered for the analyses.

6.4.1 Fill – Primary Consolidation Settlement

Primary consolidation settlement induced from earthworks have been estimated assuming 1.0m fill thickness placed across a 100 m by 100 m square area. A unit weight of 20kN/m^3 has conservatively been adopted for the fill material.

The primary consolidation settlements estimated under 1.0m fill across the site range from 20mm-60mm across the site. Results output are presented in Appendix F.

The time for consolidation settlements to be completed is dependent on the soil composition, the compressible layer thicknesses and the extent of filling. Settlement monitoring after fill placement has been completed across the site. Installation of services, pavement, and construction of future buildings at the site would only take place after these consolidation settlements have occurred, which should be demonstrated by a stabilisation in readings.

Settlement monitoring results have been reviewed by the Geotechnical Designer to confirm the long-term settlements are not expected to be worse than those predicted. This is covered in section 6.4.3 below.

6.4.2 Building – Primary Consolidation Settlement

For the purposes of assessing post-construction settlement induced by future building loads, it has been assumed that any earthworks related consolidation settlements will be completed prior to construction starting.

Primary consolidation settlements induced by future building construction have been estimated for a typical 10kPa floor load across a 15m by 15m square area. Results output are presented in Appendix F.

The primary consolidation settlements under future building loads, based on CPT data, are estimated to be less than 25mm. Differential settlements in the order of 1 in 500 are generally expected considering the maximum total settlement value estimated.

The predicted total and differential settlements are understood to be typically tolerable for the proposed type of development, provided adequate foundation system are selected and designed to accommodate the predicted long-term settlements. Recommended foundations and/or ground improvement at the site are presented in Section 6.6 of this report.

6.4.3 Settlement Monitoring

The client has instructed Zorn Surveying to install and monitor settlement pins installed on approximately every 3rd lot at the subdivision. This was to ensure that ground settlement due to the placement of fill at the site has ceased.

The results of the settlement monitoring are attached in Appendix. In summary, all the settlement pins recorded less than 10mm of settlement over a 4-week period. These will continue to be monitored as part of they Stage 2 works.

6.5 Retaining wall parameters

It is proposed to construct a retaining wall along the western boundary of the proposed subdivision. This is to retain the land from the neighbouring sites due to the proposed filling earthworks that are being undertaken to meet the NCC Flood levels in the area.

The retaining wall has been designed by Stratagroup and Engineering approval has been granted by the Napier City Council for this.

Retaining wall design parameters are presented in Table 6-3 below. All retaining walls should be designed to accommodate future potential surcharge pressures (up to 12kPa for any future new dwelling on the site).

Table 6-3 - Retaining Wall Design Parameters

Geological Unit	Bulk Density (kN/m³)	Young's Modulus of Elasticity E (mPa)	Strength		Earth Pressure Coefficients		
			Effective cohesion c' (kPa)	Friction angle, ϕ' (deg)	Active Ka	Passive Kp	At Rest Ko
Engineered Fill	19	20	0	30	0.285	4.288	0.50
Holocene Alluvium	18	10	2	28	0.309	3.868	0.53

6.6 Foundations for Lots 25 to 48 only

Given the presence of liquefiable soils at site, we consider that this risk to future buildings would be too high for standard shallow strip footing foundation option on the recently placed engineered fill. We consider that all dwellings to be located on Lots 25 to 48 are constructed on a gravel raft with a raft type foundation. These foundation types are very common for residential type buildings in the Hawkes Bay due to their ability to withstand differential settlements in the event of an earthquake event. This option is outlined below:

Gravel Raft

We recommend that the existing ground be undercut by 600mm and backfilled with imported hardfill and compacted to form a gravel raft beneath the building platform. The horizontal extent of gravel raft should be at least 1.0m outside perimeter of the building.

The imported hardfill should be placed and compacted in maximum 200mm layers using a smooth drum roller. The supplier of the hardfill should provide a NZ Heavy Compaction curve for the material which indicates the Maximum Dry Density (MDD).

The following testing should be carried out to ensure adequate compaction is being achieved:

- 95 % of MDD
- Clegg Impact values (CIV) greater than 20

Testing should be carried on a 5m grid on every 2nd lift and on the final surface.

Two layers of geogrid should be placed at the base of the excavation and at the mid-height of the gravel raft.

Foundations

A structural raft foundation (rib raft or other property system) should be designed with the following bearing capacities:

- Geotechnical ultimate bearing capacity 300kPa
- ULS factored bearing capacity 150kPa
- Allowable bearing capacity 100kPa

A raft foundation also prevents the building from 'pulling apart' in a large earthquake.

7. Main Conclusion

The geotechnical investigations and completion reporting have established that the Stage 1 (Lots 25 and 48) of the Kenny Rd Subdivision, Te Awa, Napier is suitable for residential development in accordance with the recommendations outlined in this geotechnical completion report.

The main point is that all lots 25 to 48 required the installation of a 600mm gravel raft beneath the proposed dwelling footprint and that a structural raft foundation is constructed. We recommend that the Napier City Council adopt this recommendation when assessing individual Building Consent Applications for the site.

8. Applicability

This report has been prepared for our client, Greenstone Land Developments Ltd, with respect to the brief provided to us. We note that only a representative sample of earthworks were reviewed by Initia and therefore we are relying on the contractor's PS3 for compliance with design. No liability is accepted for any omissions represented by those documents. The contractors PS3 should be obtained by the client and submitted to NCC. The advice and recommendations presented in this report should not be applied to any other project or used in any other context without prior written approval from Initia Limited.

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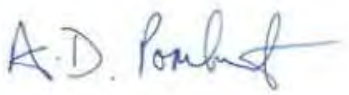

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Document control record

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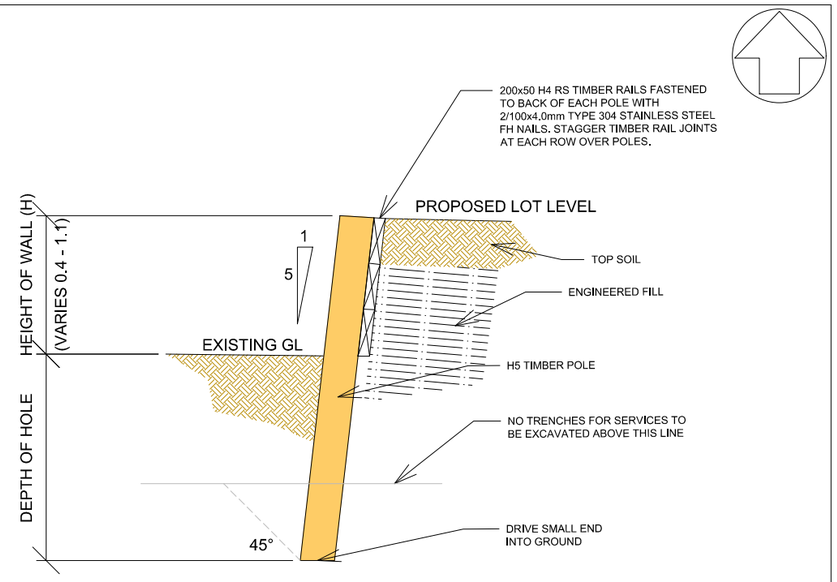
Initia Project Reference		P-000821			
Client		Greenstone Land Developments Ltd			
Revision	Date	Revision detail	Author	Author	Approved by
A	11/08/20	Draft for client review	L. Williams	R. Putoa	A. Pomfret
Current Revision		A			

Appendix A Strata Group Drawings



RETAINING WALL NOTE:
- RETAINED HEIGHT GREATER THAN 400mm TO BE 150mm DIAMETER POLES AT 900mm CENTERS. THE POLE IS TO BE EMBEDDED 1200mm WITH A 300mm DIAMETER CONCRETE ENCASEMENT.
- RETAINED HEIGHT LESS THAN 400mm TO BE 150mm DIAMETER DRIVEN POLES (1200mm EMBEDDED) AT 900mm CENTERS
- TIMBER RAILS ARE TO BE 200x50 H4 RS. NUMBER OF RAILS TO SUIT RETAINED HEIGHT.

CUT / FILL TABLE	
TOP SOIL STRIP	5,700 cu.m.
ENGINEERED FILL	16,950 cu.m.

ENGINEERED FILL TABLE			
Number	Minimum Level	Maximum Level	Colour
1	0.00	0.30	
2	0.30	0.60	
3	0.60	0.90	
4	0.90	1.20	
5	1.20	1.50	

EARTHWORKS NOTES:

- CUT FILL PLAN INDICATES THE DIFFERENTIAL SURFACE BETWEEN EXISTING GROUND AND FINISHED LEVELS.
- ALL EARTHWORKS SHALL BE IN ACCORDANCE WITH NZS 4404:2010 LAND DEVELOPMENT AND SUBDIVISION INFRASTRUCTURE AND NZS 4431:1989 EARTH FILL FOR RESIDENTIAL CONSTRUCTION (INCORPORATING ALL AMENDMENTS).
- SOIL TESTING SHALL BE IN ACCORDANCE WITH NZS 4402 1 TO 7:1986 METHODS OF TESTING SOILS FOR CIVIL ENGINEERING PURPOSES - SOIL TESTS.
- ALL VOLUMES HAVE BEEN CALCULATED IN SOLID ON FIXED DESIGN DEPTHS. VOLUMES EXCLUDE POSSIBLE UNDER-CUT OF SOFT SPOTS, UNDERGROUND FEATURES AND CONTAMINATED MATERIALS.
- ALL MEASUREMENTS SHALL BE VERIFIED ONSITE.
- DO NOT SCALE FROM DRAWING, IF EXTRA INFORMATION IS REQUIRED, PLEASE CONTACT STRATA GROUP CONSULTING ENGINEERS.
- IT IS THE CONTRACTORS RESPONSIBILITY TO SURVEY THE SUB-GRADE AND UNDER-CUT OF SOFT SPOTS & ANY IRREGULARITIES TO ENSURE ACCURACY OF CUT - FILL VOLUMES.
- REFER TO SHEET C061 "EROSION AND SEDIMENT CONTROL PLAN" FOR THE SEDIMENT CONTROL MEASURES AND CONTROL.
- REFER TO TECHNICAL SPECIFICATION FOR CONSTRUCTION MONITORING AND TESTING REQUIREMENTS.

SAFETY IN DESIGN

ALL REASONABLY PRACTICABLE STEPS HAVE BEEN TAKEN TO ENSURE SAFETY IN DESIGN HAS BEEN CONSIDERED WITHIN STRATA GROUP'S SCOPE OF WORK FOR THIS DESIGN IN ACCORDANCE WITH IPENZ PRACTICE NOTE 07 "DESIGN FOR SAFETY IN BUILDINGS AND OTHER STRUCTURES (JULY 2006)". IT REMAINS THE RESPONSIBILITY OF THE OWNER AND/OR OPERATOR TO ENSURE APPROPRIATE PRACTICES ARE IN PLACE TO PROTECT THE SAFETY OF THE WORKERS AND THE PUBLIC IN THE OPERATION OF THE FACILITY.

REV	REASON FOR ISSUE	DATE	BY
1	FOR RESOURCE CONSENT	11/7/19	MC

THE CONTRACTOR IS TO BE AWARE OF ALL INSPECTIONS TO BE MADE BY THE ENGINEER AS A REQUIREMENT OF THE PRODUCER STATEMENT PS4 CONSTRUCTION REVIEW DOCUMENTATION. THE ENGINEER WILL REQUIRE 24 HOURS PRIOR NOTIFICATION FOR ALL INSPECTIONS.

strata group CONSULTING ENGINEERS
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F 06 876 7645
www.stratagroup.net.nz
PO BOX 758
Business HQ
1/308 Queen Street East
Hastings, New Zealand
Structural Fire Civil Project Management

CLIENT: Greenstone LAND DEVELOPMENTS

PROJECT: TE AWA - KENNY ROAD

TITLE: EARTHWORKS PLAN

DESIGNED MC
DRAWN MC
CHECKED DJ
DATE 26/6/19

0 5 10 20 30
Full Size 1:500 ; Half Size 1:1000
Scale (m)

PROJECT NO.: J5174 SHEET: C060 REVISION: 1

PATH:J:\GREENSTONE LAND DEVELOPMENTS LTD\J5174 - TEAWA- FREIDLANDER BLOCK\2 - DWGS\J5174 C060 EARTHWORKS PLAN.DWG
DATE:7/2/2018

EROSION & SEDIMENT CONTROL NOTES:

- ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN ACCORDANCE WITH "HAWKES BAY REGIONAL COUNCIL - HAWKE'S BAY WATERWAY GUIDELINES EROSION AND SEDIMENT CONTROL".
- ALL SEDIMENT CONTROL MEASURES ARE TO BE ESTABLISHED AND APPROVED BY NCC PRIOR TO EARTHWORKS COMMENCING.
- EXCAVATIONS SHALL BE PLANNED TO MINIMISE THE LENGTH OF TIME THAT CUT AND FILL AREAS ARE LEFT EXPOSED - FIRST LAYERS OF SUB-BASE TO BE CONSTRUCTED AS EARLY AS PRACTICAL TO REDUCE POTENTIAL SEDIMENT LADEN RUN-OFF.
- DISCUSS ORDER OF EARTHWORKS WITH ENGINEERS TO OPTIMISE SEDIMENT CONTROL AND REDUCE EXPOSURE TIMES;
- EARTHWORKS SHALL BE BE UNDERTAKEN WITH THE ROAD FORMATION BEING EXCAVATED 1ST (ACTING AS A PRIMARY SEDIMENT POND) WITH EARTHWORKS WORKING OUTWARD TOWARDS THE DEVELOPMENT PERIPHERY (UNLESS AGREED OTHERWISE). DOING SO, INITIAL EXCAVATIONS (TO SUB-GRADE) WILL BE LOWER THAN SURROUNDING LAND, AND DISHED TO THE EXISTING OPEN DRAIN / SEDIMENT CONTROL POND - DECANTING EARTH BUND.
- SITE MANAGER SHOULD IMMEDIATELY NOTIFY NAPIER CITY COUNCIL ENVIRONMENTAL SOLUTIONS TEAM AVAILABLE 24HOURS A DAY AT 06 8357579 OF ANY SIGNIFICANT NON-COMPLIANCE.
- ALL EARTH STOCKPILES AND EXPOSED BATTERS SHALL BE SOWN WITH GRASS AS SOON AS PRACTICAL TO AVOID DUST AND SEDIMENT RUN-OFF ISSUES.
- GRASSED AREAS AROUND EXCAVATION AREAS TO BE MAINTAINED AT >150MM TO ENTRAP SEDIMENT
- SEDIMENT CONTROL MEASURES TO BE LEFT IN OPERATION UNTIL ALL SURFACES ARE STABILISED.
- ALL SEDIMENT CONTROL DEVICES TO BE CHECKED AND MAINTAINED AFTER EVERY SIGNIFICANT RAIN EVENT.
- ALL MEASURES MUST BE TAKEN TO PREVENT THE INGRESS OF SEDIMENT INTO EXISTING STORMWATER PIPES AND DRAINS.
- ENSURE CONTRACTOR IS AWARE OF LEGAL IMPLICATIONS OF DISCHARGING SEDIMENT-LADEN WATER TO THE ENVIRONMENT THROUGH THE NAPIER CITY COUNCIL STORMWATER BYLAW 2012 AND THE RESOURCE MANAGEMENT ACT SECTION 15.
- CONTRACTOR MUST ENSURE ALL EARTHWORKS AND SEDIMENT LADEN RUN-OFF DOES NOT TRAVEL BEYOND THE PROPERTY BOUNDARY
- TO LIMIT DUST NUISANCE, THE FOLLOWING MEASURES SHALL BE ADHERED TO;
  1. LIMIT VEHICLE SPEEDS TO 10KM PER HOUR
  2. LIMIT EARTHWORKS DROP HEIGHTS WHEN LOADING OR UNLOADING MATERIALS
  3. MATERIALS STOCKPILES TO HAVE SIDE SLOPES NO GREATER THAN 1 VERTICAL: 3 HORIZONTAL
  4. WATER TANKERS SHALL BE UTILISED TO MITIGATE ANY DUST NUISANCE DURING CONSTRUCTION.

LEGENDS

	TEMPORARY SOIL STOCKPILE
	TEMPORARY OPEN DRAIN
	500mm HIGH EARTH BUND

SAFETY IN DESIGN

ALL REASONABLY PRACTICABLE STEPS HAVE BEEN TAKEN TO ENSURE SAFETY IN DESIGN HAS BEEN CONSIDERED WITHIN STRATA GROUP'S SCOPE OF WORK FOR THIS DESIGN IN ACCORDANCE WITH IPENZ PRACTICE NOTE 07 "DESIGN FOR SAFETY IN BUILDINGS AND OTHER STRUCTURES (JULY 2006)". IT REMAINS THE RESPONSIBILITY OF THE OWNER AND/OR OPERATOR TO ENSURE APPROPRIATE PRACTICES ARE IN PLACE TO PROTECT THE SAFETY OF THE WORKERS AND THE PUBLIC IN THE OPERATION OF THE FACILITY.

REV	REASON FOR ISSUE	DATE	BY
1	FOR RESOURCE CONSENT	22/1/20	MC

THE CONTRACTOR IS TO BE AWARE OF ALL INSPECTIONS TO BE MADE BY THE ENGINEER AS A REQUIREMENT OF THE PRODUCER STATEMENT PS4 CONSTRUCTION REVIEW DOCUMENTATION. THE ENGINEER WILL REQUIRE 24 HOURS PRIOR NOTIFICATION FOR ALL INSPECTIONS.

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Business HQ
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Hastings, New Zealand
Structural Fire Civil Project Management

CLIENT: Greenstone LAND DEVELOPMENTS

PROJECT: TE AWA - KENNY ROAD

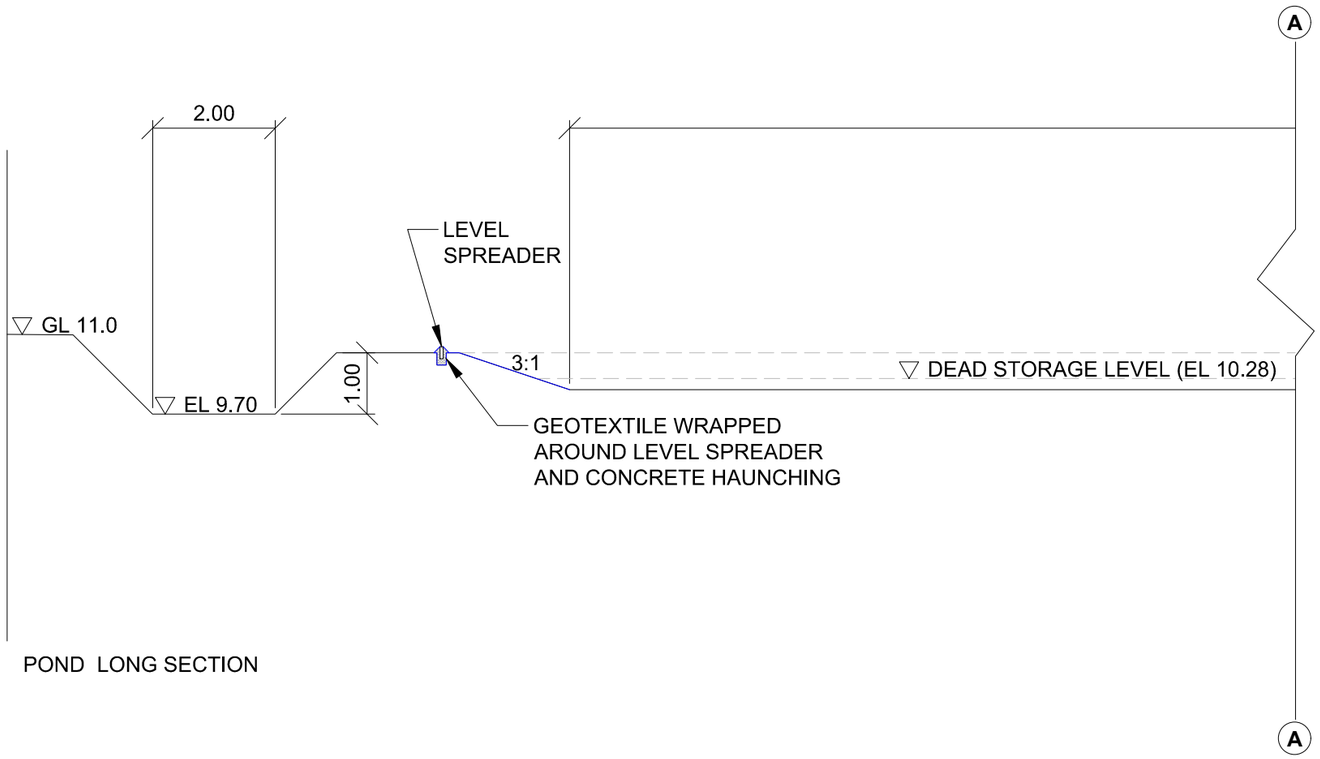
TITLE: SEDIMENT CONTROL PLAN

DESIGNED	MC
DRAWN	MC
CHECKED	DJ
DATE	22/01/20

0 0.05 0.1 0.2 0.3
Full Size 1:5 ; Half Size 1:10
Scale (m)

PROJECT NO.: J5174 | SHEET: C061 | REVISION: 1

PATH:J:\GREENSTONE LAND DEVELOPMENTS LTD\J5174 - TEAWA- FREIDLANDER BLOCK\2 - DWGS\POND2.DWG DATE:7/2/2018

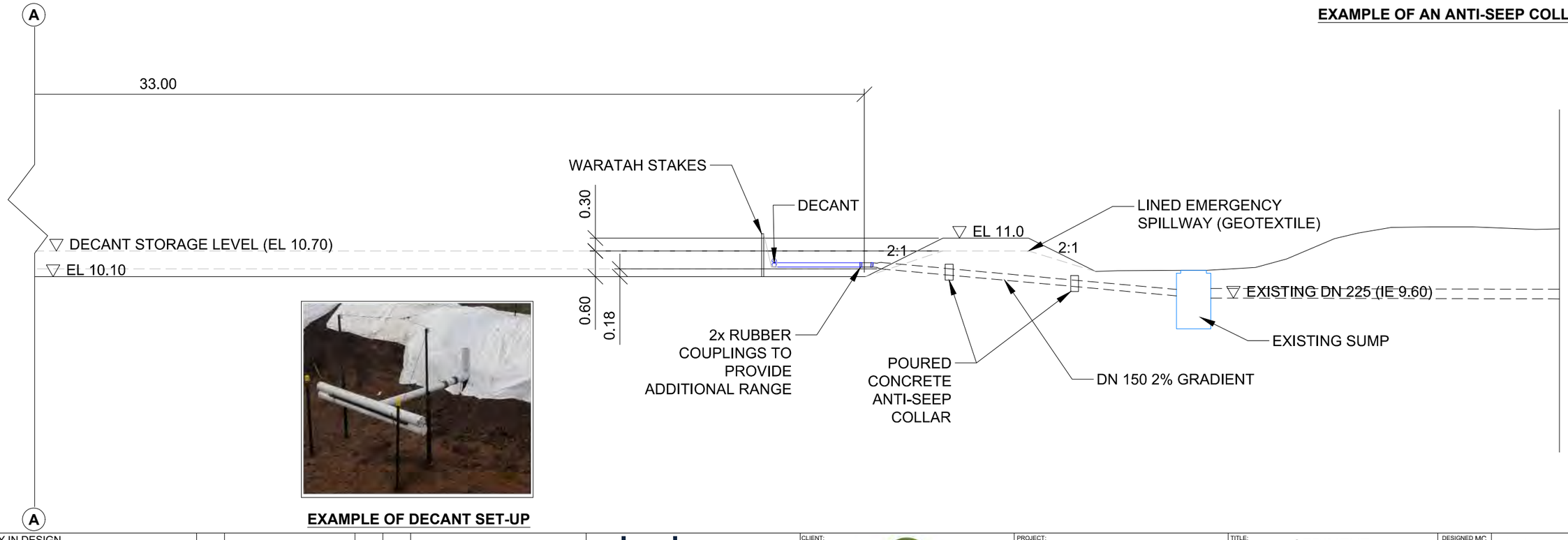


SCALE: 1:50H, 1:50V
DATUM: 6.00

POND LONG SECTION

EXAMPLE OF A LEVEL SPREADER

EXAMPLE OF AN ANTI-SEEP COLLAR



EXAMPLE OF DECANT SET-UP

SAFETY IN DESIGN

ALL REASONABLY PRACTICABLE STEPS HAVE BEEN TAKEN TO ENSURE SAFETY IN DESIGN HAS BEEN CONSIDERED WITHIN STRATA GROUP'S SCOPE OF WORK FOR THIS DESIGN IN ACCORDANCE WITH IPENZ PRACTICE NOTE 07 "DESIGN FOR SAFETY IN BUILDINGS AND OTHER STRUCTURES (JULY 2006)". IT REMAINS THE RESPONSIBILITY OF THE OWNER AND/OR OPERATOR TO ENSURE APPROPRIATE PRACTICES ARE IN PLACE TO PROTECT THE SAFETY OF THE WORKERS AND THE PUBLIC IN THE OPERATION OF THE FACILITY.

REV	REASON FOR ISSUE	DATE	BY
1	FOR RESOURCE CONSENT	22/1/20	MC

THE CONTRACTOR IS TO BE AWARE OF ALL INSPECTIONS TO BE MADE BY THE ENGINEER AS A REQUIREMENT OF THE PRODUCER STATEMENT PS4 CONSTRUCTION REVIEW DOCUMENTATION. THE ENGINEER WILL REQUIRE 24 HOURS PRIOR NOTIFICATION FOR ALL INSPECTIONS.

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Hastings, New Zealand
Structural Fire Civil Project Management

CLIENT: Greenstone LAND DEVELOPMENTS

PROJECT: TE AWA - KENNY ROAD

TITLE: SEDIMENT POND LONG SECTION

DESIGNED	MC
DRAWN	MC
CHECKED	DJ
DATE	22/01/20

0 0.5 1 2 3
Full Size 1:50 ; Half Size 1:100
Scale (m)

PROJECT NO.:	SHEET:	REVISION:
J5174	C062	1

PATH:J:\GREENSTONE LAND DEVELOPMENTS LTD\J5174 - TEAWA- FREIDLANDER BLOCK\2 - DWGS\POND2.DWG DATE:7/2/2018

Appendix B RDCL Report and Investigation Logs

PO Box 28057
Havelock North
New Zealand
Tel: +64 6 877 1652

Our Ref: L-19290602-01

9 July 2019

Greenstone Land Developments Ltd
C/- 204 Queen Street East,
HASTINGS, 4122

Attention: Tim Wilkins

56 KENNY ROAD – PRELIMINARY GEOTECHNICAL REPORT

EXECUTIVE SUMMARY

The site comprises loose unconsolidated alluvial deposits, highly susceptible to liquefaction. Deep tree root bowls and rubbish holes may be encountered onsite.

Foundations will require TC3 type in accordance with MBIE Part C Technical Guidance, dated April 2015 which in Hawkes Bay, practically means a 1.2m undercut with reinforced (geogrid+geofabric), gravel raft fill.

The site has a very high risk of liquefaction with vertical settlements of 300mm anticipated for a ULS event. Lateral spread is possible on the eastern boundary (adjacent to the existing drain) and is a definite risk for any new drainage or excavations.

The site is prone to flood levels for a 50 year return period. Earthworks may be required to elevate ground level above flood levels.

Road subgrades are <3% and will require lime and cement modifications to achieve adequate subgrade.

The site has been assessed for the levels and ground conditions at the time of testing. Any changes to ground levels or excavations are likely to affect geotechnical recommendations and need to be specifically considered.

INTRODUCTION

Greenstone Land Development Ltd has engaged Resource Development Consultants Ltd (RDCL) to undertake a Preliminary Geotechnical Report at 56 Kenny Road, Te Awa Napier.

The findings in this report are based on current ground conditions and levels at the time of testing. Any changes in levels or ground conditions as a result of earthworks may have a significant impact on the geotechnical engineering and will need to be considered at that time.

SITE DESCRIPTION

The site is located at 56 Kenny Road, Te Awa ~90m from the coastline and is bordered by Erickson Road to the west, Kenny Road to the south and residential subdivision to the north and east.

The site is near level, with a man-made drainage channel (1m wide x 0.5m deep) oriented north to south along the eastern boundary.

A residential dwelling, garage and ancillary shed is located on the property adjacent to Kenny Road to the south-east.

The south eastern quadrant of the site is planted in citrus and large wind-break trees border the boundary.

SCOPE OF WORK

Our scope of work is presented in the short form agreement (SFA), reference 19290, dated 17 may 2019.

DESKTOP STUDY

GEOLOGY

The site subsoils are likely to comprise loose, unconsolidated estuarine, lagoon and swamp deposits of sand, silt and minor gravel that has been drained or reclaimed since 1850 (Hawkes bay Emergency Management Group portal).

The HBEMP indicates no known faults cross the site (Hawkes Bay Emergency Management Group Portal).

LIQUEFACTION SUSCEPTIBILITY

The online Hawkes Bay Emergency Management Group Portal (HBEMP) indicates the site is located within a zone of "High Liquefaction vulnerability".

HISTORICAL IMAGERY

Historical Imagery reviewed from RetroLens.NZ database since 1948 indicates the site comprised a residential dwelling on the corner of Erickson Road and Kenny Road and the land has been used as farmland. No significant earthworks or earthwork modifications were evident in the photos.

FLOODING

The HBEMG portal indicates the site is prone to flooding.

Based on that dataset, the Flood extents are:

- Flood Return Period 50 (yr);
- Site Contours ~11m to 11.5m (From NCC Intramaps database;
- Flood Level 11.3m (datum msl – 10m);
- Accuracy 0.2.

RUBBISH DUMPS

Anecdotal evidence (discussion with neighbour) suggests there may be a small buried rubbish hole or holes across the site. Rubbish may include household waste, organic waste, and contaminants.

CONTAMINATION

Contamination assessment is explicitly excluded from this work. We simply make the comment that the risk of contamination on this site does seem plausible.

SITE TESTING

RDCL undertook site testing on 21/5/2019and consisted of the following:

- Eight (8) Test Pit excavations; to
    - Between 3m and 3.4m below ground level (depth of excavator).
- Eight (8) DCP tests undertaken within the test pit excavation: to
    - 2.9m depth, terminated at target depth.
- Ten (10) CPT Tests to between:
    - 10.34m and 13.42m, terminated due to high qc (~20MPa).

Test Pit Logs are in Appendix A with CPT test logs in Appendix B.

SITE INVESTIGATION RESULTS

SUBSOIL CONDITIONS

The shallow subsoil conditions typically comprised, horizontally bedded unconsolidated alluvial deposits consistent with the published geology. Typical sequence from testing is for:

- TOPSOIL (0.15m to 0.3m thick); Organic sandy SILT, dark brown moist with some rootlets; overlying
- SILT and f-m SAND (to 0.9m and 1.3m bgl): grey with orange mottling, loose, non to low-plastic, moist, trace of rootlets;
- Silty CLAY or clayey SILT, trace of sand (to 1.4m and 2.1m bgl);:grey with orange mottling, wet, firm, moderate plasticity;
- F-m SAND (to 2.4m and 3.0m bgl), dark bluish grey, minor shells, wet, medium dense
- Silty CLAY to depth of excavations, some fine sand, bluish grey, wet, soft, moderate plasticity.

Sensitive fine grained materials were encountered within 2m depth in CPT tests indicated weak or soft clay or organic materials.

GROUNDWATER

Groundwater seepage was encountered between 2.3m and 2.9m depth. Groundwater is anticipated to fluctuate seasonally and could be anticipated to be encountered at shallow depths

GEOTECHNICAL ASSESSMENT

SHALLOW BEARING CAPACITY

DCP test results correlated to Ultimate Bearing Capacity (UBC) in accordance with M.J Stockwell (1977) indicate low bearing soils of:

- >200kPa UBC; which are
- Likely to reduce in bearing capacity when wet (i.e. after rain).

LIQUEFACTION ASSESSMENT

LIQUEFACTION POTENTIAL

A liquefaction assessment was carried out on the results of the CPT investigation (Appendix B). The assessment indicates the site is at:

- Very High risk of liquefaction (LPI) during an Ultimate Limit State (ULS) design seismic event, and
- High Risk of liquefaction during a Serviceability Limit State (SLS) with
    - Moderate to severe expression of liquefaction based on Liquefaction Severity Number (LSN).

Liquefaction assessment outputs are attached as Appendix C.

VERTICAL SETTLEMENT

Vertical settlement assessment is anticipated to be:

- ~200mm to 300mm under ULS conditions; and
- ~220mm under SLS conditions.

DIFFERENTIAL SETTLEMENT

Differential settlement is anticipated to be:

- ~150mm during a ULS event

LATERAL SPREAD

Lateral spreading on the eastern boundary into the shallow drain should be considered.

Any new excavations such as stormwater drainage trenches or the like, which would result in a free face into which lateral spread could develop, need to be carefully considered.

Engineering works to protect against lateral spread in that case would most likely be required.

BASIS OF ASSESSMENT

The liquefaction assessment for the site was carried out using CLiq, accepted industry software package, CPT data of current ground conditions and the following input parameters (NZS1170.5 section 3.1.3 (Standards New Zealand, 2004)):

- Magnitude (M) = 7.5 (SLS & ULS);
- PGA = 0.44 g (ULS), based on:
  - Z = 0.38 (Napier);
  - C = 1.12 (Class D Soil), and
  - R = 1 (ULS).
- Groundwater level assumed 1.0 m deep based on TP investigation.

The design earthquake was chosen on the basis of probability of recurrence. The probability is based on historical earthquakes. A 7.5 magnitude earthquake for an Importance Level 2 correlates with a 500 year return period (ULS). A 50 year design life was assigned.

The liquefaction analysis method used was Moss et al (2006).

SEISMIC SOIL CLASSIFICATION

The site is classified as site subsoil "Class D – Deep or Soft Soil Site" in accordance with NZS1170.5:2004, part 5: Earthquake Actions – New Zealand.

The site subsoil class was assessed based on review of borehole lithology in them surrounding area in Hawke's Bay Regional Council (HBRC) Well Database.

GEOTECHNICAL CONSIDERATIONS

GROUND CONDITIONS

Ground conditions comprise loose, unconsolidated silts and sands of weak bearing and susceptible to liquefaction. Naturally occurring organic materials (peat, buried organics) may be encountered at shallow depth within 1m of ground level.

Relic root bowls may be encountered where old shelter belts once stood. These may be susceptible to low bearing and long term settlement.

FLOOD LEVEL EARTHWORKS

Ground levels are anticipated to be required to be increased above the existing flood levels (+0.2m) plus freeboard. Fill materials o0n site are unlikely to be suitable for structural fill in the natural state. Fill will most likely need to be imported, or site materials stabilised with cement.

Site testing of source material will be required to understand the classification and compaction criteria. |All fill work would need to be under direction and approval of a chartered geotechnical engineer.

ANTICIPATED FOUNDATIONS

Conditions do not meet the requirements of NZS3604:2011 due to liquefaction and low bearing capacity. Specific design will be required for all foundations.

Liquefaction criteria determine that foundations will require:

- TC3 Type in accordance with MBIE Part C Technical Guidance, version 3a, dated April 2015.

Practically, in Hawkes Bay, this means a 1.2m deep undercut with reinforced (geogrid + geofabric), gravel raft fill.

ROAD SURFACING

Insitu subgrade comprises weak, alluvial soils with low subgrade strengths (CBR of <3%). Ground improvement may be required to achieve suitable subgrade capacity.

Earthworks to treat flood level may incorporate engineered fill to improve road subgrade CBR and may require lime cement modification.

BURIED RUBBISH AND TREE HOLES

There may be a risk that buried rubbish and tree holes may be exposed during topsoil stripping. If encountered these will need to be excavated to the full depth and reinstated with engineered fill.

LIMITATIONS

- This letter has been prepared for the particular purpose outlined in the project brief and no responsibility is accepted for the use of any part in other contexts or for any other purpose.
- Ground conditions assessed in this letter are inferred from published sources, site inspection and the investigations described. Variations from the interpreted conditions may occur, and special conditions relating to the site may not have been revealed by this investigation, and which are therefore not taken into account. No warranty is included either expressed or implied that the actual conditions will conform to the interpretation contained in this letter.
- No responsibility is accepted by Resource Development Consultants Ltd for inaccuracies in data supplied by others. Where data has been supplied by others, it has been assumed that this information is correct.
- Groundwater conditions can vary with season or due to other events. Any comments on groundwater conditions are based on observations at the time.
- This letter is provided for sole use by the client and Napier City Council and is confidential to the client and their professional advisors. No responsibility whatsoever for the contents of this letter shall be accepted for any person other than the client.

We trust this meets your current needs. Should you wish to discuss any aspect of the contents of this document please contact me the undersigned on 06 877 1652.

Sincerely,

Prepared by:

T Bunny
BSc Geol; PGDip Eng Geol
Snr Engineering Geologist

Approved by:

CA Wylie
MSc, MIPENZ; CPEng
Principal

FIGURE 1 SITE PLAN

Legend

- Cone Penetration Test
- Test Pit with Dynamic Cone Penetrometer
- Primary parcels

Notes:
New Zealand Primary Parcels, New Zealand Topo50 Map and Hawke's Bay 0.3 m Rural Aerial Imagery (2014-2015) obtained from https://data.linz.govt.nz/layer

RDCL
PO Box 28057 | 8/308 Queen St East Hastings NZ
Tel: +64 6 8771652 | Fax: +64 6 877 5015
Email: info@rdcl.co.nz www.rdcl.co.nz

Title	Site Investigation Layout	Drawn By	SD	Date	24/05/19	Drawing Size- A3
Project	192900602 - Kenny Rd Subdivision (56 Kenny Rd)	Checked By	TB	Date	24/05/19	File Name
Client	GLDL	Approved By	TB	Date	24/05/19	Figure Number: 1

APPENDIX A TEST PIT & DCP TESTS

TEST PIT LOG

TP01

SHEET 1 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0				SILT, with some rootlets; dark brown . Non-plastic; moist; (Topsoil).				3		3
								3		3
								3		3
				Sandy SILT, with trace rootlets; brown with grey and orange mottling. Firm; non-plastic; moist; sand, fine to medium.		FM		1	FSV: 0.35m 67/41kPa	1
0.5								3		3
				SAND; brown with orange mottling. Loose; moist; sand, fine to medium.				2		2
								4		4
								3		3
					M	L		2		2
1.0								4		4
								3		3
								2		2
								3		3
				CLAY, with trace sand; grey with orange mottling. Firm; moderate plasticity; moist; sand, medium to coarse.				2		2
1.5								2		2
						FM		2		2
								4		4
								3		3
				SAND; dark grey with dark orange mottling. Medium dense; sand, fine to medium; some shells .				5		5
2.0								5		5
								8		8
								10		10
								7		7
				SAND; bluish grey. Medium dense; wet; sand, fine to medium; minor shells.		MD		7		7
								5		5
2.5								3		3
					W			4		4
								3		3
								5		5
3.0				Silty CLAY, with some sand; bluish grey. Soft; moderate plasticity; wet; sand, fine.		S				
				EOH: 3.40m						
3.5										
4.0										
4.5										

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

RDCL
8/308 QUEEN ST EAST, HASTINGS | PO BOX 28057, HAVELOCK NORTH 4130 | NEW ZEALAND
Ph: +64 6 8771652 | Email: info@rdcl.co.nz

TEST PIT LOG

TP02

SHEET 2 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0				SILT, with some rootlets; dark brown. Firm; non-plastic; (Topsoil).		FM		2		2
								3		3
				SILT, with some sand, with trace rootlets; light brown, orange mottling. Low plasticity; moist; sand, fine.				5		5
0.5								3		3
					M			2		2
								2		2
				SAND, with minor silt, with trace rootlets; greyish brown, with orange mottling. Loose; non-plastic; moist; sand, fine to medium.		L		2		2
1.0								1		1
								1		1
								1		1
								4		4
				Silty CLAY, with trace sand; grey with orange mottling. Firm; moderate plasticity; wet; sand, fine.				2	FSV: 1.20m 30/11kPa	2
								3		3
1.5						FM		3		3
								4		4
								3		3
								3		3
								4		4
								4		4
				SAND, with some silt; bluish grey. Medium dense; non-plastic; wet; sand, fine to medium; some shells.				5		5
2.0								6		6
					W			5		5
								10		10
						MD		12		12
								9		9
2.5		▶						5		5
								4		4
								5		5
								5		5
3.0				CLAY, with minor silt; bluish grey. Firm; moderate plasticity; wet; trace shells.		FM				
				EOH: 3.30m						
3.5										
4.0										
4.5										

REMARKS

SYMBOLS

- ▼ Standing Water Level
- ◁ Out flow
- ▷ In flow

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TEST PIT LOG

TP03

SHEET 3 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0		Groundwater Not Encountered		SILT, with some rootlets, with minor sand. Firm; non-plastic; dry; sand, fine to medium; organic (Topsoil).	D			4		4
								4	FSV: 0.20m 107/30kPa	4
								6		6
				SILT, with some sand, with trace rootlets; brown with orange mottling. Firm; low plasticity; moist; sand, fine to medium.		FM		3		3
0.5								3		3
								2		2
								2		2
								3		3
				SAND; brown with orange mottling. Moist; sand, fine to medium.	M			2		2
1.0								2		2
								2		2
								2		2
								2	FSV: 1.20m 44/17kPa	2
				CLAY, with some silt; grey with dark orange mottling. Moderate plasticity; moist.				2		2
								1		1
1.5								2		2
								1		1
								4		4
								3		3
								3		3
				SAND, with minor silt; dark grey. Medium dense; non-plastic; wet; sand, fine to medium; some shells.				5		5
2.0								5		5
								5		5
								4		4
								3		3
					W	MD		2		2
2.5								3		3
								3		3
								4		4
								4		4
				Silty CLAY; bluish grey. Soft; moderate plasticity; wet; trace shells.		S		3		3
3.0				EOH: 3.40m						
3.5										
4.0										
4.5										

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

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TEST PIT LOG

TP04

SHEET 4 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0		Groundwater Not Encountered		SILT, with some rootlets; dark brown. Stiff; non-plastic; organic (Topsoil).		SF		2		2
								3		3
								3		3
				SILT, with some sand; brown with orange mottling. Firm; low plasticity; moist; sand, fine.	M	FM		2	FSV: 0.40m 47/33kPa	2
0.5								2		2
								3		3
								3		3
								3		3
								3		3
1.0				SAND; greyish brown, orange mottling. Loose; moist; sand, fine to medium.		L		1		1
								3		3
				Silty CLAY; grey with dark orange mottling. Moderate plasticity; wet.				2	FSV: 1.20m 33/14kPa	2
								2		2
1.5								1		1
								2		2
								3		3
								3		3
				SAND, with trace silt; blluish grey. Medium dense; non-plastic; wet; some shells.	W	MD		5		5
								6		6
2.0								5		5
								4		4
								5		5
								4		4
								4		4
2.5								3		3
								4		4
								4		4
								4		4
3.0				Silty CLAY; bluish grey. Soft; moderate plasticity; wet; trace shells.		S		6		6
				EOH: 3.30m						
3.5										
4.0										
4.5										

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

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TEST PIT LOG

TP05

SHEET 5 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0		Groundwater Not Encountered		SILT; dark brown . Non-plastic; moist; Organic (Topsoil).	M	FM		4 4 3 4 2 3 3 4 9 6 5 3 2 4 2 3 3 5 8 7 9 6 8 7 5 4 5 6 7	FSV: 1.20m 32/17kPa FSV: 1.50m 14/11kPa	4 4 3 4 2 3 3 4 9 6 5 3 2 4 2 3 3 5 8 7 9 6 8 7 5 4 5 6 7
0.5				SILT, with some sand, with trace rootlets; brown with orange mottling. Firm; non-plastic; moist; sand, fine; some organic material.						
1.0				SAND; greyish brown, orange mottling. Loose; moist; sand, fine to medium; some roots.		L				
1.5				CLAY; greyish brown withorange mottling. Moderate plasticity; moist.						
2.0				CLAY, with trace sand; bluish grey. Soft; moderate plasticity; wet; sand, fine.	W	S				
2.5				SAND, with trace silt; bluish grey. Medium dense; wet; sand, fine to medium; some shells.		MD				
3.0				Clayey SILT, with some sand; bluish grey. Soft; moderate plasticity; wet; sand, fine; trace shells.		S				
3.2				EOH: 3.20m						
3.5										
4.0										
4.5										

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

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TEST PIT LOG

TP06

SHEET 6 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0	Sandy, with some gravel, with trace rootlets; dark brown. Dense; moist.	M	D		2 4 3 2 3 1 3 1 2 1 3 4 1 2 3 4 4 7 4 3 2 3 4 3 3 4 3 5 4	FSV: 1.00m 47/14kPa	2 4 3 2 3 1 3 1 2 1 3 4 1 2 3 4 4 7 4 3 2 3 4 3 3 4 3 5 4
0.5	SILT, with some sand; brown . Firm; low plasticity; moist; sand, fine; reworked/disturbed ground.		FM				
1.0	SILT, with some sand; brown, grey mottling . Low plasticity; moist; sand, fine.						
1.0	Silty CLAY; greyish brown, orange mottling. Firm; moderate plasticity; wet.	W	FM				
1.5	SAND, with trace silt; greyish brown with orange mottling. Non-plastic; wet; sand, fine to medium; some shells.						
2.0	SAND, with trace silt; bluish grey. Medium dense; wet; sand, fine to medium; minor shells.		MD				
2.5	Silty CLAY; bluish grey. Firm; moderate plasticity; wet; trace shells.		FM				
3.0	EOH: 3.10m						
3.5							
4.0							
4.5							

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

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TEST PIT LOG

TP07

SHEET 7 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS
0.0	SILT, with minor rootlets; dark brown. Stiff; moist; (Topsoil).		SF		3, 3
0.5	Silty SAND, with trace rootlets; greyish brown with orange mottling. Loose; moist; sand, fine.		L		4, 4, 4, 4
	SAND; greyish brown, orange mottling. Medium dense; moist; sand, fine to medium.		MD		2, 0, 1
1.0	Clayey SILT; greyish brown, orange mottling. Firm; moderate plasticity; moist.	M	FM		1, 1, 1, 3, 2, 3, 5
1.5	SAND, with trace silt; greyish brown. Medium dense; moist; sand, fine to medium; some shells.		MD		6, 7, 7, 5, 7, 6, 3, 3
2.0	SAND, with minor silt; dark grey. Medium dense; wet; sand, fine to medium; minor shells.	W			2, 2, 3, 4, 4, 4
2.5	Clayey SILT, with minor sand. Soft; moderate plasticity; wet; sand, fine; trace shells.		S		
3.0	EOH: 3.00m				
3.5					
4.0					
4.5					

Groundwater Not Encountered

SAMPLES & TESTS: FSV: 1.00m 51/17kPa

DCP Blows: 3, 3, 4, 4, 4, 4, 2, 1, 1, 1, 3, 2, 5, 6, 7, 7, 5, 7, 6, 3, 3, 2, 2, 3, 4, 4, 4

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

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TEST PIT LOG

TP08

SHEET 8 OF 8

CLIENT:	Greenstone Land Developments Ltd	PROJECTION:	NZTM2000	STARTED:	21-05-2019
PROJECT:	192900602	EASTING:		FINISHED:	21-05-2019
LOCATION:	56 Kenny Rd	NORTHING:			
	56 Kenny Rd	DATUM:	-	LOGGED BY:	SD DATE: 21-05-2019
OFFICE:	RDCL - Hastings	ELEVATION:	-	CHECKED BY:	DATE:
ENGINEER:	TB	DIMENSIONS:	m x m	STATUS:	Draft data
CONTRACTOR:		MACHINE TYPE & MODEL:			

DEPTH (m)	RL (m)	WATER	GRAPHIC LOG	ROCK / SOIL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / DENSITY	CLASSIFICATION	DCP BLOWS	SAMPLES & TESTS	DCP Blows
0.0		Groundwater Not Encountered		Sandy SILT, with some rootlets; dark brown. Firm; moist; Organic (Topsoil).	M	FM		3		3
				Sandy SILT; brown . Firm; non-plastic; moist; sand, fine.				5		5
0.5				SAND; brown with orange mottling. Loose; moist.		L		3		3
								2		2
1.0				Clayey SILT; greyish brown with orange mottling. Firm; moderate plasticity; moist.		FM		2		2
								3		3
1.5				SAND, with some silt; greyish brown . Medium dense; non-plastic; wet; sand, fine; some shells.	W	MD		3		3
								2		2
2.0								1		1
								1	FSV: 1.00m 50/15kPa	1
2.5				SAND, with trace silt; bluish grey. Medium dense; wet; sand, fine to medium; minor shells.				3		3
								2		2
3.0				Clayey SILT; bluish grey. Soft; moderate plasticity; wet; trace shells.		S		3		3
								4		4
3.5								3		3
								2		2
4.0								2		2
								6		6
4.5								7		7
								4		4
								5		5
								8		8
								3		3
								3		3
								3		3
								3		3
								3		3
								3		3
								3		3
								6		6
				EOH: 3.20m						

REMARKS

SYMBOLS

- Standing Water Level
- Out flow
- In flow

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APPENDIX B CPT TEST RESULTS

CONE PENETRATION TEST

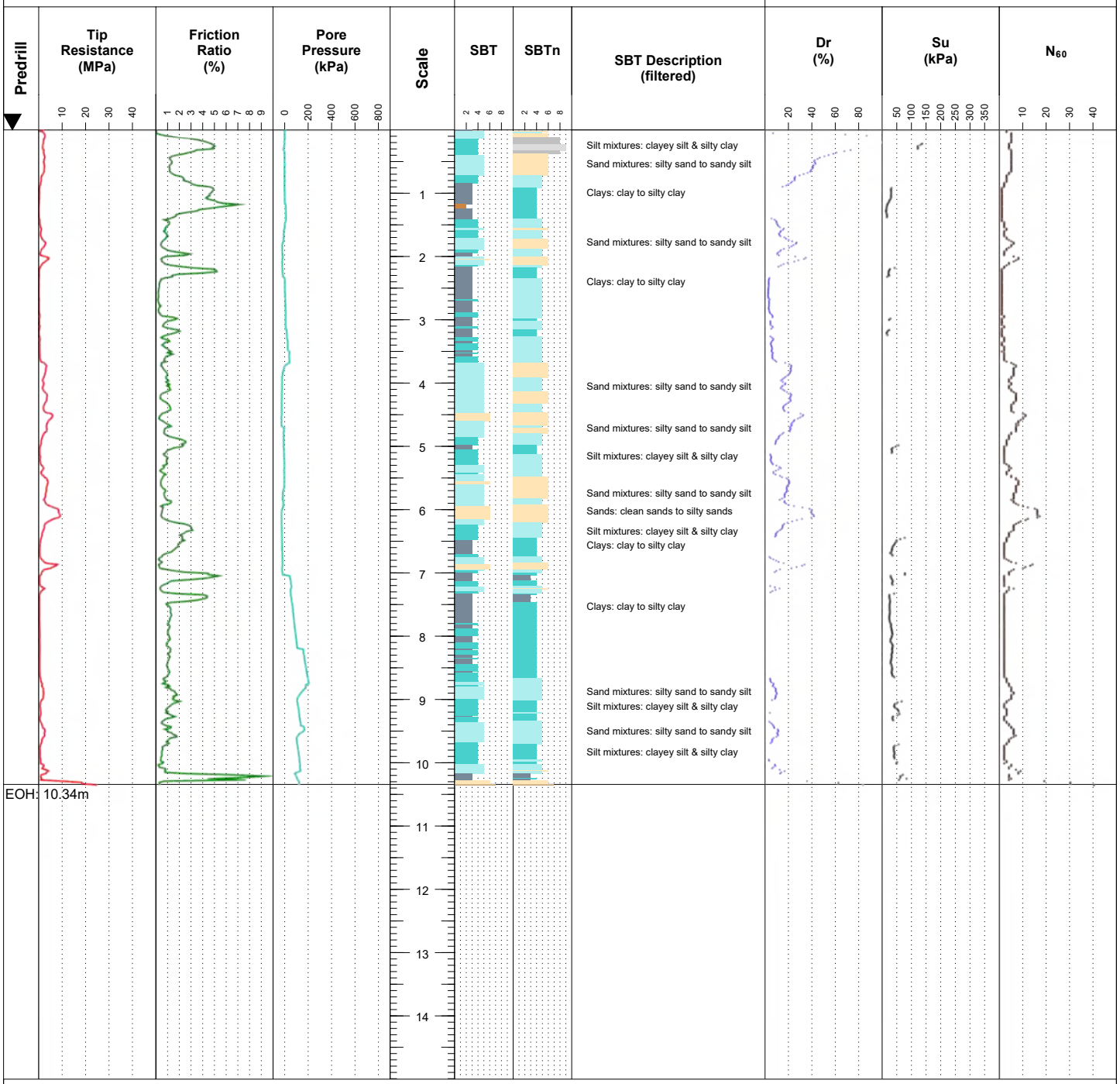
Job:	**192900602**
CPT No.:	**CPT01**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617595.00
East (m): 1936383.00
Elevation (m): 0.00
Hole Depth (m): 10.34

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 10.34

Printed: 24-05-2019

CONE PENETRATION TEST

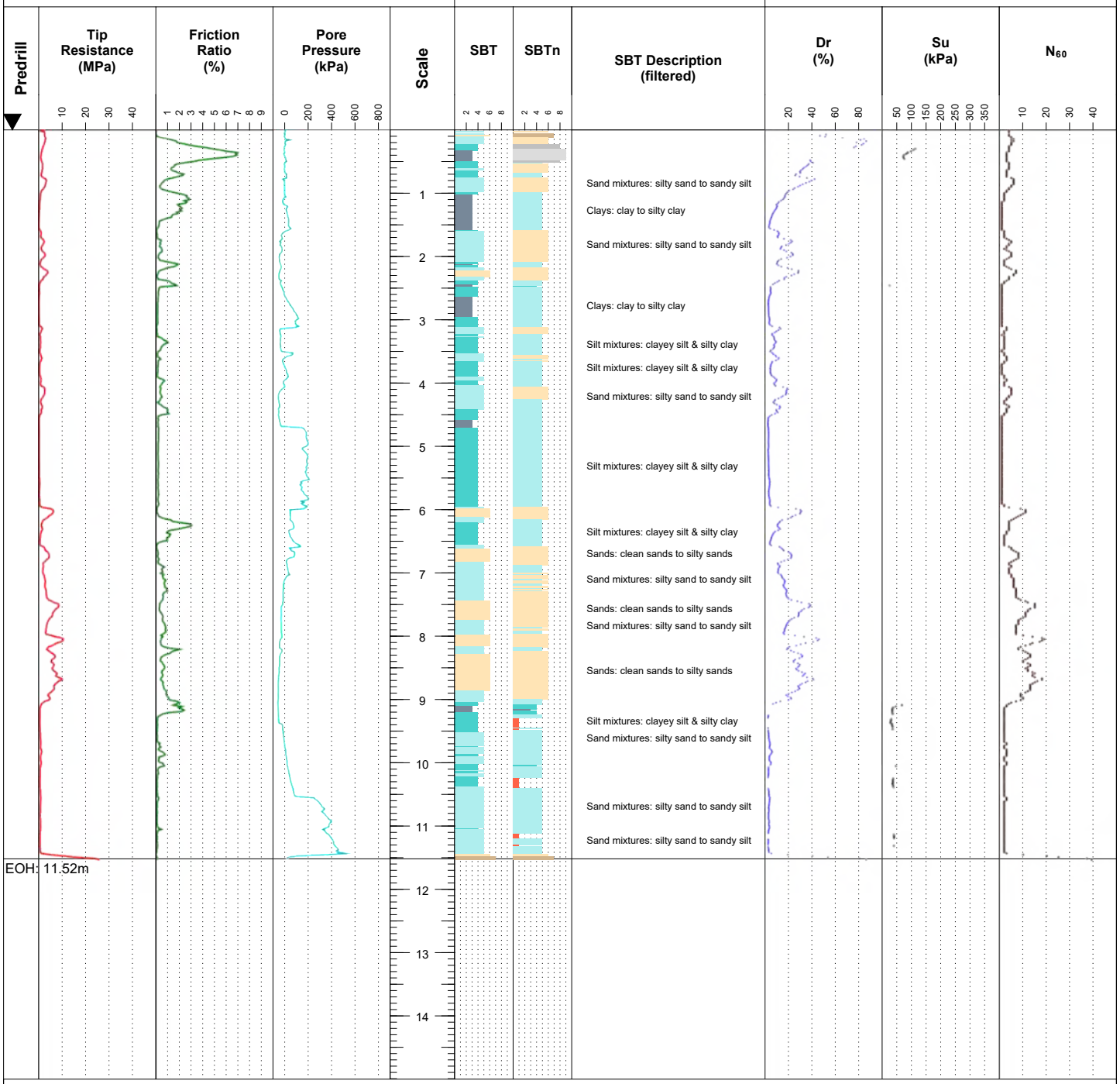
Job:	**192900602**
CPT No.:	**CPT02**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617551.00
East (m): 1936322.00
Elevation (m): 0.00
Hole Depth (m): 11.52

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 11.52

Printed: 24-05-2019

CONE PENETRATION TEST

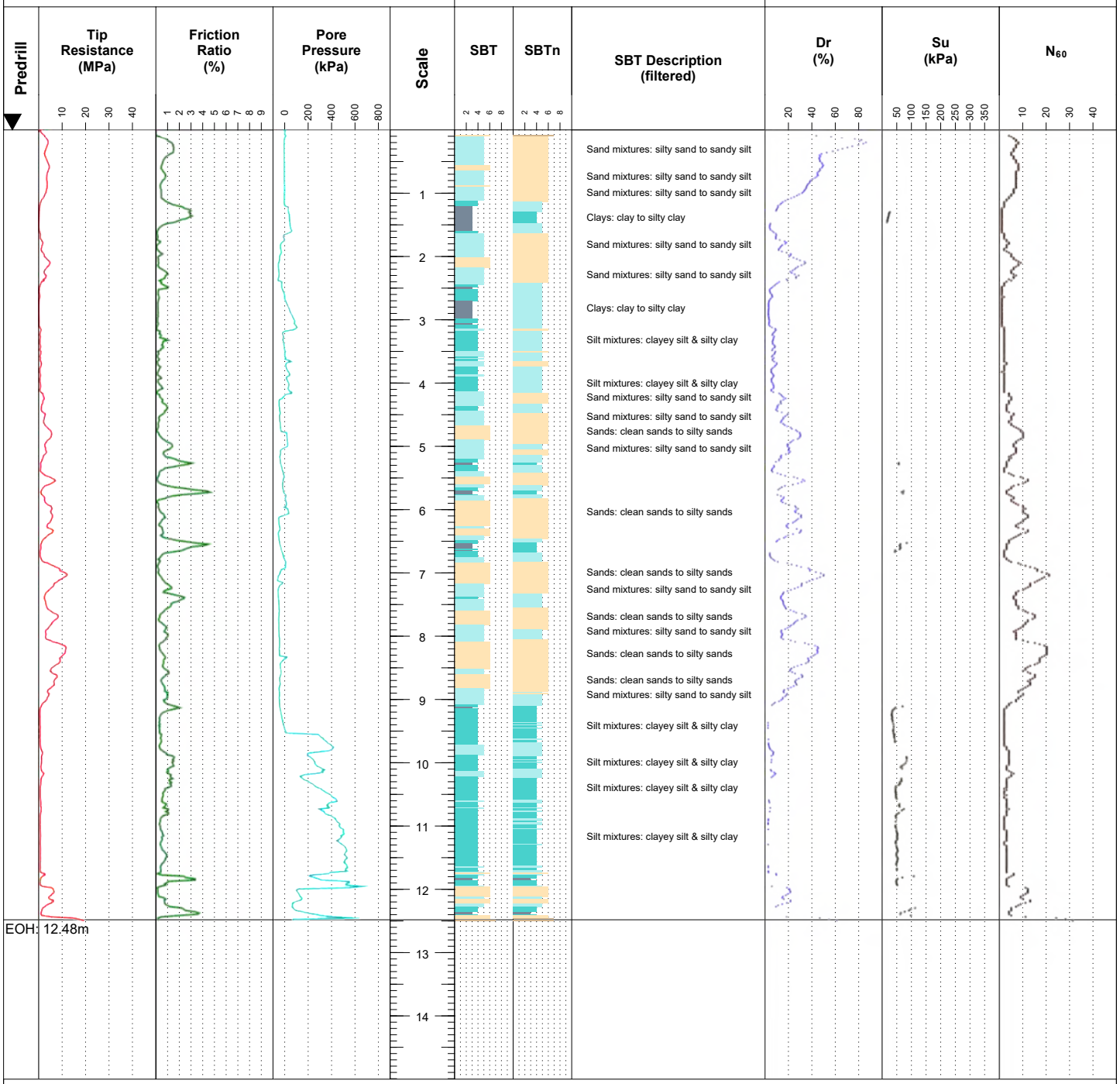
Job:	**192900602**
CPT No.:	**CPT03**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617593.00
East (m): 1936284.00
Elevation (m): 0.00
Hole Depth (m): 12.48

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 12.48

Printed: 24-05-2019

CONE PENETRATION TEST

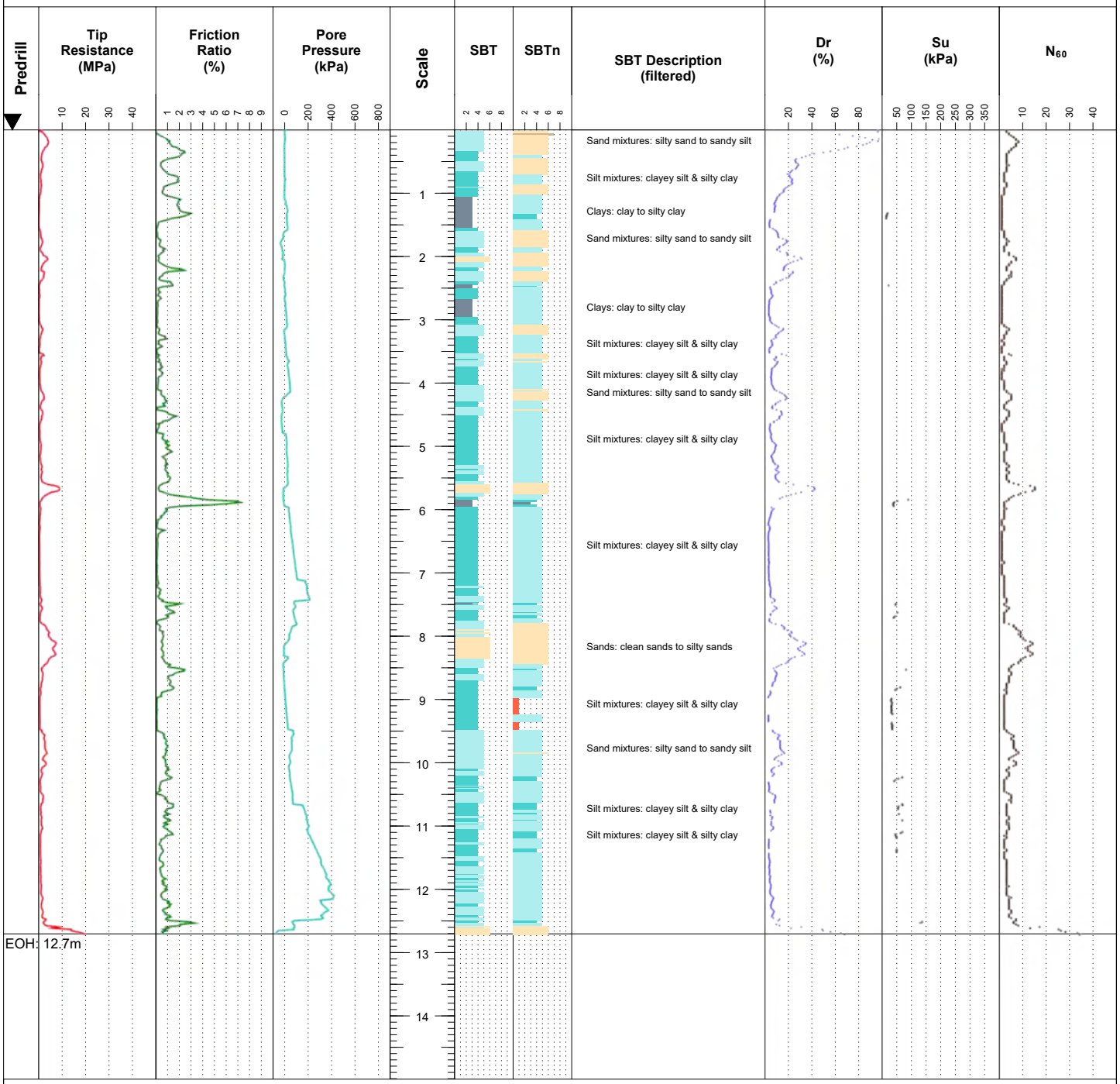
Job:	**192900602**
CPT No.:	**CPT04**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617525.00
East (m): 1936245.00
Elevation (m): 0.00
Hole Depth (m): 12.70

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 12.70

Printed: 24-05-2019

CONE PENETRATION TEST

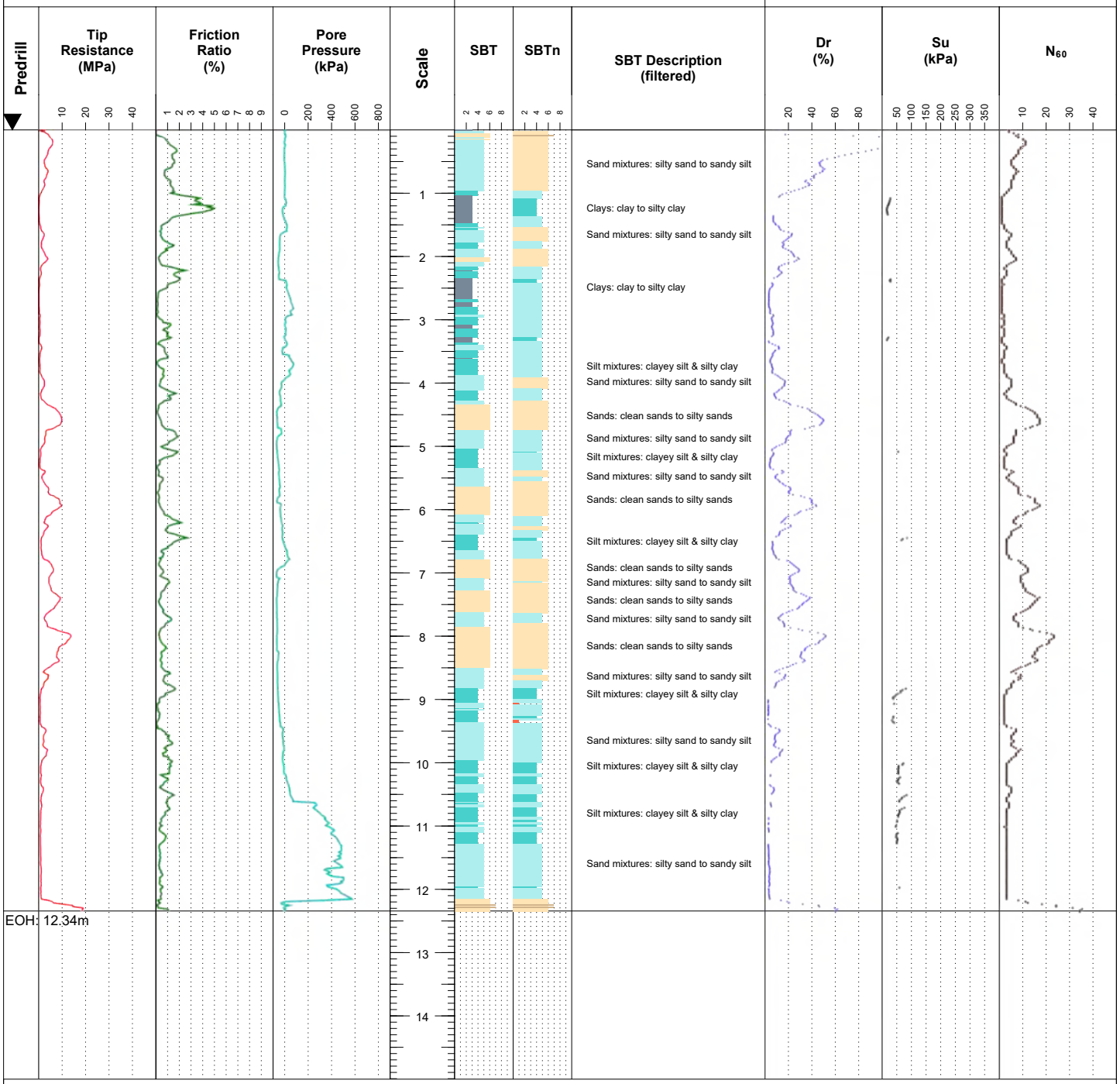
Job:	**192900602**
CPT No.:	**CPT05**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617477.00
East (m): 1936276.00
Elevation (m): 0.00
Hole Depth (m): 12.34

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 12.34

Printed: 24-05-2019

CONE PENETRATION TEST

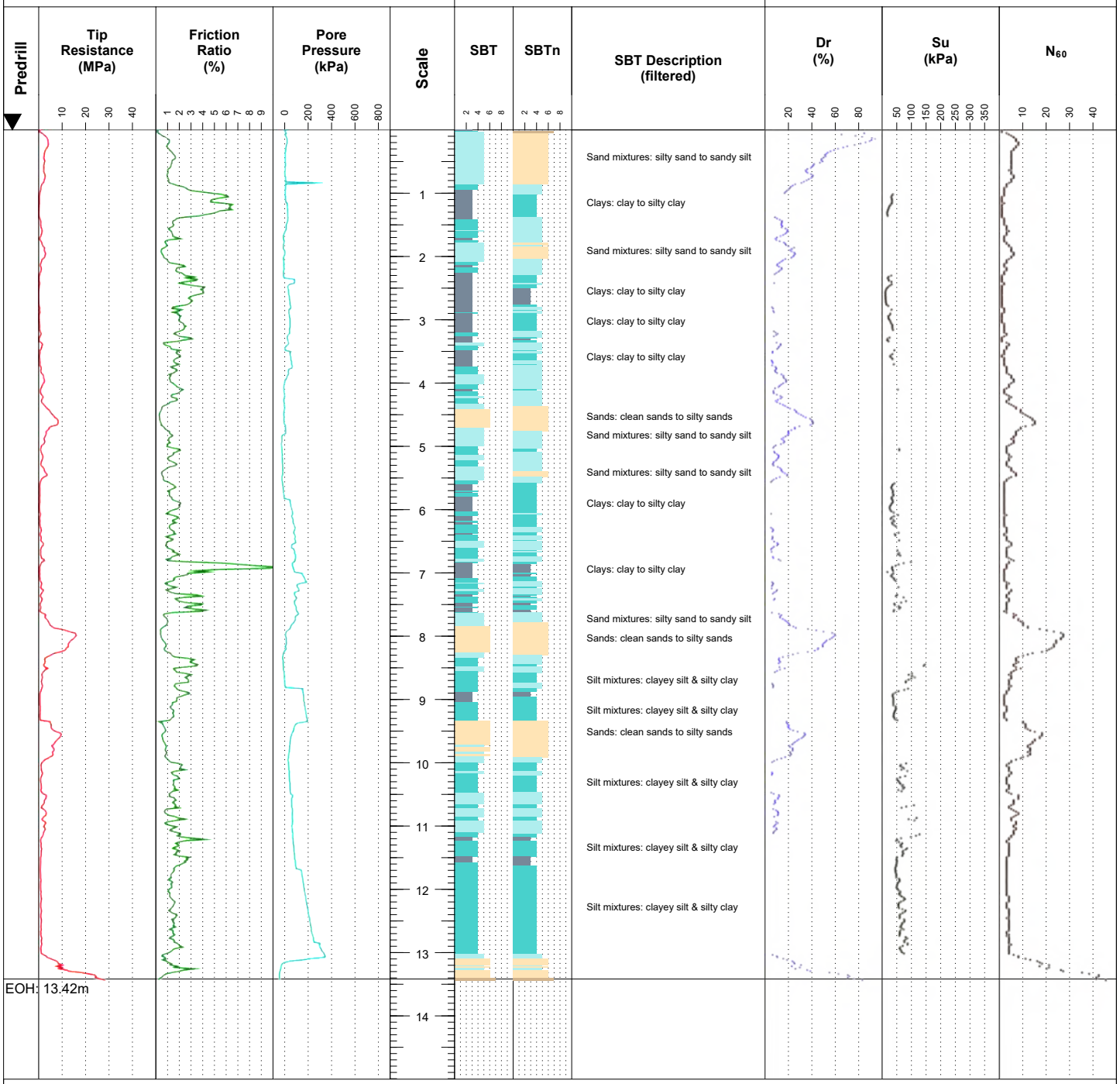
Job:	**192900602**
CPT No.:	**CPT06**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617435.00
East (m): 1936235.00
Elevation (m): 0.00
Hole Depth (m): 13.42

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 13.42

Printed: 24-05-2019

CONE PENETRATION TEST

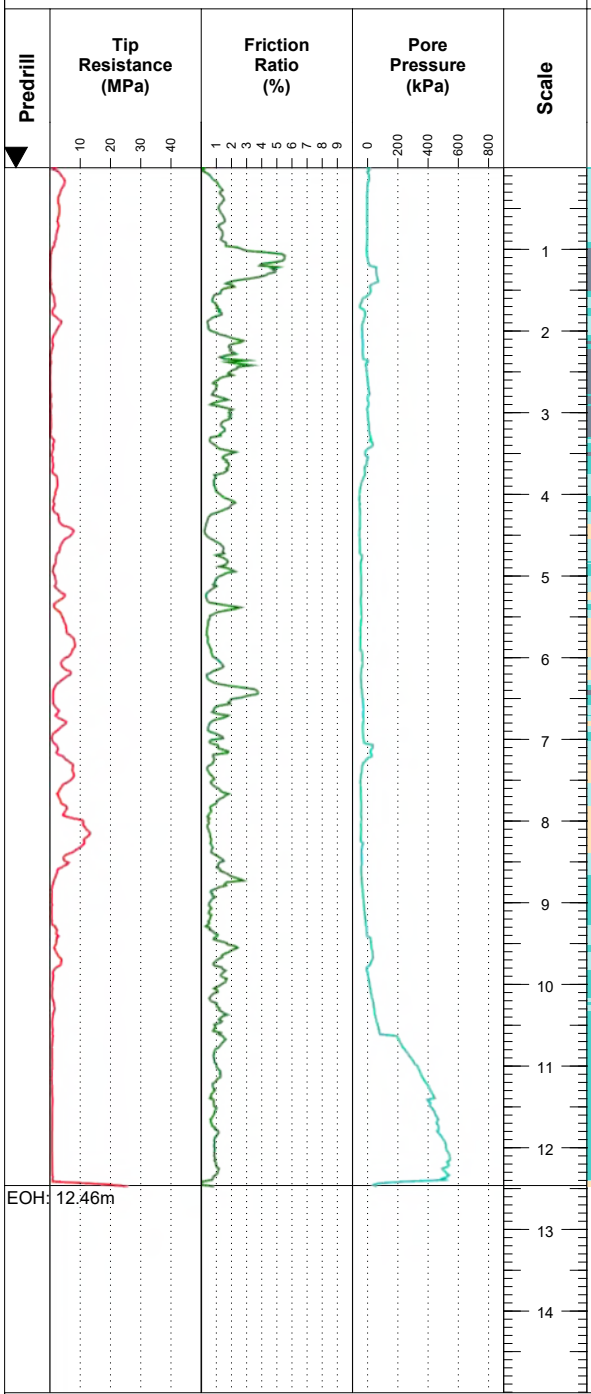
Job:	**192900602**
CPT No.:	**CPT07**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

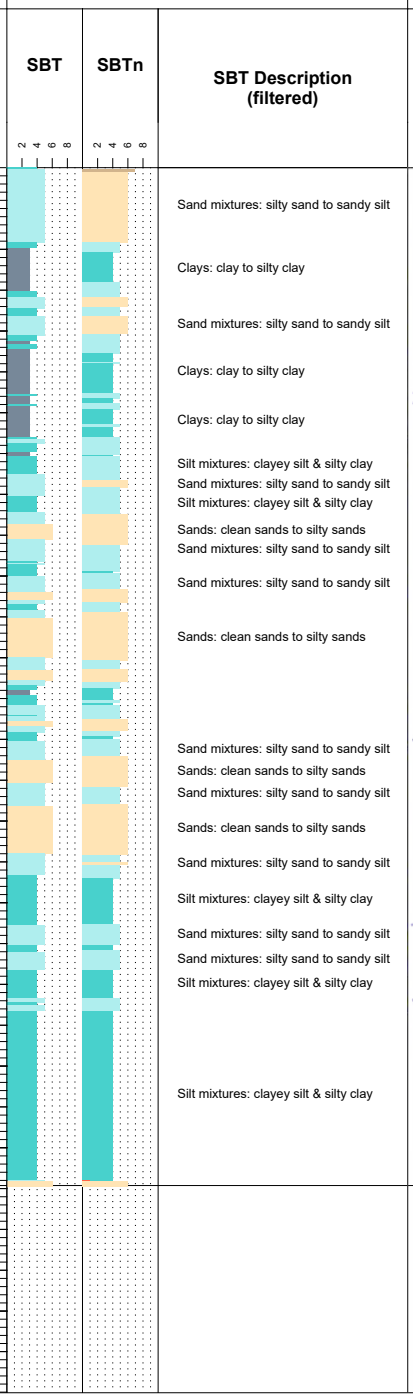
Grid: NZTM
Datum: -
Termination: -

North (m): 5617433.00
East (m): 1936309.00
Elevation (m): 0.00
Hole Depth (m): 12.46

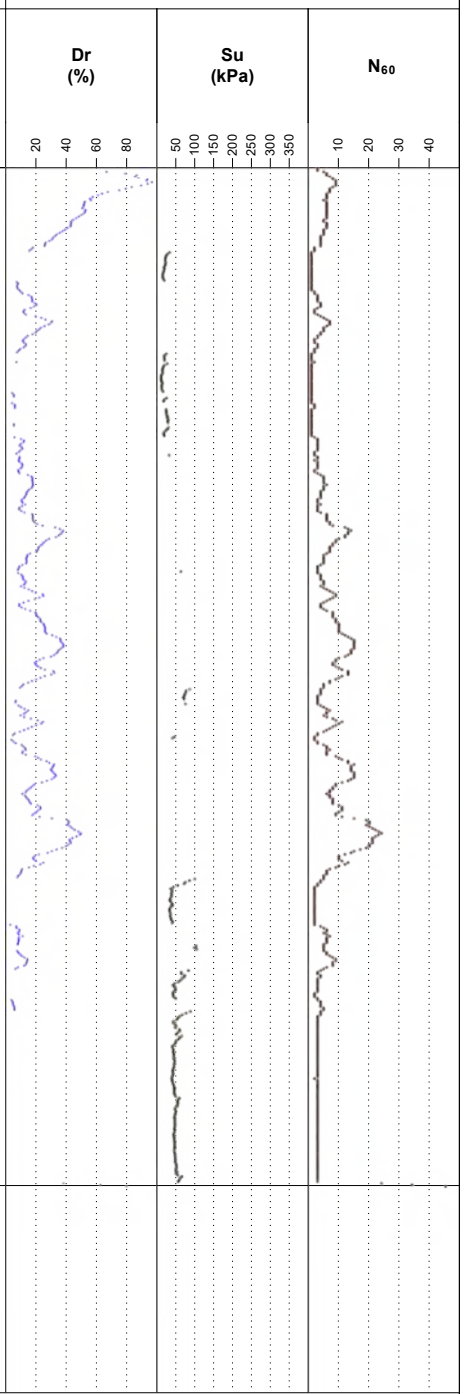
RAW DATA



SOIL BEHAVIOUR TYPE



ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 12.46

Printed: 24-05-2019

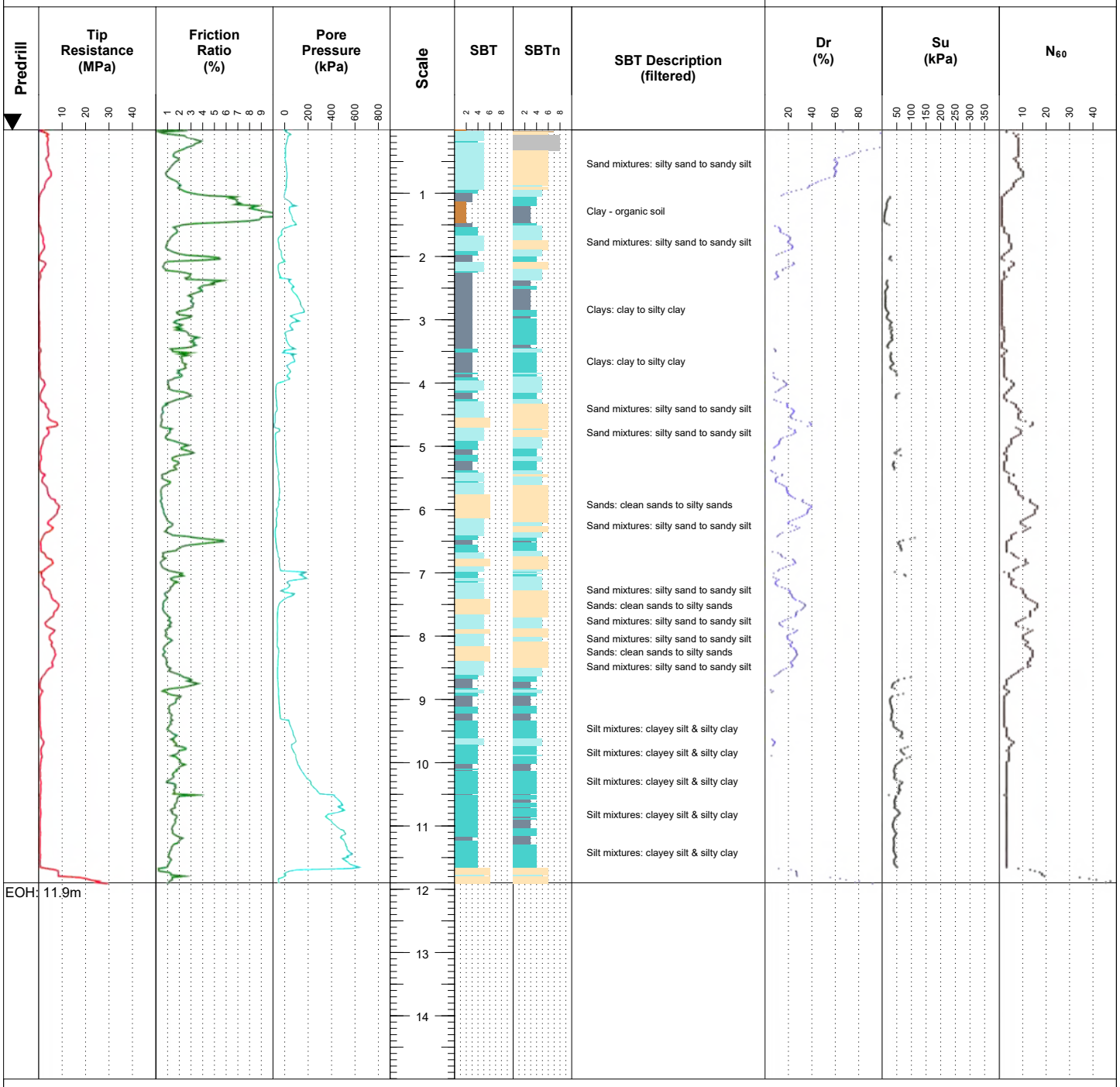
CONE PENETRATION TEST

Job:	**192900602**
CPT No.:	**CPT08**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617509.00
East (m): 1936317.00
Elevation (m): 0.00
Hole Depth (m): 11.90



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

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.

Remarks

Hole Depth (m): 11.90

Printed: 24-05-2019

CONE PENETRATION TEST

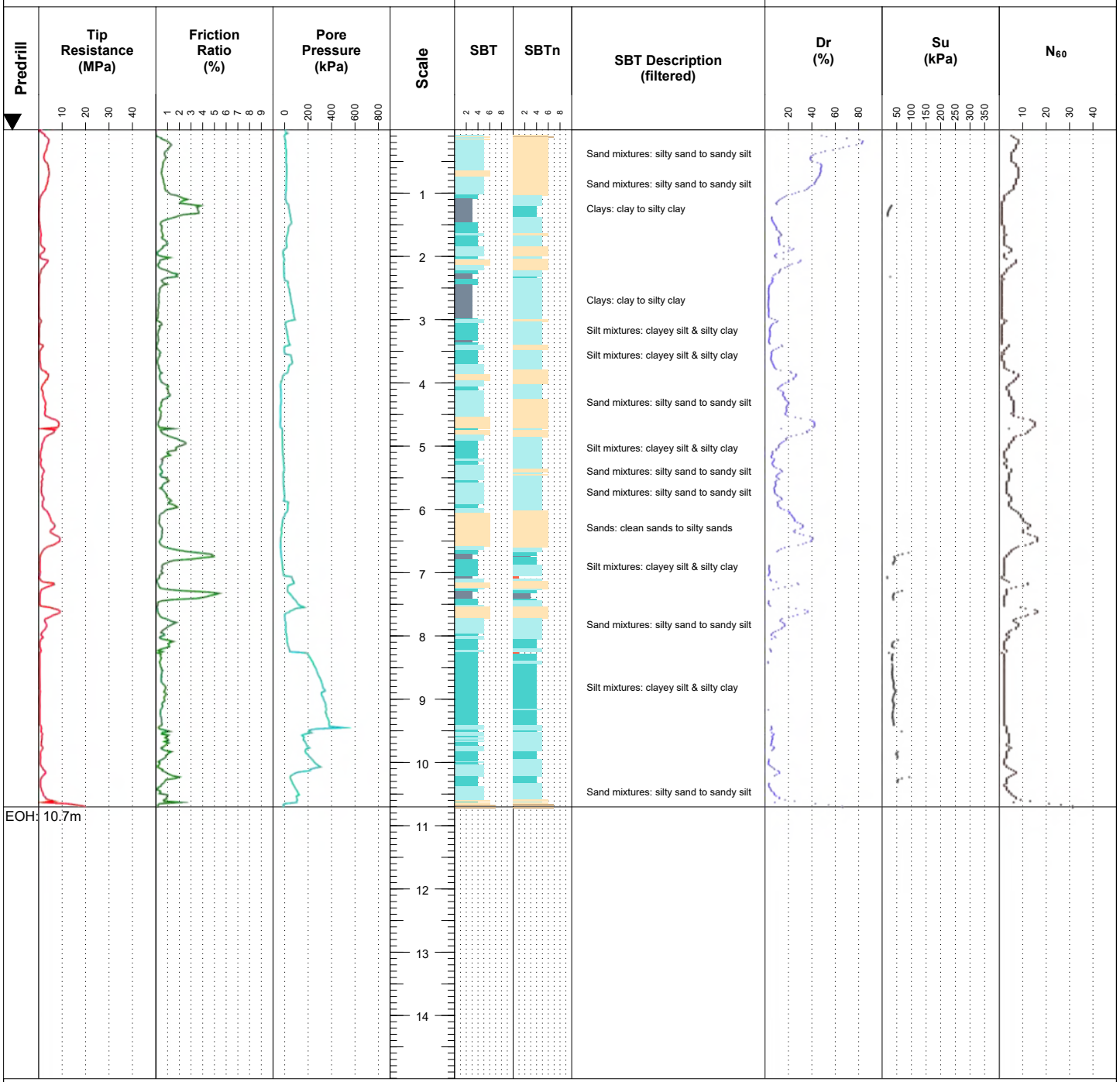
Job:	**192900602**
CPT No.:	**CPT09**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

Grid: NZTM
Datum: -
Termination: -

North (m): 5617509.00
East (m): 1936381.00
Elevation (m): 0.00
Hole Depth (m): 10.70

RAW DATA | SOIL BEHAVIOUR TYPE | ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 10.70

Printed: 24-05-2019

CONE PENETRATION TEST

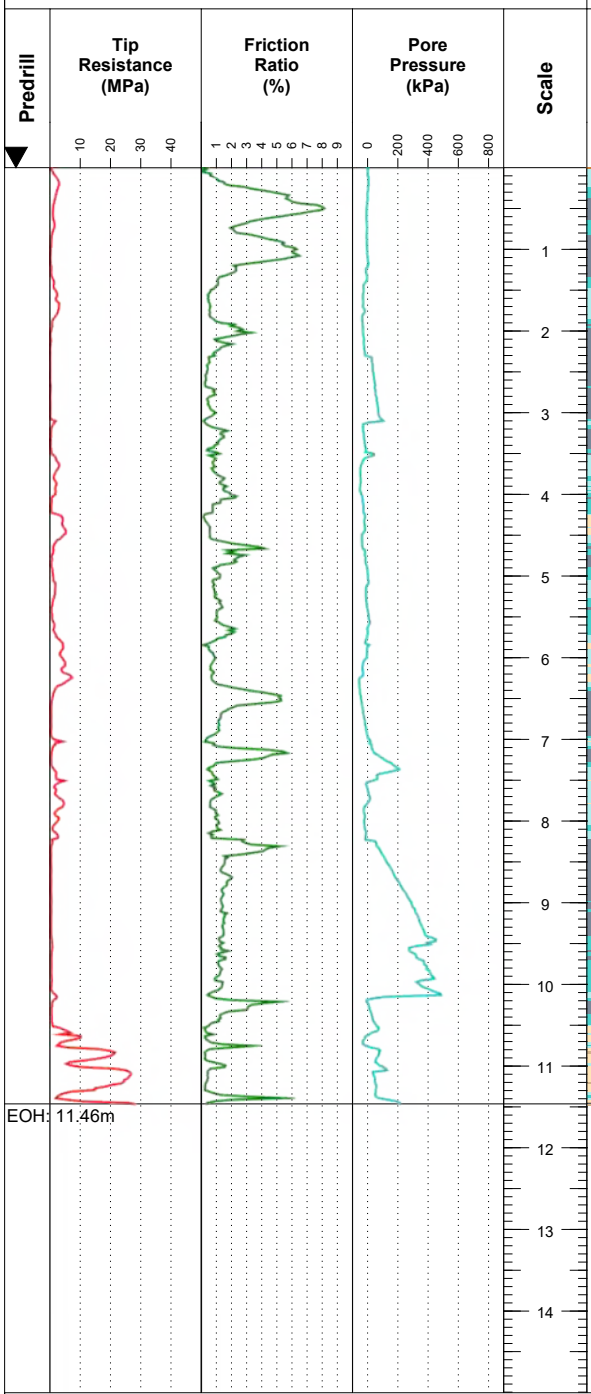
Job:	**192900602**
CPT No.:	**CPT10**

Name: 56 Kenny Rd
Client: Greenstone Land Developments Ltd
Location: 56 Kenny Rd

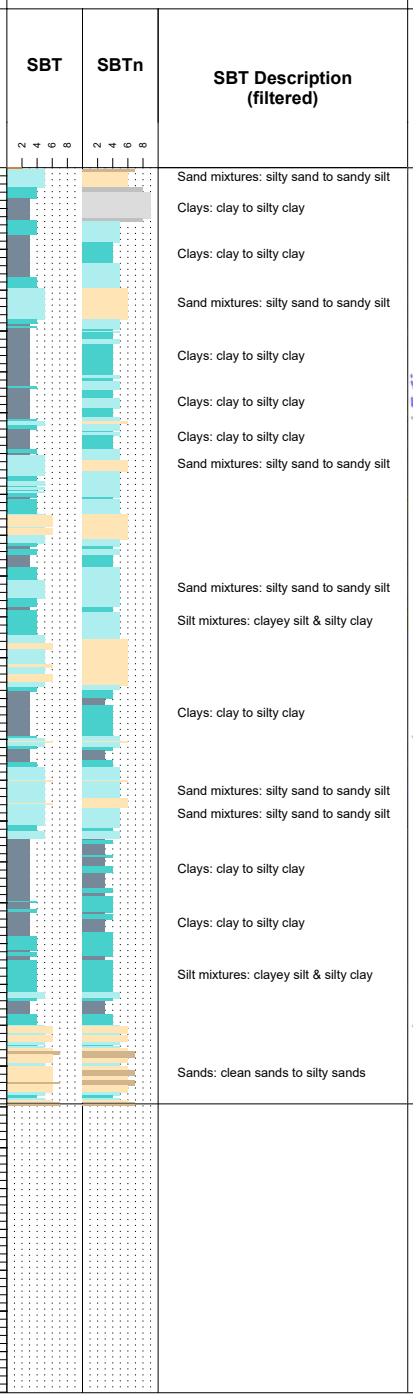
Grid: NZTM
Datum: -
Termination: -

North (m): 5617439.00
East (m): 1936379.00
Elevation (m): 0.00
Hole Depth (m): 11.46

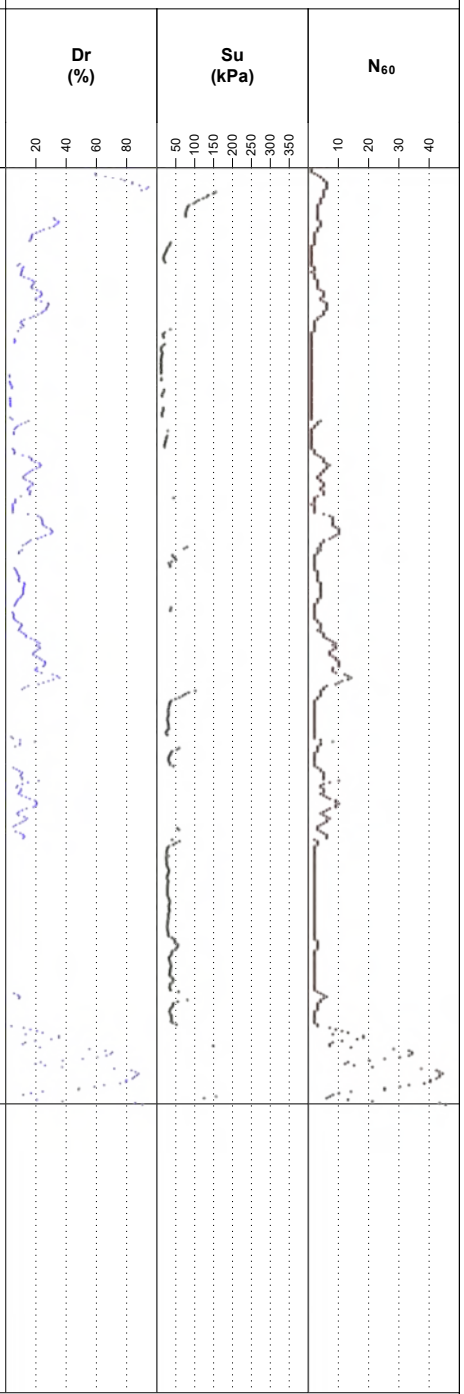
RAW DATA



SOIL BEHAVIOUR TYPE



ESTIMATED PARAMETERS



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

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.

Remarks

Hole Depth (m): 11.46

Printed: 24-05-2019

SOUNDING DETAILS: CPT01

Sounding: 1

Machine: Geoprobe 54LT
Operator: VE
Cone Reference: 4447
Cone Area Ratio: 0.85
Cone Type: -
Date: 20-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 7.8398
Tip Resistance Final: -0.0024
Local Friction Initial: 119
Local Friction Final: 0.3
Pore Pressure Initial: 231.2
Pore Pressure Final: -0.2

SOUNDING DETAILS: CPT02

Sounding: 1

Machine: Geoprobe 54LT
Operator: BR
Cone Reference: 4483
Cone Area Ratio: 0.83
Cone Type: -
Date: 21-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 6.5896
Tip Resistance Final: 0.0021
Local Friction Initial: 133.9
Local Friction Final: -0.2
Pore Pressure Initial: 267.1
Pore Pressure Final: 0.2

SOUNDING DETAILS: CPT03

Sounding: 1

Machine: Geoprobe 54LT
Operator: BR
Cone Reference: 4483
Cone Area Ratio: 0.83
Cone Type: -
Date: 21-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 6.5826
Tip Resistance Final: 0.0022
Local Friction Initial: 134
Local Friction Final: -0.2
Pore Pressure Initial: 269
Pore Pressure Final: -0.7

SOUNDING DETAILS: CPT04

Sounding: 2

Machine: Geoprobe 54LT
Operator: BR
Cone Reference: 4483
Cone Area Ratio: 0.83
Cone Type: -
Date: 21-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 6.5869
Tip Resistance Final: -0.008
Local Friction Initial: 134.1
Local Friction Final: -0.1
Pore Pressure Initial: 267.9
Pore Pressure Final: 0.4

SOUNDING DETAILS: CPT05

Sounding: 3

Machine: Geoprobe 54LT
Operator: BR
Cone Reference: 4447
Cone Area Ratio: 0.85
Cone Type: -
Date: 21-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 7.8513
Tip Resistance Final: -0.0199
Local Friction Initial: 118.3
Local Friction Final: 0
Pore Pressure Initial: 232.5
Pore Pressure Final: -0.4

SOUNDING DETAILS: CPT06

Sounding: 4

Machine: Geoprobe 54LT
Operator: VE
Cone Reference: 4447
Cone Area Ratio: 0.85
Cone Type: -
Date: 21-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 7.8182
Tip Resistance Final: 0.015
Local Friction Initial: 117.6
Local Friction Final: 0.2
Pore Pressure Initial: 232.3
Pore Pressure Final: -0.1

SOUNDING DETAILS: CPT07

Sounding: 5

Machine: Geoprobe 54LT
Operator: BR
Cone Reference: 4483
Cone Area Ratio: 0.83
Cone Type: -
Date: 21-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 6.5564
Tip Resistance Final: 0.0177
Local Friction Initial: 134.1
Local Friction Final: -0.3
Pore Pressure Initial: 268.6
Pore Pressure Final: -0.4

SOUNDING DETAILS: CPT08

Sounding: 1

Machine: Geoprobe 54LT
Operator: VE
Cone Reference: 4483
Cone Area Ratio: 0.83
Cone Type: -
Date: 22-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 6.9711
Tip Resistance Final: 0.0166
Local Friction Initial: 119.6
Local Friction Final: -0.9
Pore Pressure Initial: 265.2
Pore Pressure Final: -1.1

SOUNDING DETAILS: CPT09

Sounding: 2

Machine: Geoprobe 54LT
Operator: VE
Cone Reference: 4447
Cone Area Ratio: 0.85
Cone Type: -
Date: 22-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 7.3945
Tip Resistance Final: 0.0078
Local Friction Initial: 133.2
Local Friction Final: -0.2
Pore Pressure Initial: 237.2
Pore Pressure Final: -0.8

SOUNDING DETAILS: CPT10

Sounding: 3

Machine: Geoprobe 54LT
Operator: VE
Cone Reference: 4483
Cone Area Ratio: 0.83
Cone Type: -
Date: 22-05-2019
Predrill: 0.00
Water Level: -
Tip Resistance Initial: 6.9706
Tip Resistance Final: 0.0134
Local Friction Initial: 118.3
Local Friction Final: 0.1
Pore Pressure Initial: 263.1
Pore Pressure Final: 0.8

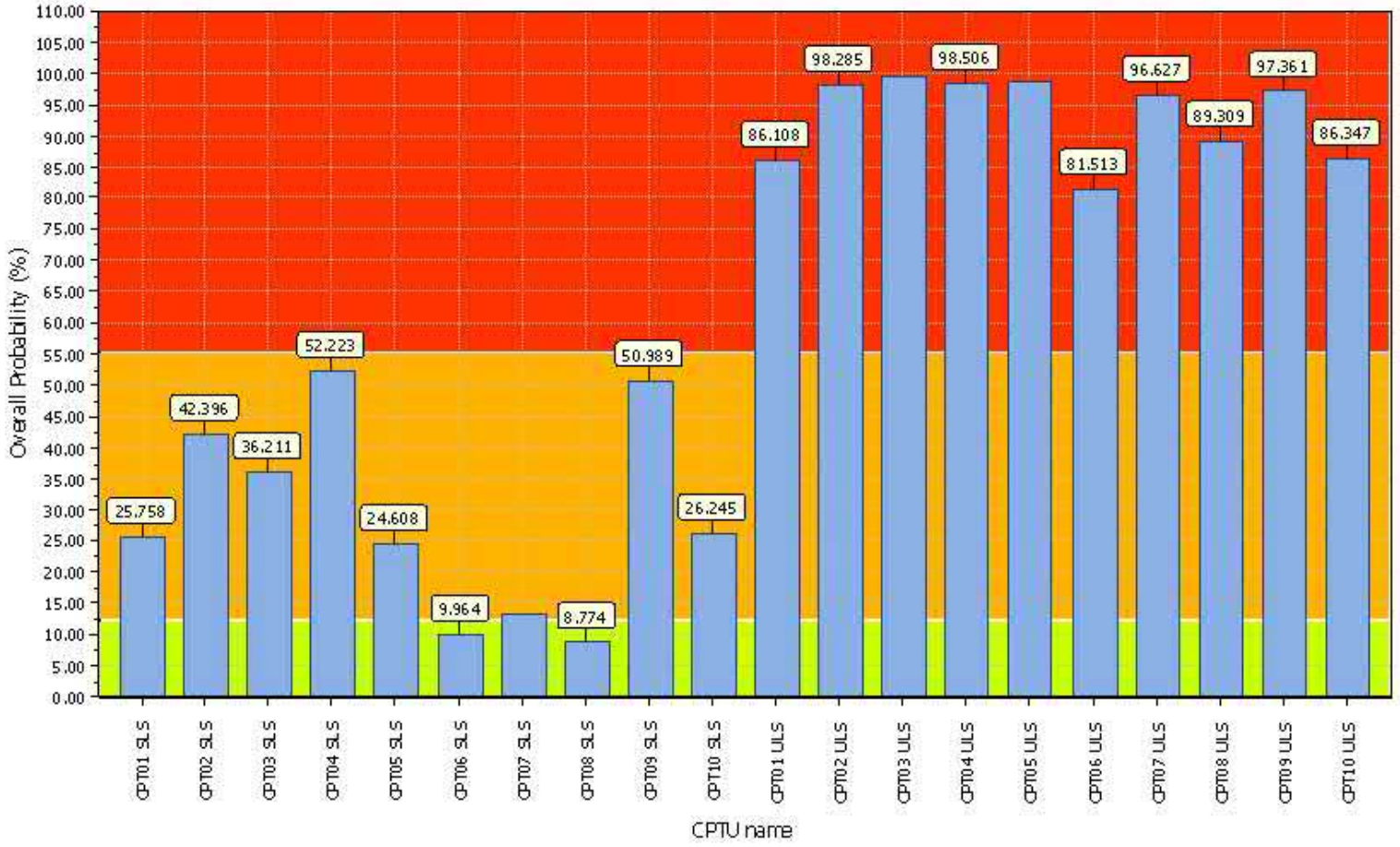
APPENDIX C LIQUEFACTION ASSESSMENT RESULTS

RDCL
Geotechnical Specialists
8/308 Queen St, Hastings
http://www.rdcl.co.nz

Project title :

Location :

Overall Probability for Liquefaction report



Probability color scheme

- Very High Probability
- High Probability
- Low Probability

Basic statistics

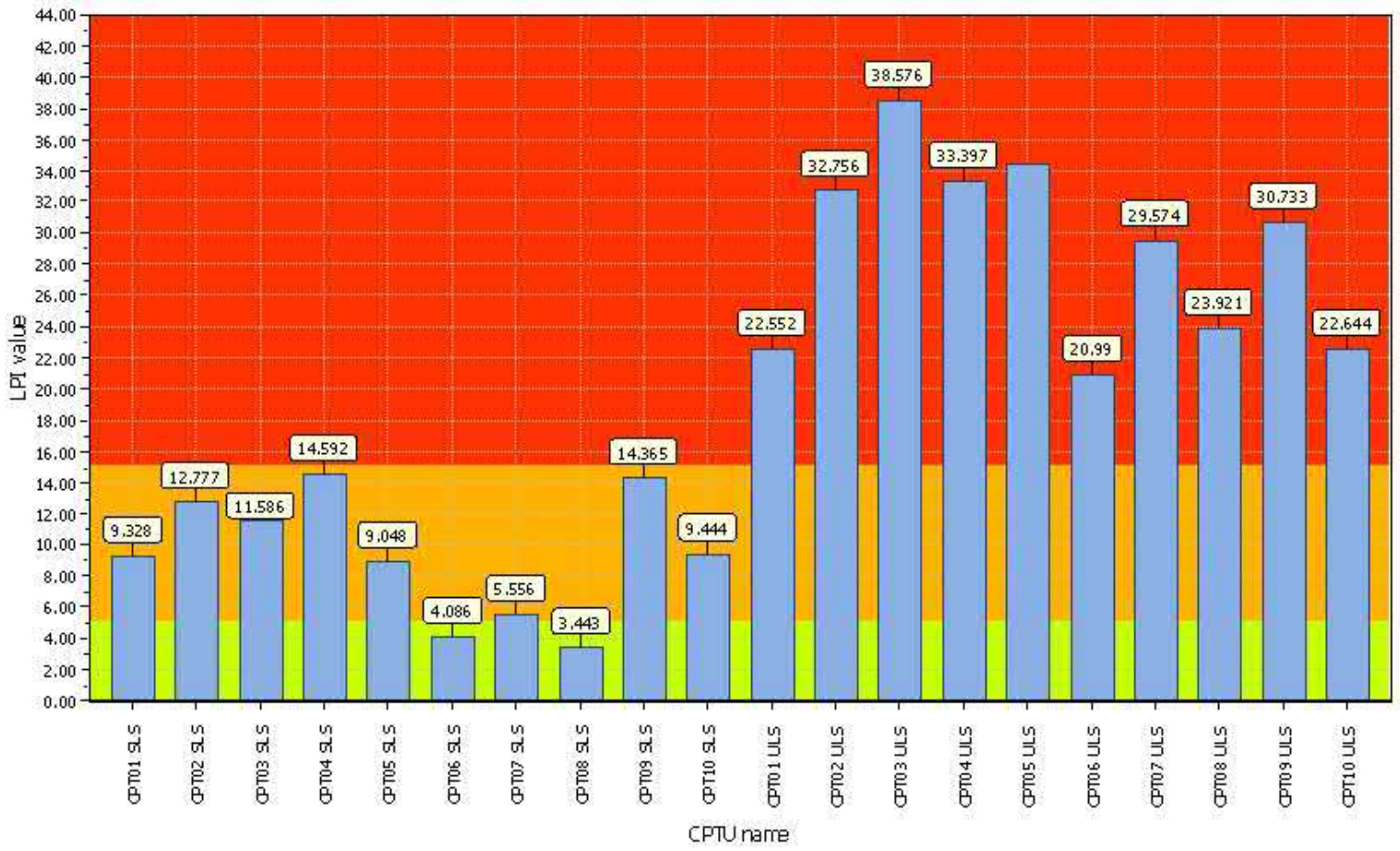
Total CPT number: 20
10.00% low probability
40.00% high probability
50.00% very high probability

RDCL
Geotechnical Specialists
8/308 Queen St, Hastings
http://www.rdcl.co.nz

Project title :

Location :

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

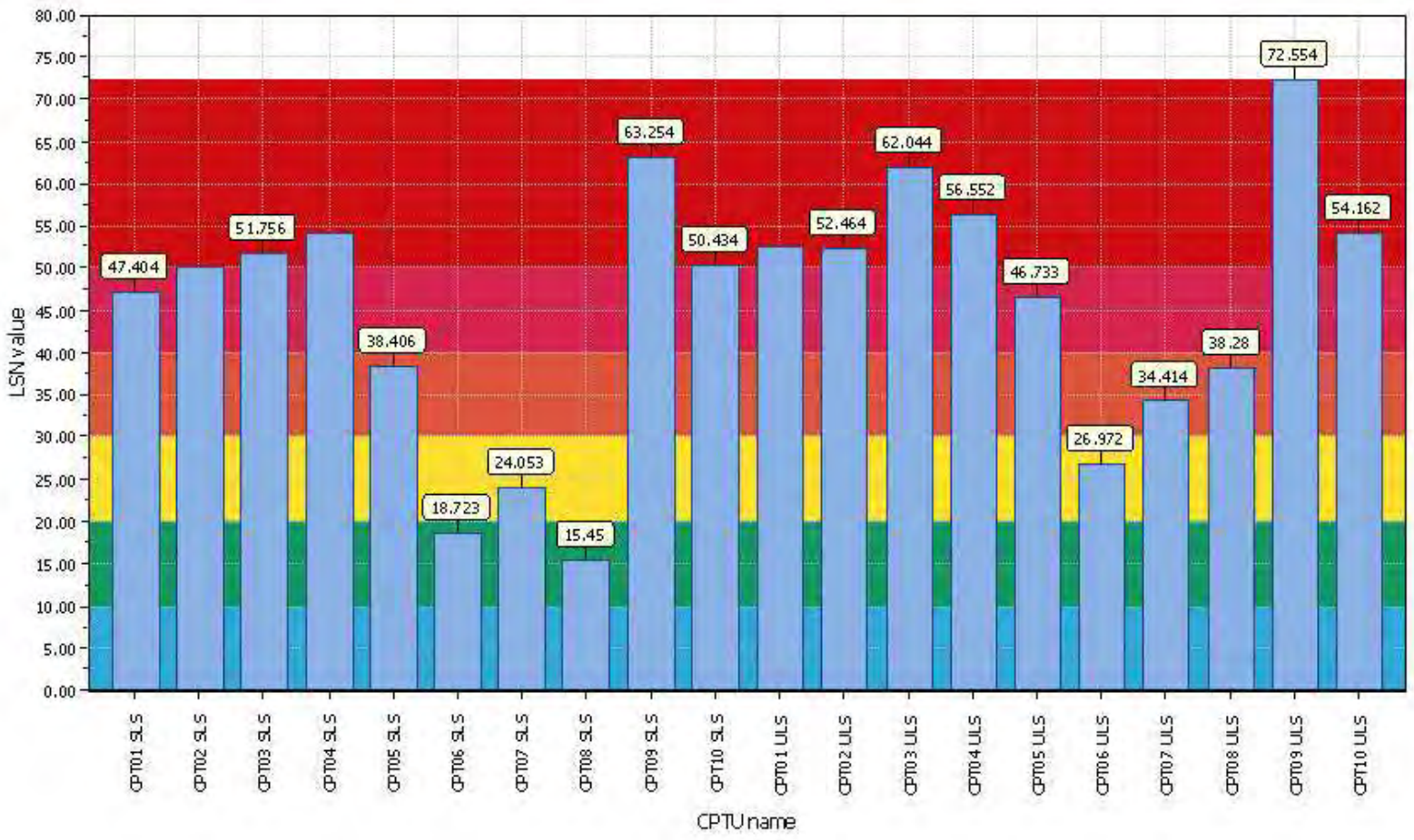
Total CPT number: 20
10.00% low risk
40.00% high risk
50.00% very high risk

RDCL
Geotechnical Specialists
8/308 Queen St, Hastings
http://www.rdcl.co.nz

Project title :

Location :

Overall Liquefaction Severity Number report



LSN color scheme

- Severe damage
- Major expression of liquefaction
- Moderate to severe exp. of liquefaction
- Moderate expression of liquefaction
- Minor expression of liquefaction
- Little to no expression of liquefaction

Basic statistics

Total CPT number: 20

0.00% little liquefaction

10.00% minnor liquefaction

10.00% moderate liquefaction

15.00% moderate to major liquefaction

10.00% major liquefaction

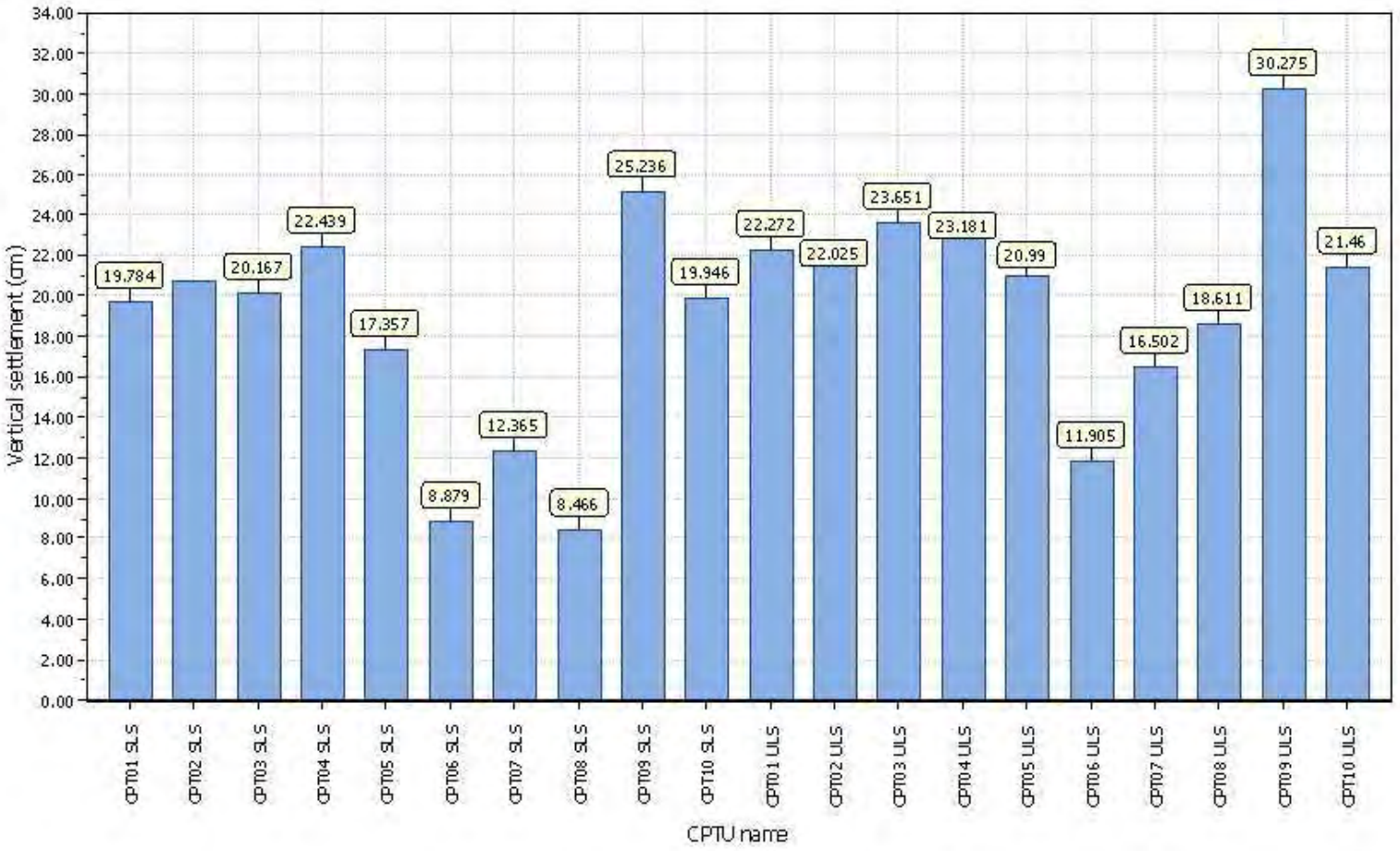
55.00% severe liquefaction

RDCL
Geotechnical Specialists
8/308 Queen St, Hastings
http://www.rdcl.co.nz

Project title :

Location :

Overall vertical settlements report



RDCL
Geotechnical Specialists
8/308 Queen St, Hastings
http://www.rdcl.co.nz

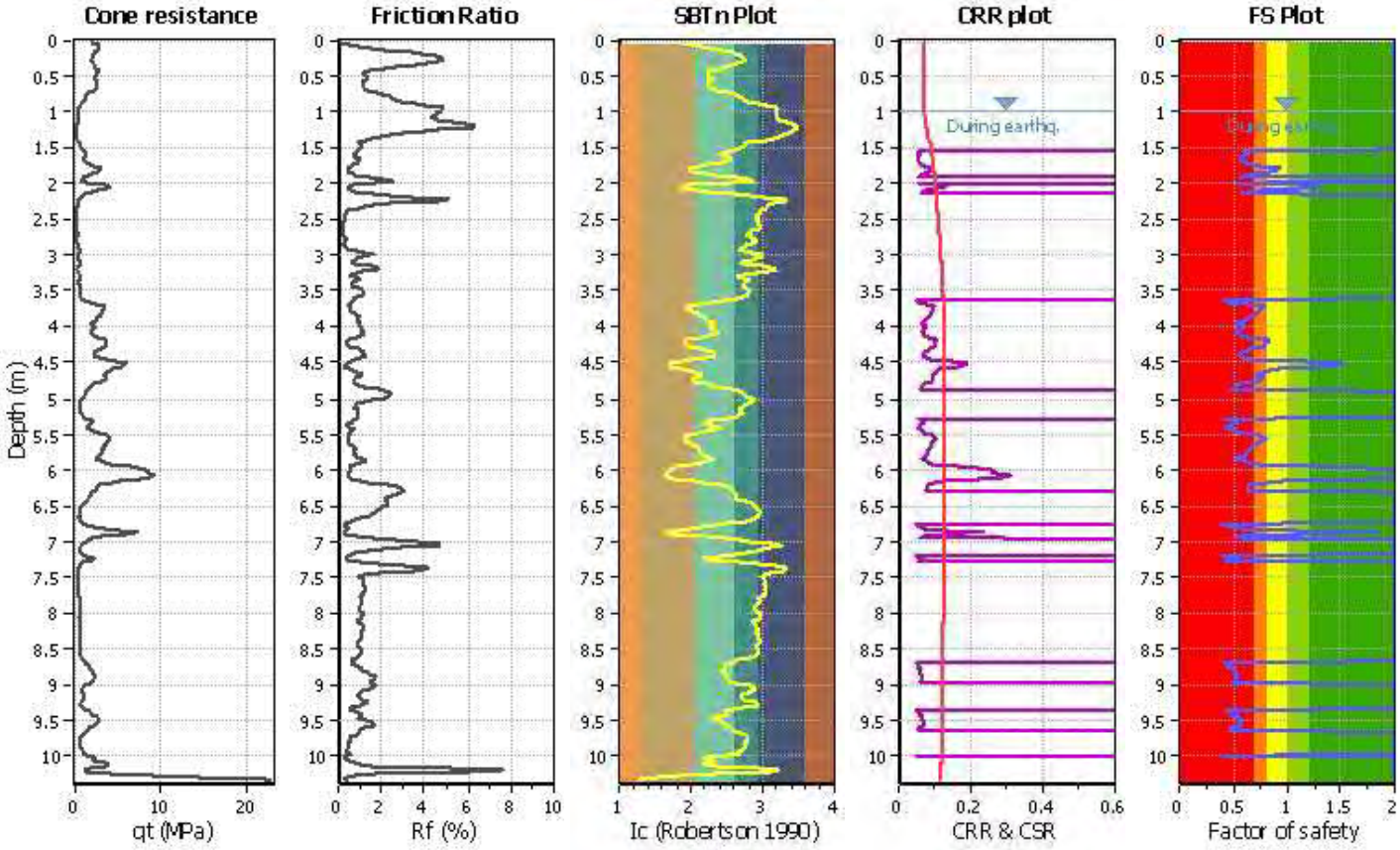
LIQUEFACTION ANALYSIS REPORT

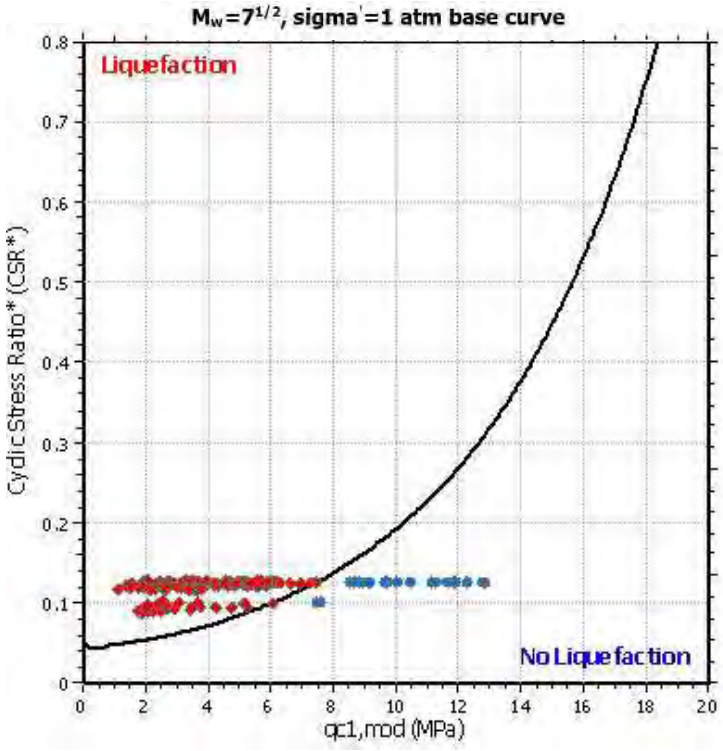
Project title : **Location :**

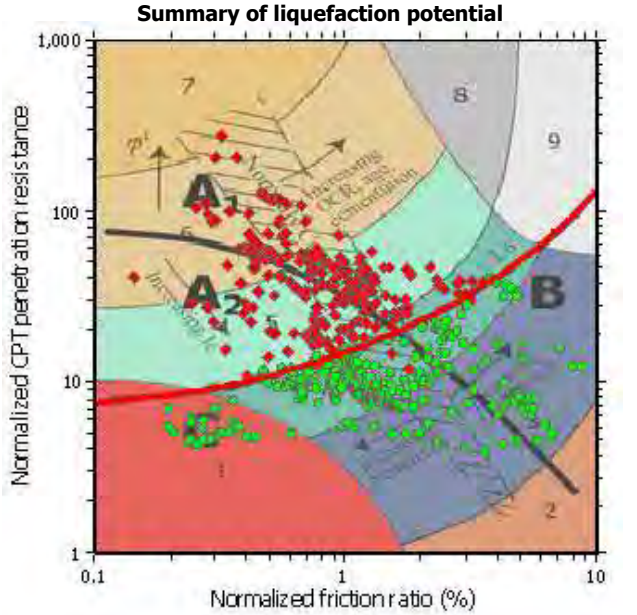
CPT file : CPT01 SLS

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

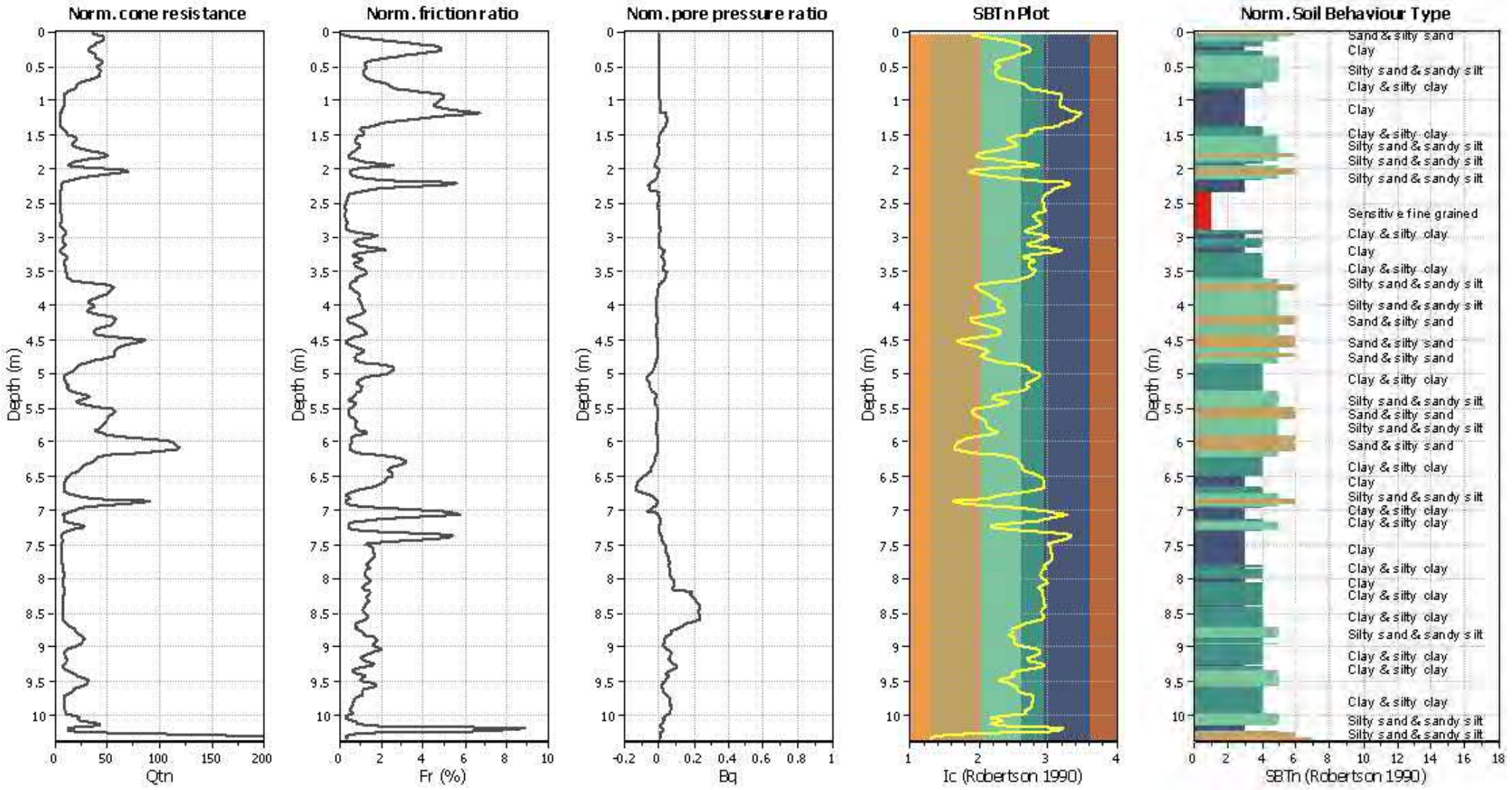






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



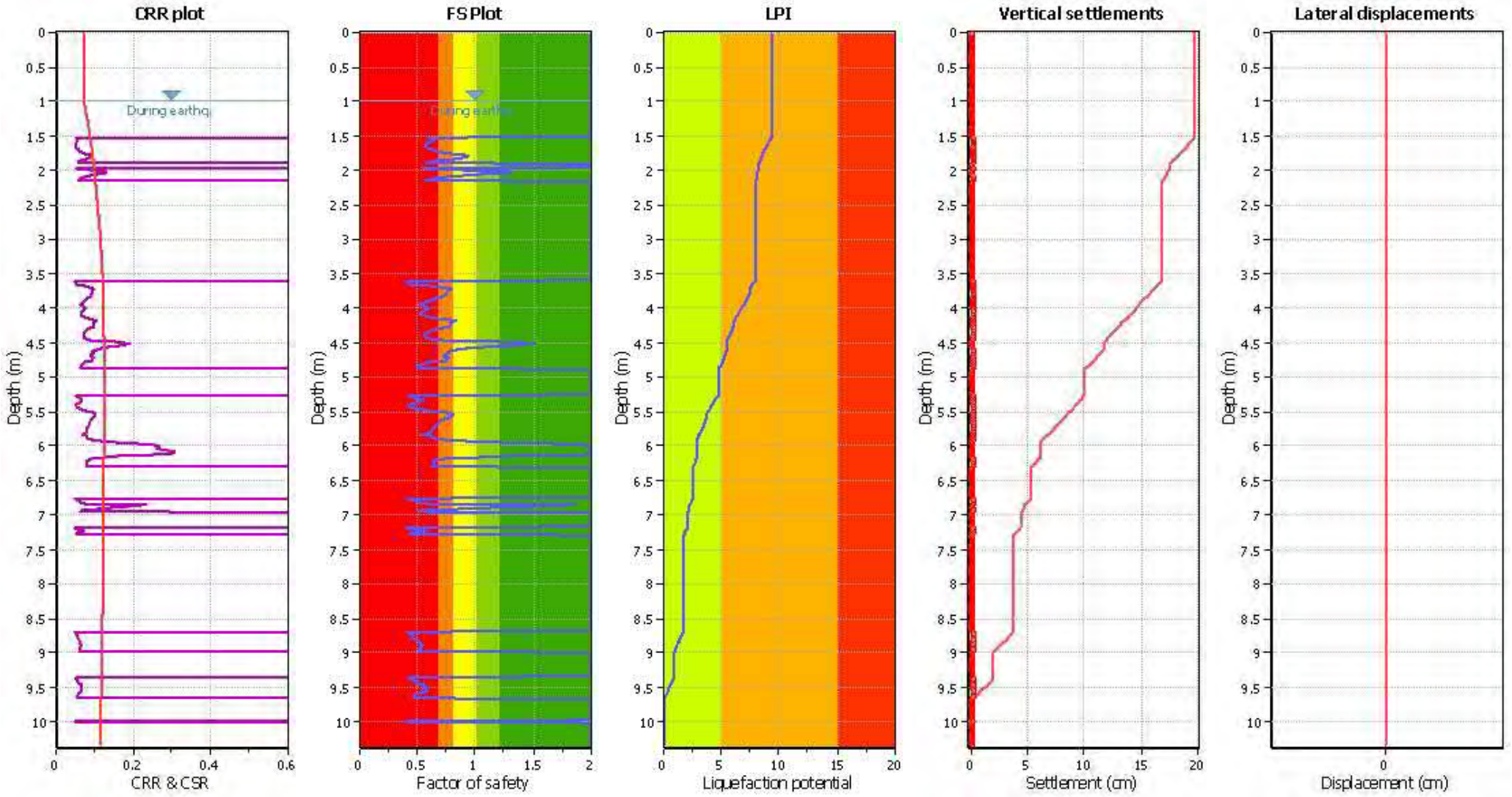
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

RDCL
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8/308 Queen St, Hastings
http://www.rdcl.co.nz

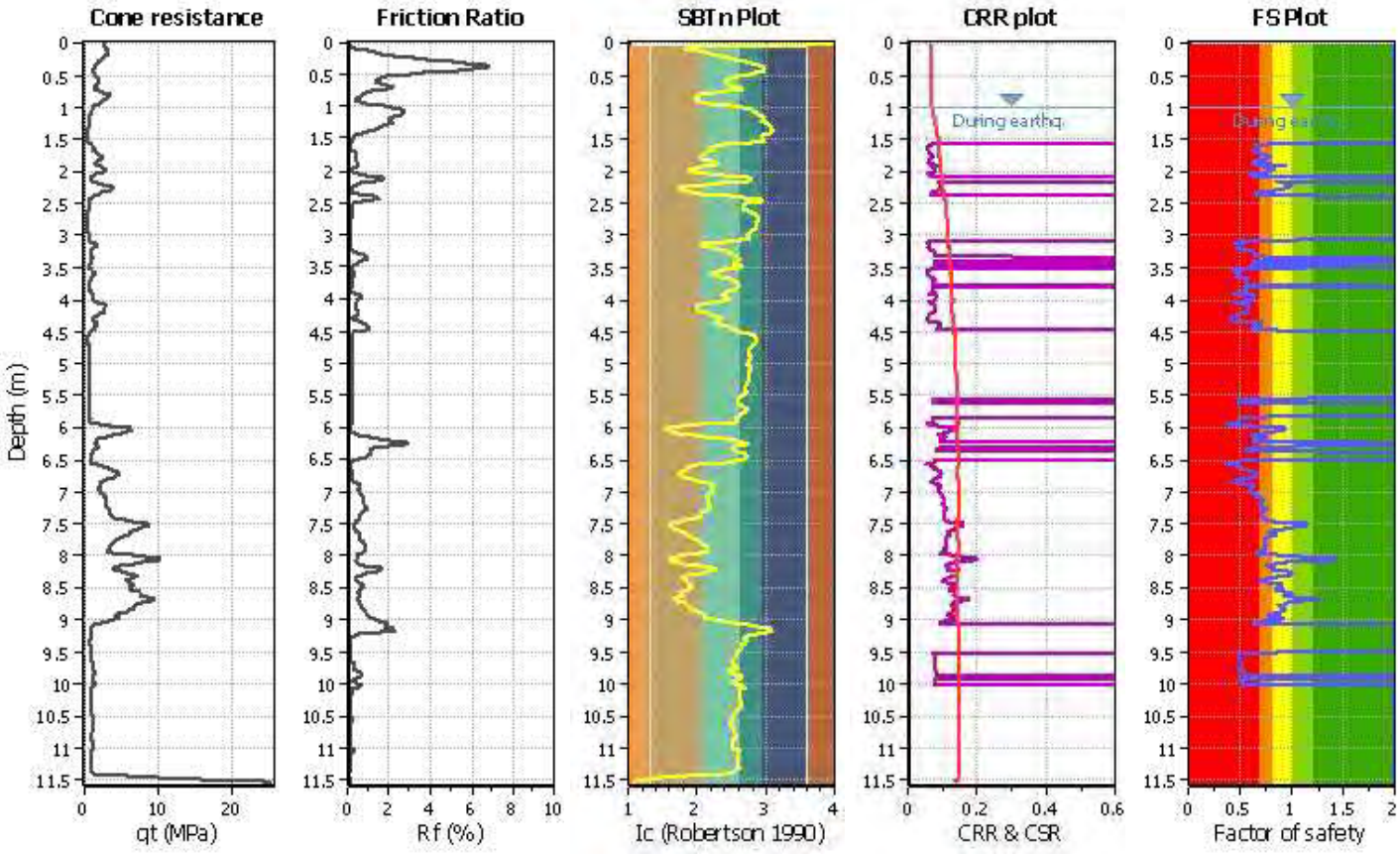
LIQUEFACTION ANALYSIS REPORT

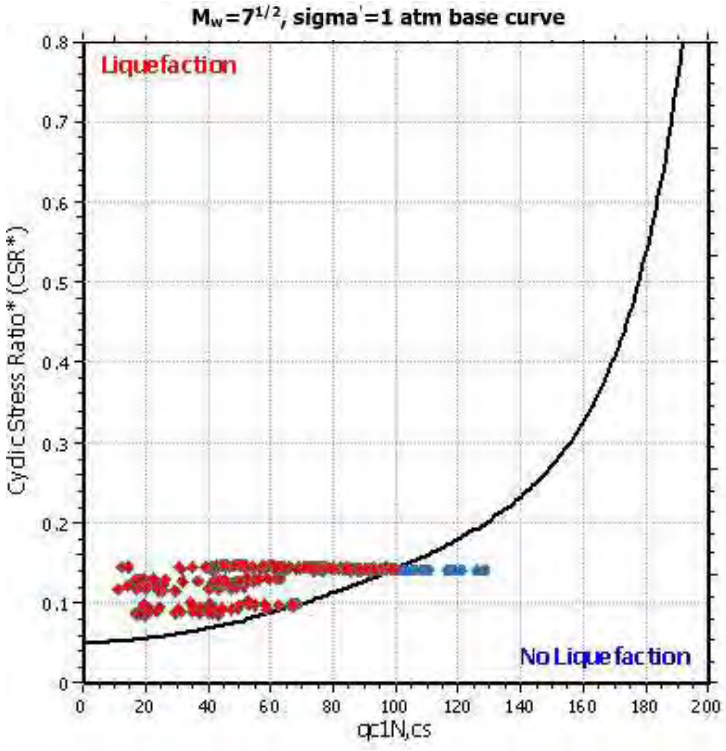
Project title : **Location :**

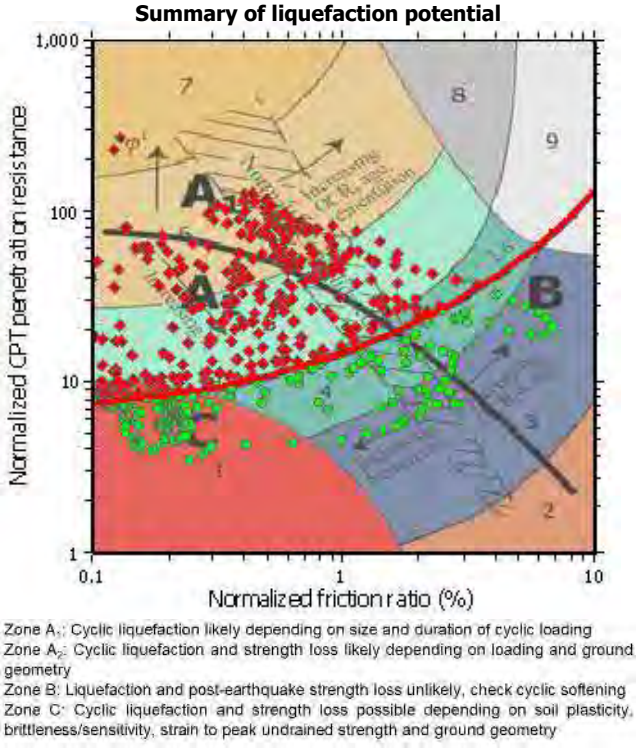
CPT file : CPT02 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

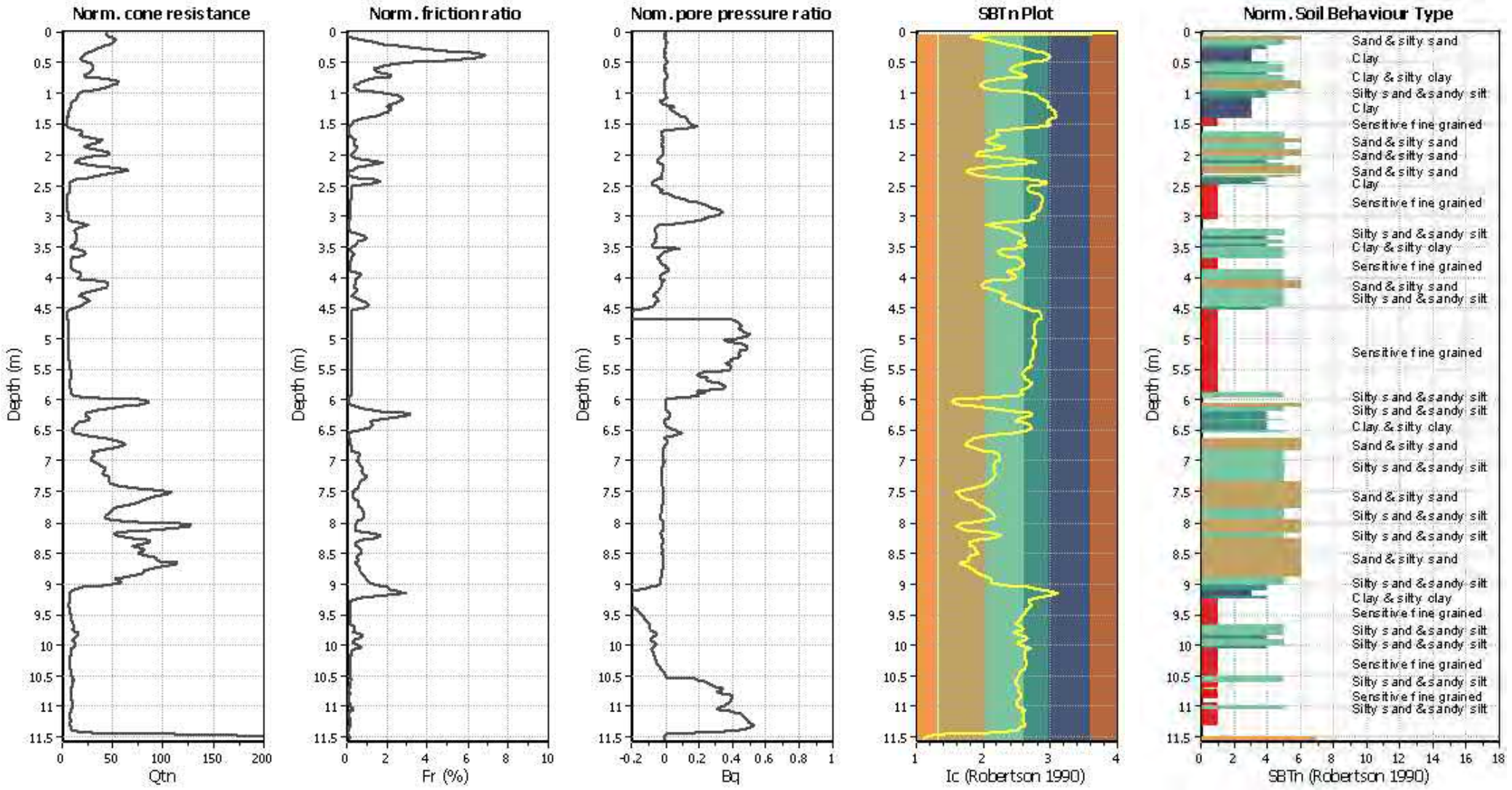






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



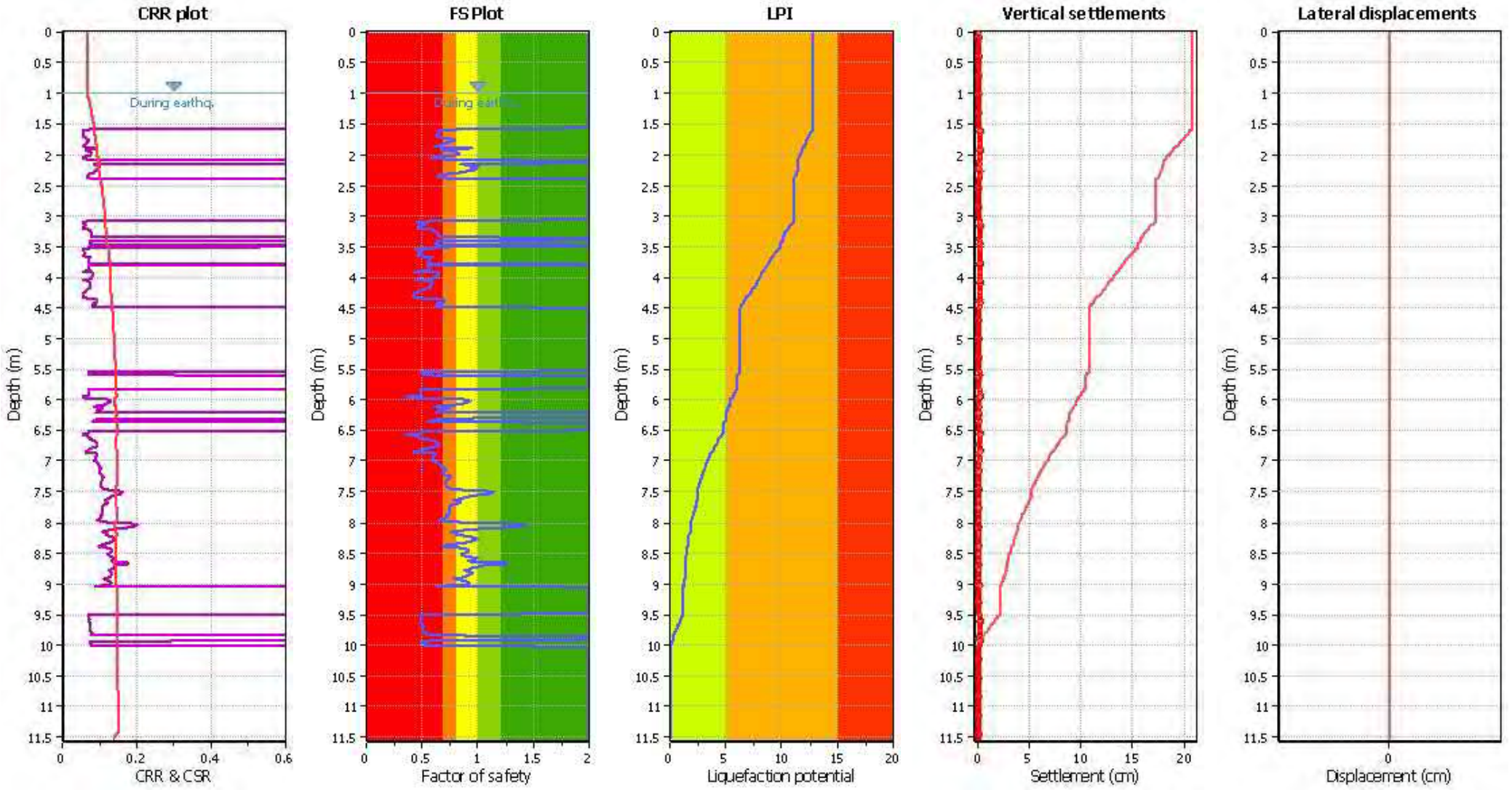
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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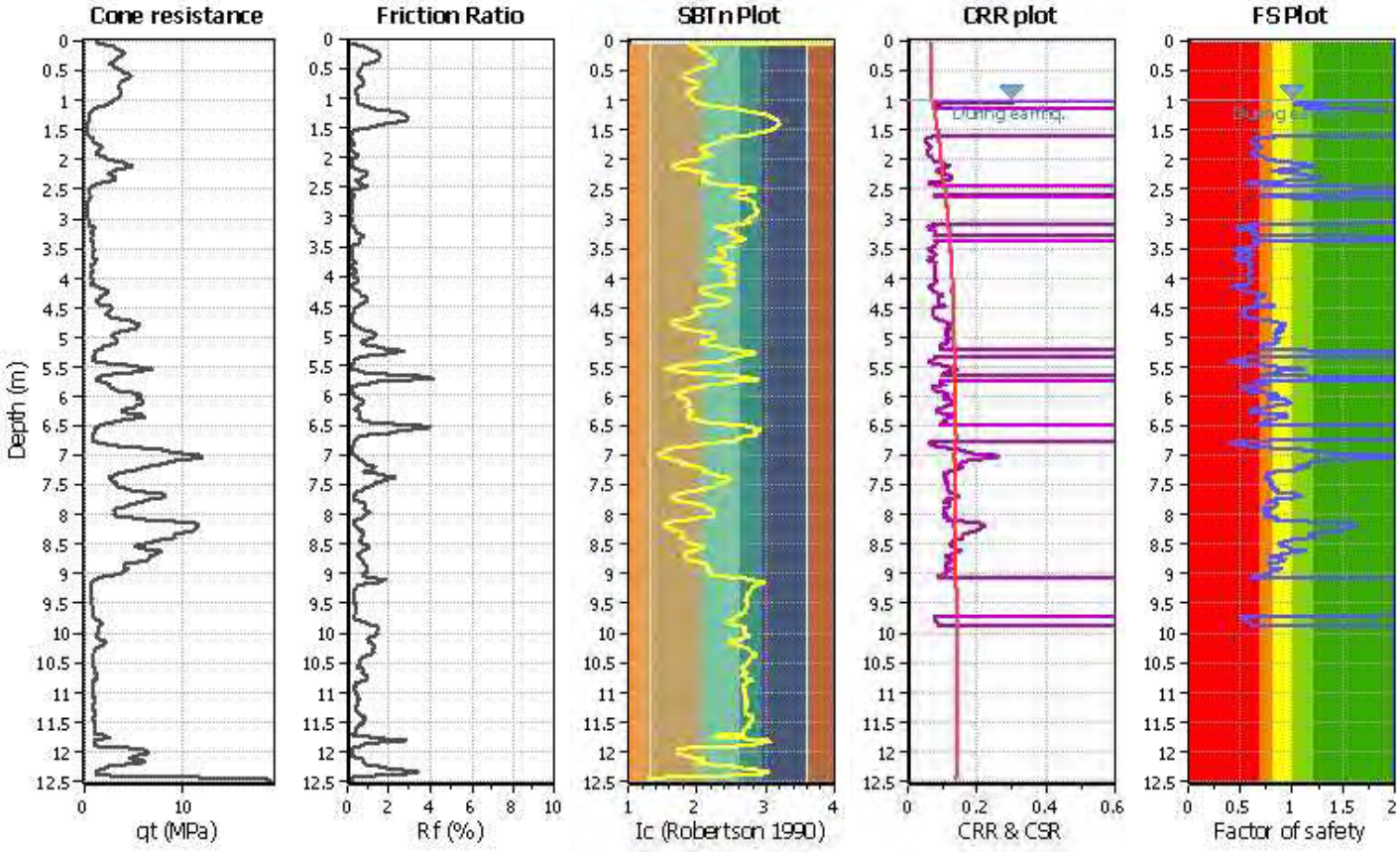
LIQUEFACTION ANALYSIS REPORT

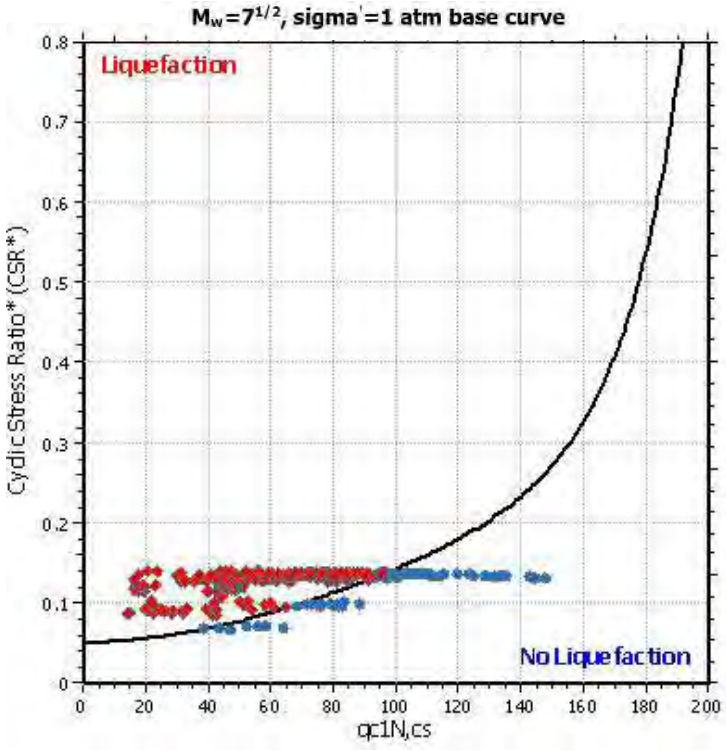
Project title : **Location :**

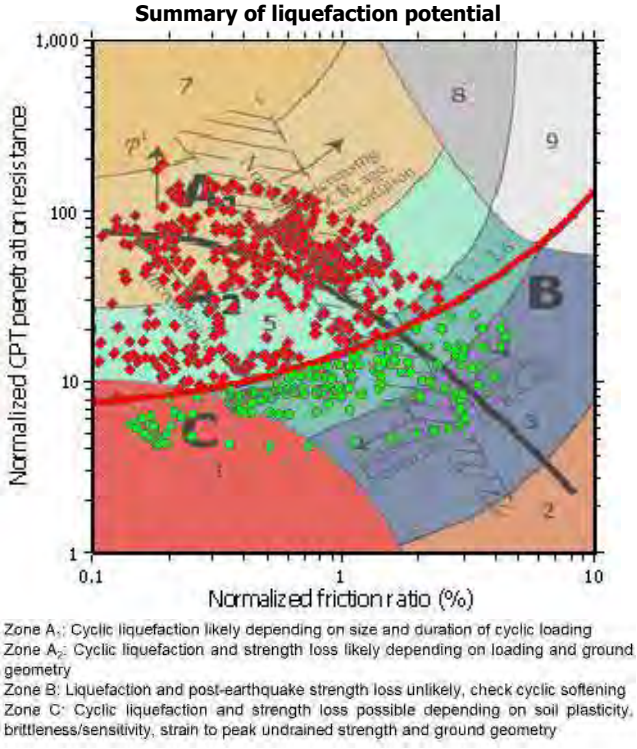
CPT file : CPT03 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

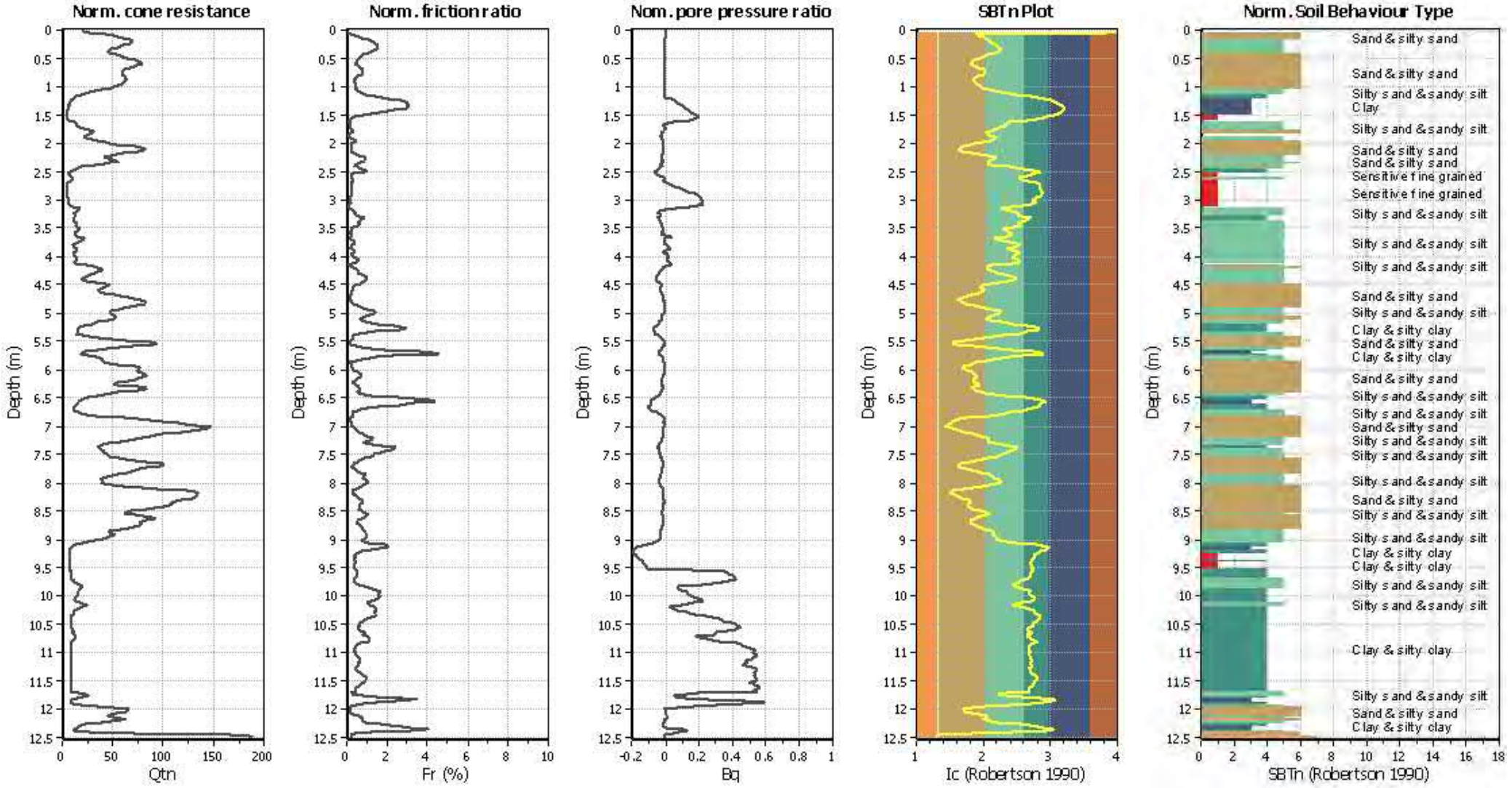






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



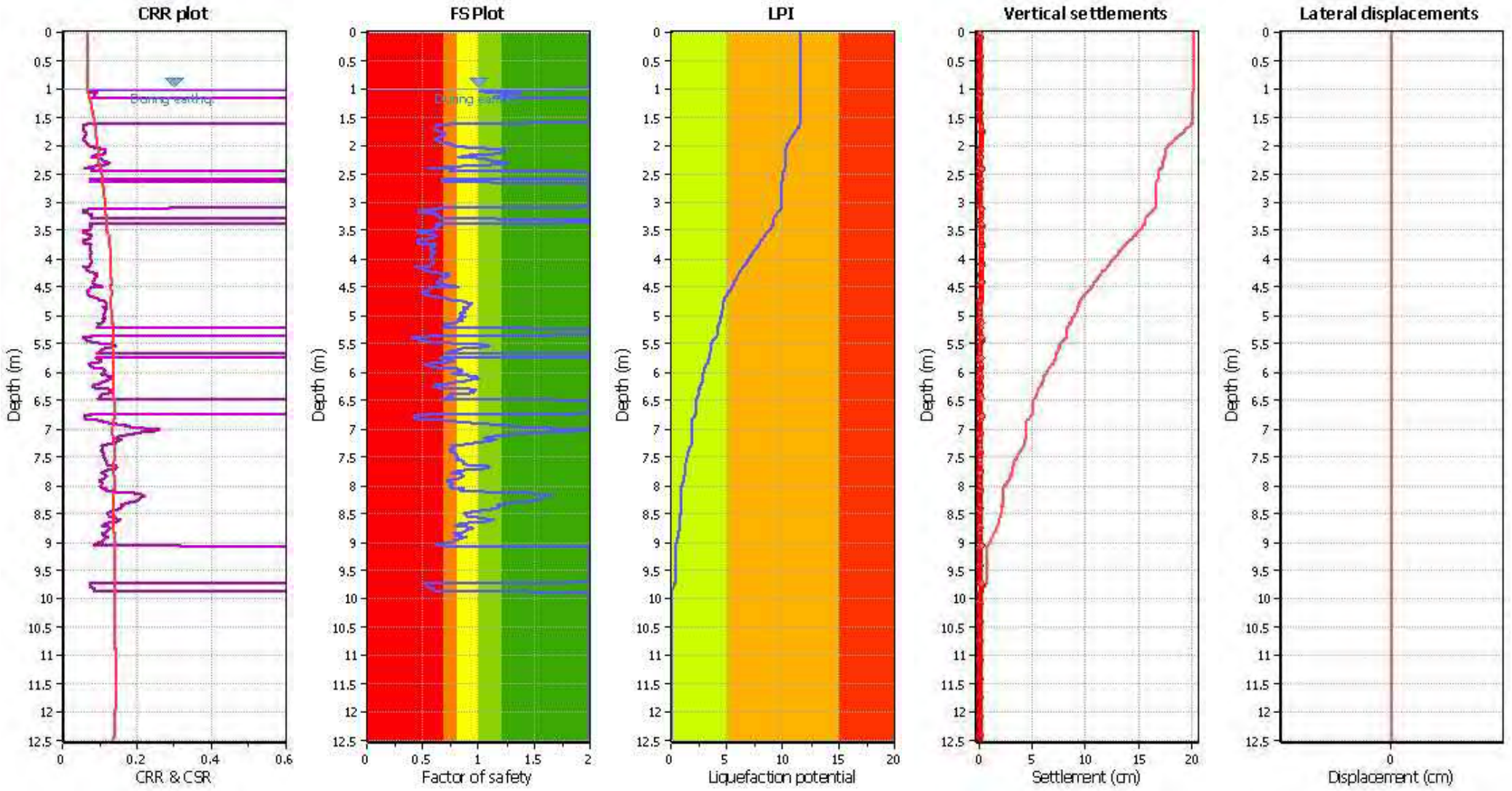
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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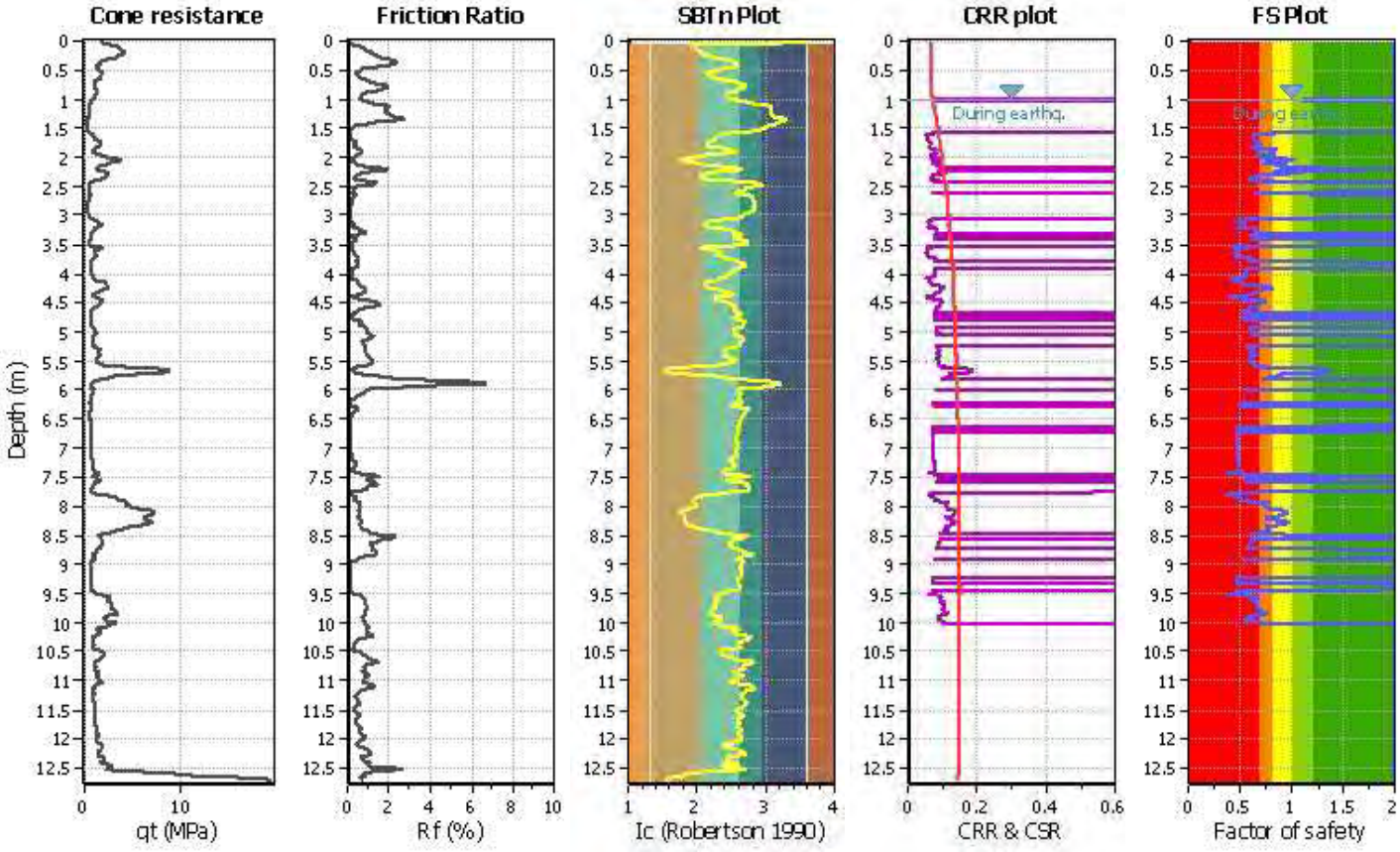
LIQUEFACTION ANALYSIS REPORT

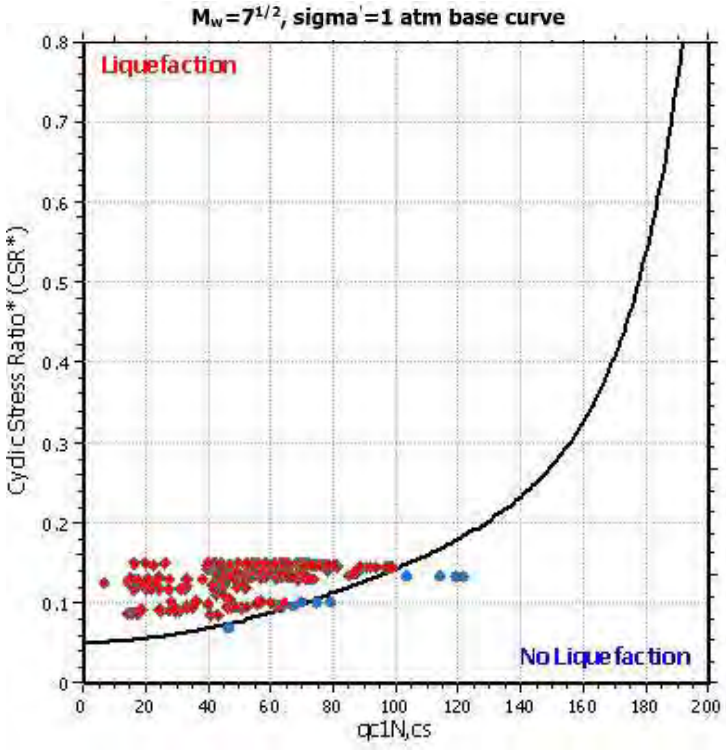
Project title : **Location :**

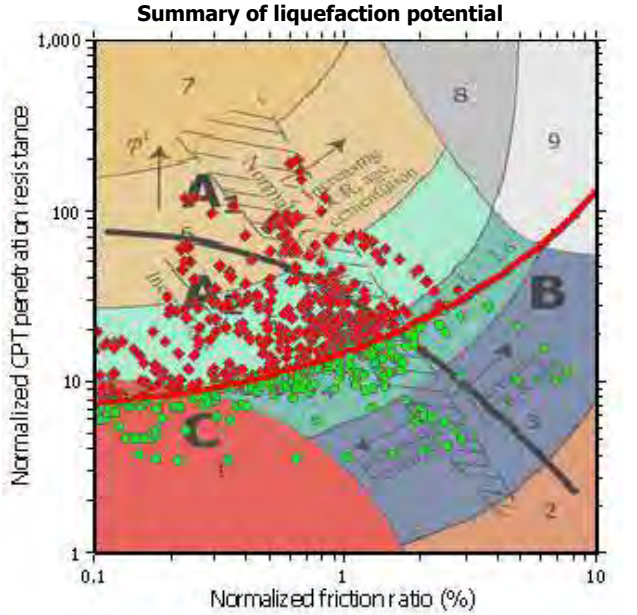
CPT file : CPT04 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

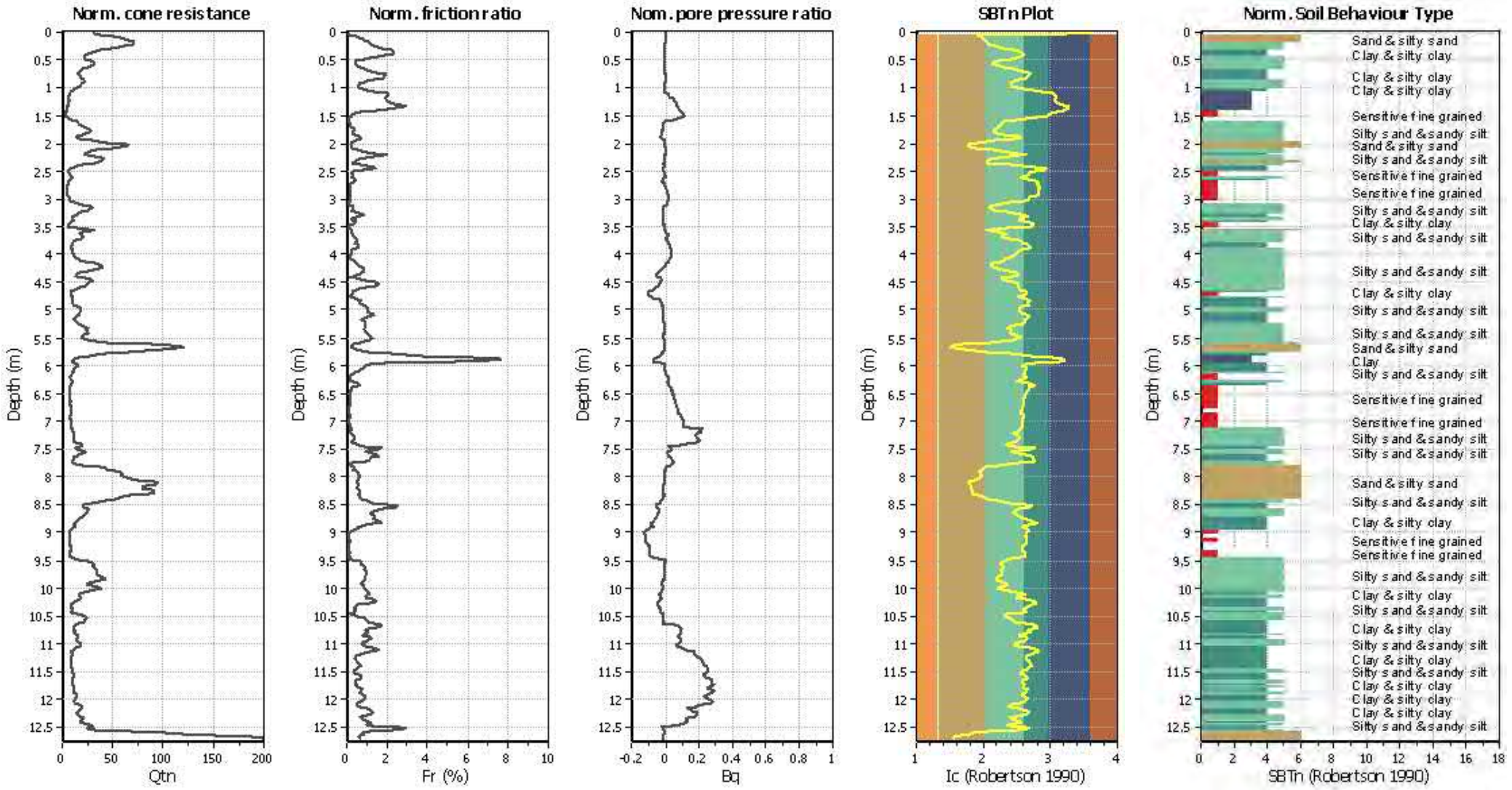






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



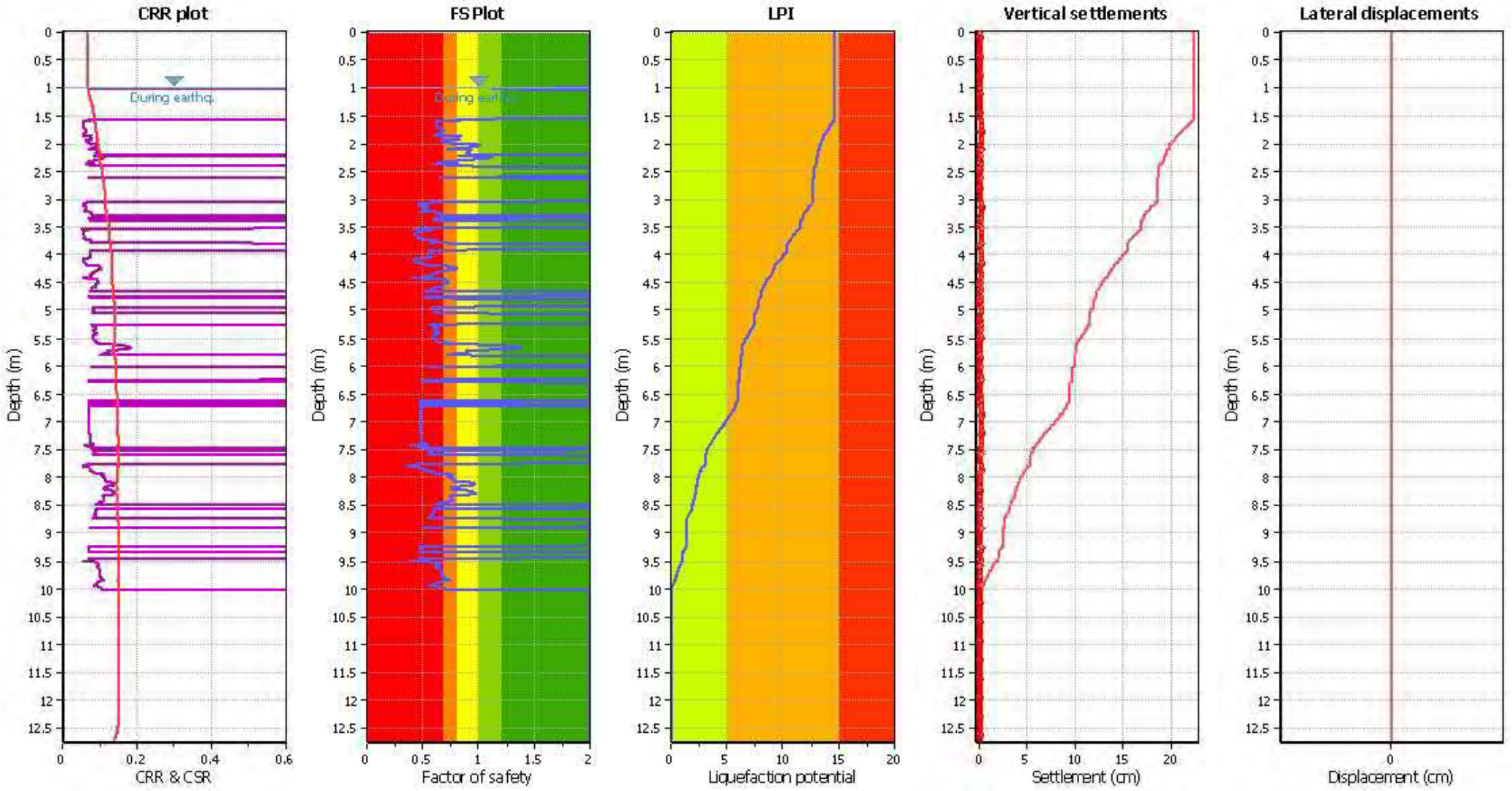
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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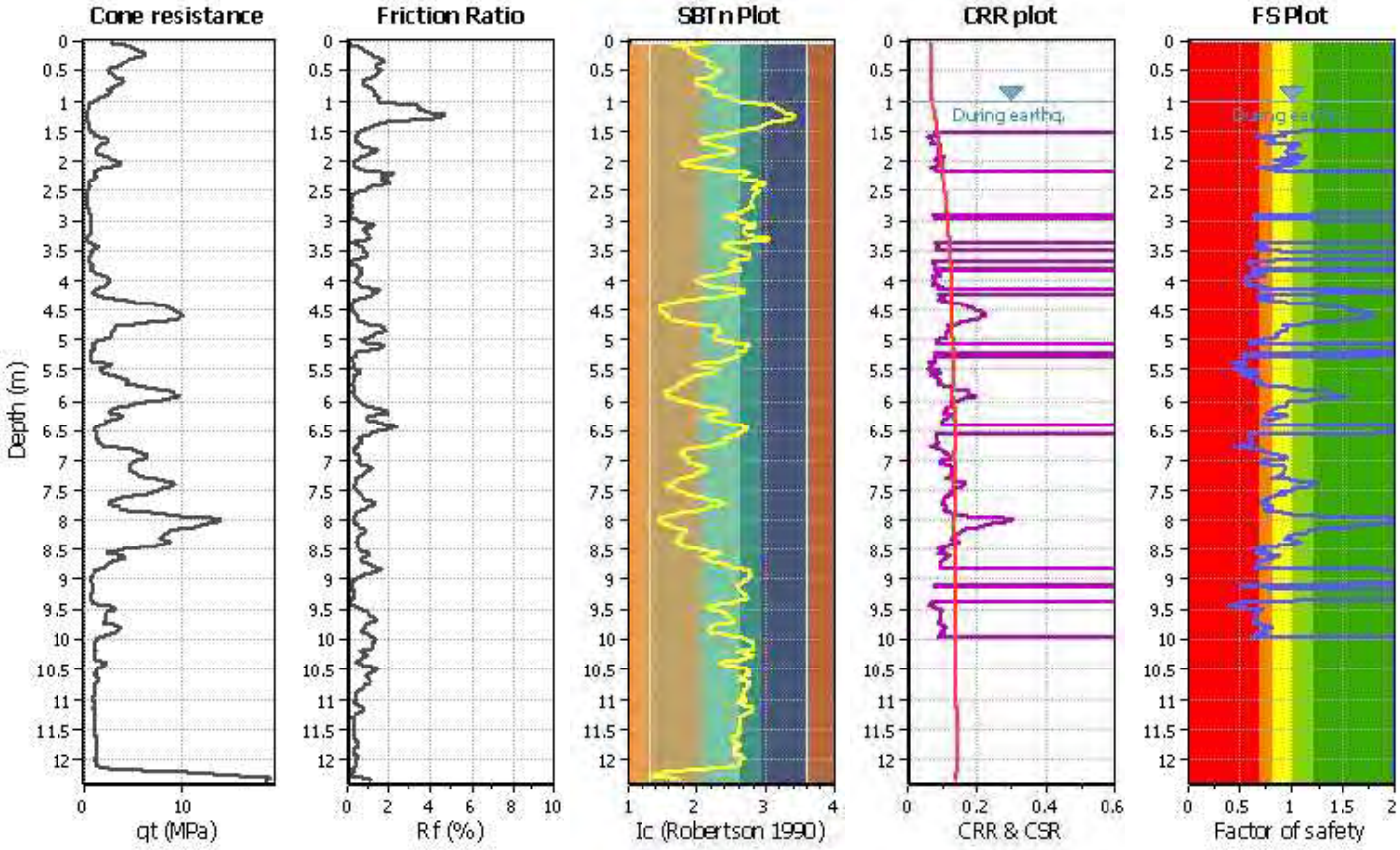
LIQUEFACTION ANALYSIS REPORT

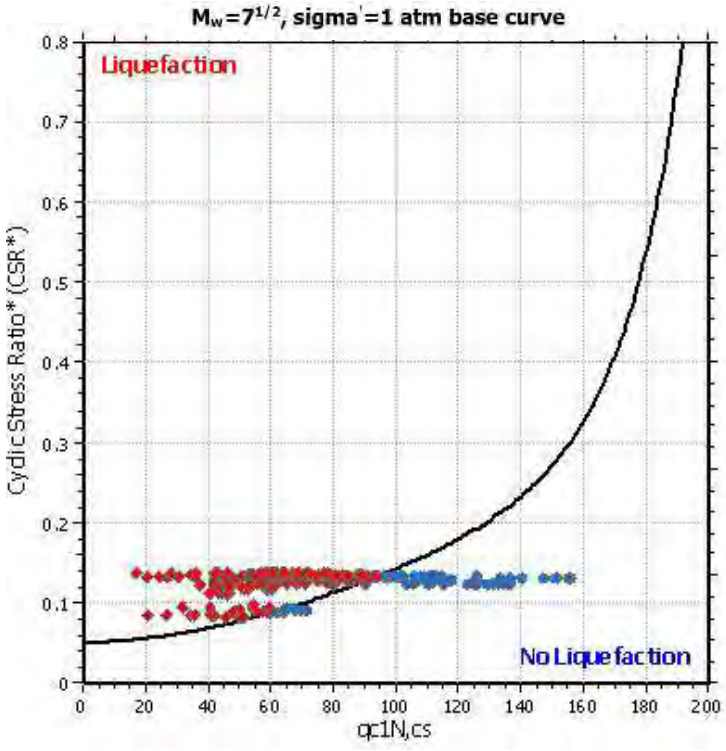
Project title : **Location :**

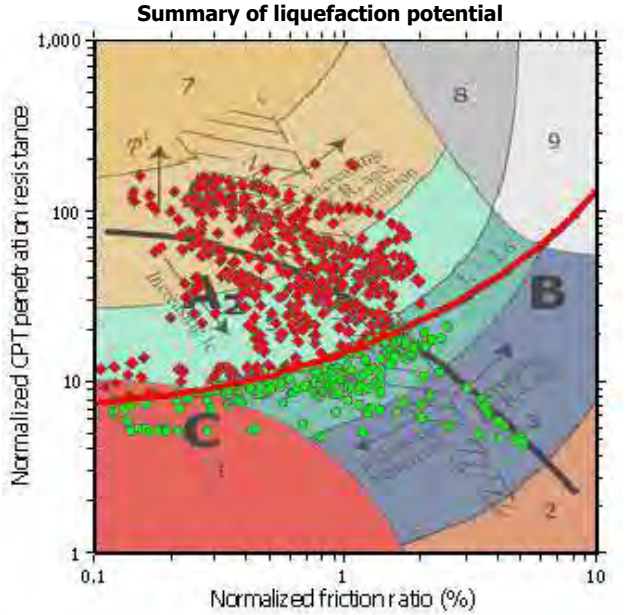
CPT file : CPT05 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

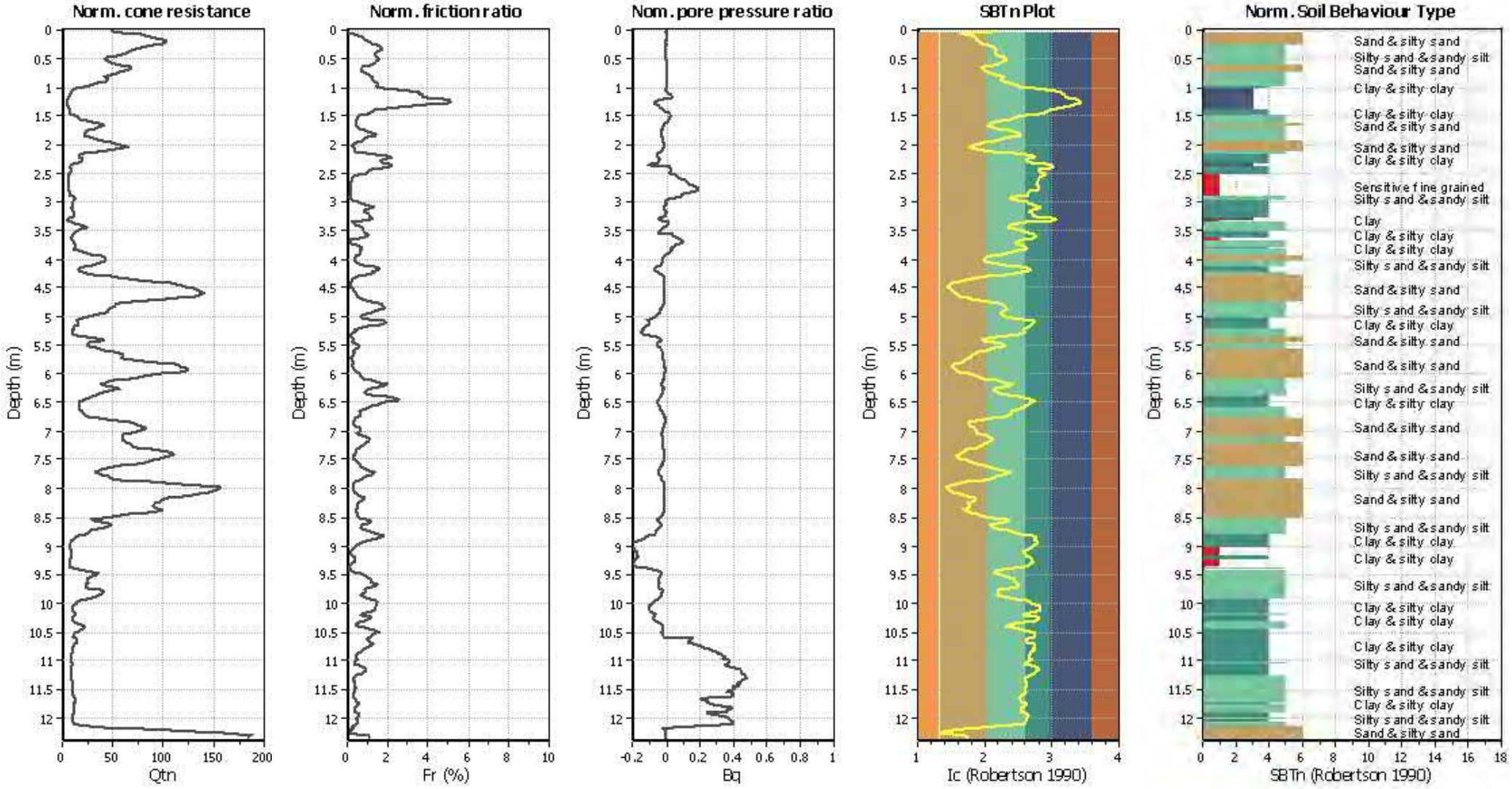






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



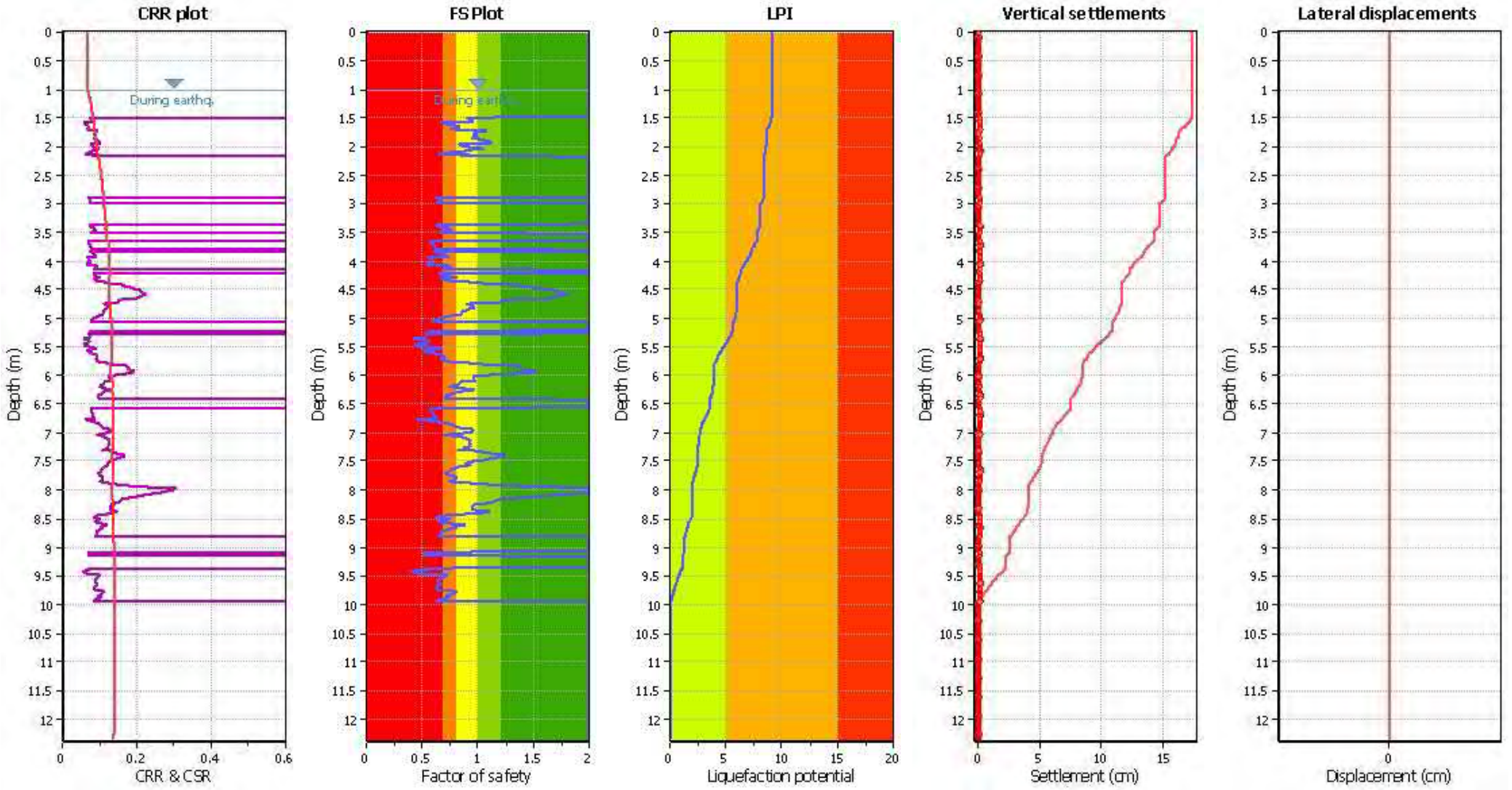
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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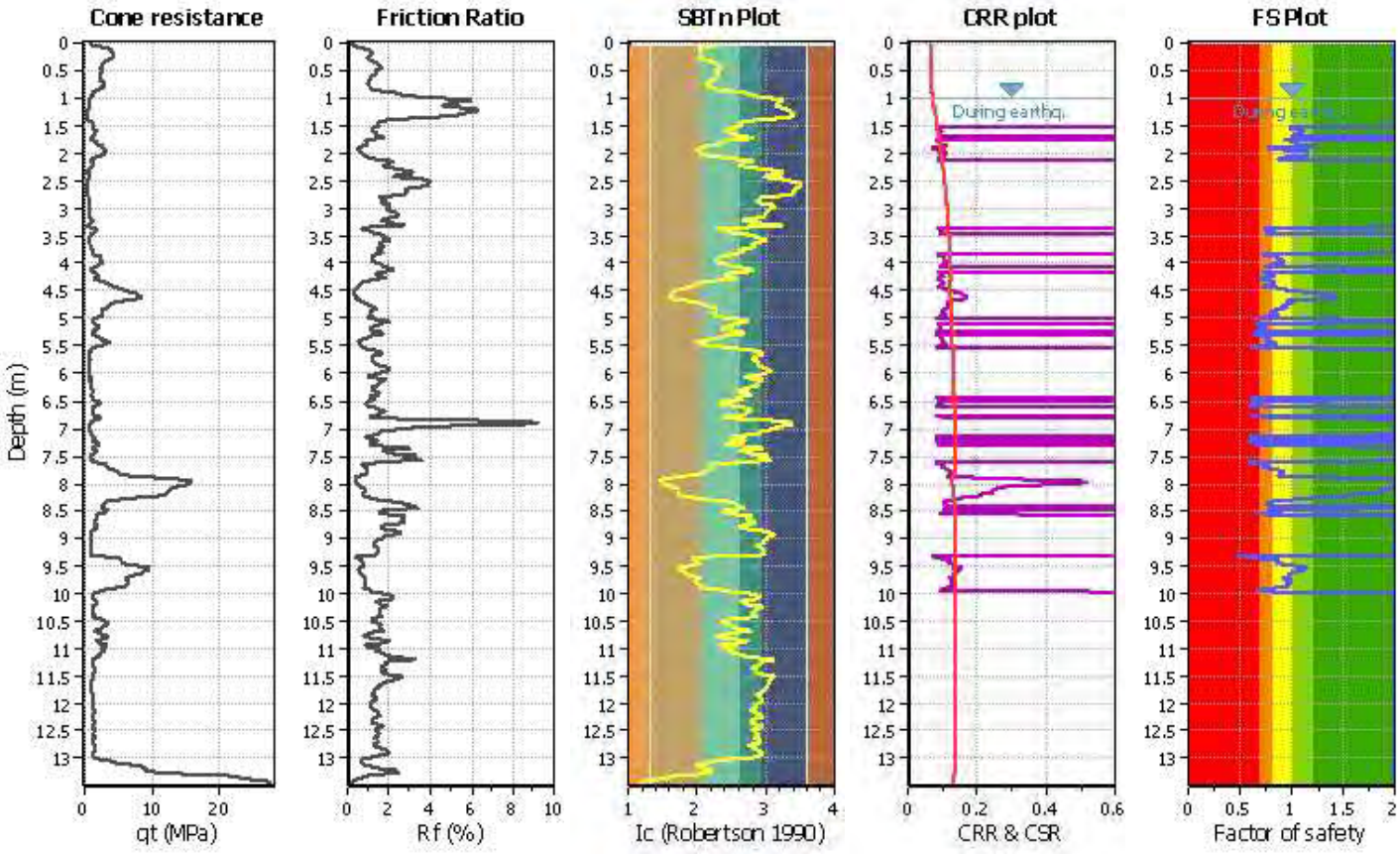
LIQUEFACTION ANALYSIS REPORT

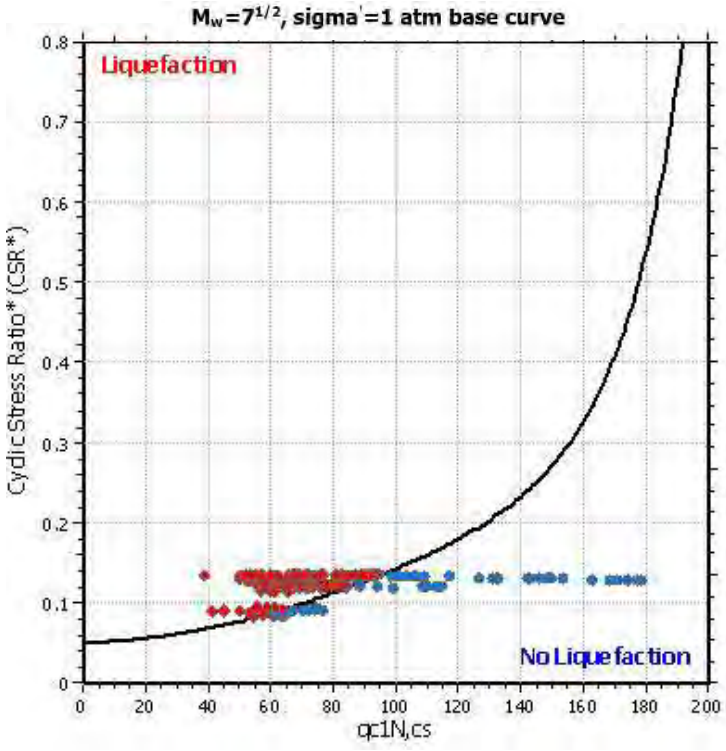
Project title : **Location :**

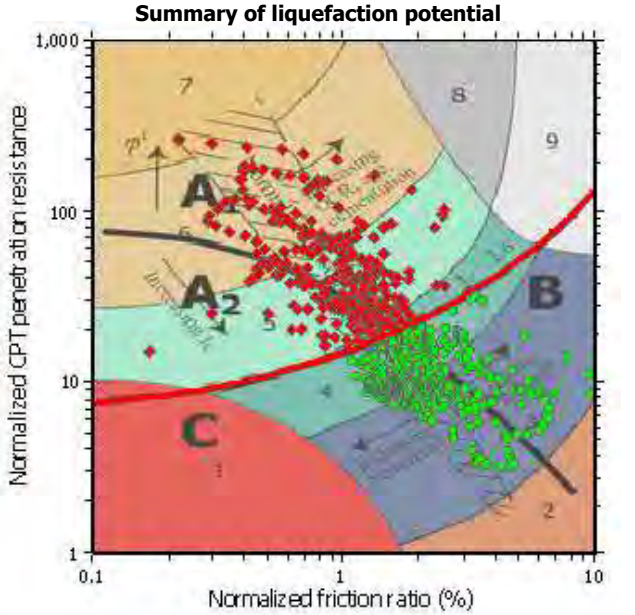
CPT file : CPT06 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

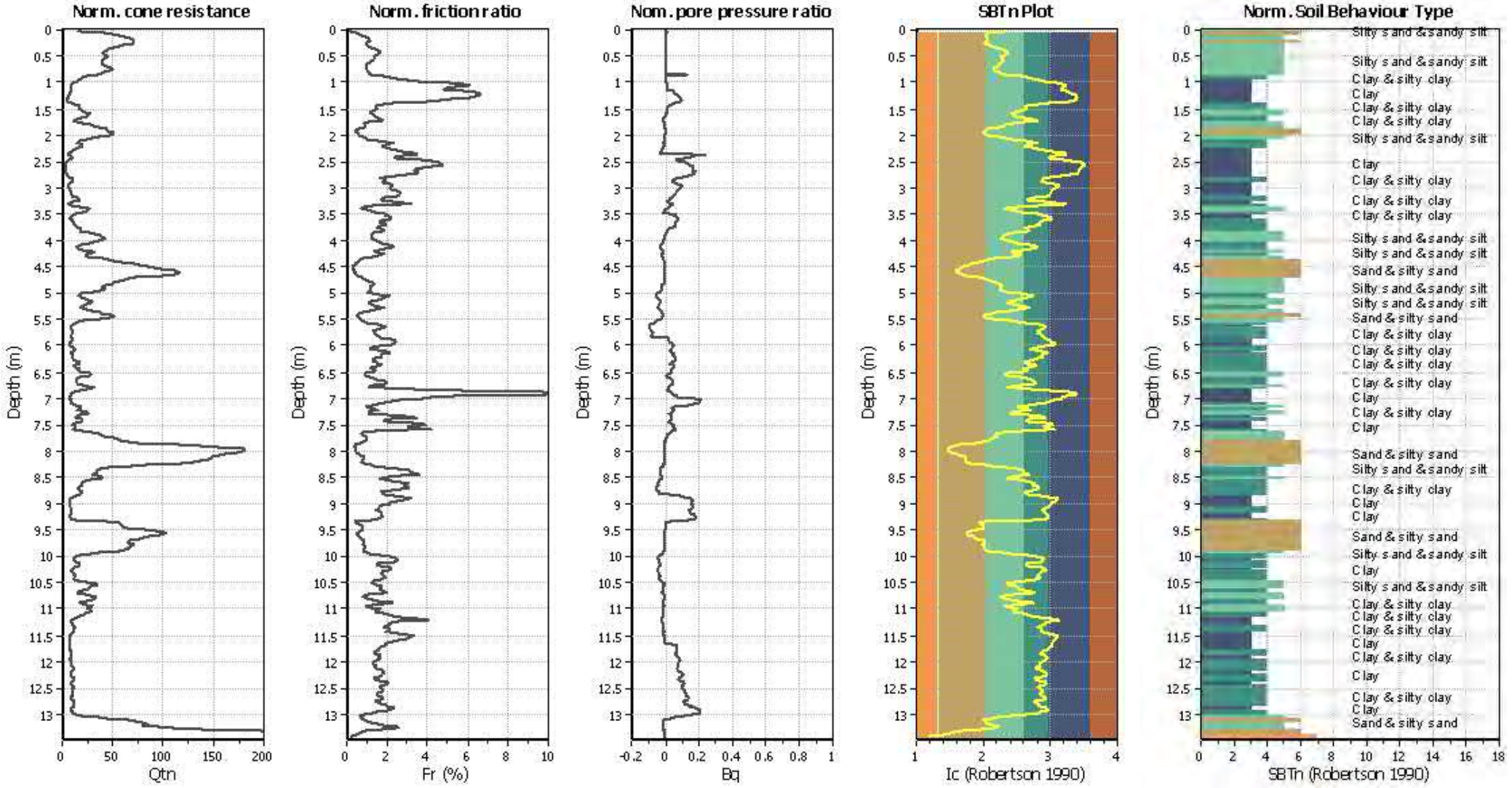






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



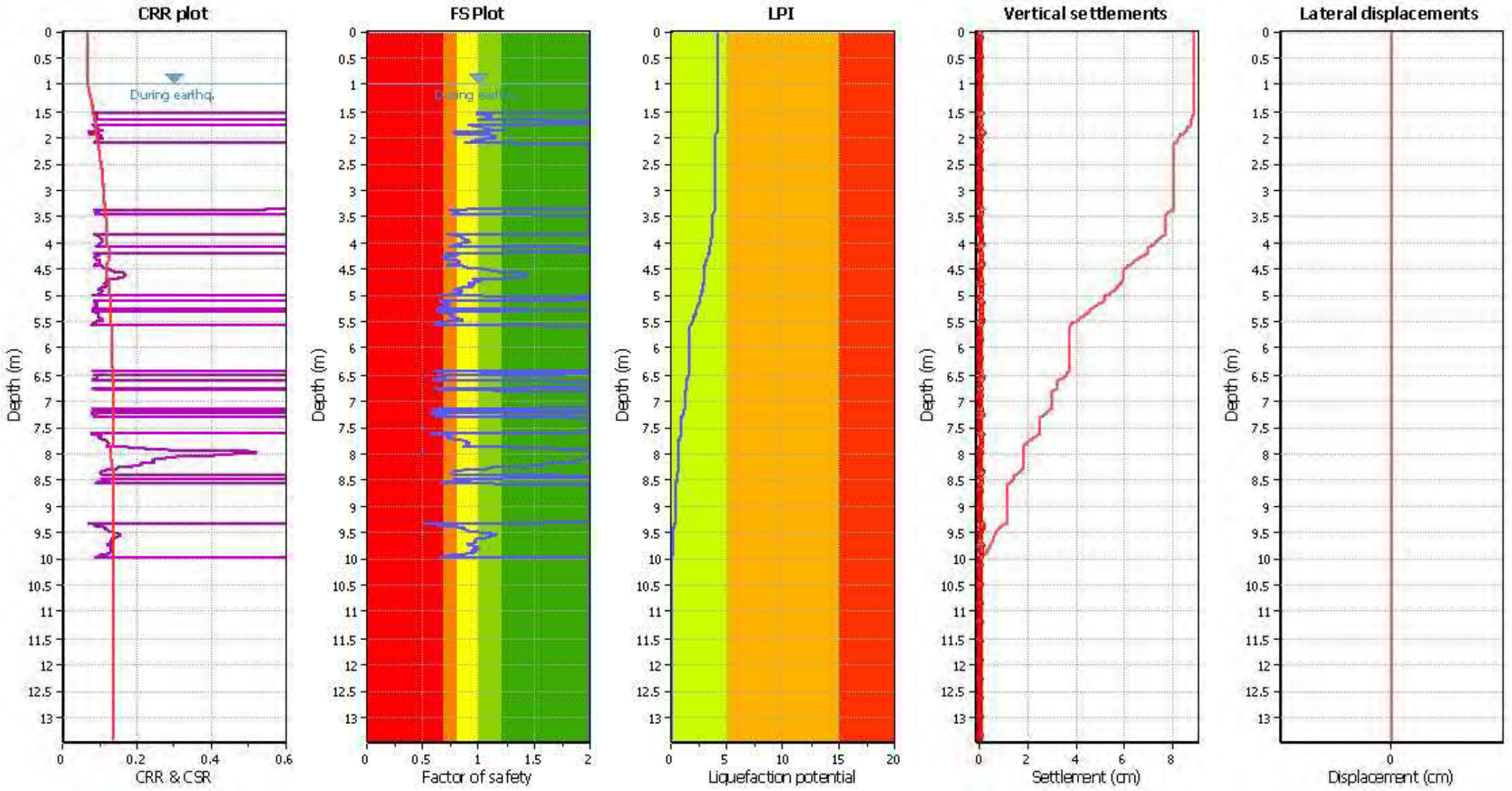
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn legend

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

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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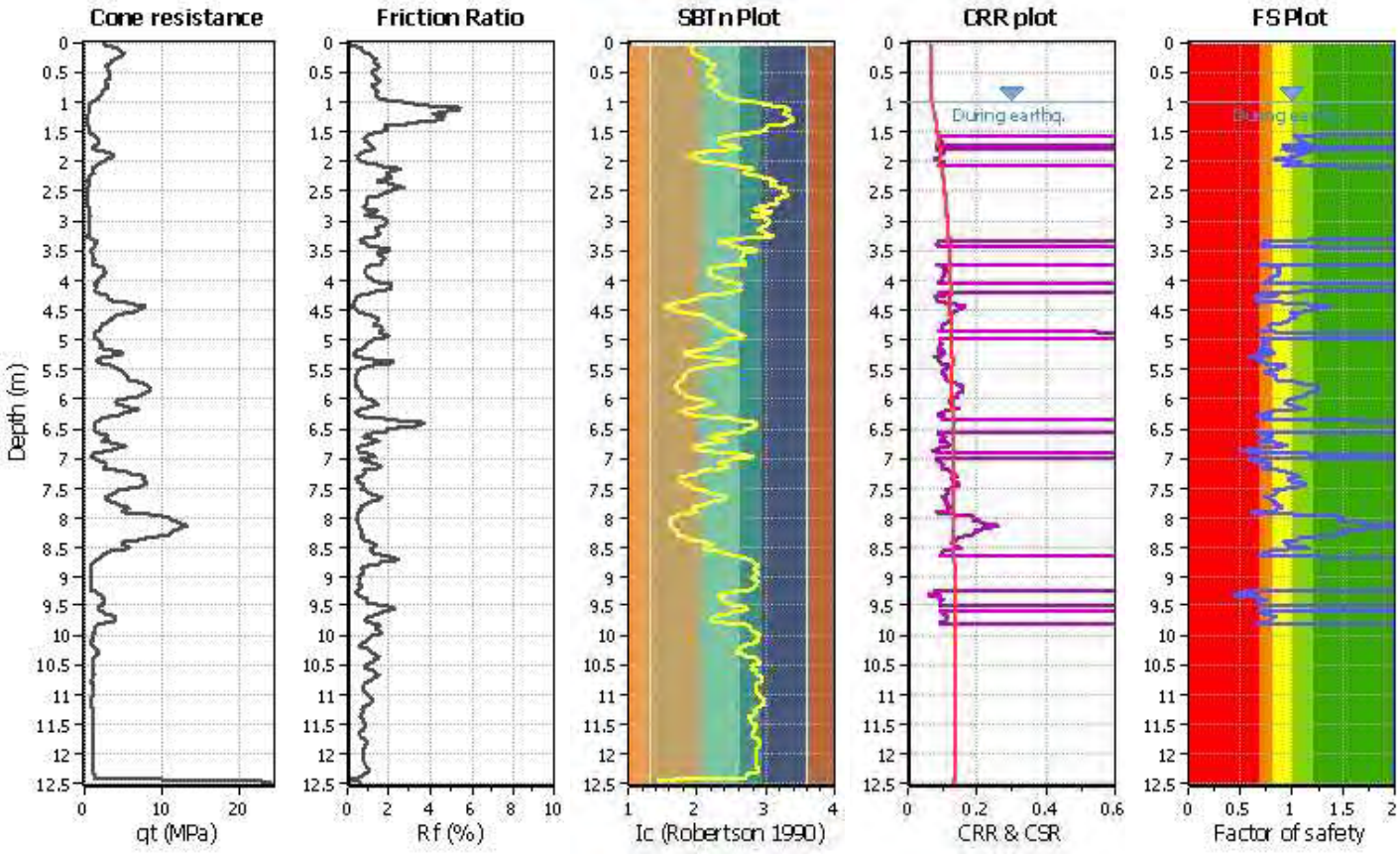
LIQUEFACTION ANALYSIS REPORT

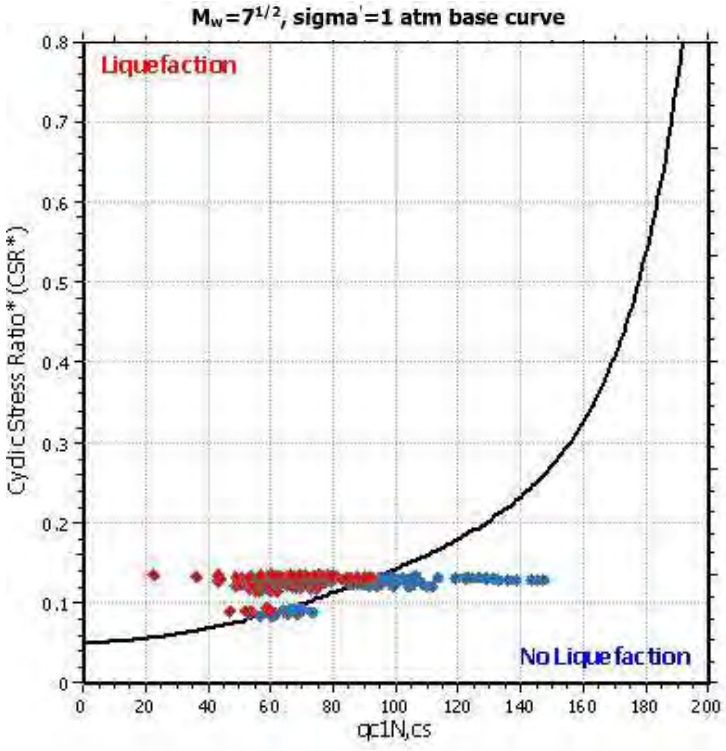
Project title : **Location :**

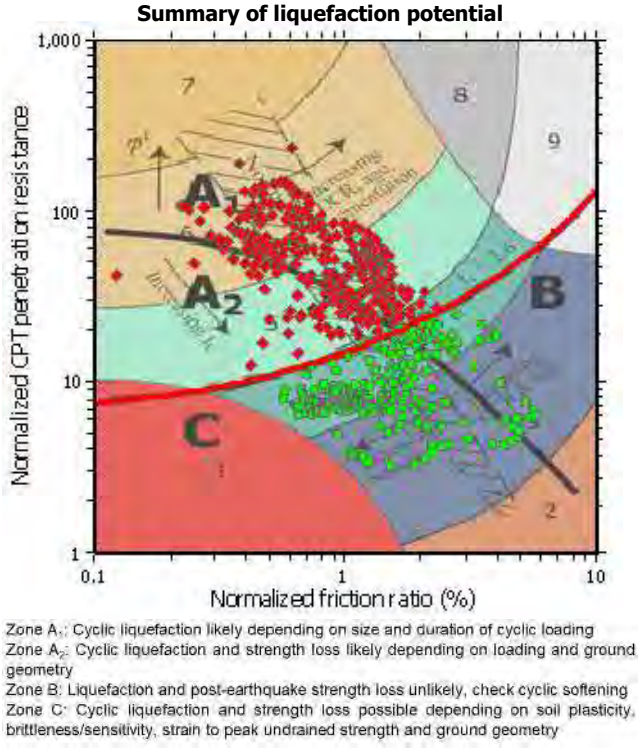
CPT file : CPT07 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

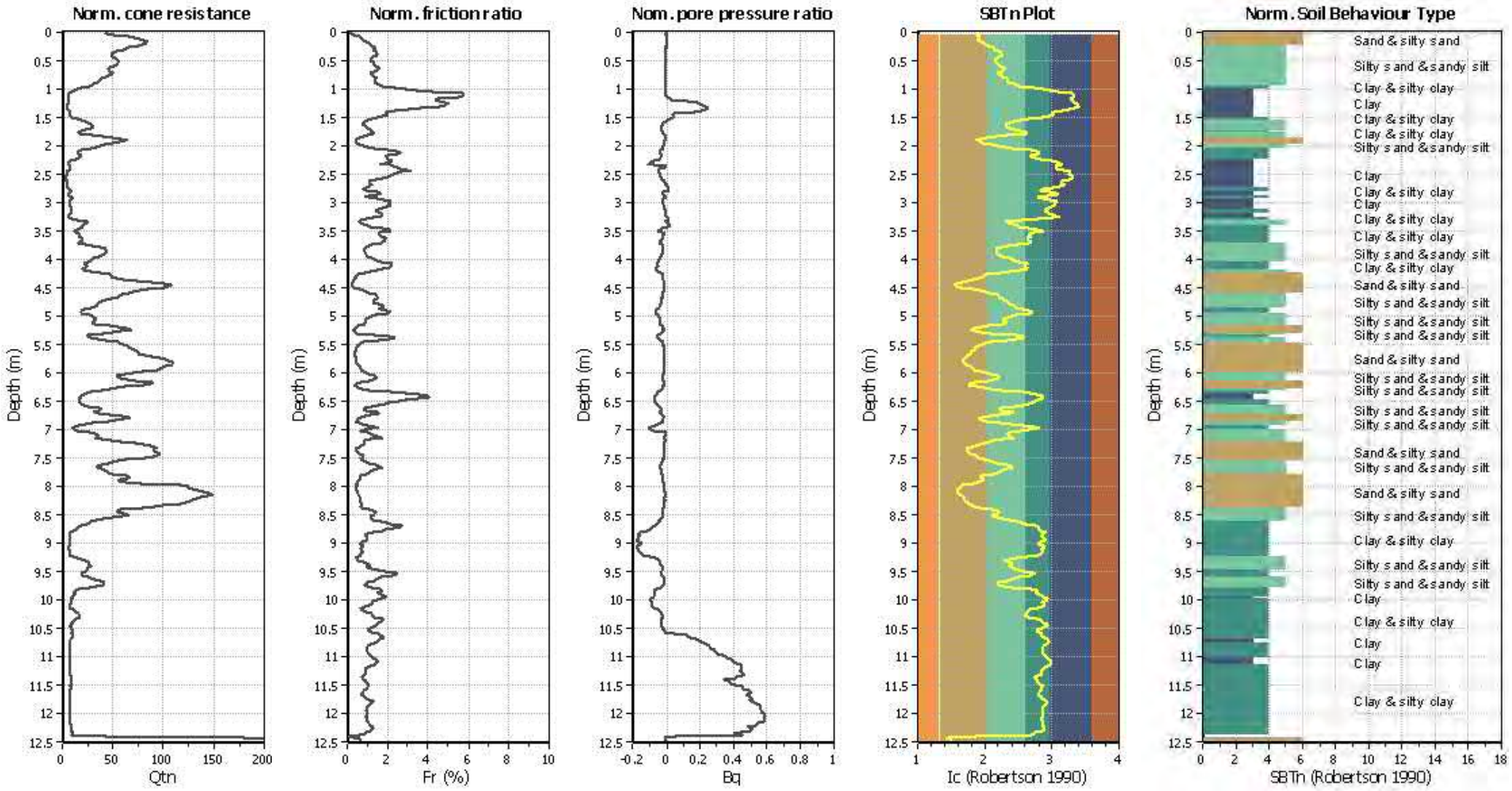






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



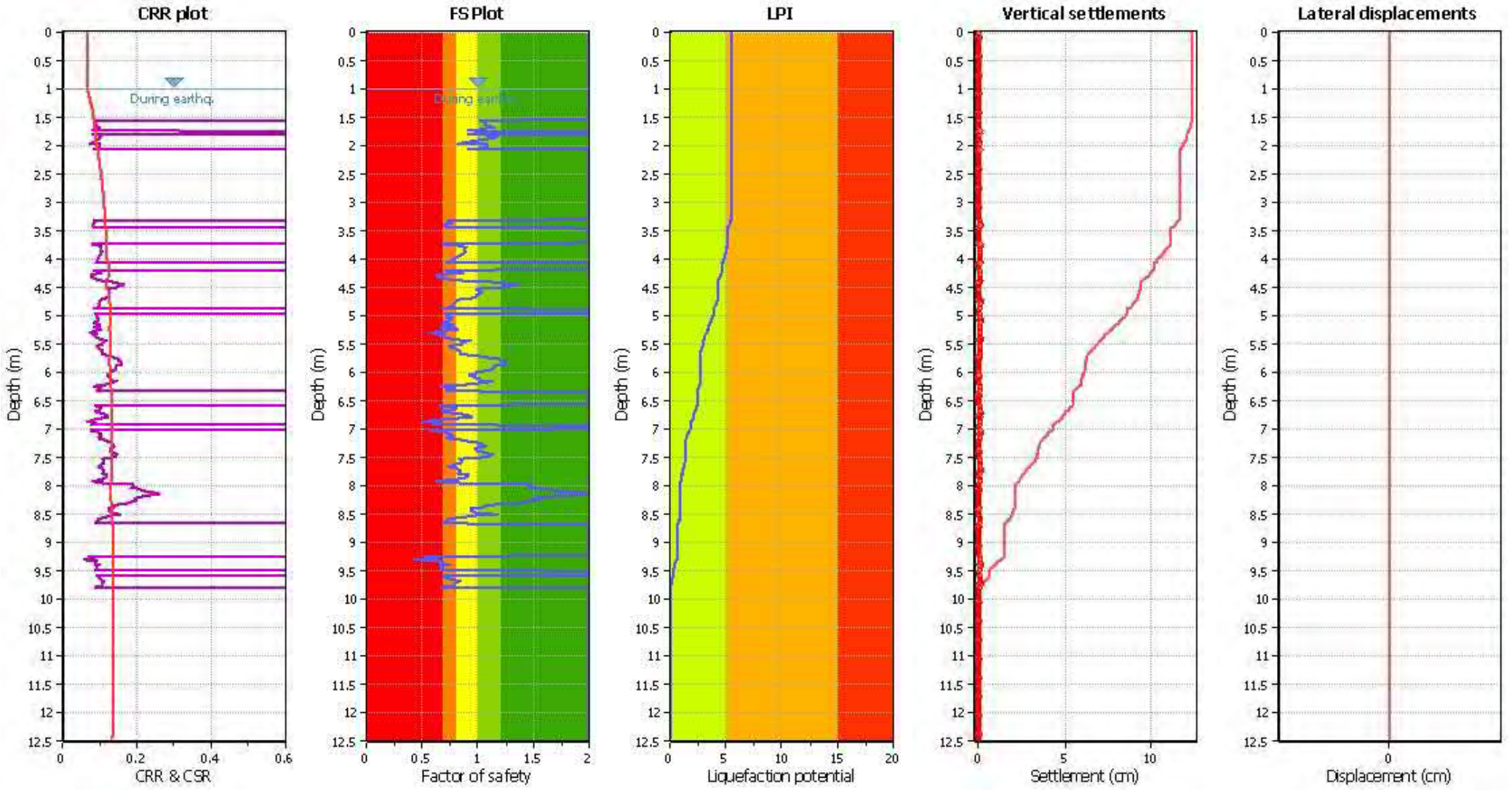
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn legend

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

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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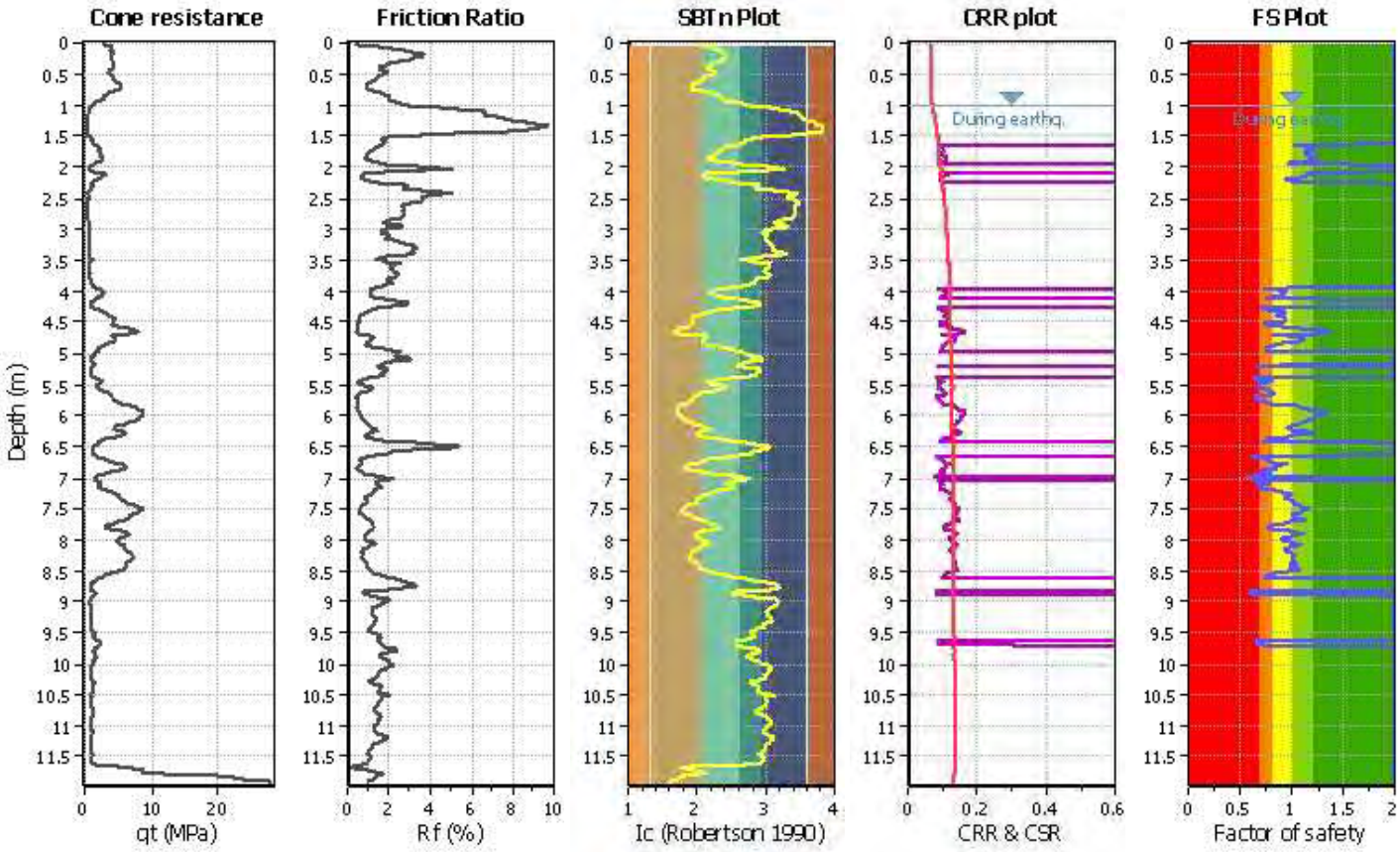
LIQUEFACTION ANALYSIS REPORT

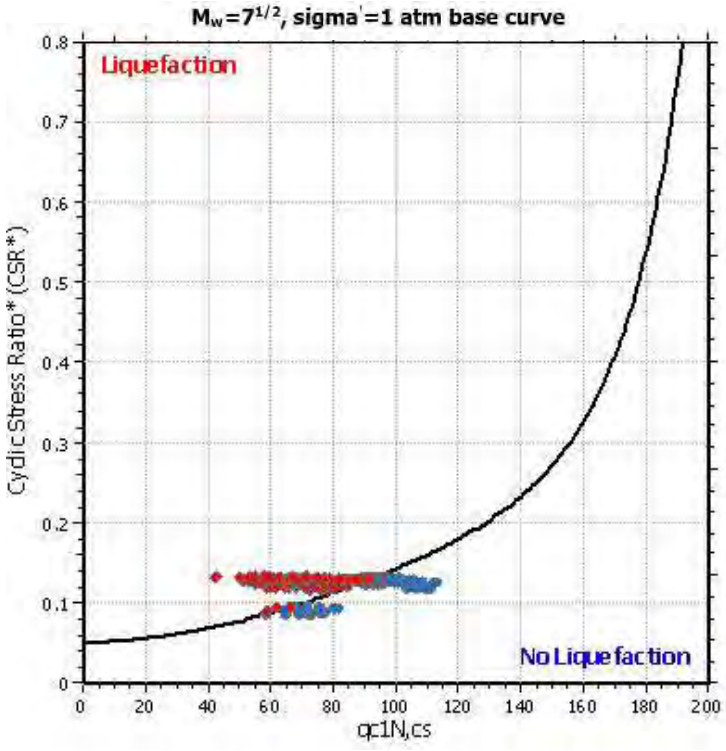
Project title : **Location :**

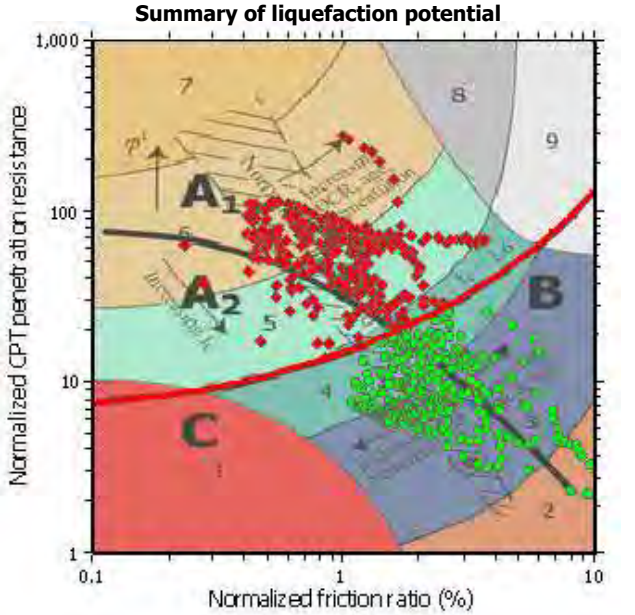
CPT file : CPT08 SLS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

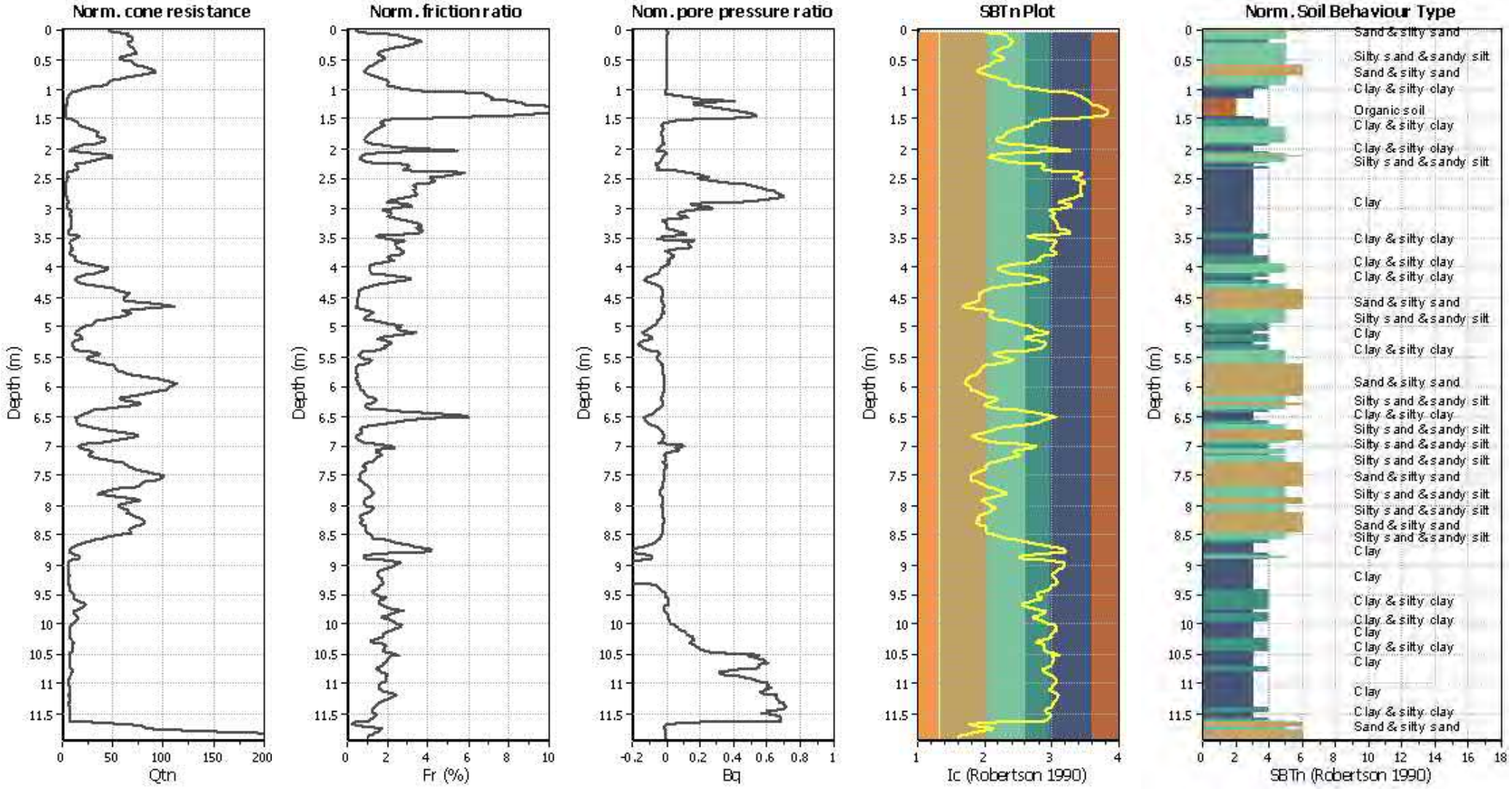






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



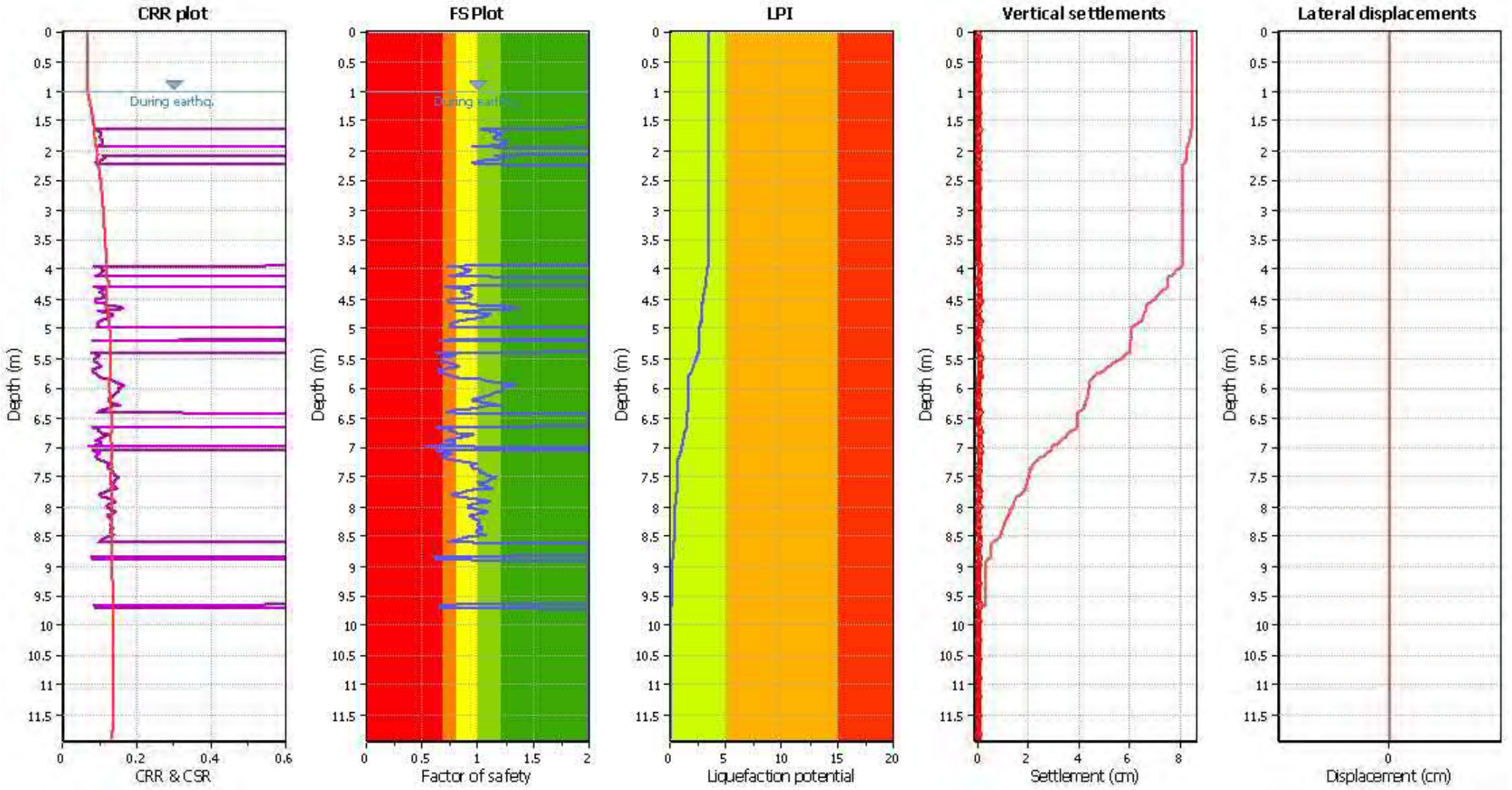
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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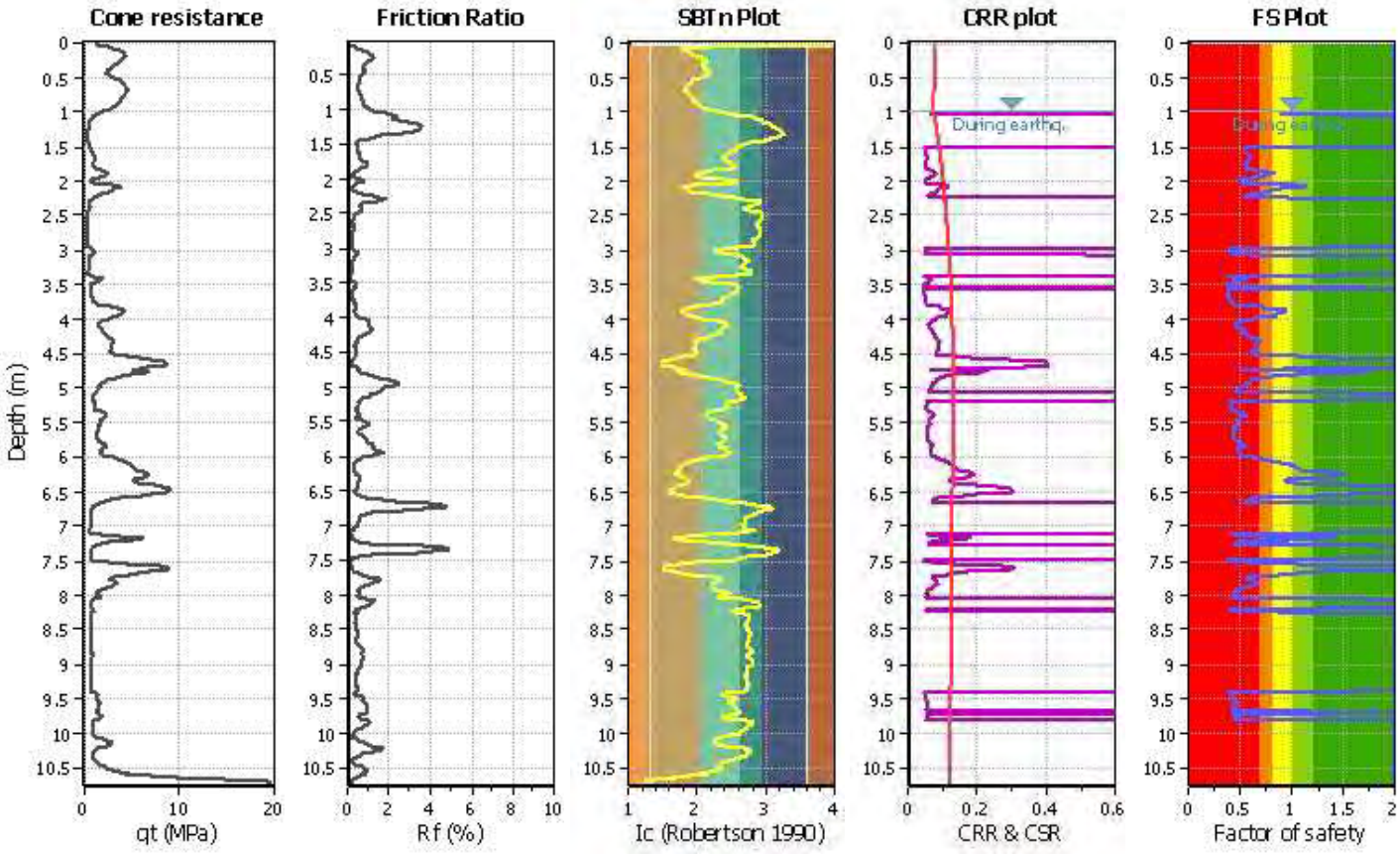
LIQUEFACTION ANALYSIS REPORT

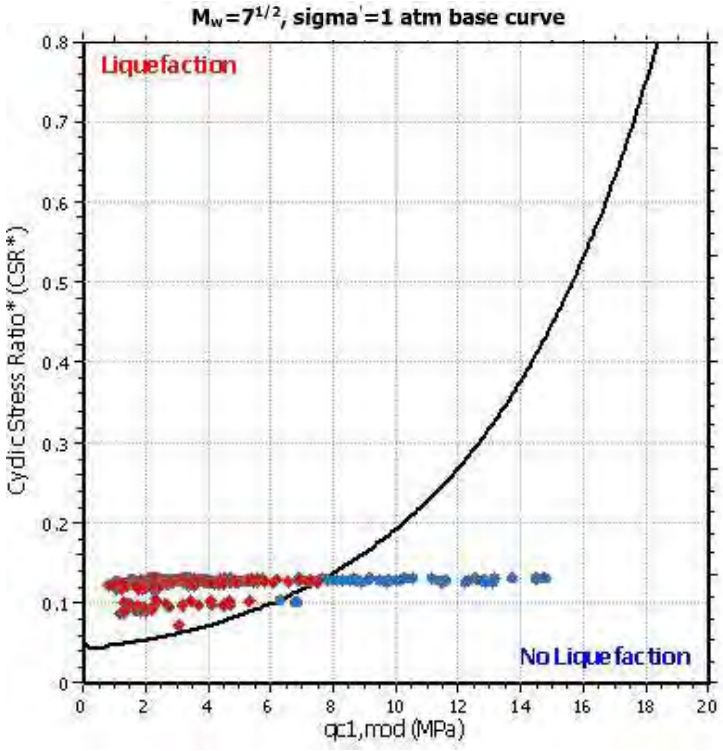
Project title : **Location :**

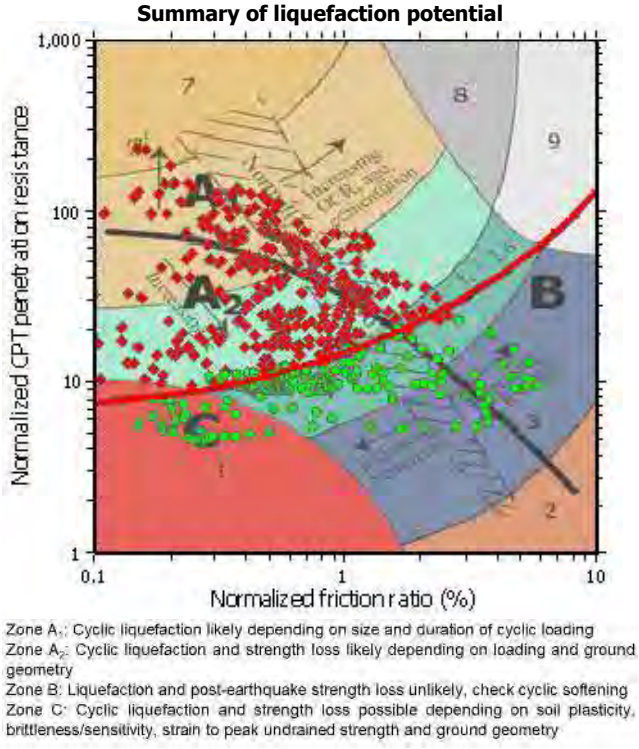
CPT file : CPT09 SLS

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

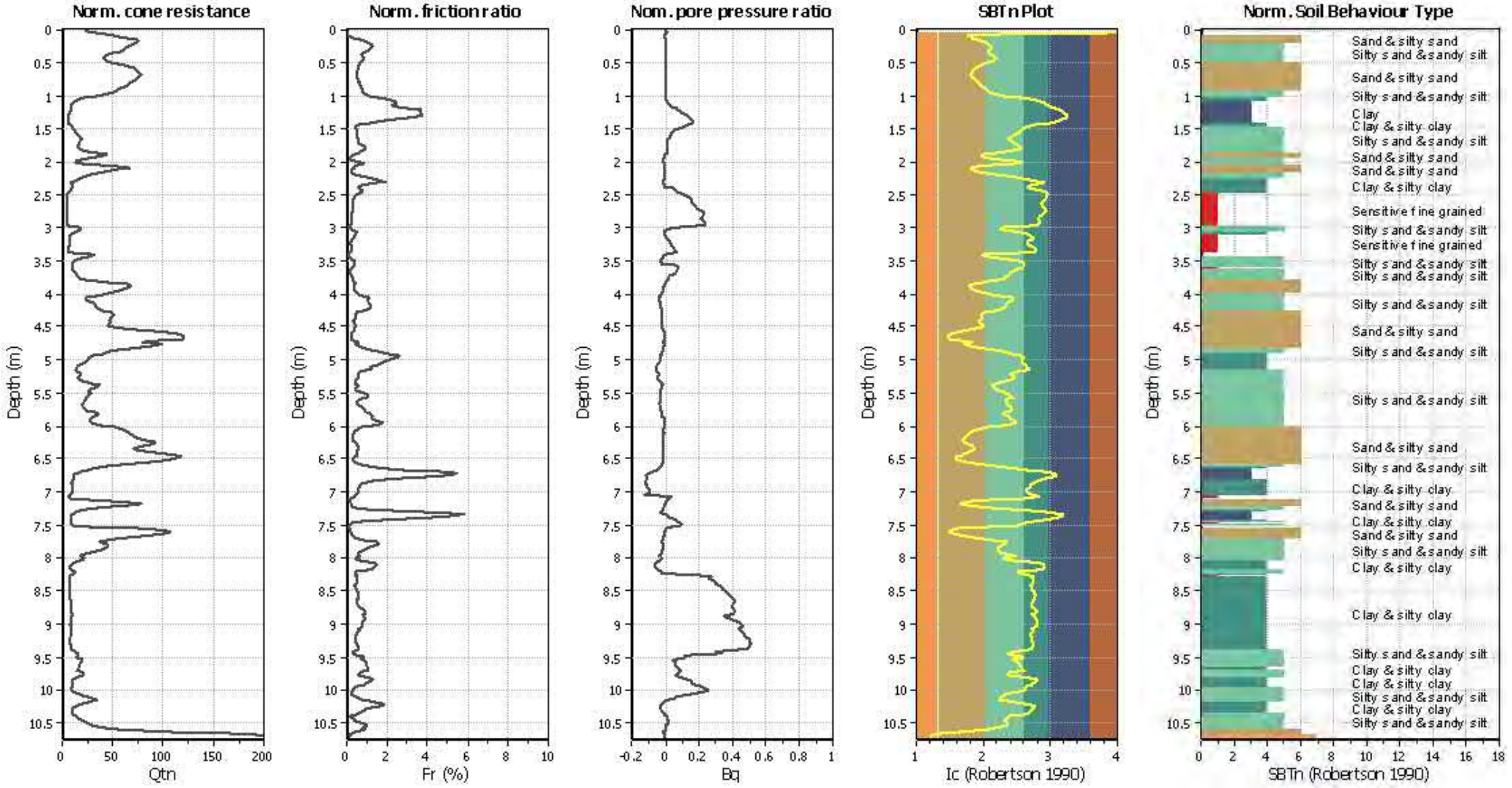






Zone A: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



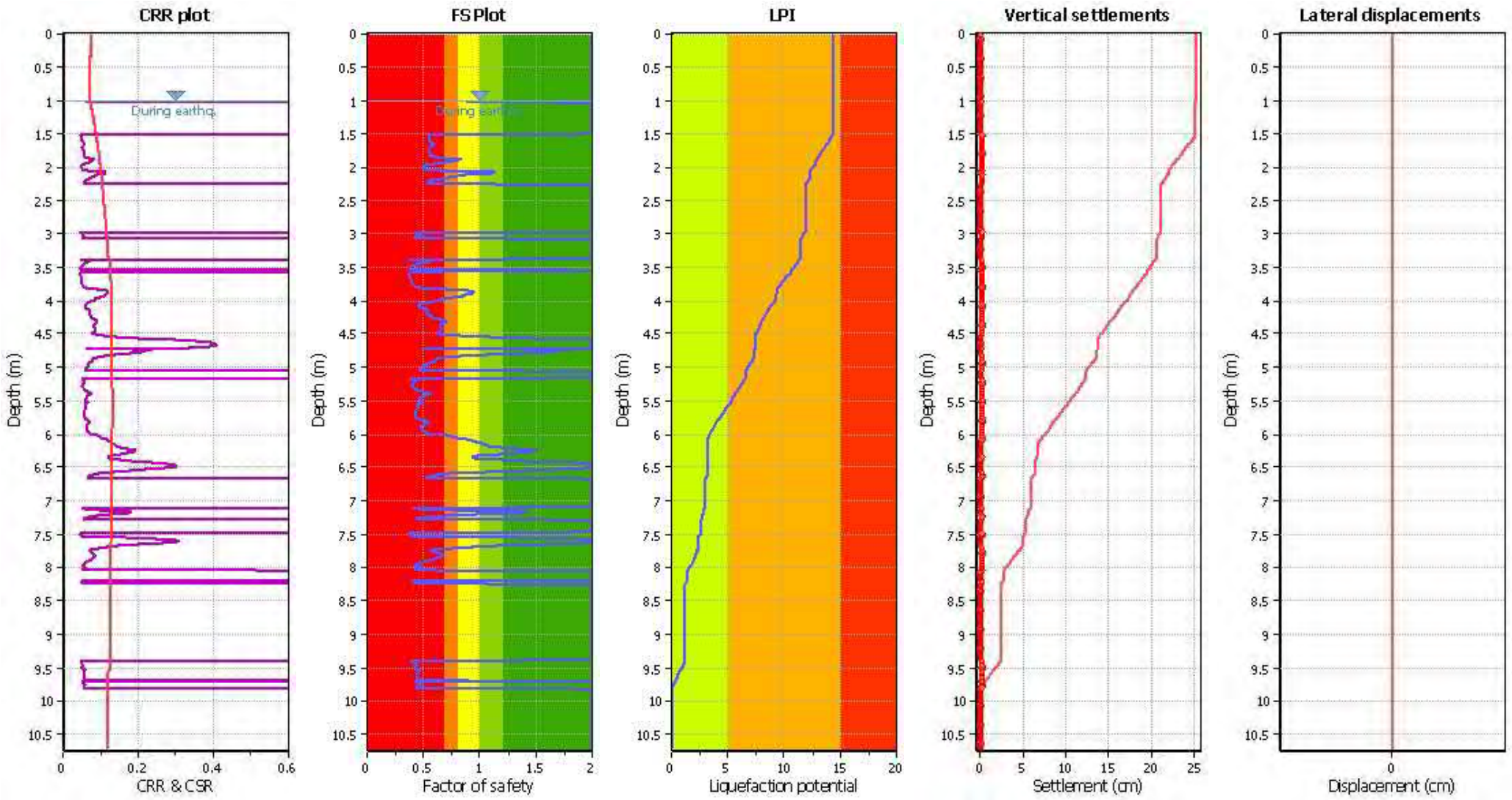
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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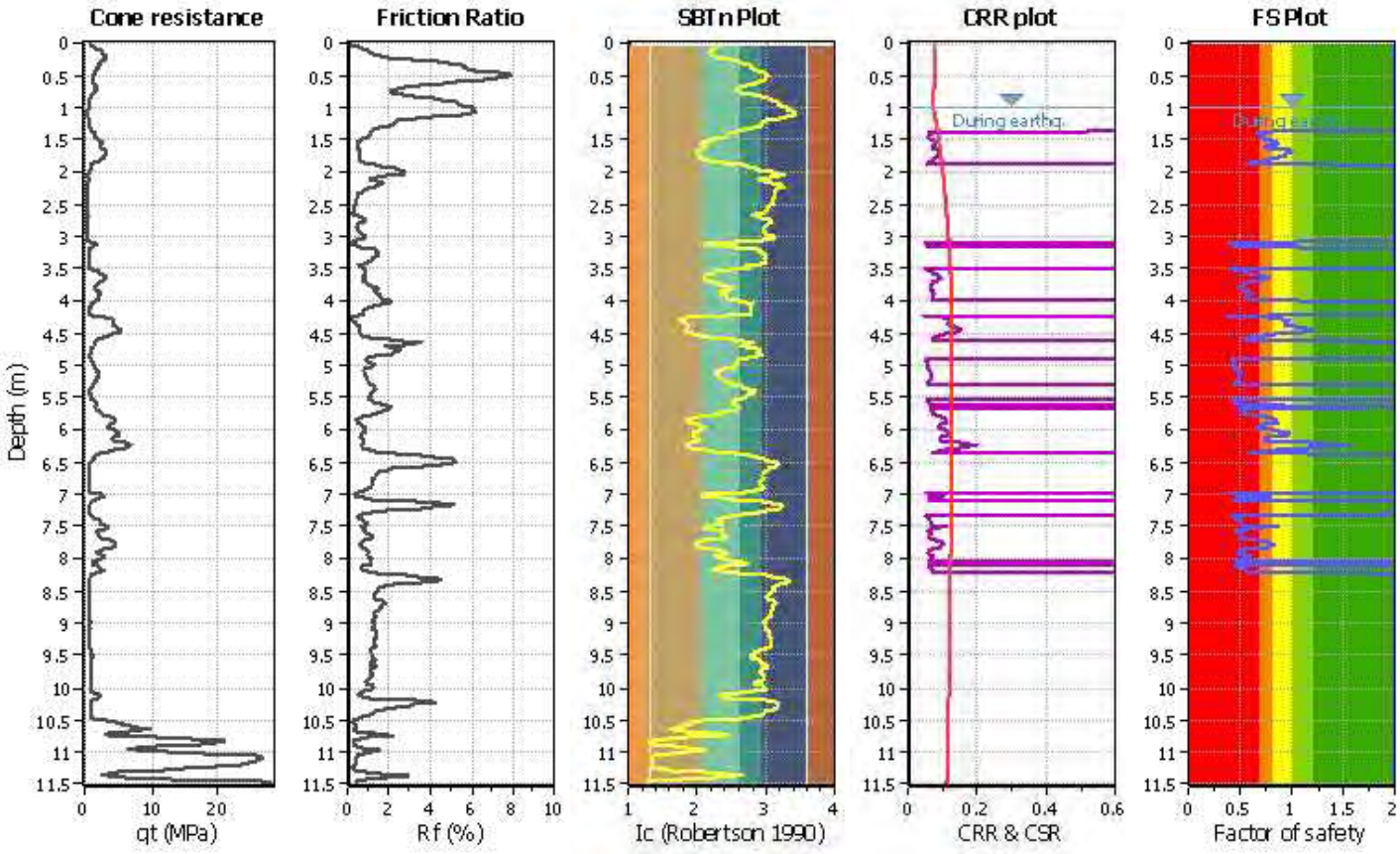
LIQUEFACTION ANALYSIS REPORT

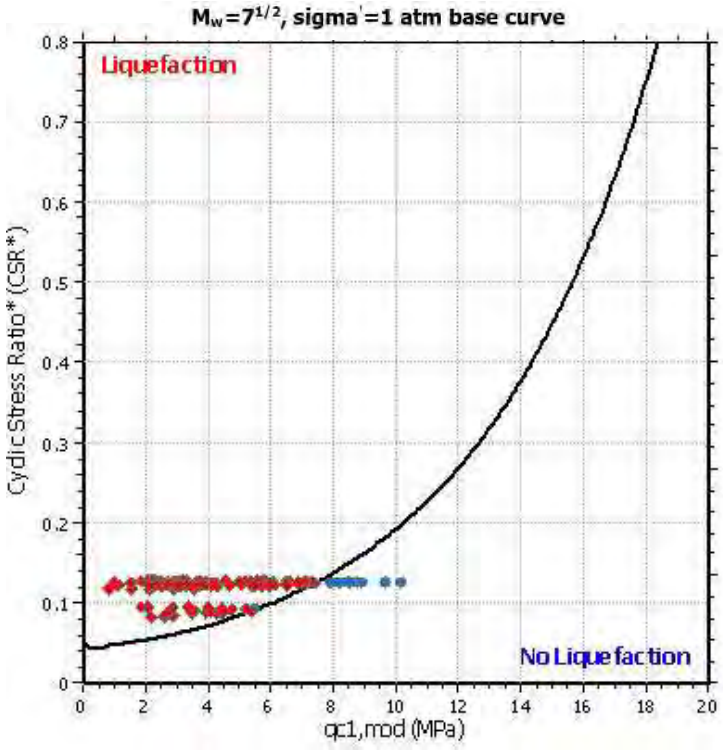
Project title : **Location :**

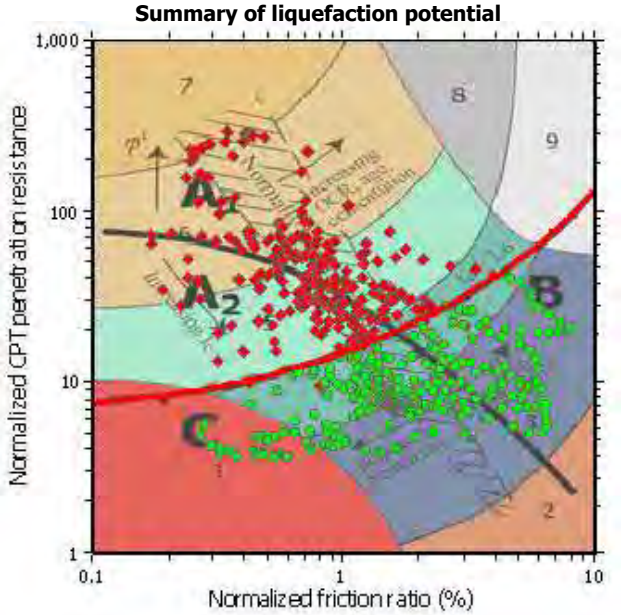
CPT file : CPT10 SLS

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.11	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

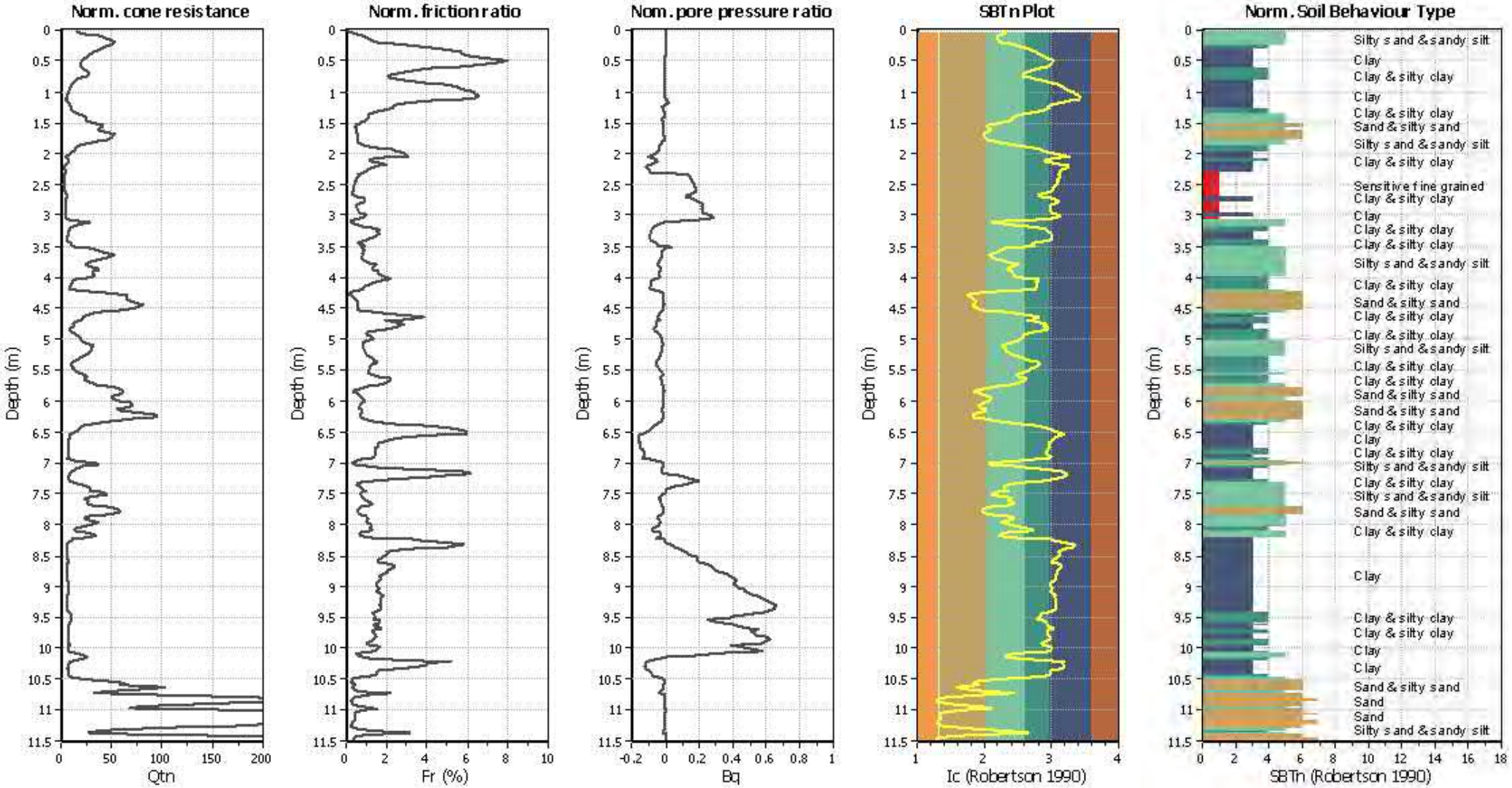






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



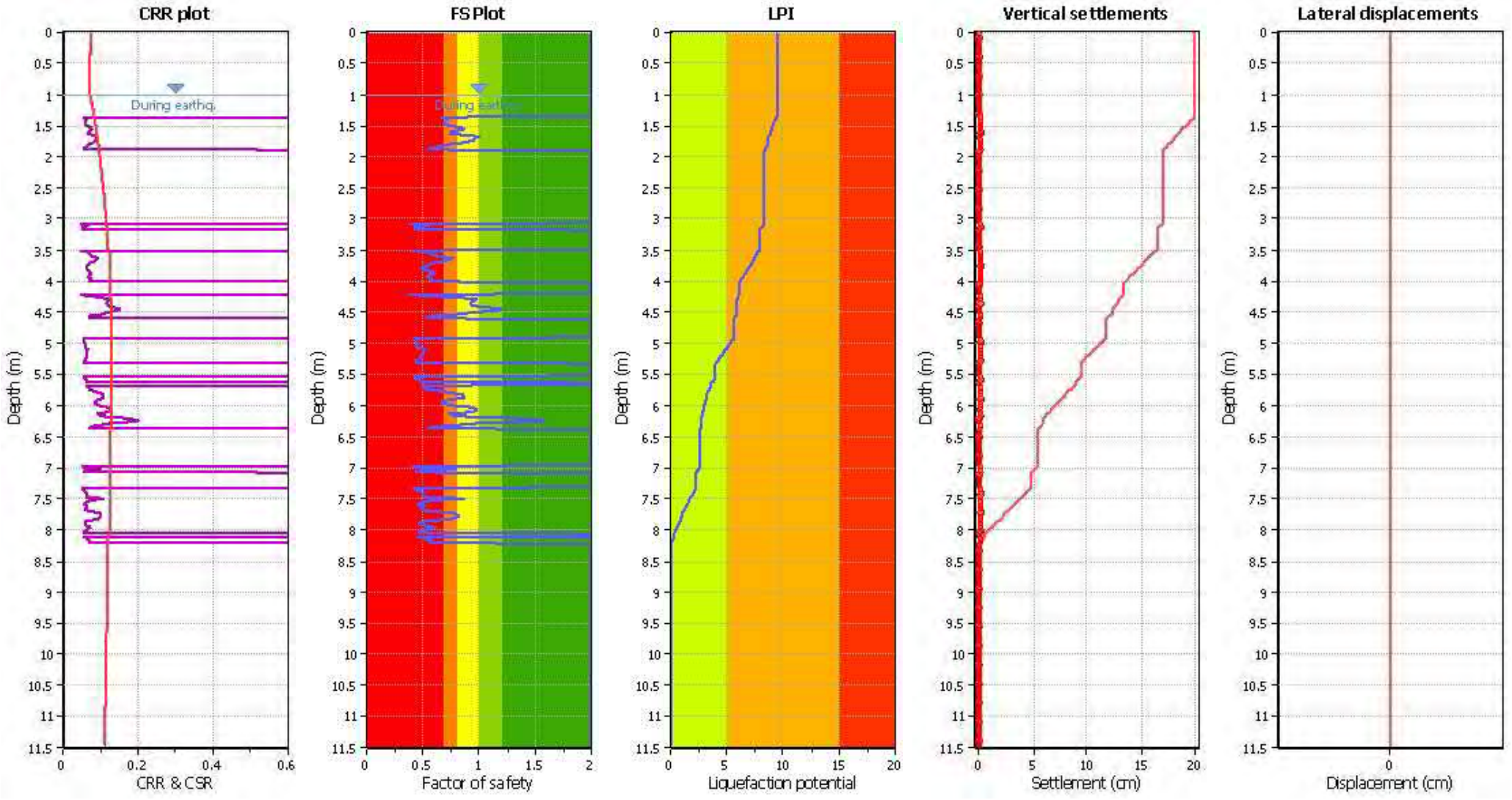
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.11	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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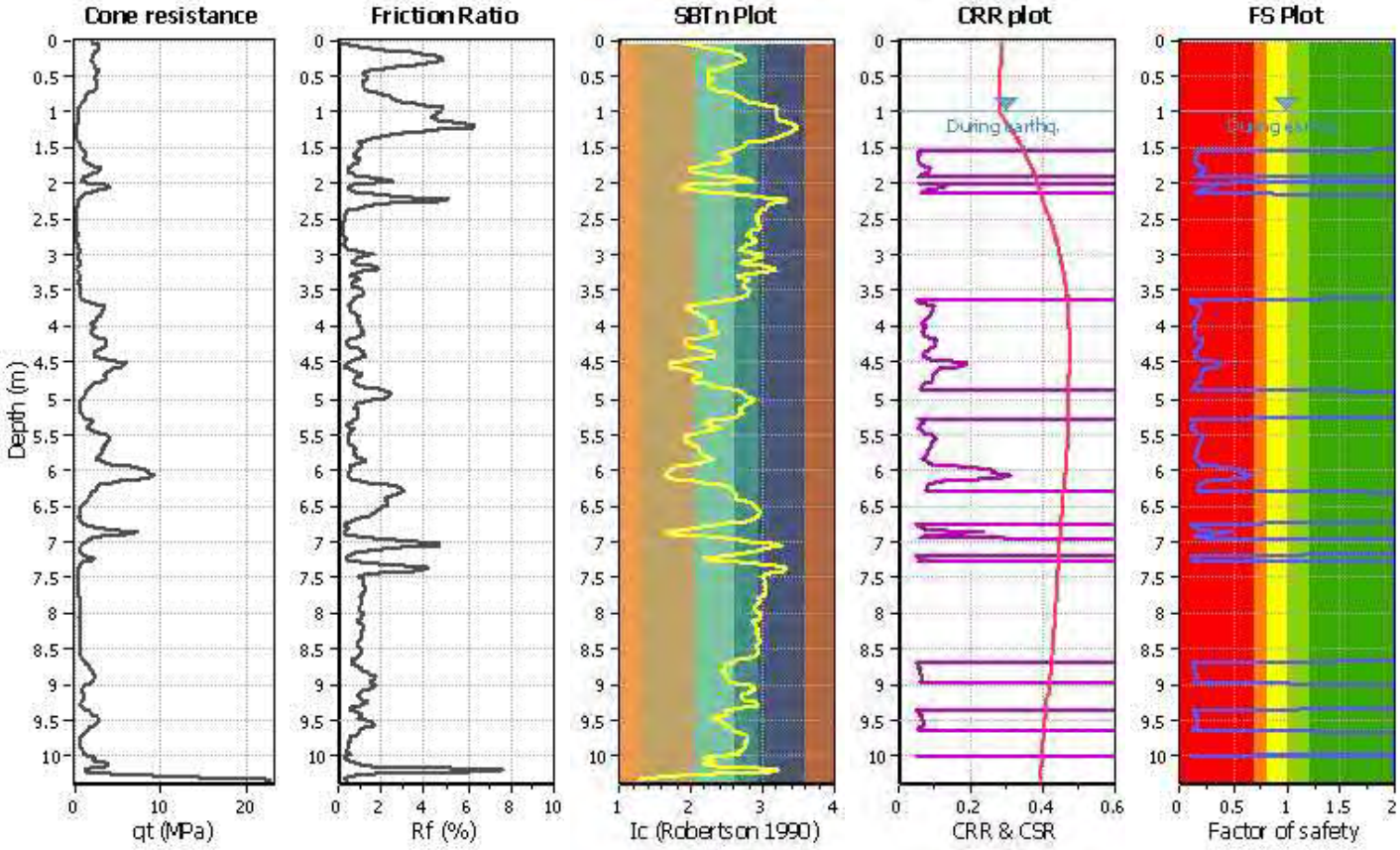
LIQUEFACTION ANALYSIS REPORT

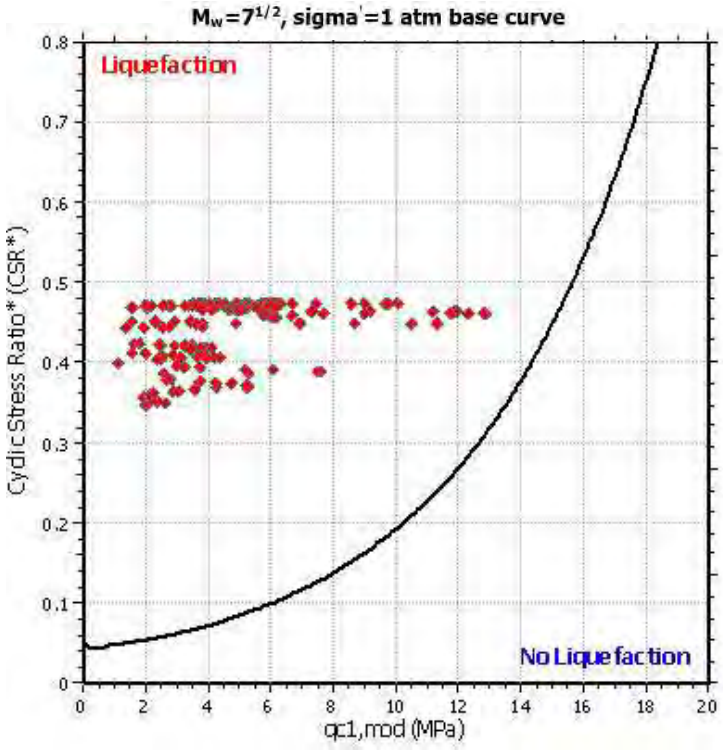
Project title : **Location :**

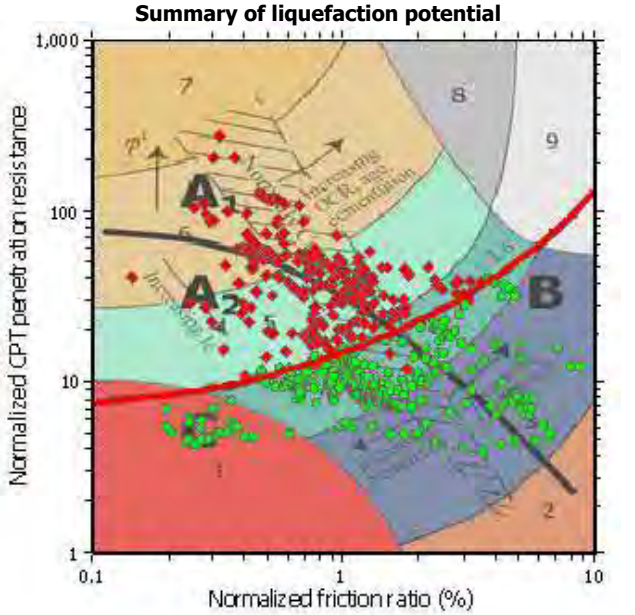
CPT file : CPT01 ULS

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

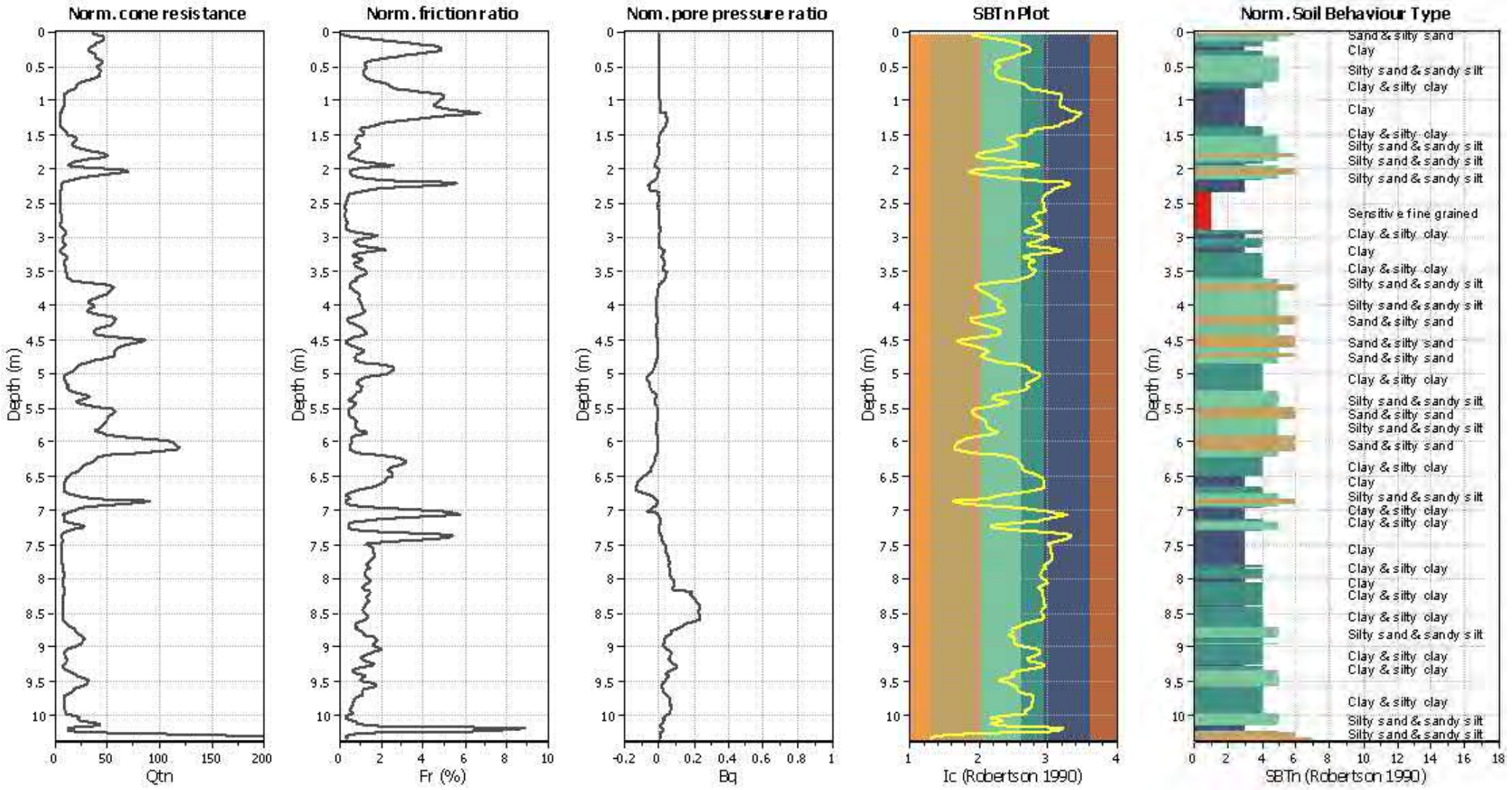






Zone A1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



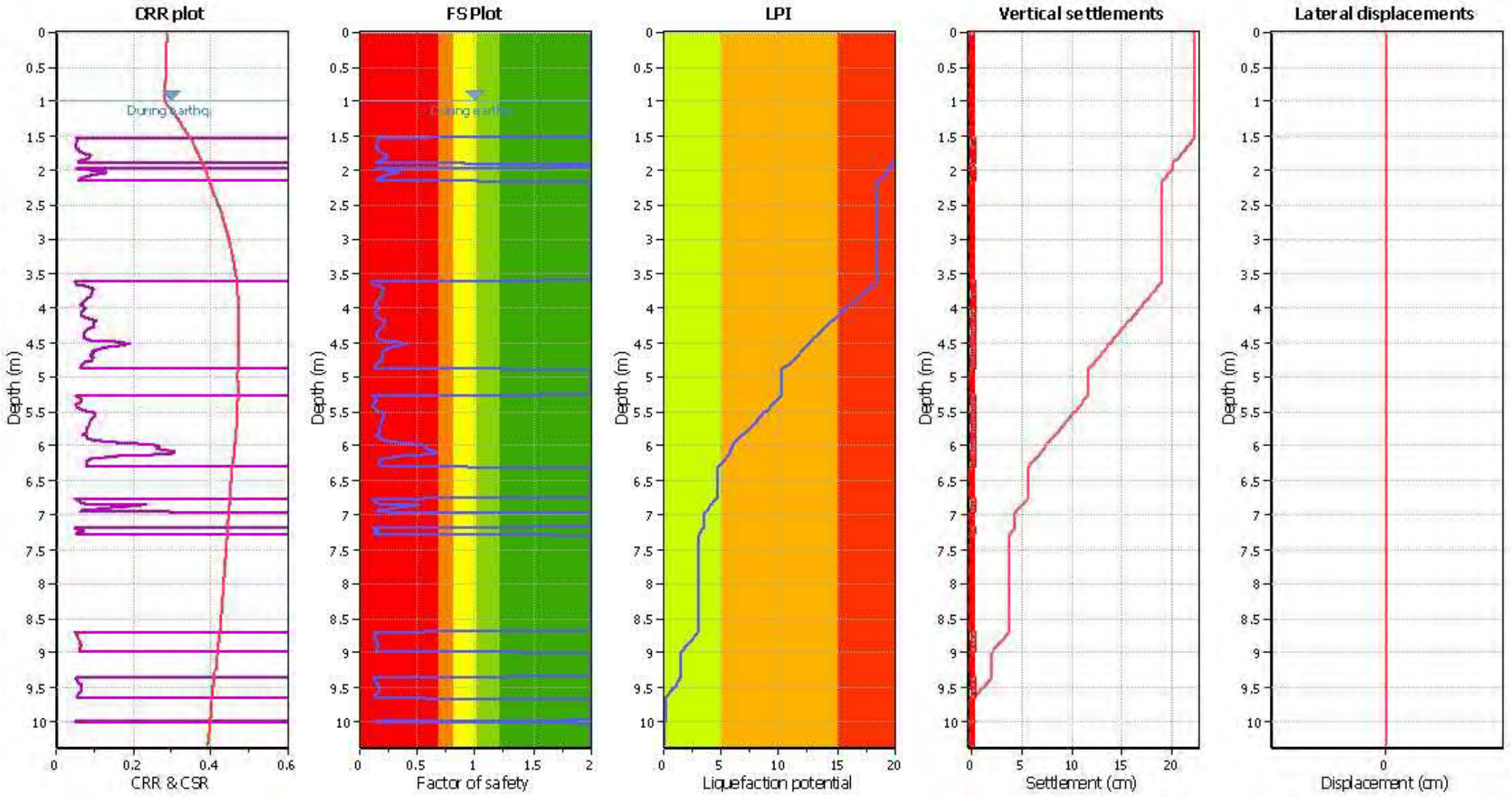
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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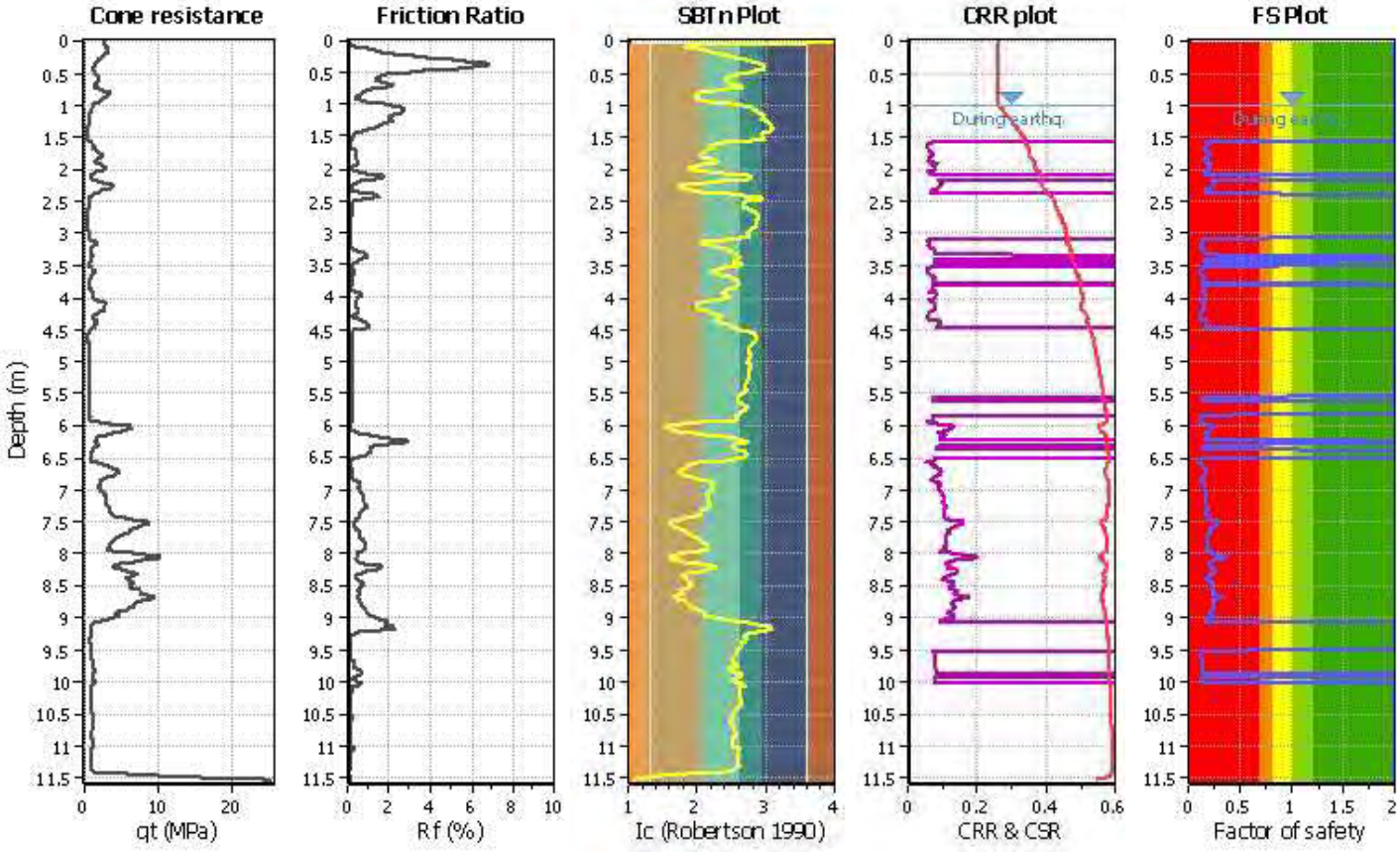
LIQUEFACTION ANALYSIS REPORT

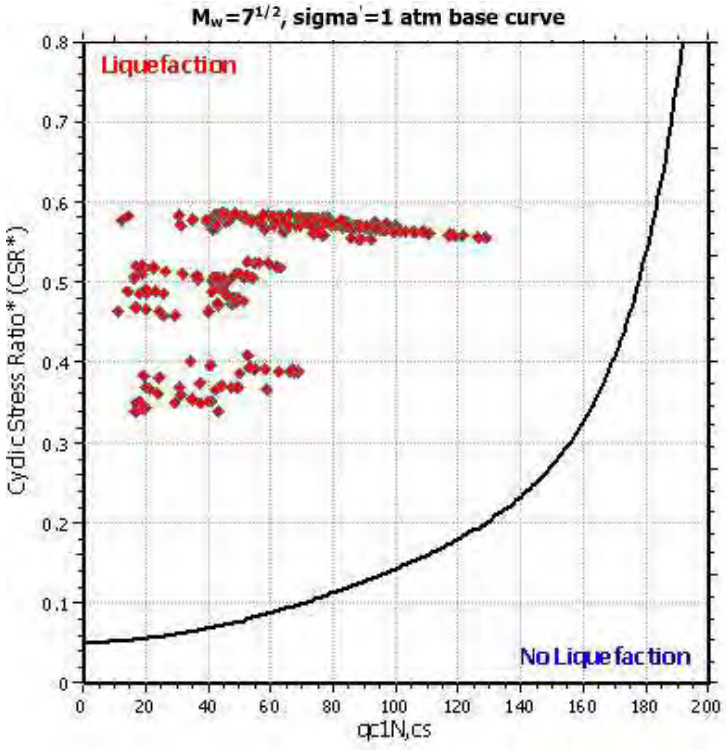
Project title : **Location :**

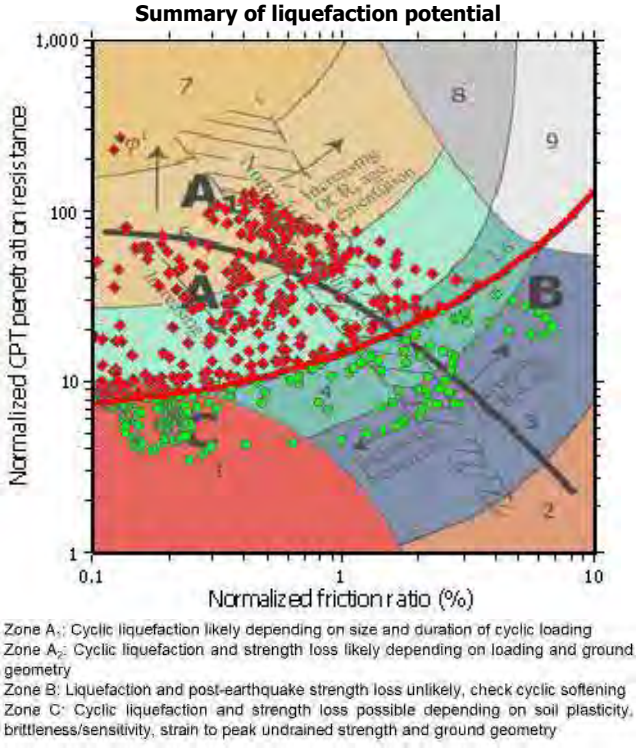
CPT file : CPT02 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

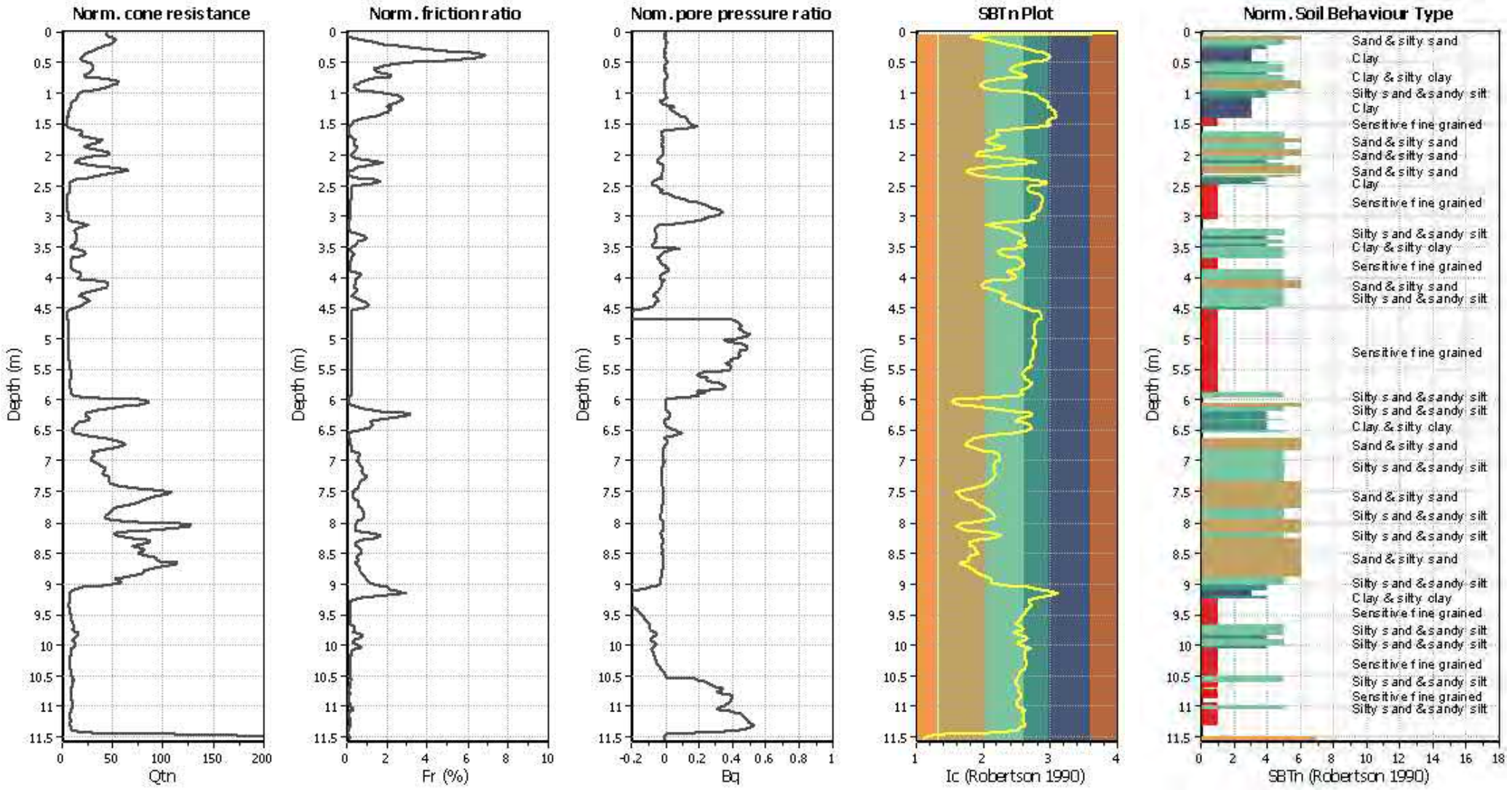






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



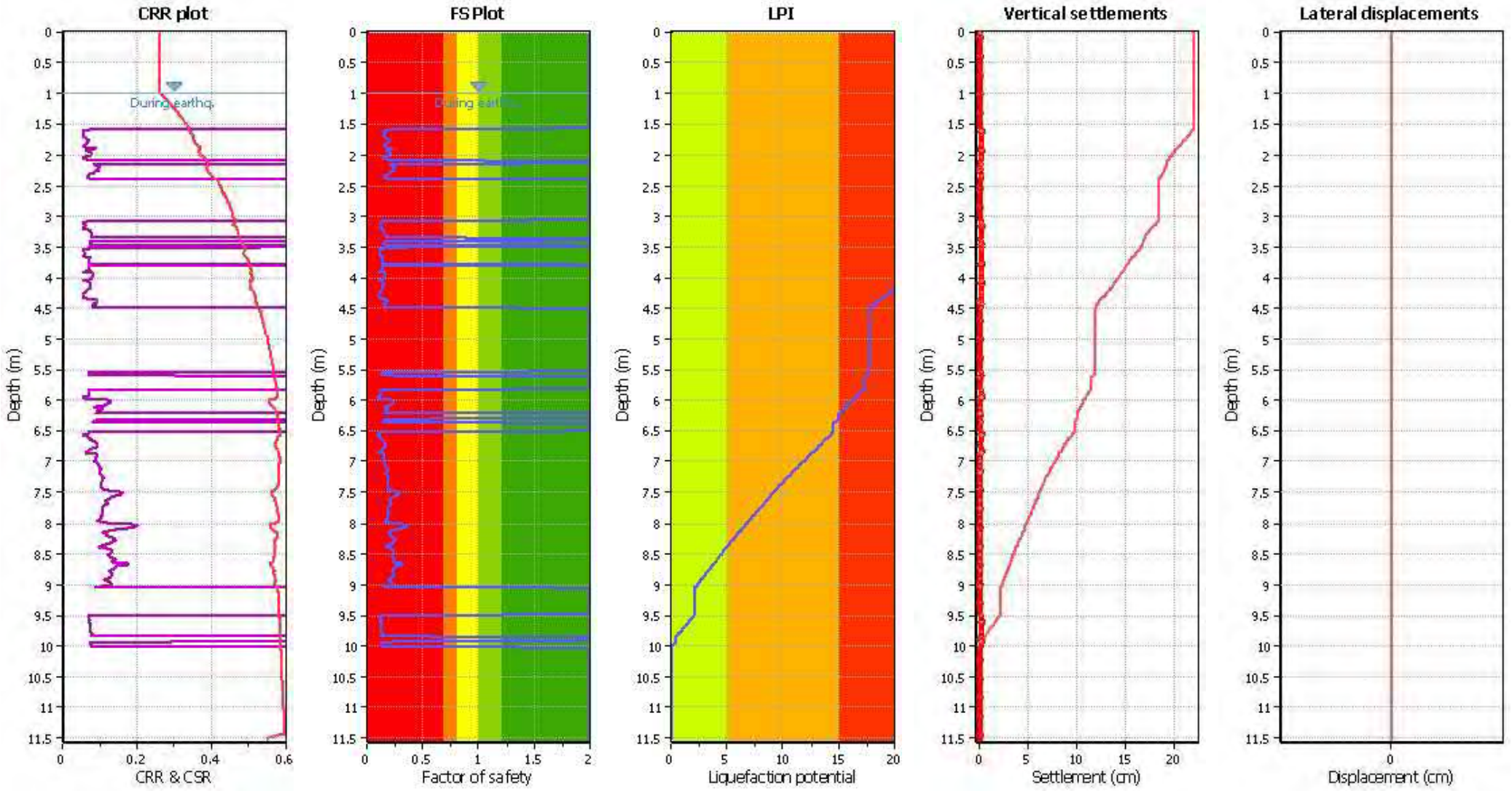
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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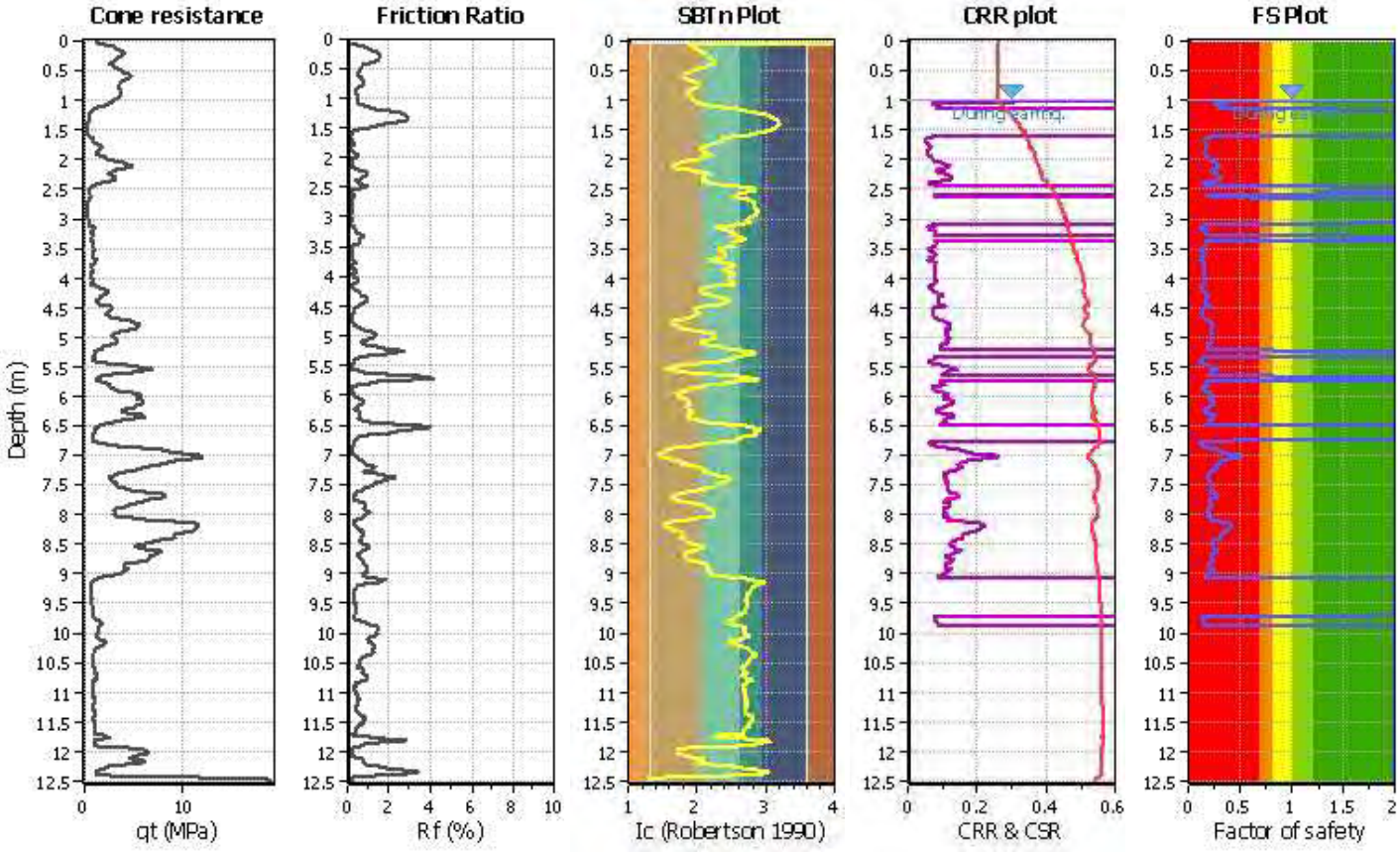
LIQUEFACTION ANALYSIS REPORT

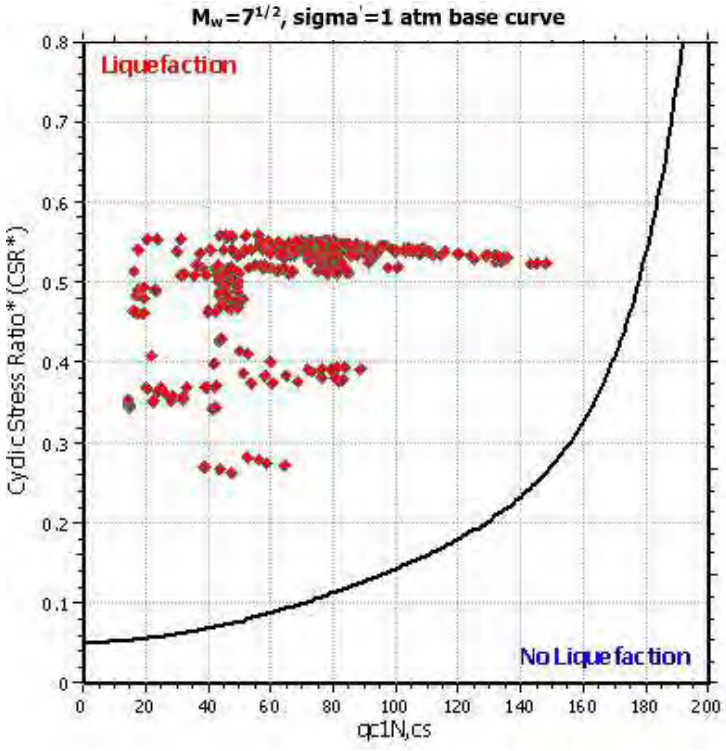
Project title : **Location :**

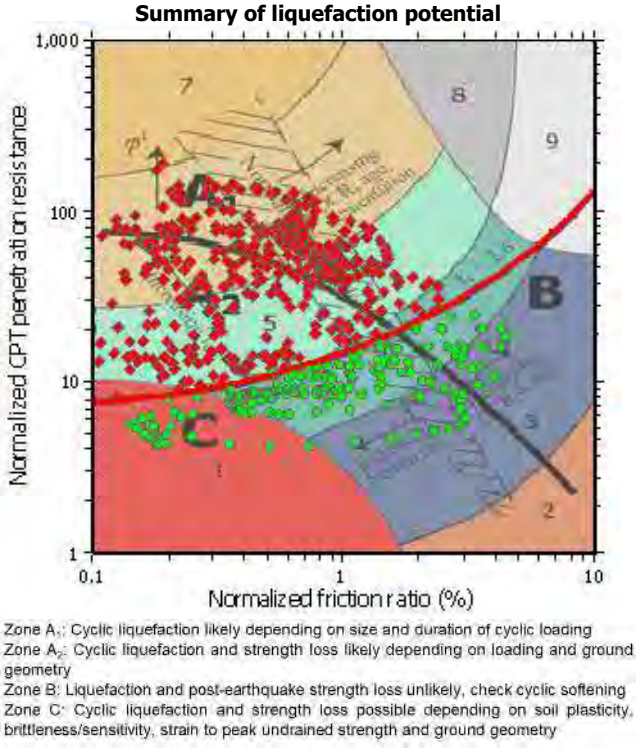
CPT file : CPT03 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

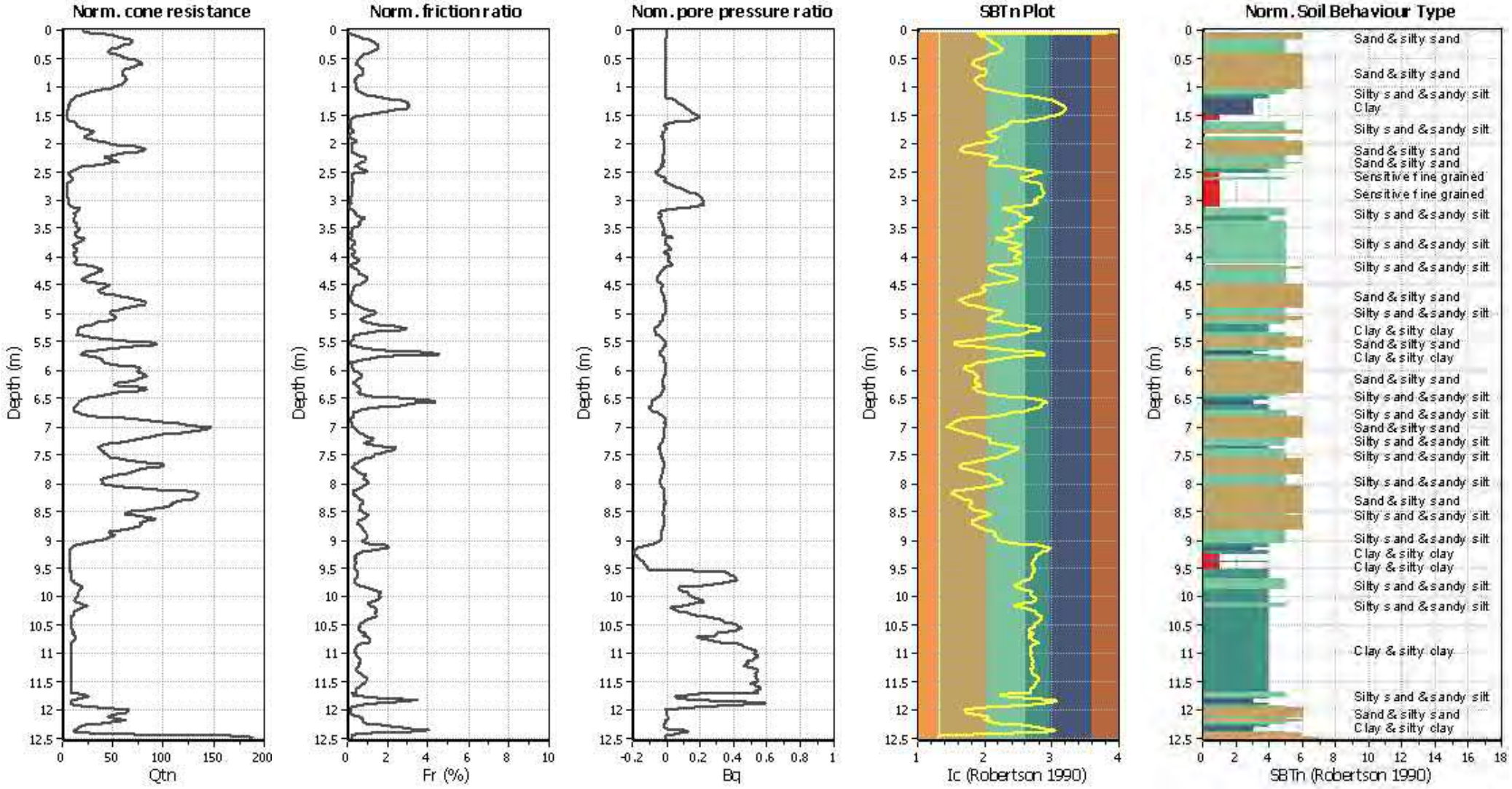






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



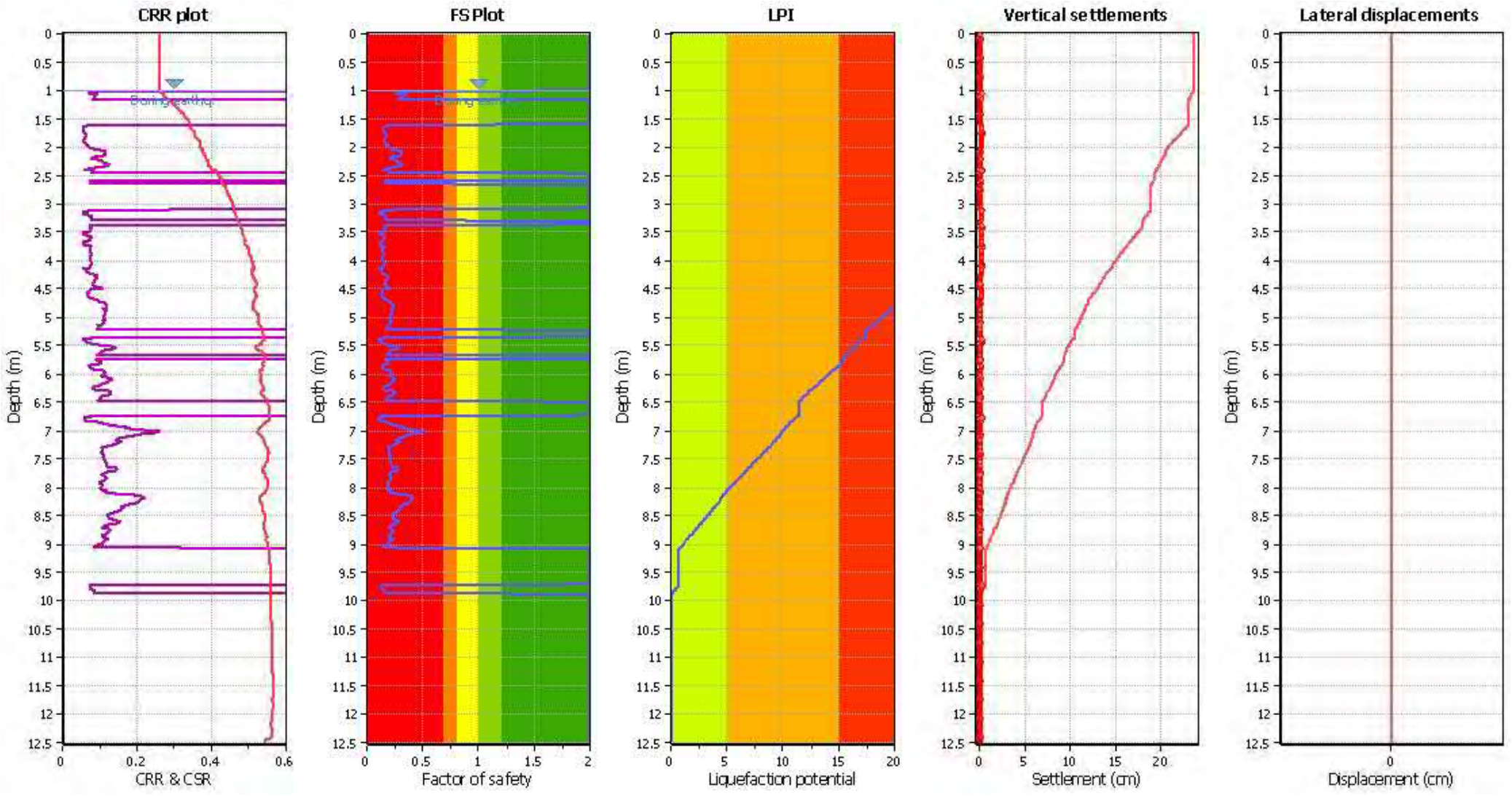
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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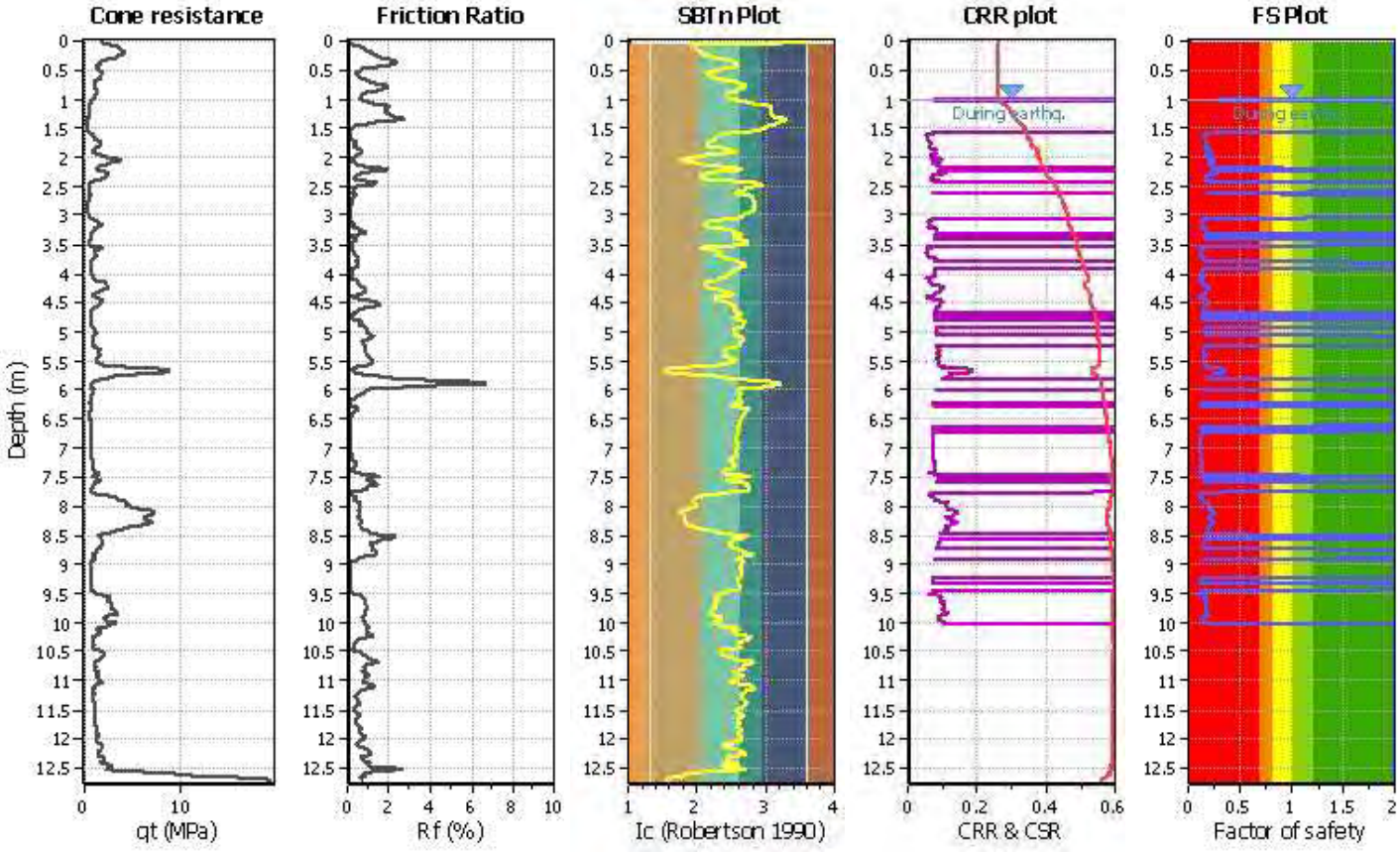
LIQUEFACTION ANALYSIS REPORT

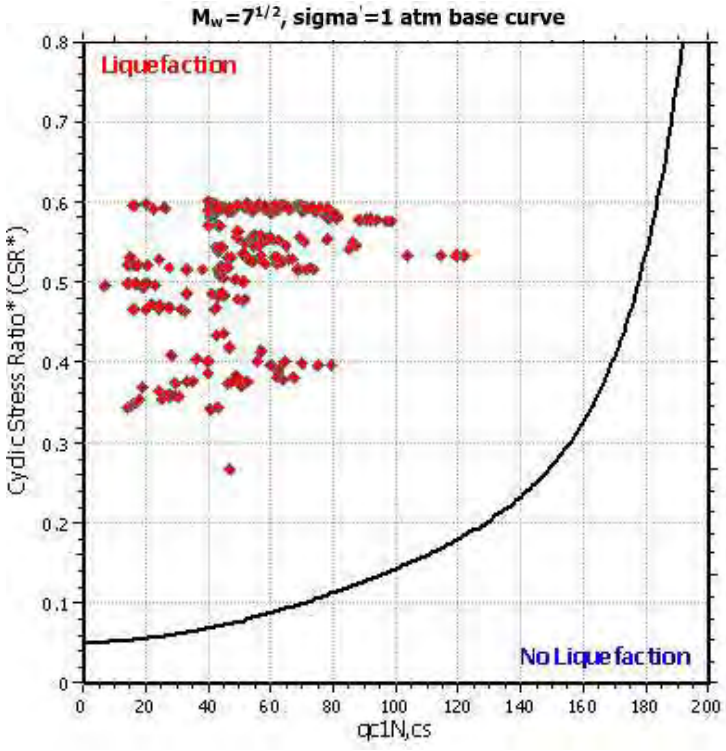
Project title : **Location :**

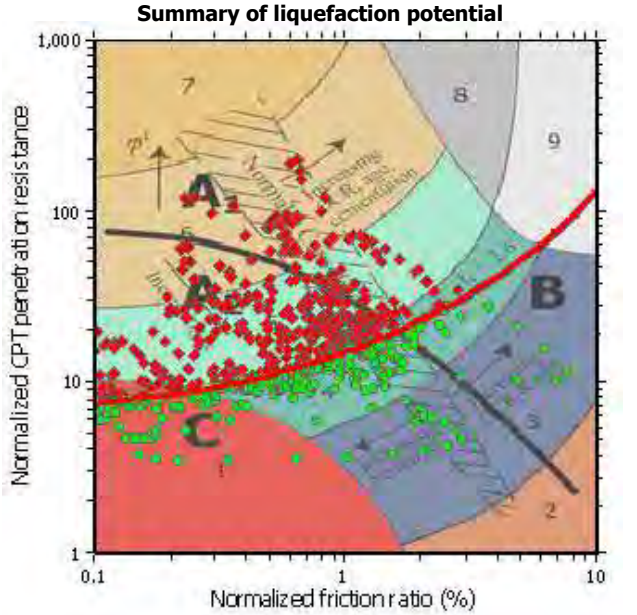
CPT file : CPT04 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

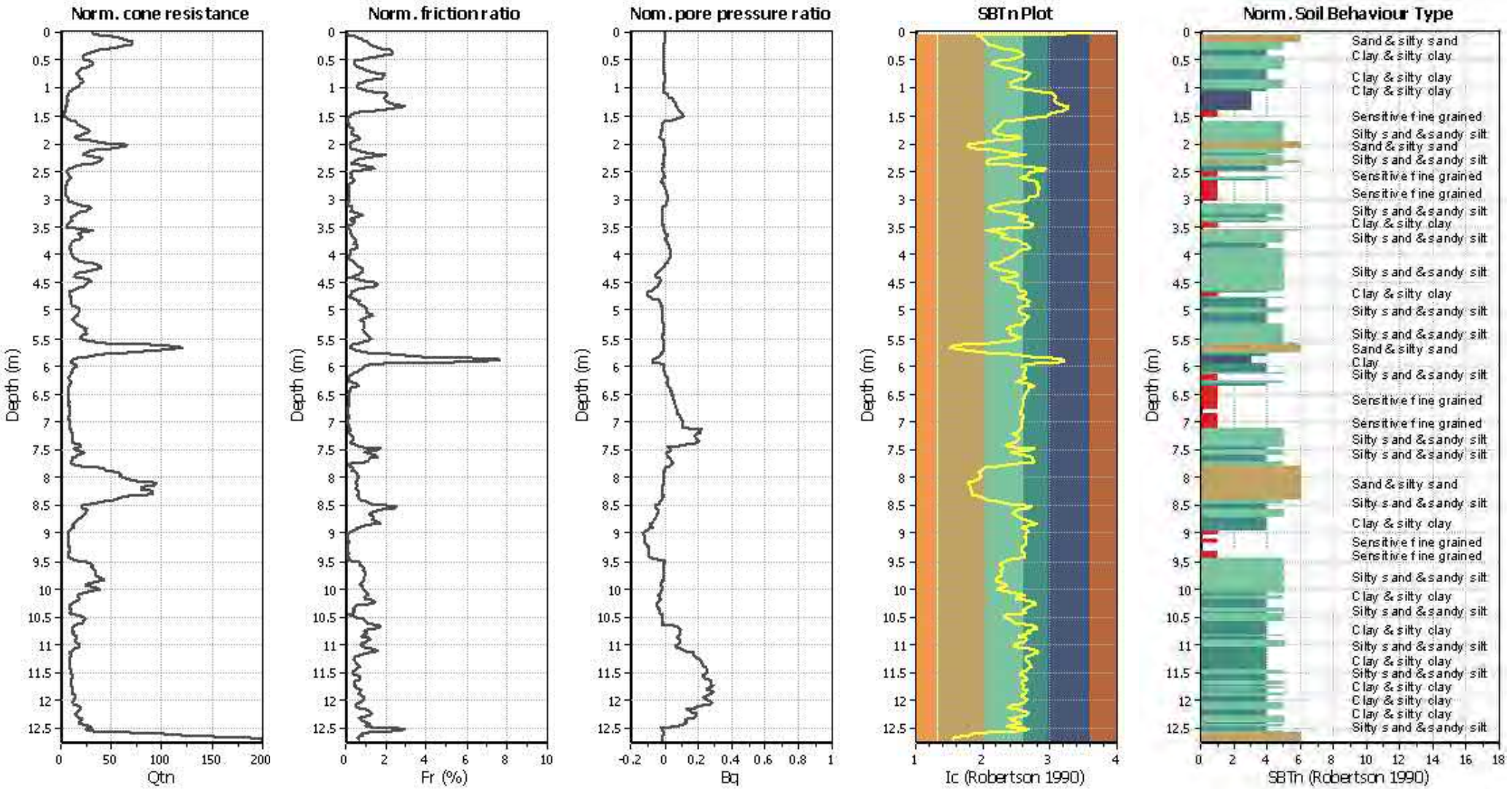






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



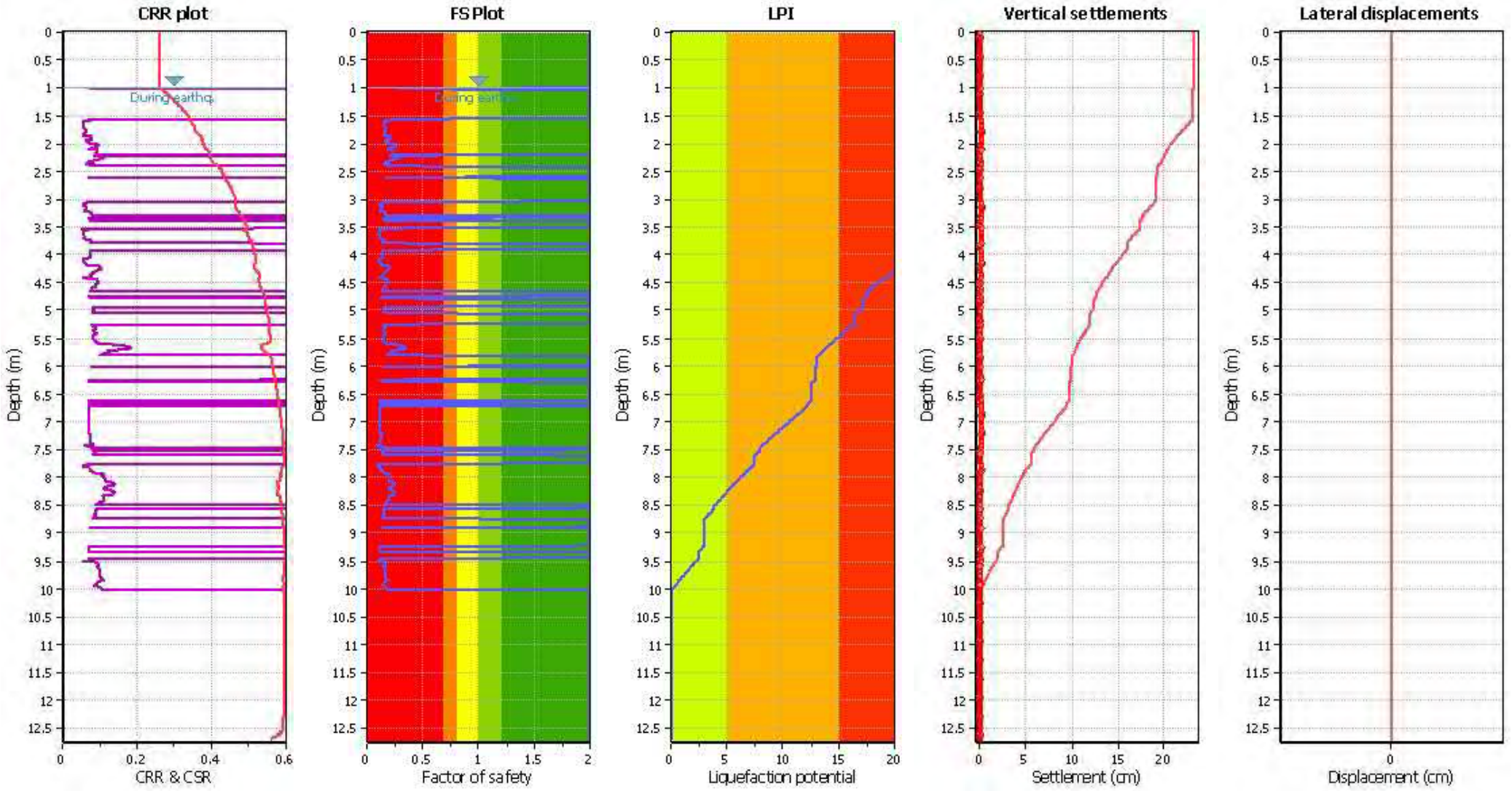
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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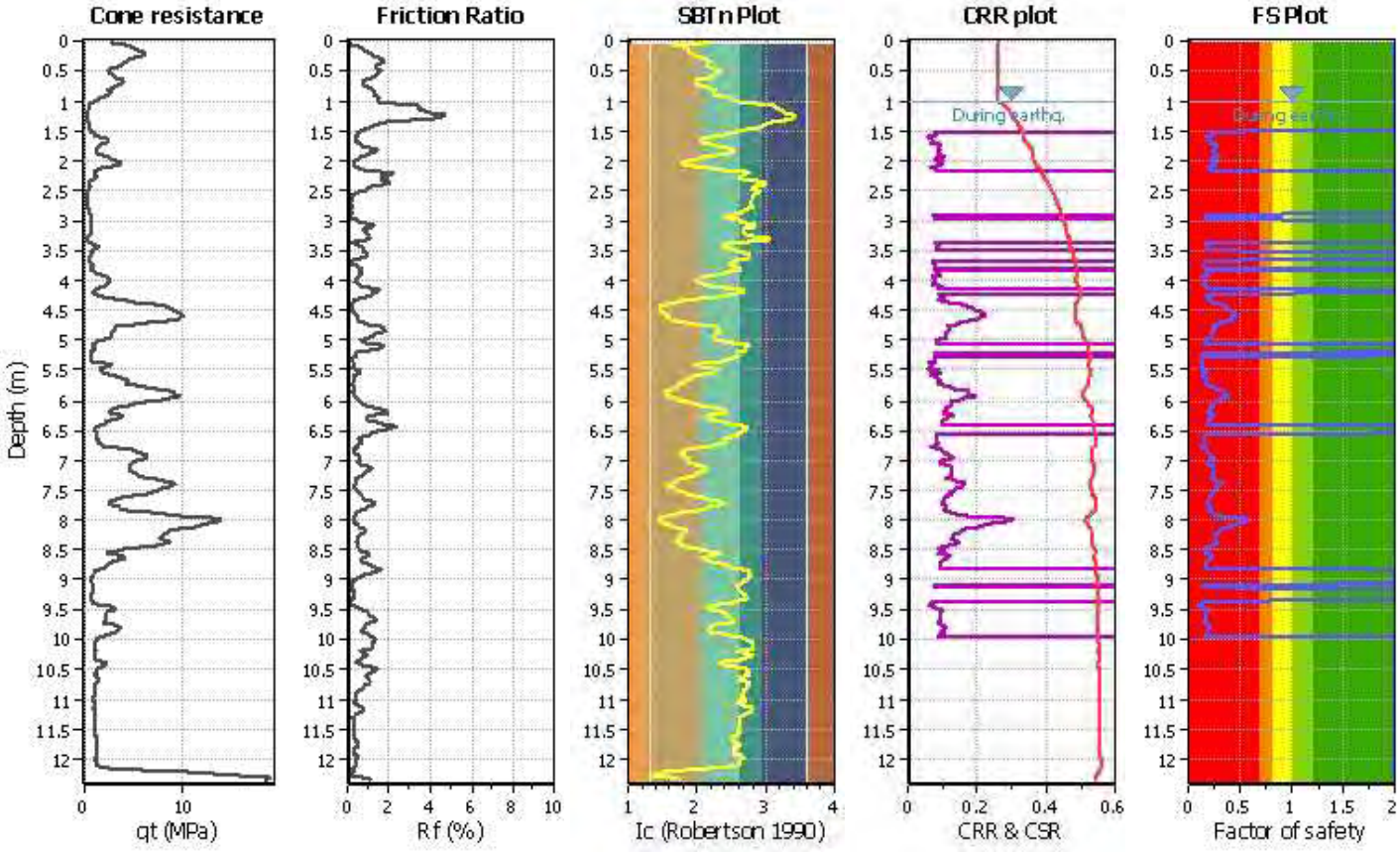
LIQUEFACTION ANALYSIS REPORT

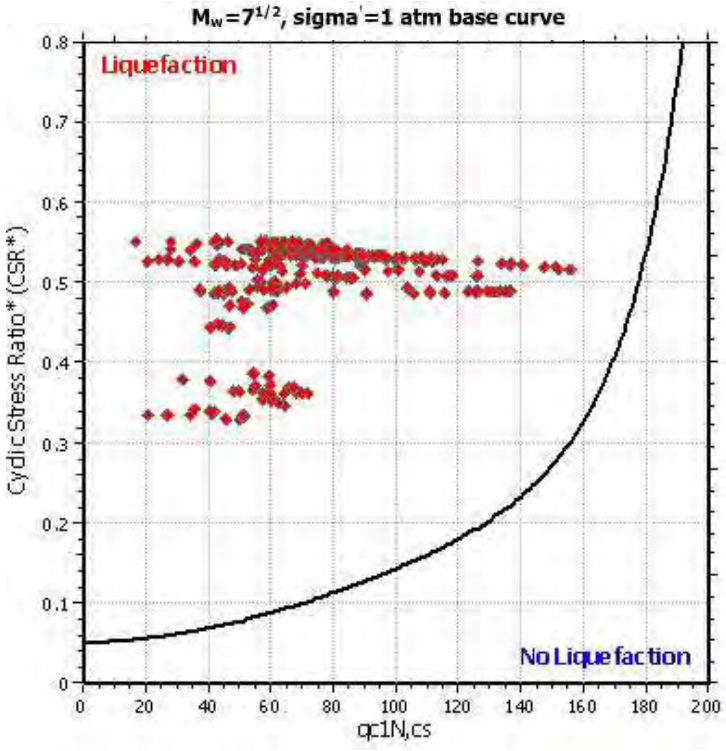
Project title : **Location :**

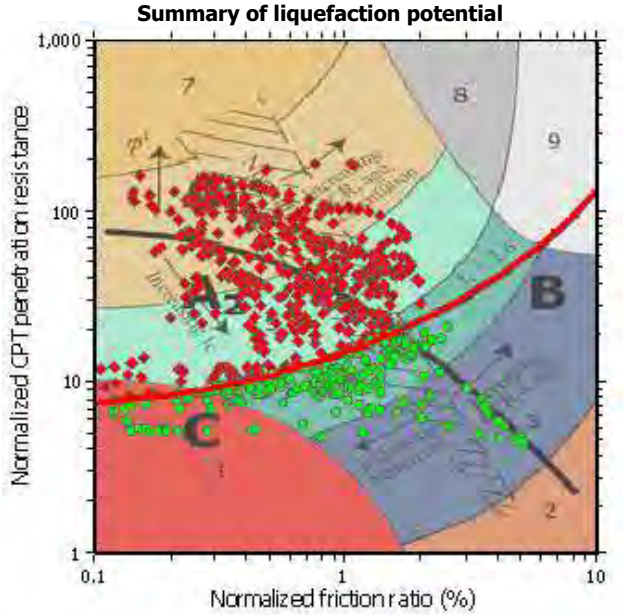
CPT file : CPT05 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

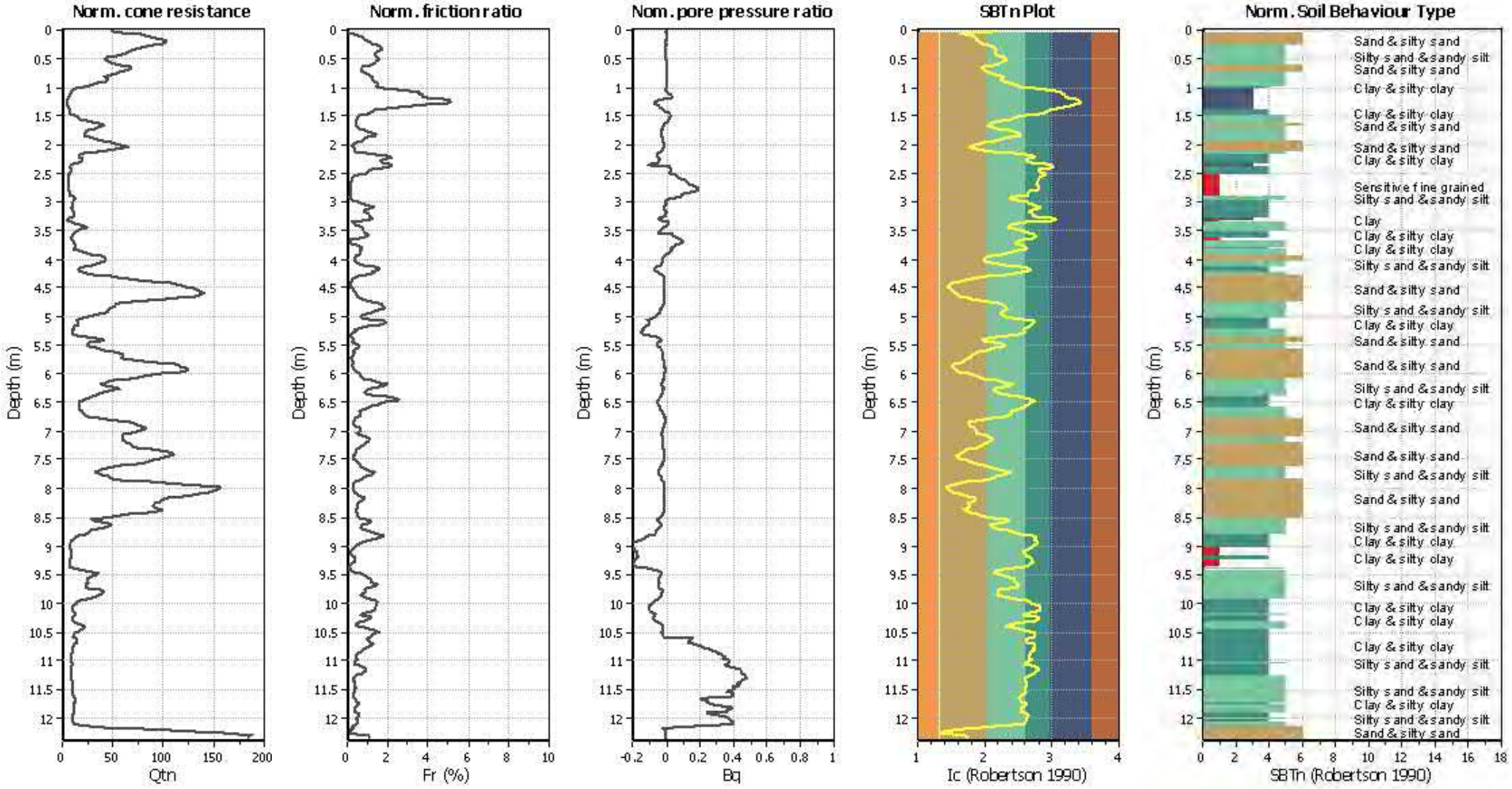






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



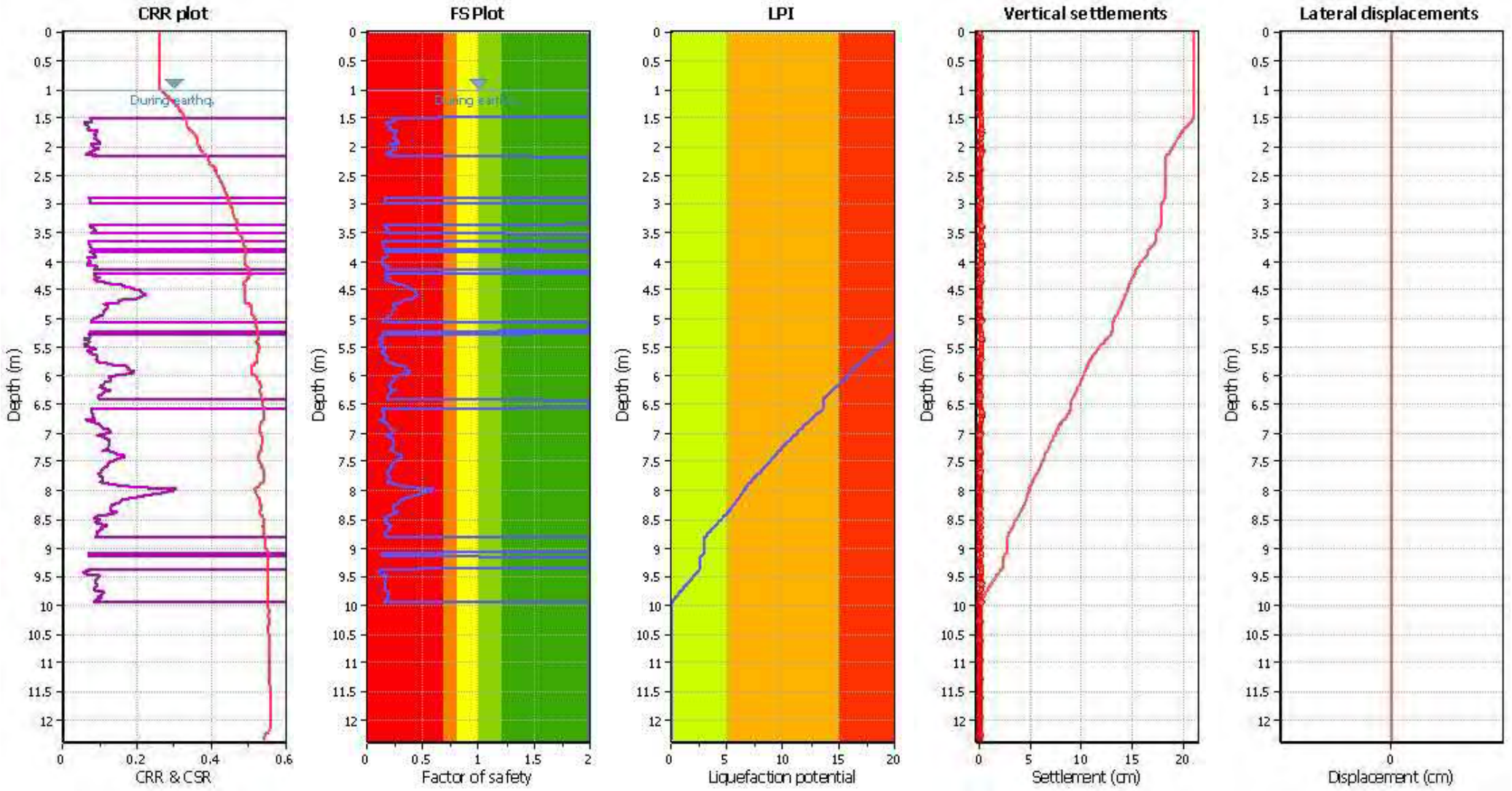
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn legend

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

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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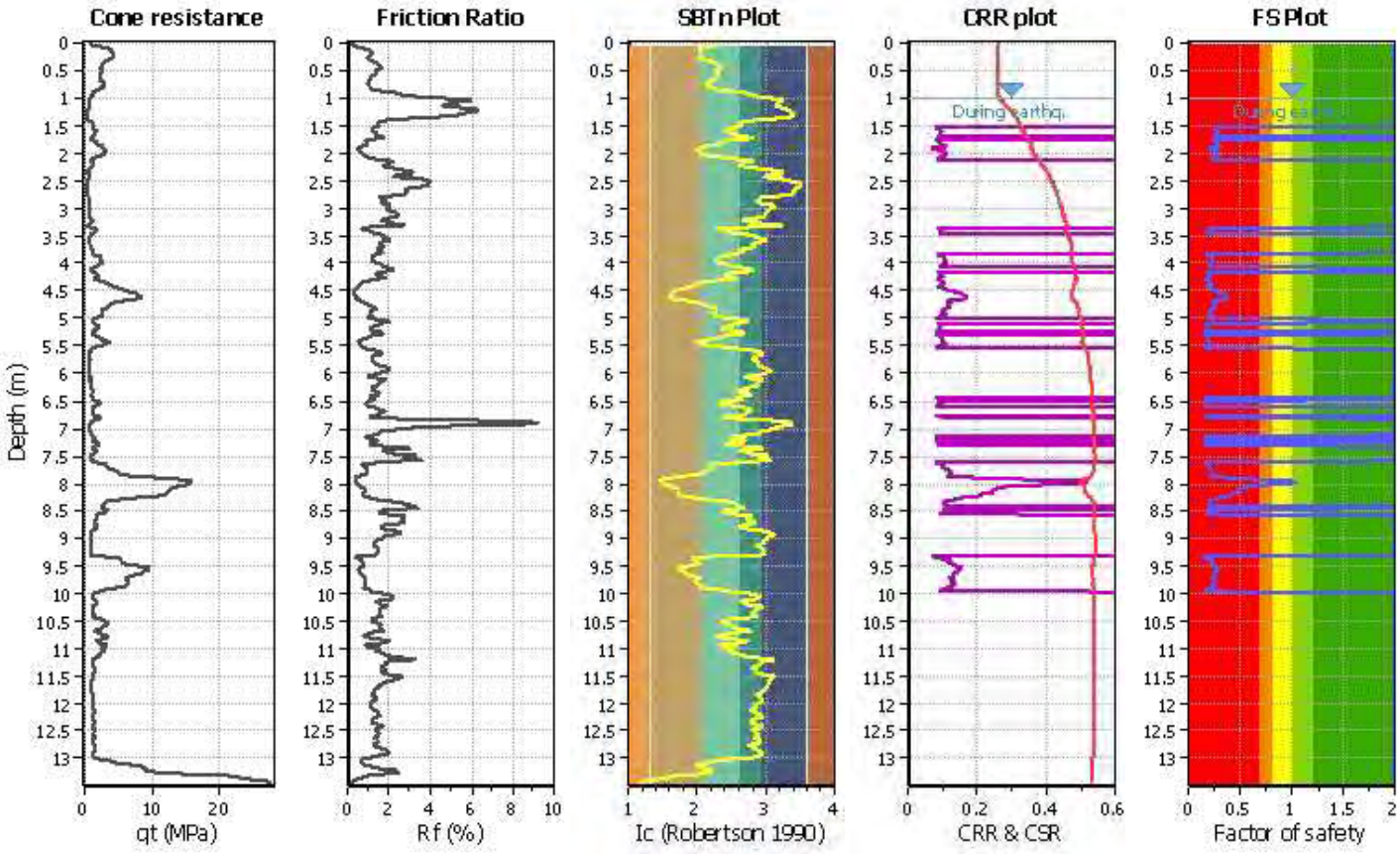
LIQUEFACTION ANALYSIS REPORT

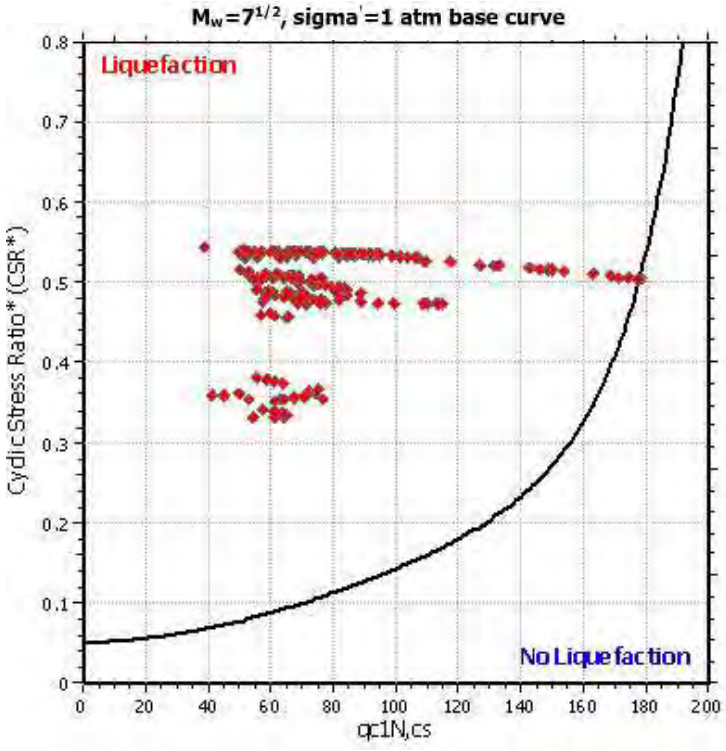
Project title : **Location :**

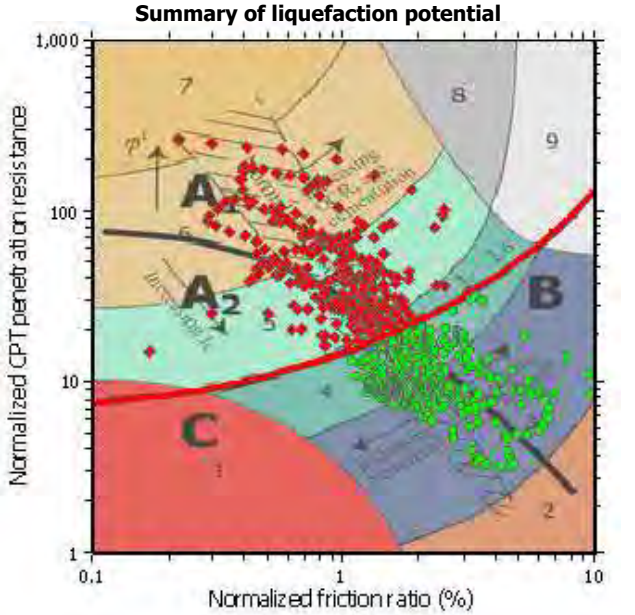
CPT file : CPT06 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

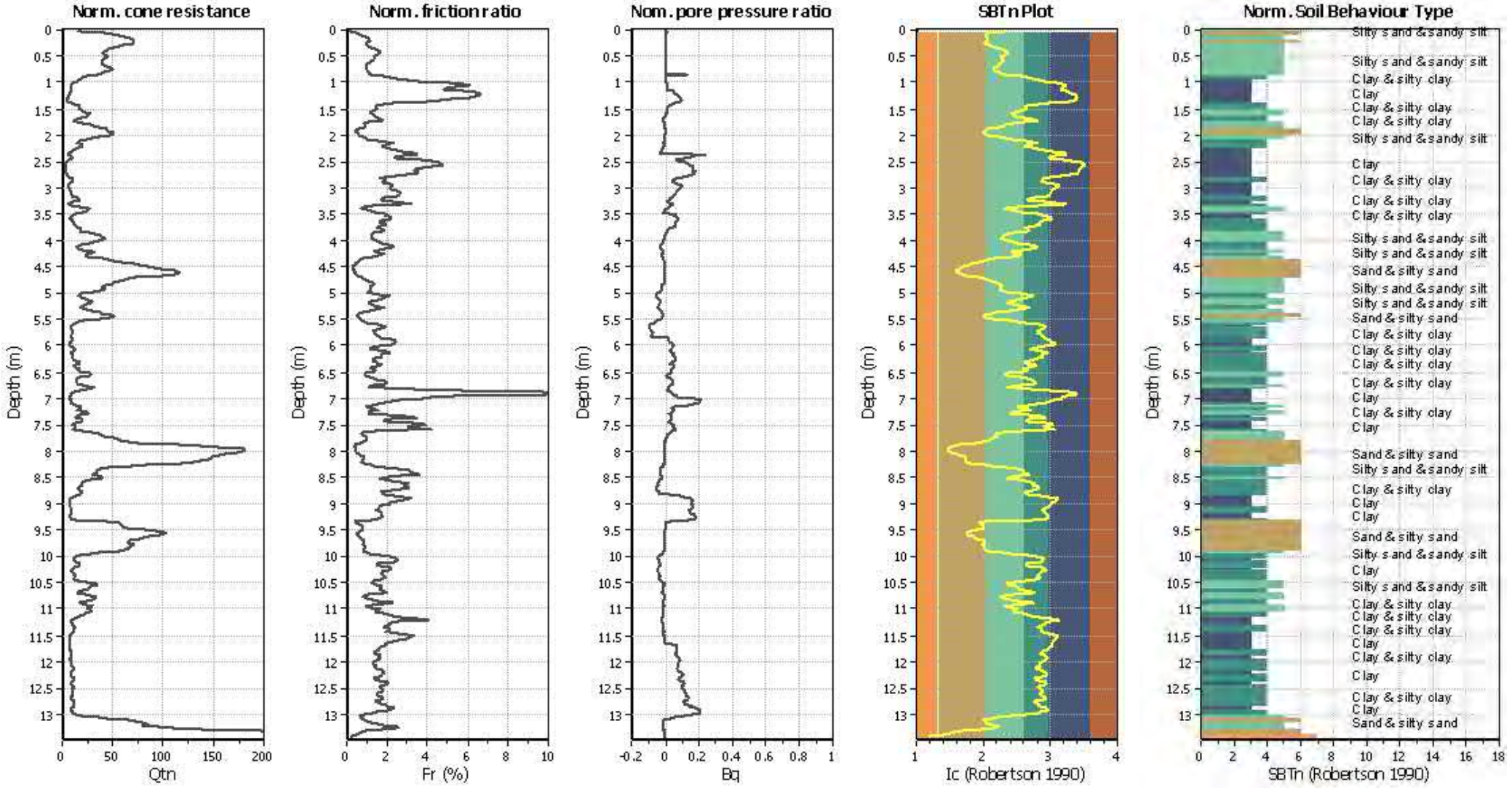






Zone A: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



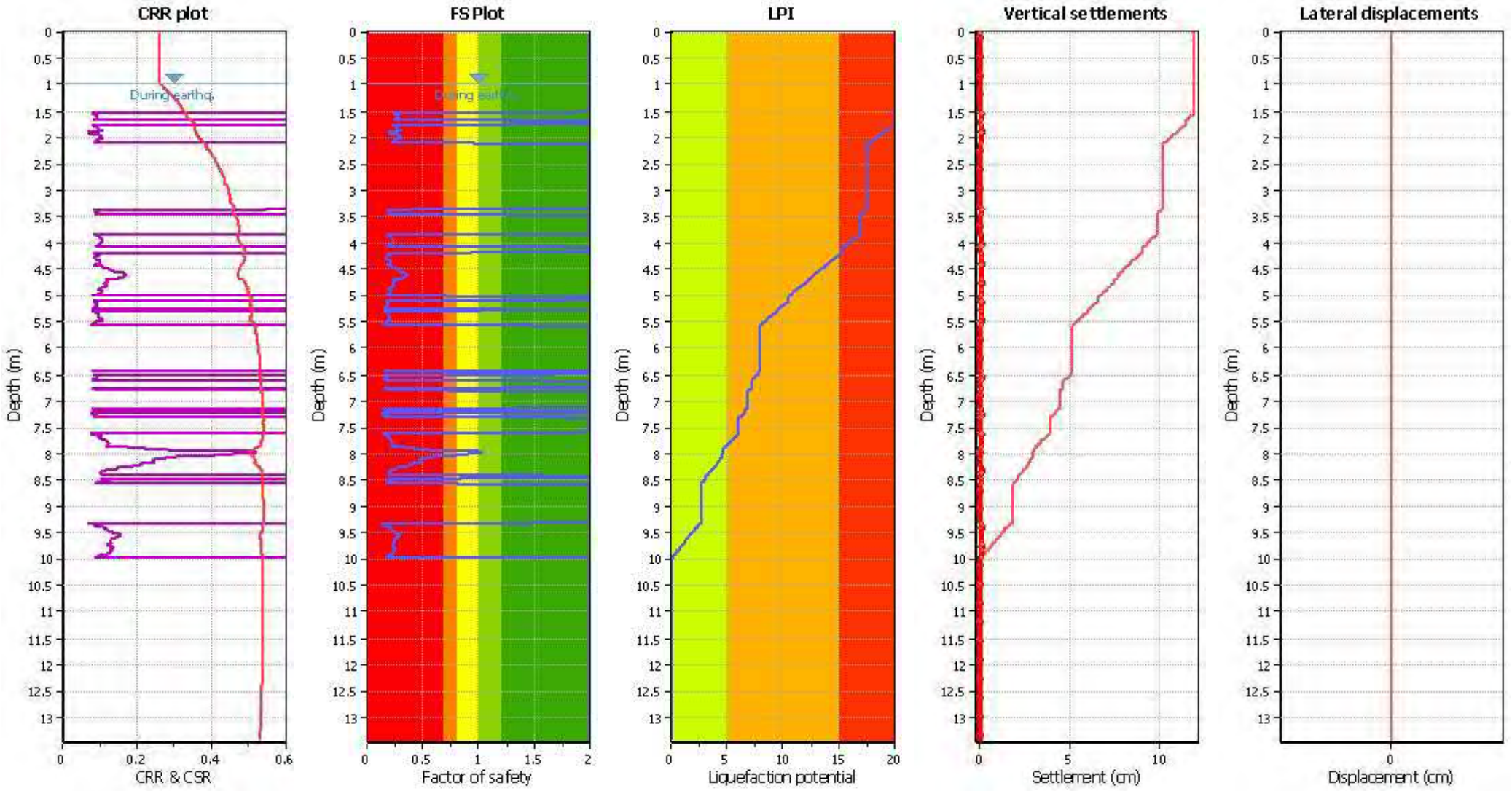
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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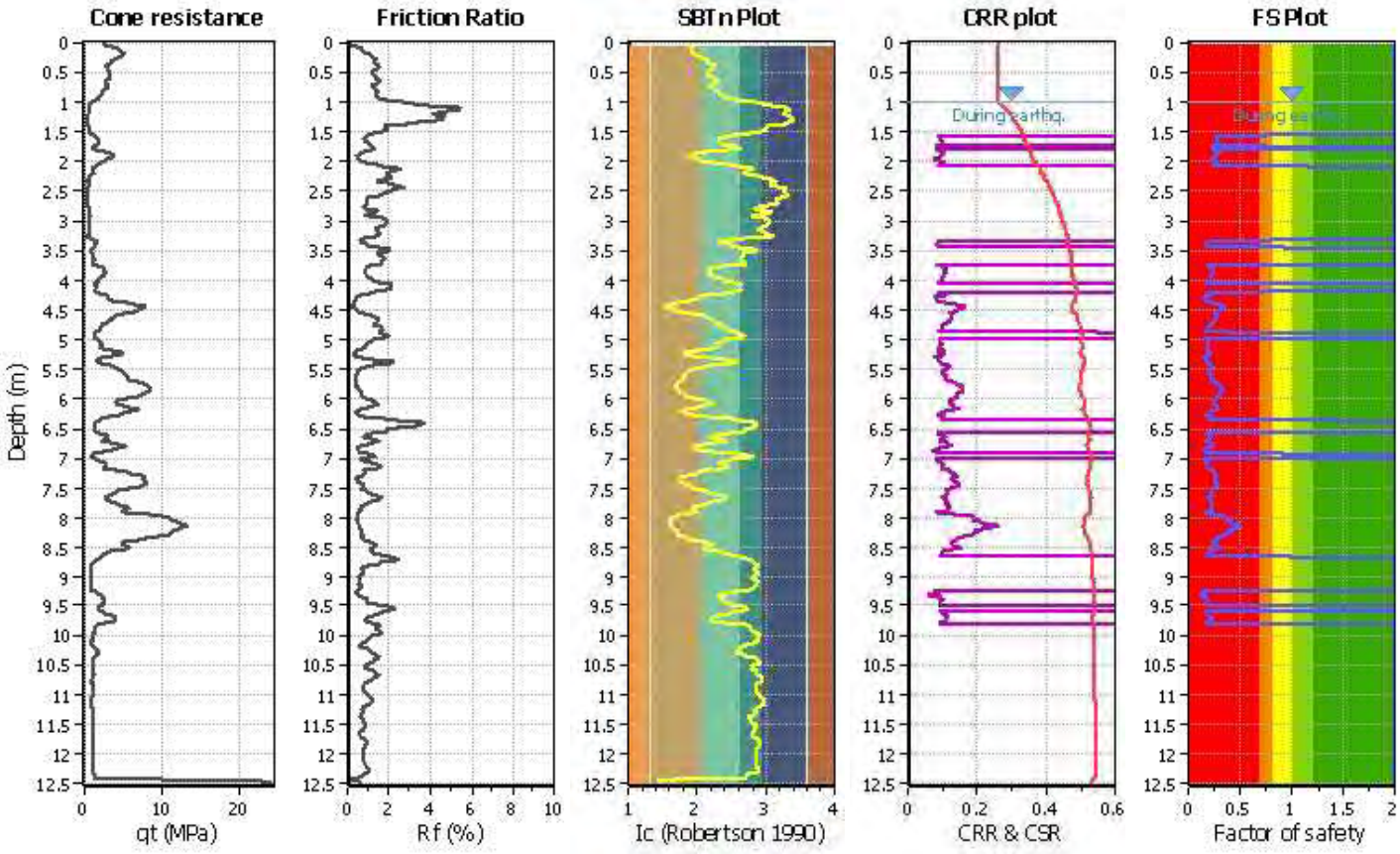
LIQUEFACTION ANALYSIS REPORT

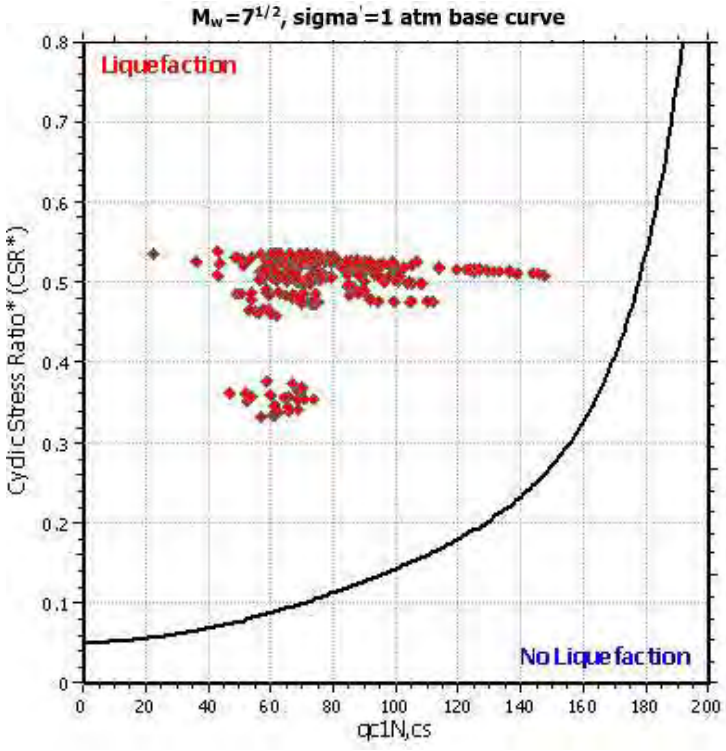
Project title : **Location :**

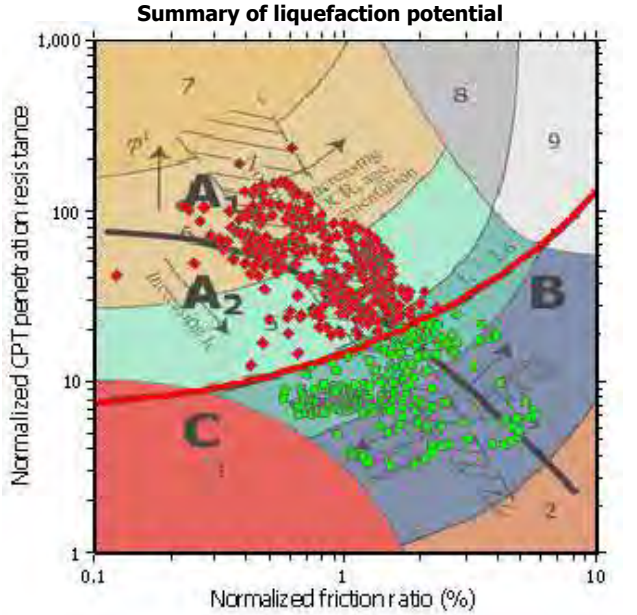
CPT file : CPT07 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

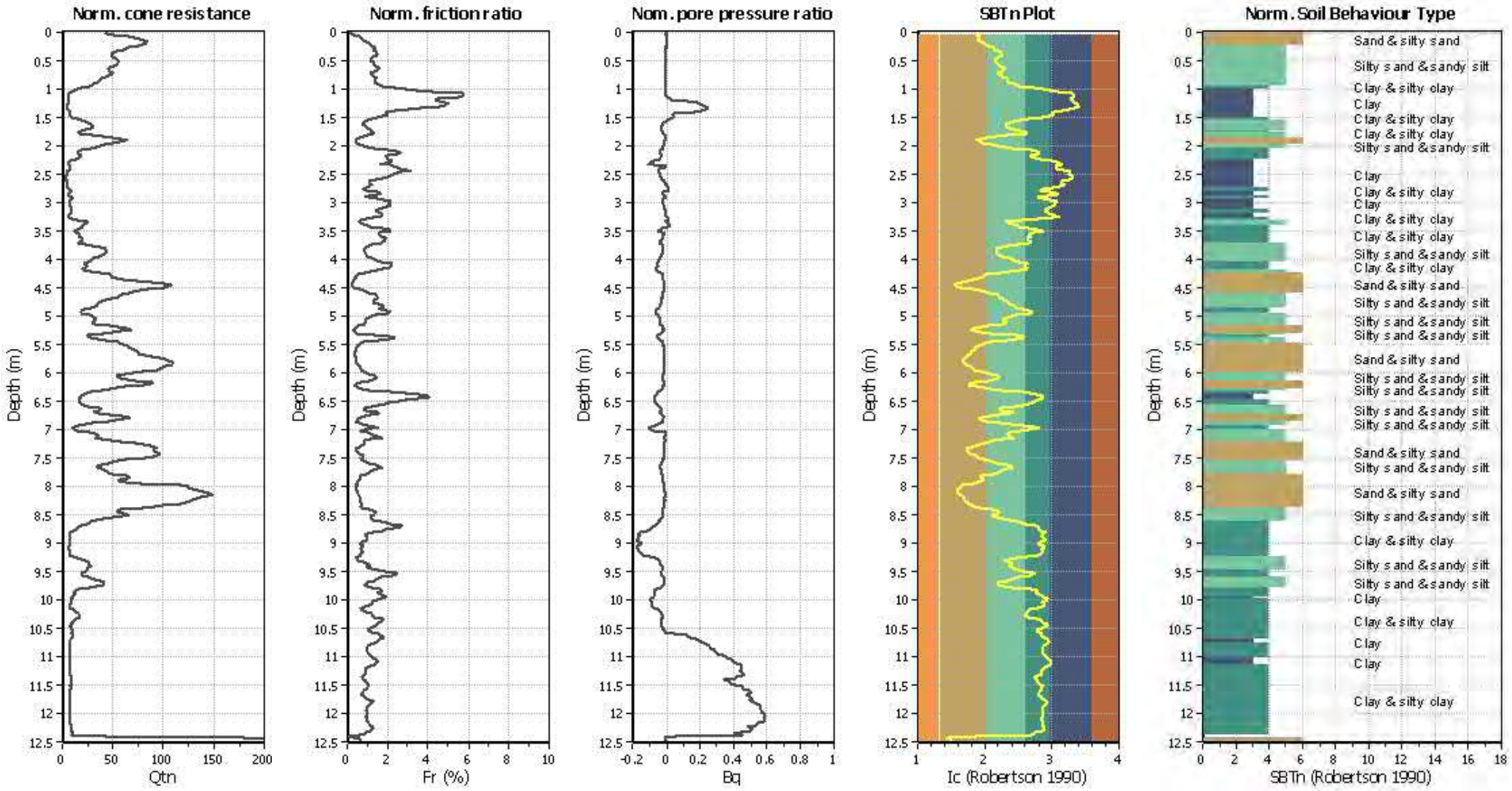






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



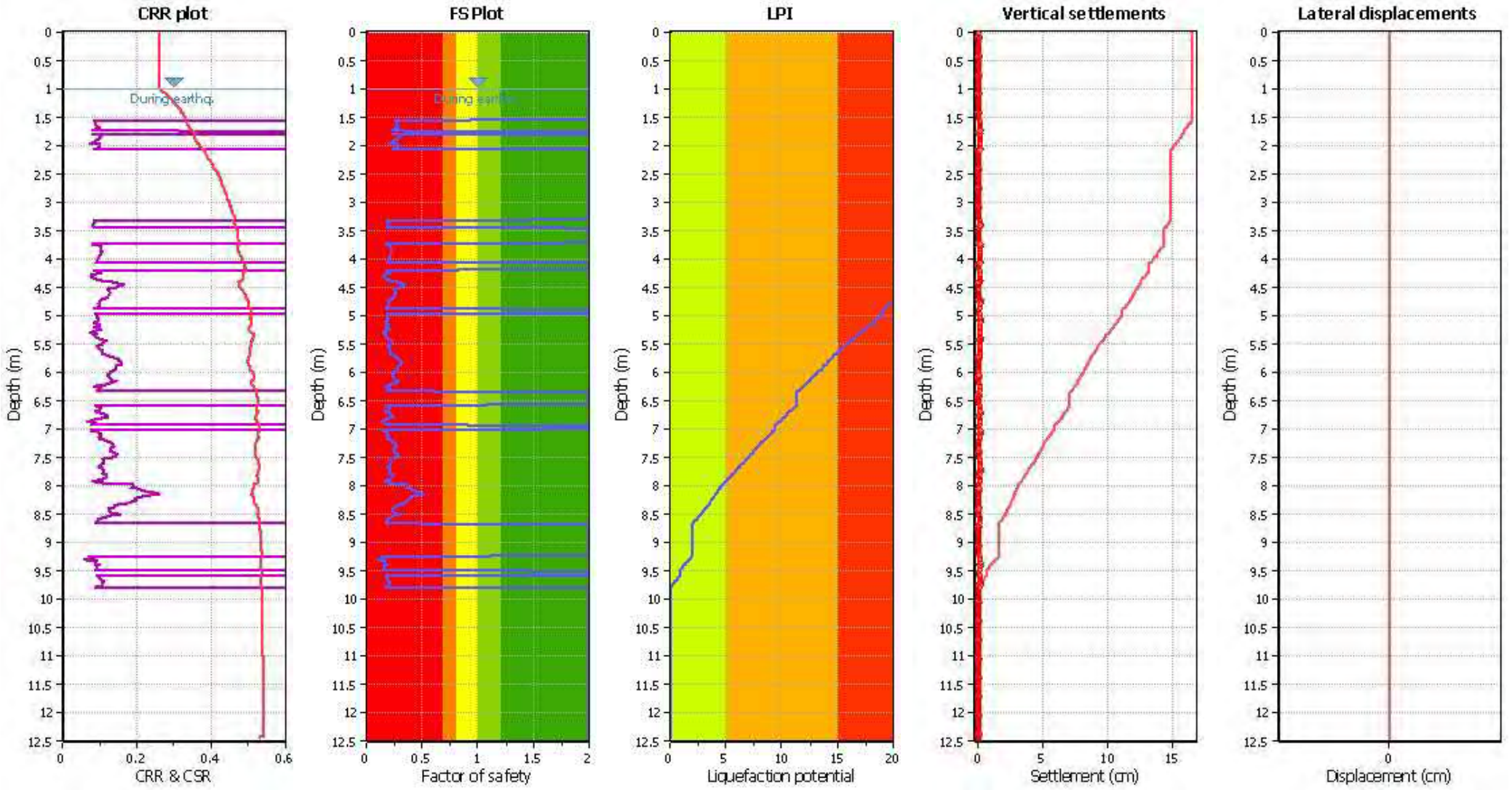
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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http://www.rdcl.co.nz

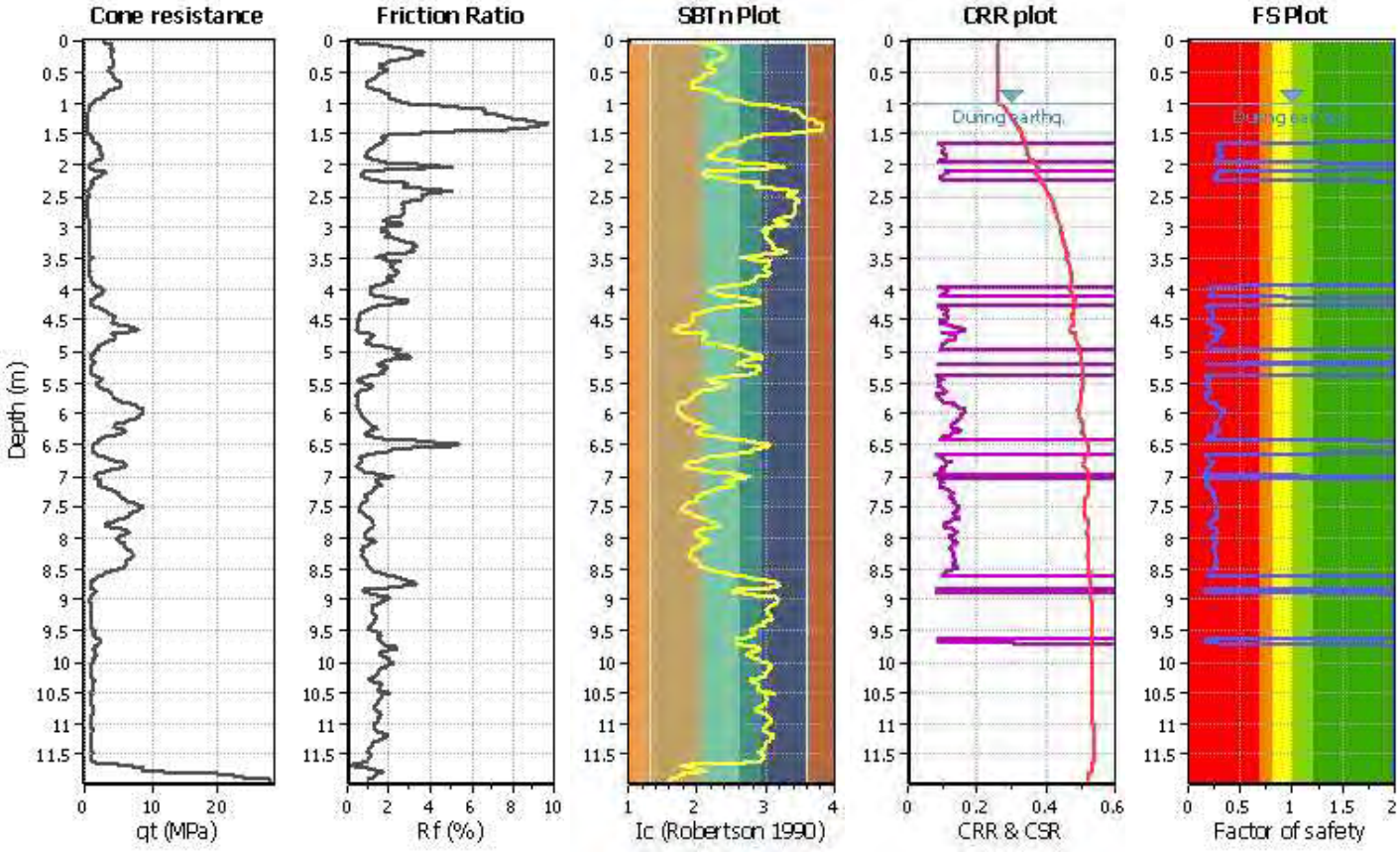
LIQUEFACTION ANALYSIS REPORT

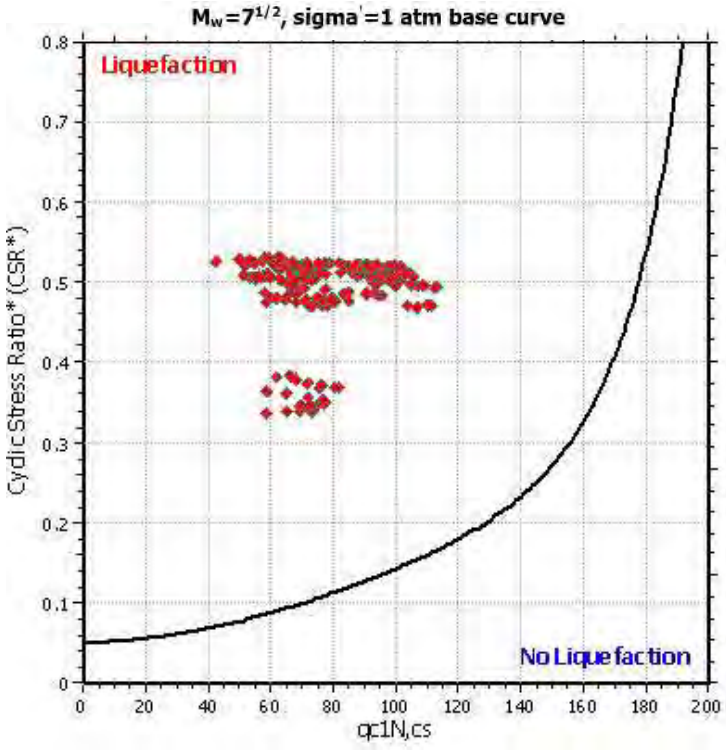
Project title : **Location :**

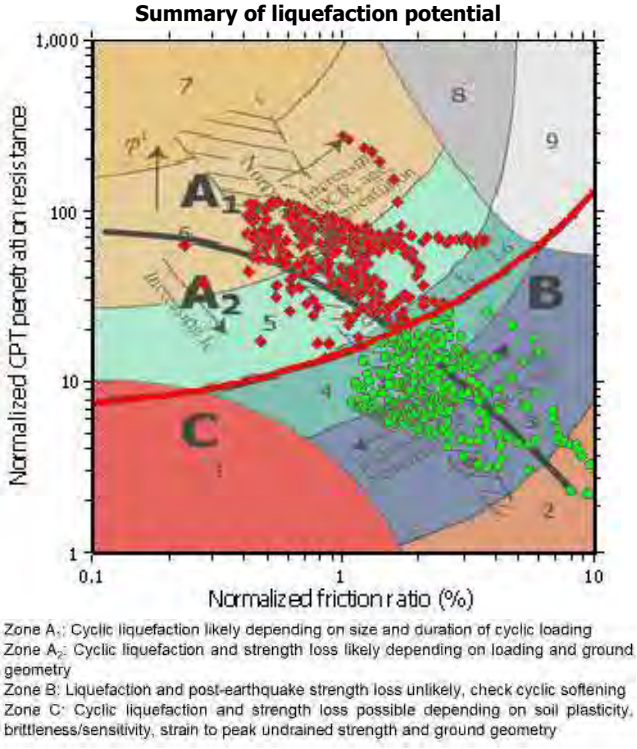
CPT file : CPT08 ULS

Input parameters and analysis data

Analysis method:	I&B (2008)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	R&W (1998)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

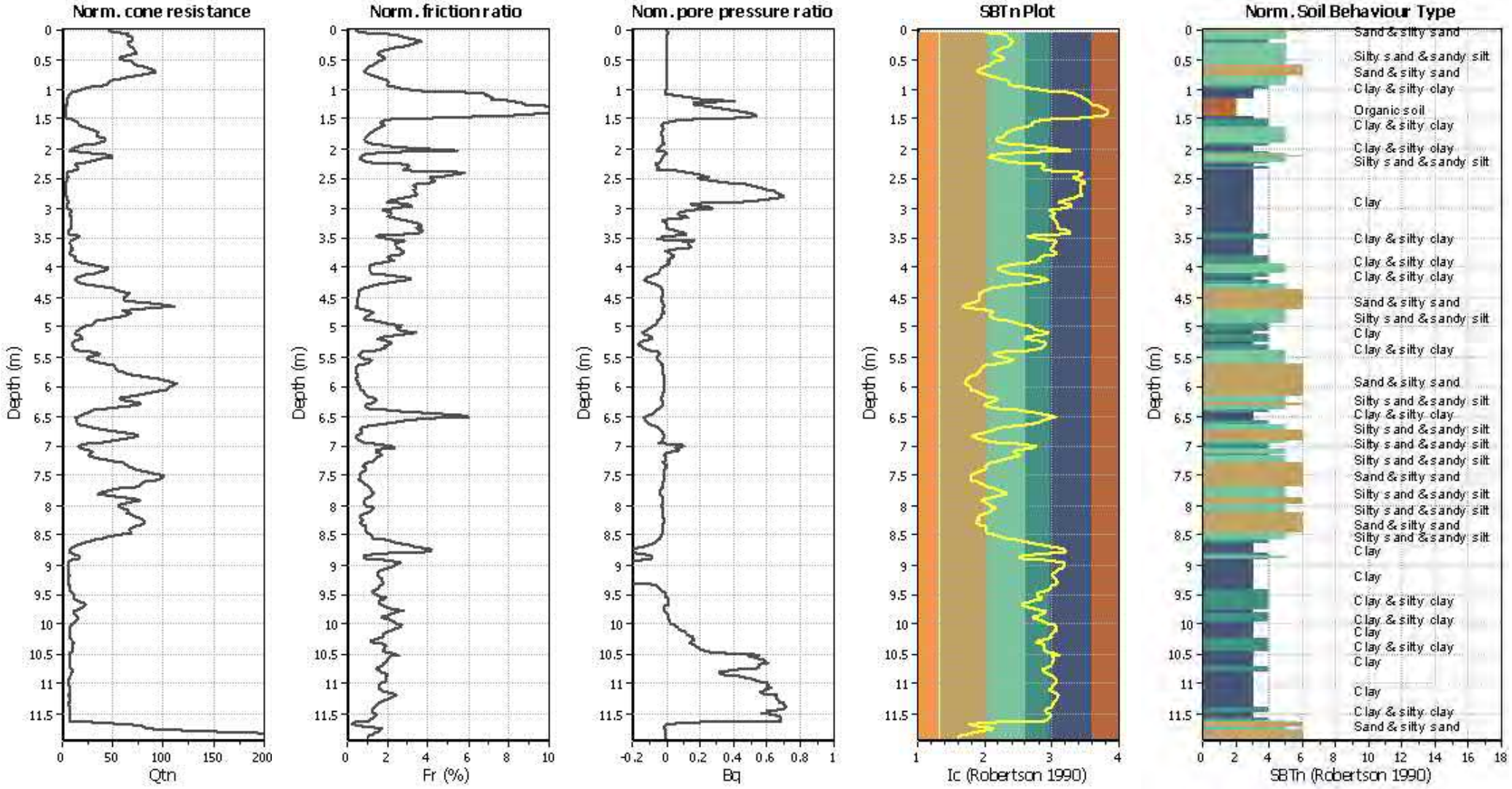






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



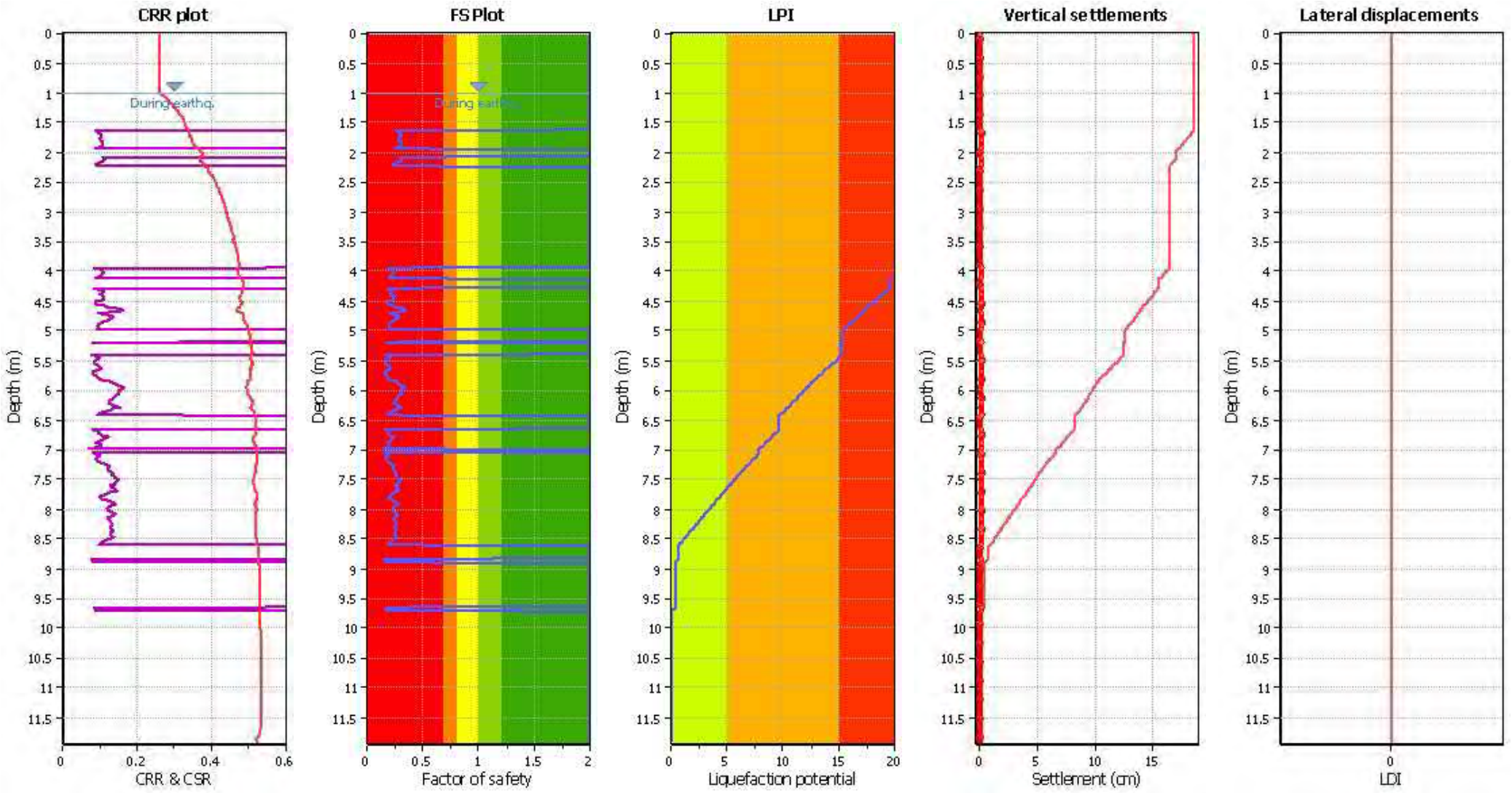
Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	I&B (2008)	Depth to GWT (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	R&W (1998)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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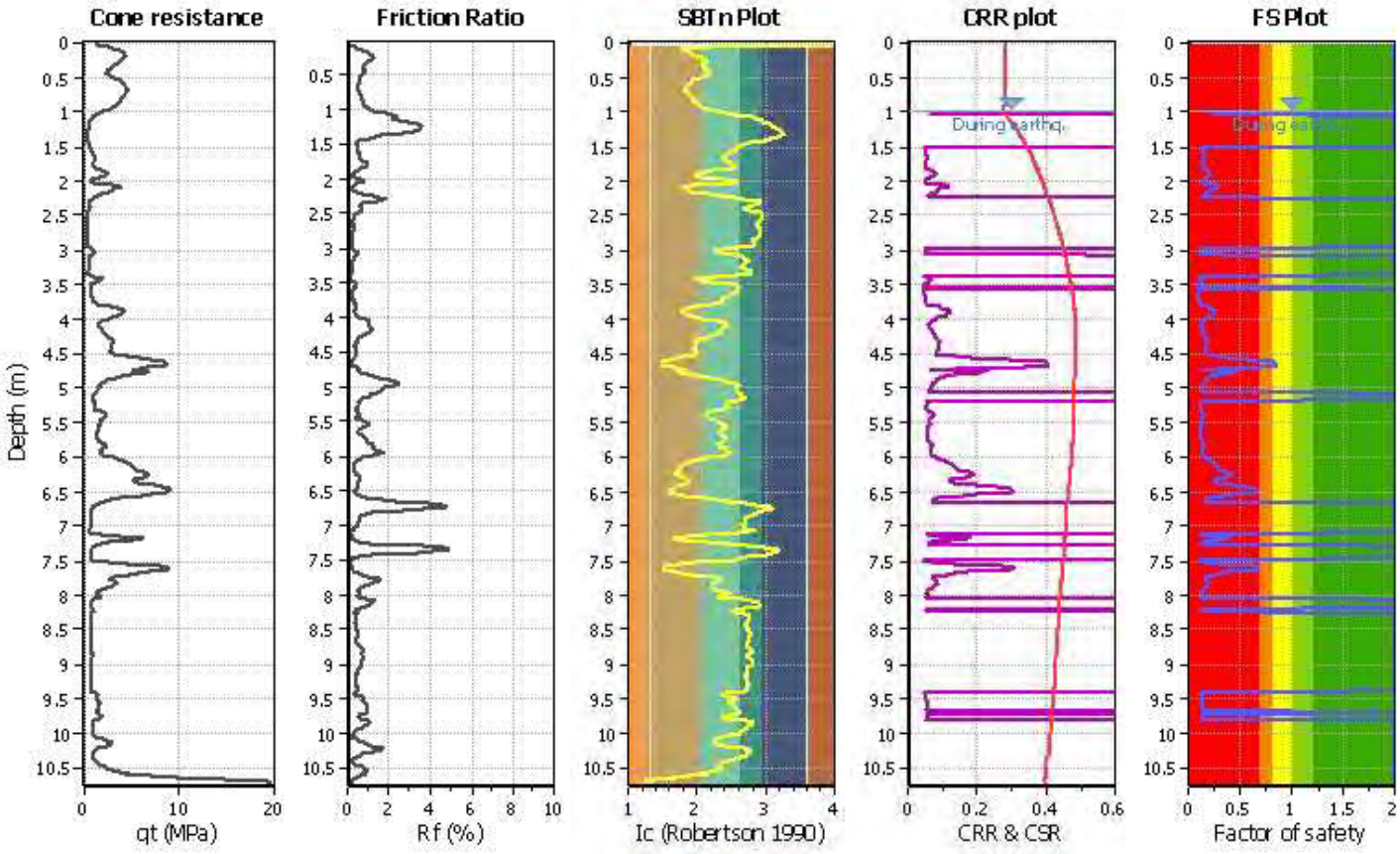
LIQUEFACTION ANALYSIS REPORT

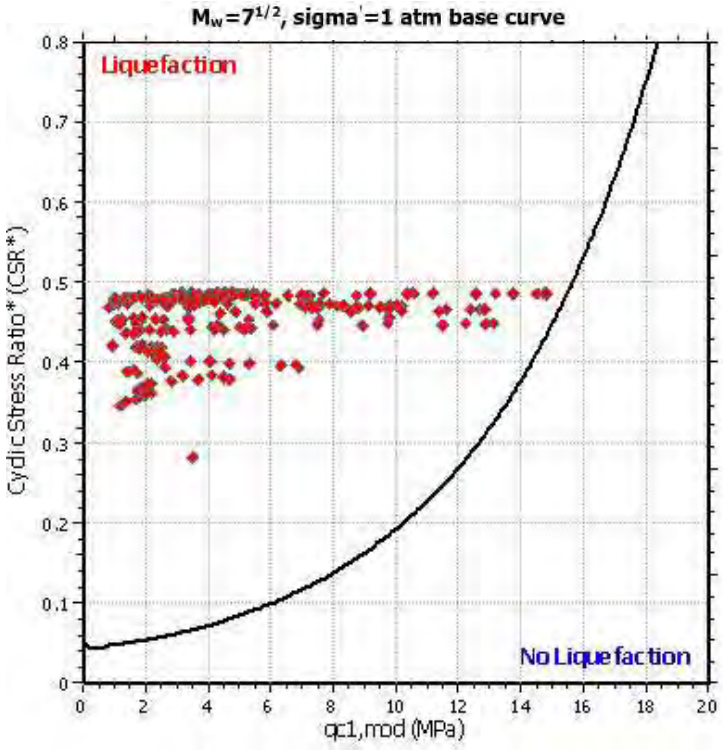
Project title : **Location :**

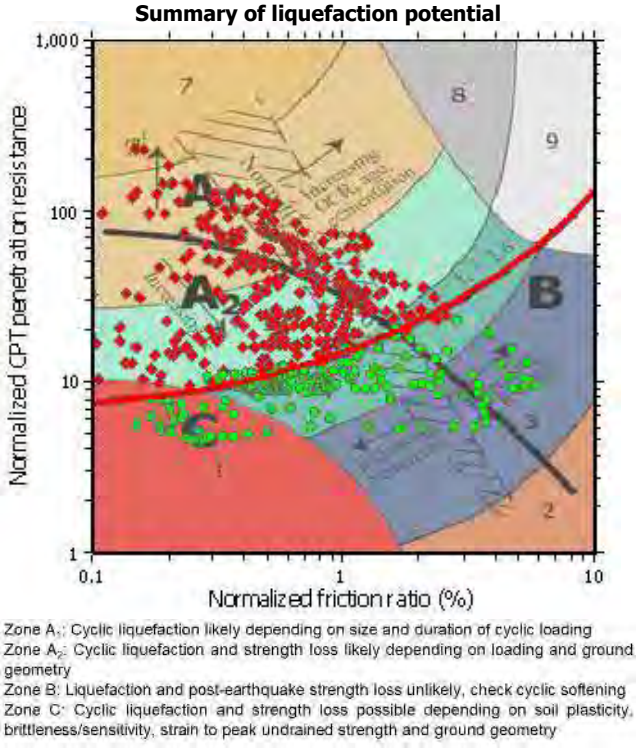
CPT file : CPT09 ULS

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

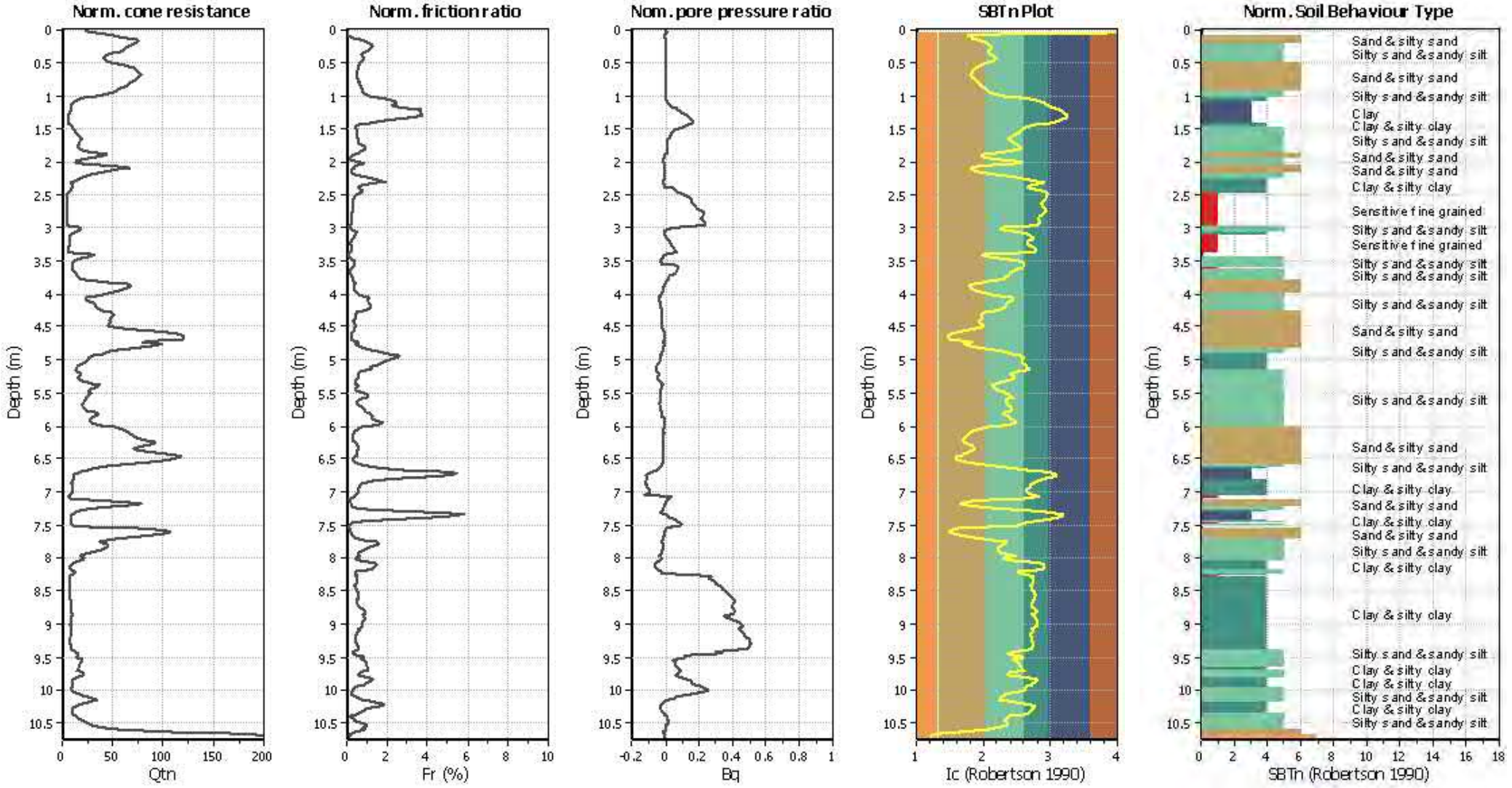






Zone A: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



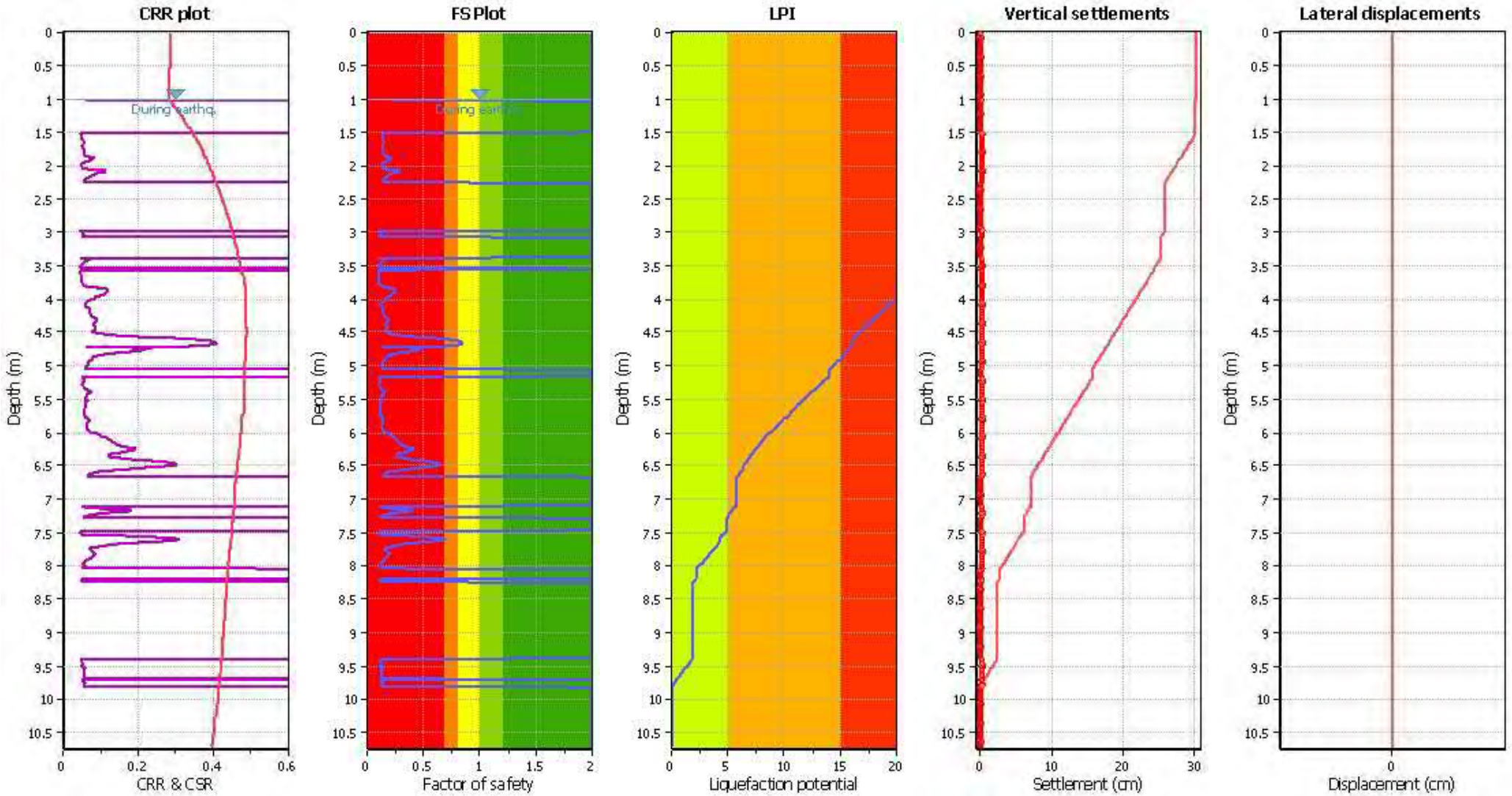
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

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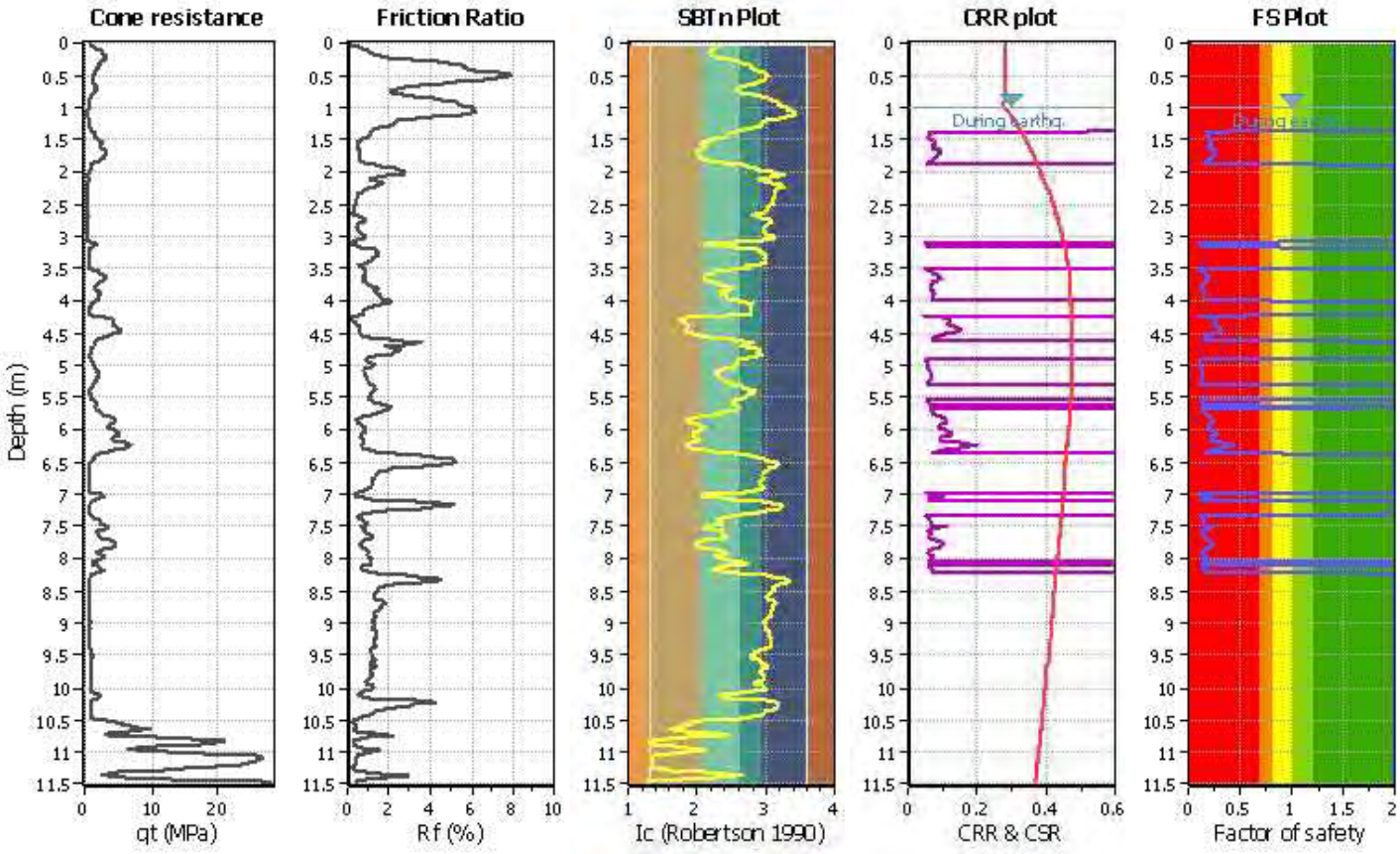
LIQUEFACTION ANALYSIS REPORT

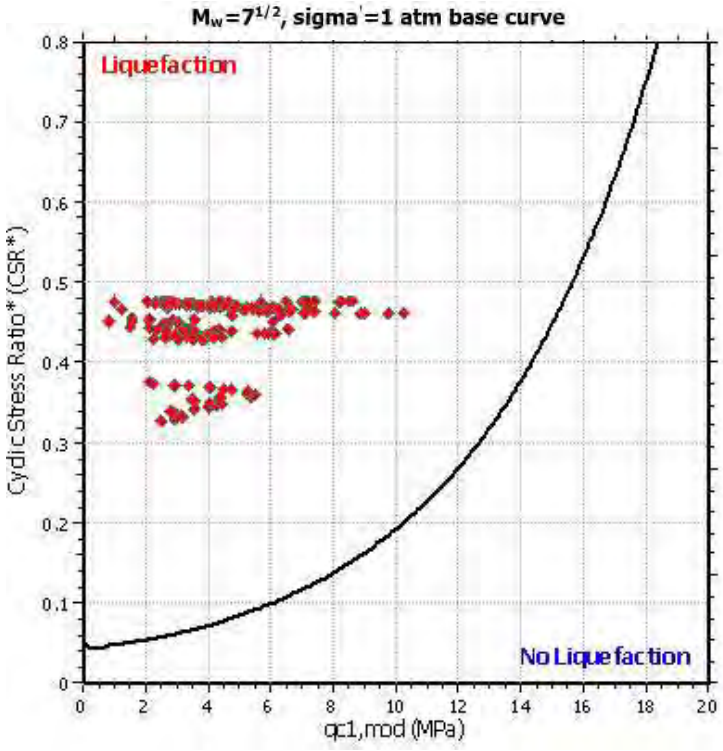
Project title : **Location :**

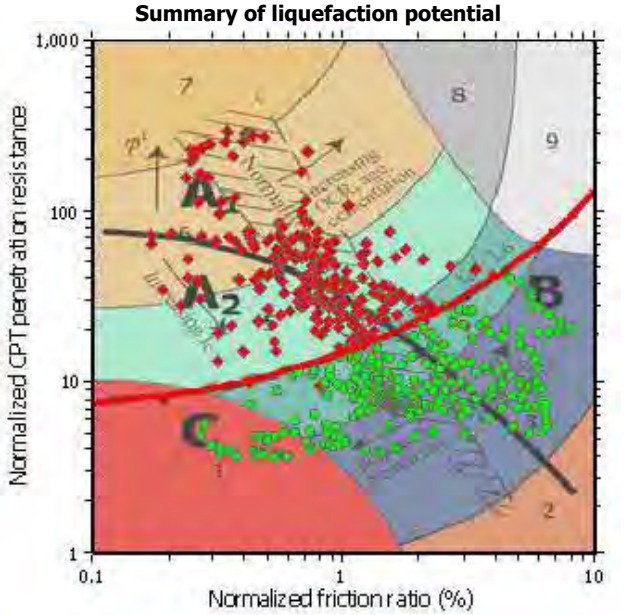
CPT file : CPT10 ULS

Input parameters and analysis data

Analysis method:	Moss et al. (2006)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	Moss et al. (2006)	G.W.T. (earthq.):	1.00 m	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	10.00 m
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.44	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

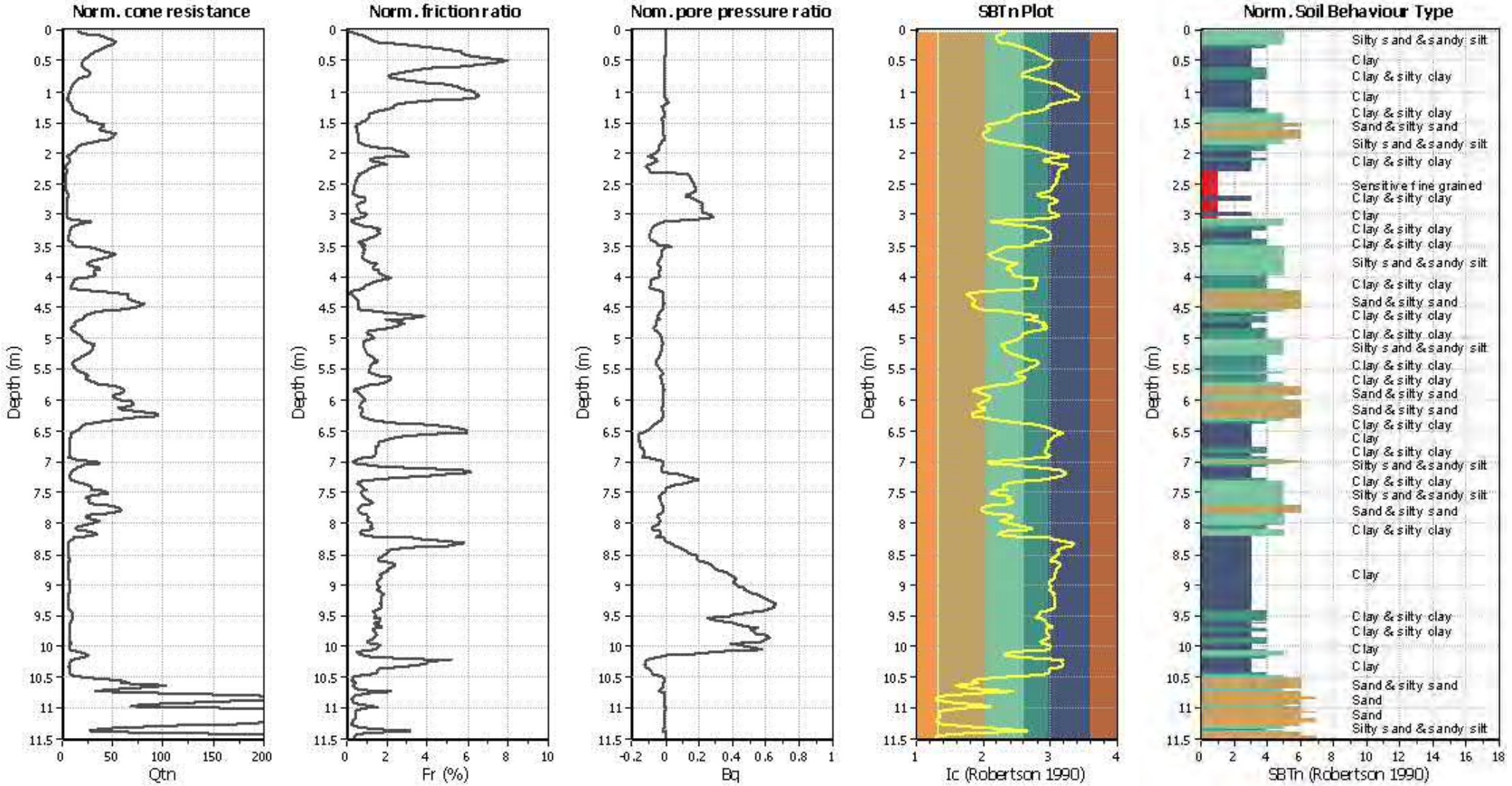






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots (normaliz



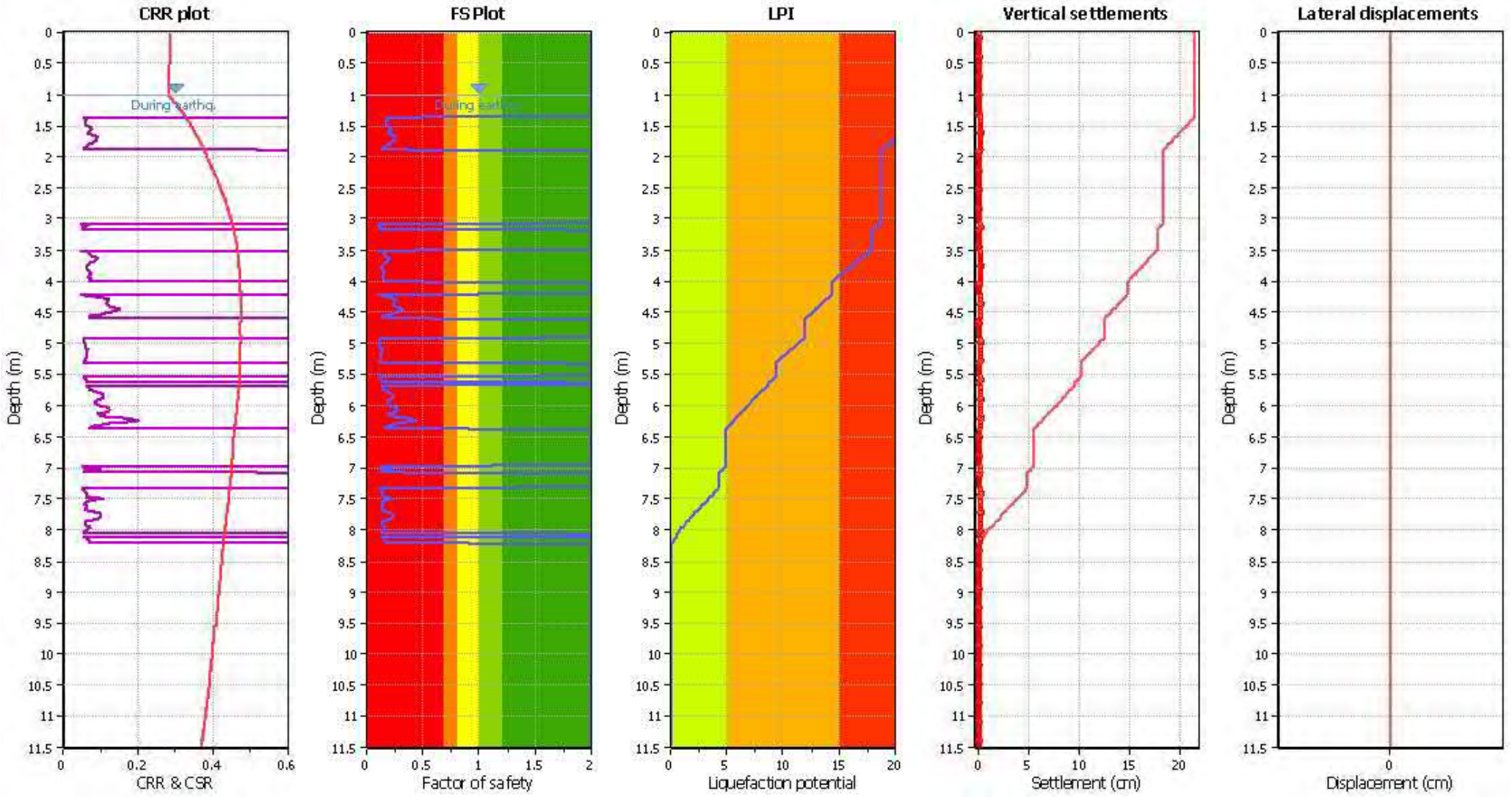
Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 m	Fill height:	N/A	Limit depth:	10.00 m

SBTn 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 plot



Input parameters and analysis data

Analysis method:	Moss et al. (2006)	Depth to water table (erthq.):	1.00 m	Fill weight:	N/A
Fines correction method:	Moss et al. (2006)	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:	7.50	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.44	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	2.00 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

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can

construction project.

Geotechnical-Engineering Services Are Performed for

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

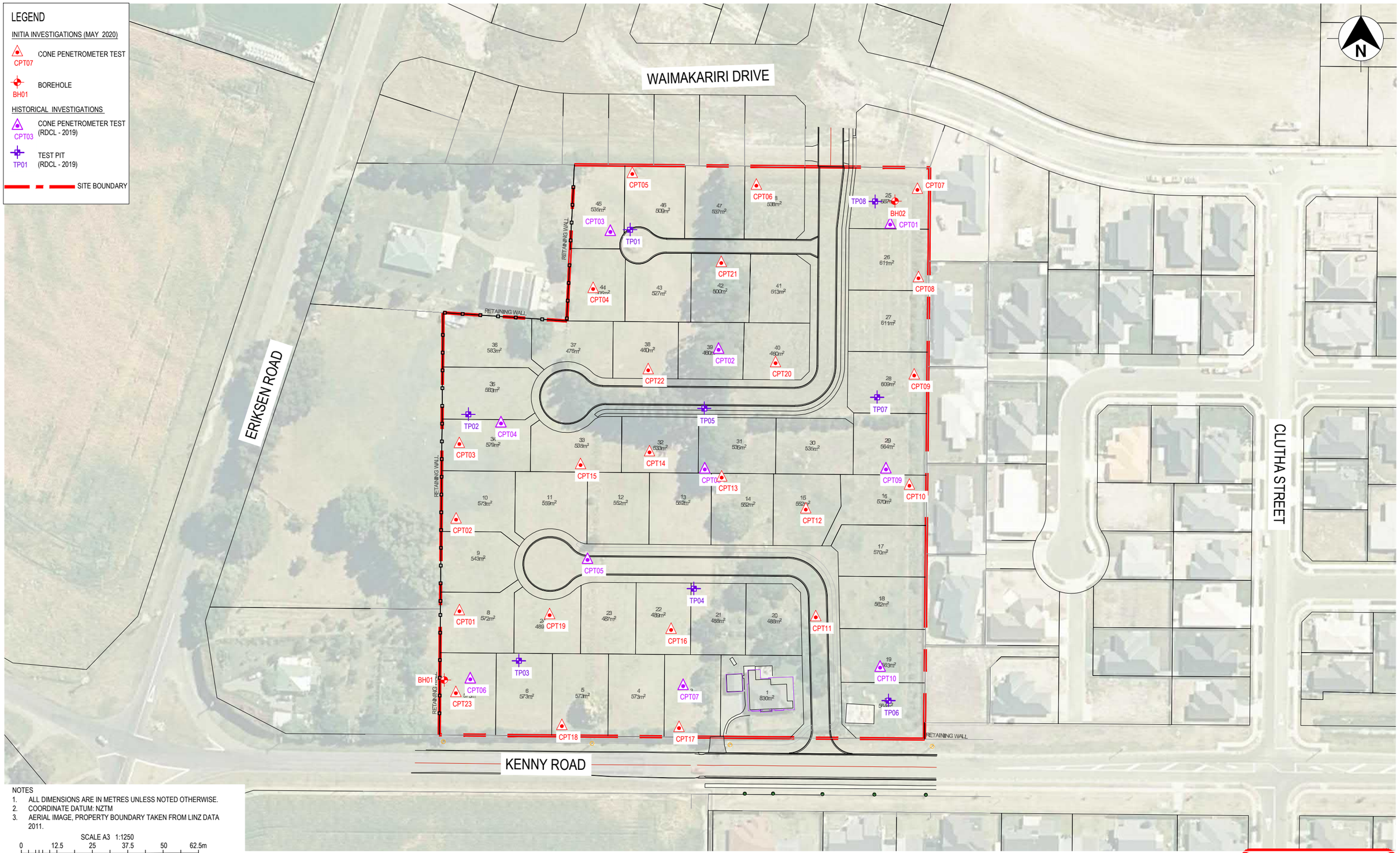
Obtain Professional Assistance to Deal with Moisture

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Appendix C Initia Investigation Plan and Logs



NOTES
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATE DATUM: NZTM
3. AERIAL IMAGE, PROPERTY BOUNDARY TAKEN FROM LINZ DATA 2011.

SCALE A3 1:1250

0 12.5 25 37.5 50 62.5m

FOR INFORMATION

Rev	Revision Description	Designed	Drawn	Checked
A	FIRST ISSUE (28/05/2020)		JG	

NOT FOR CONSTRUCTION
THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS SIGNED AS APPROVED
APPROVED:
DATE:
Scale AS SHOWN Original Size A3

INITIA GEOTECHNICAL SPECIALISTS
Unit 13, 114 St Georges Bay Rd
Parnell, Auckland, 1052
Phone: +64 09 977 0460
Email: enquiries@initia.co.nz

GREENSTONE LAND DEVELOPMENTS LTD

56 KENNY ROAD, TE AWA, NAPIER

GEOTECHNICAL INVESTIGATION PLAN

Initia Project ref: P000821
Figure Number 821-001
Revision A

C:\USERS\JULIE\INITIA LIMITED\INITIA LIMITED TEAM SITE - PROJECTS\P-000821 - KENNY RD, TE AWA\CAD\2_WORKING FILES\821-001.DWG, 5/08/2020 8:46 AM

DRILLHOLE LOG

INITIA
GEOTECHNICAL SPECIALISTS

HOLE NO.: BH01

CLIENT: Greenstone Land Developments **SITE LOCATION:** 56 Kenny Road, Napier
PROJECT: Kenny Road Subdivision Development
Project Ref.: P-000821

CO-ORDINATES: 1936225.3mE, 5617434.0mN **ELEVATION:** 11.5m **CONTRACTOR:** Geotech Drilling
Co-ordinate system: NZTM **Datum:** NAPIHT1962 **RIG:** Sonic Tractor Mounted Rig
Location method: GPSH **Level method:** CONTOUR **DRILLER:** Troy/Zack
ORIENTATION (°): Vertical **INCLINATION (°):** 90

START DATE: 20/05/2020
END DATE: 20/05/2020
LOGGED BY: LBW
CHECKED BY:

UNIT	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	GRAPHIC	WEATHERING (LW SW MW HW CW EW)	STRENGTH (VW W MS S VS ES)	DEPTH	RL	SAMPLES	METHOD	TCR (%) (25 50 75)	RQD (%) (25 50 75)	INSITU TESTING (SPT 'N' Vane shear strength)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION	CORE BOXES
Holocene Alluvium	Silty SAND; grey mottled orange. Loose; low plasticity; dry; sand, fine to medium.				0	11.0		SNC	100					Bentonite 0.0m; Sand 0.75m	
	Sandy SILT; grey mottled orange. Firm; high plasticity; dry.														
	Silty CLAY; grey mottled orange. Soft; high plasticity; moist. 1.20m - 1.40m: Core Loss	C/L C/L			1	10.0									
	Sandy SILT; grey and brown mottled orange. Firm; low plasticity; moist. 1.5m: Grey							SNC	88					Gravel	
	SAND; grey. Loose; wet; sand, fine to medium.				2	9.0									Box 1, 0.0-2.5m
	Sandy SILT; grey. Firm; low plasticity; wet; sand, fine to medium.														
	SILT; grey. Soft; high plasticity; wet. 2.0m: Trace shells														
	Sandy SILT; grey. Soft; low plasticity; wet.				3	8.0		SNC	100						
	SAND; grey. Loose; saturated; sand, fine to medium; trace shells.				4	7.0								4.25m Sand 4.5m	Box 2, 2.5-4.9m
	Sandy SILT; grey. Firm; low plasticity; wet; sand, fine to medium.				5	6.0		SNC	100						
	Silty CLAY; grey. Soft; high plasticity; wet; trace shell fragments. 6.2m: no shells				6	5.0		SNC	100					Bentonite	Box 3, 4.9-7.4m
	Sandy SILT; grey. Firm; low plasticity; wet; sand, fine to medium.				7	4.0									
	Clayey SILT; grey. Firm; high plasticity; wet.														
	Sandy SILT; grey. Firm; low plasticity; wet.				8	3.0		SNC	100						
	SAND; grey. Loose; wet; sand, fine to coarse. 8.3m: Organics.														
	Sandy SILT; grey. Firm; low plasticity; wet.				9	2.0									Box 4, 7.4-9.6m
	Silty SAND; grey. Loose; wet; sand, fine to coarse; trace shell fragments.							SNC	100						Box 5, 9.6-

REMARKS:
Groundwater encountered at 1.6m after drilling.

Checked By:

DRILLHOLE LOG

INITIA
GEOTECHNICAL SPECIALISTS

HOLE NO.: BH01

CLIENT: Greenstone Land Developments **SITE LOCATION:** 56 Kenny Road, Napier
PROJECT: Kenny Road Subdivision Development
Project Ref.: P-000821

CO-ORDINATES: 1936225.3mE, 5617434.0mN **ELEVATION:** 11.5m **CONTRACTOR:** Geotech Driiling
Co-ordinate system: NZTM **Datum:** NAPIHT1962 **RIG:** Sonic Tractor Mounted Rig
Location method: GPSH **Level method:** CONTOUR **DRILLER:** Troy/Zack
ORIENTATION (°): Vertical **INCLINATION (°):** 90

START DATE: 20/05/2020
END DATE: 20/05/2020
LOGGED BY: LBW
CHECKED BY:

UNIT	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	GRAPHIC	WEATHERING (UW SW MW HW CW EW)	STRENGTH (VW W MS S VS ES)	DEPTH	RL	SAMPLES	METHOD	TCR (%) (25 50 75)	RQD (%) (25 50 75)	INSITU TESTING (SPT 'N' Vane shear strength)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION	CORE BOXES
Holocene Alluvium	[CONT] Silty SAND; grey; Loose; Wet; sand, fine to coarse; trace shell fragments.					1.0		SNC	100						
	Sandy SILT. Firm; wet; sand, fine to medium; trace shell fragments.				11										
	Clayey SILT; grey. Firm; high plasticity; wet.					0.0		SNC	100						11.4m
	Sandy SILT; grey. Firm; low plasticity; wet; sand, fine to medium.														
	Clayey SILT; grey. Firm; high plasticity; wet.				12										
	Silty CLAY; grey. Firm; high plasticity; wet.					-1.0		SNC	100						
	Sandy SILT; grey. Firm; high plasticity; saturated; sand, fine to medium.													Bentonite	
	Clayey SILT; grey. Firm; high plasticity; wet.				13										
	Silty sandy GRAVEL; grey. Dense; wet; gravel, fine to medium, subround to subangular.					-2.0		SPT	100		9, 12 / 12, 11, 12, 14 N=49				
	Sandy GRAVEL; grey. Dense; saturated; gravel, fine to medium, rounded to subangular.				14			SNC	100						Box 6, 11.4-14.5m
	Silty sandy GRAVEL; grey. Very dense; saturated; gravel, fine to medium, rounded to subangular.					-3.0									
	EOH: 15.37m				15			SPT	100		8, 14 / 16, 14, 20 for 70mm N=50+ for 220mm			15.37m	Box 7, 14.5-15.4m
						-4.0									
						-5.0									
						-6.0									
						-7.0									
						-8.0									

REMARKS:
Groundwater encountered at 1.6m after drilling.

CORE PHOTOS

HOLE NO.: BH01

JOB NO.: P-000821

Box 1, 0.0-2.5m

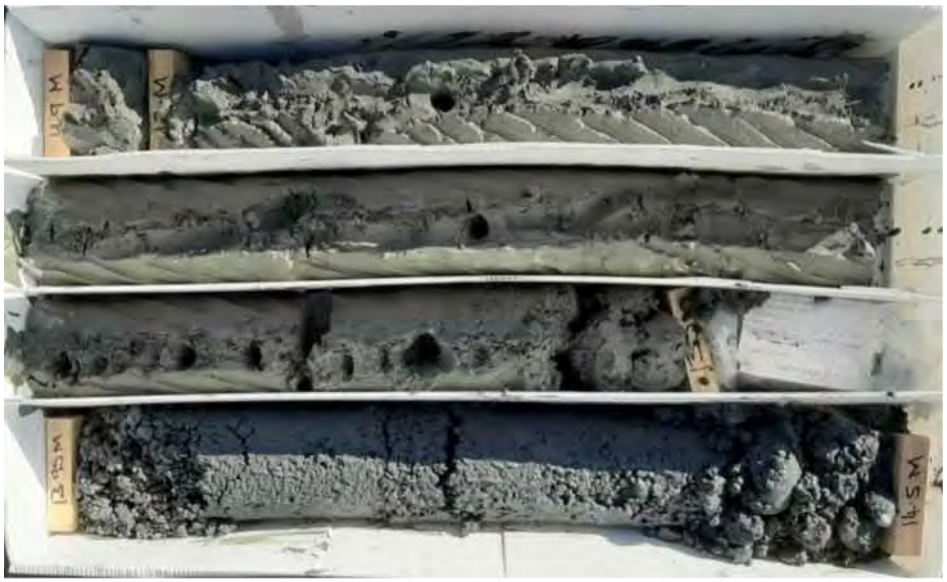
Box 2, 2.5-4.9m

Box 3, 4.9-7.4m

Box 4, 7.4-9.6m

Box 5, 9.6-11.4m

Box 6, 11.4-14.5m



CORE PHOTOS

HOLE NO.: BH01
JOB NO.: P-000821

Box 7, 14.5-15.4m

DRILLHOLE LOG

INITIA
GEOTECHNICAL SPECIALISTS

HOLE NO.: BH02

CLIENT: Greenstone Land Developments **SITE LOCATION:** 56 Kenny Road, Napier
PROJECT: Kenny Road Subdivision Development
Project Ref.: P-000821

CO-ORDINATES: 1936384.3mE, 5617602.9mN **ELEVATION:** 11.5m **CONTRACTOR:** Geotech Drilling
Co-ordinate system: NZTM **Datum:** NAPIHT1962 **RIG:** Sonic Tractor Mounted Rig
Location method: GPSH **Level method:** CONTOUR **DRILLER:** Troy/Zack
ORIENTATION (°): Vertical **INCLINATION (°):** 90

START DATE: 20/05/2020
END DATE: 20/05/2020
LOGGED BY: LBW
CHECKED BY:

UNIT	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	GRAPHIC	WEATHERING (UW SW MW HW CW)	STRENGTH (EW VW W MS S VS ES)	DEPTH	RL	SAMPLES	METHOD	TCR (%) (25 50 75)	RQD (%) (25 50 75)	INSITU TESTING (SPT 'N' Vane shear strength)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION	CORE BOXES
Holocene Alluvium	0.00m - 0.50m: Core Loss Sandy SILT; brown. Firm; non-plastic; dry; sand, fine to medium.				0	11.0		SNC	37					Bentonite	
	Clayey SILT, with trace sand; brown. Soft; moist.														
	SAND; brown. Loose; moist; sand, fine to coarse.				1	10.0		SNC	100						
	Clayey SILT; grey mottled orange. Firm; high plasticity; moist. 1.50m - 1.70m: Core Loss														
	Silty CLAY; brown. Soft; high plasticity; wet.				2	9.0		SNC	86						
	Sandy SILT; brown. Firm; low plasticity; wet; sand, fine to medium; trace shell fragments.														
	Silty CLAY; dark grey. Soft; high plasticity; wet. 3.5m: Grey; trace shell fragments.				3	8.0		SNC	100						Box 1, 0.0-2.9m
	Sandy SILT; grey. Firm; high plasticity; wet; sand, fine to medium; trace shell fragments.				4	7.0		SNC	100						
	Silty SAND; grey. Loose; non-plastic; wet; sand, fine to medium.				5	6.0		SNC	100						Box 2, 2.9-5.2m
	Sandy SILT; grey. Firm; low plasticity; wet.														
	Clayey SILT; grey. Firm; high plasticity; wet.				6	5.0		SNC	100						
	SAND; grey. Loose; wet; sand, fine to medium.														
	Silty SAND; grey. Loose; wet; sand, fine to medium.				7	4.0		SNC	100						Box 3, 5.2-7.5m
	SAND; grey. Loose; wet; sand, fine to medium.														
	Clayey SILT, with minor sand; grey. Soft; high plasticity; wet.				8	2.0		SNC	100						
	Silty CLAY; grey. Soft; high plasticity; wet; trace shell fragments.														
	Clayey SILT; grey. Soft; high plasticity; wet.				9										Box 4, 7.5-9.9m
	Sandy SILT; grey. Soft; low plasticity; wet; sand, fine to medium.														

REMARKS:
Groundwater encountered at 2.3m after drilling.

Checked By:

DRILLHOLE LOG

INITIA
GEOTECHNICAL SPECIALISTS

HOLE NO.: BH02

CLIENT: Greenstone Land Developments **SITE LOCATION:** 56 Kenny Road, Napier
PROJECT: Kenny Road Subdivision Development
Project Ref.: P-000821

CO-ORDINATES: 1936384.3mE, 5617602.9mN **ELEVATION:** 11.5m **CONTRACTOR:** Geotech Drilling
Co-ordinate system: NZTM **Datum:** NAPIHT1962 **RIG:** Sonic Tractor Mounted Rig
Location method: GPSH **Level method:** CONTOUR **DRILLER:** Troy/Zack
ORIENTATION (°): Vertical **INCLINATION (°):** 90

START DATE: 20/05/2020
END DATE: 20/05/2020
LOGGED BY: LBW
CHECKED BY:

UNIT	MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	GRAPHIC	WEATHERING (UW SW MW HW CW EW)	STRENGTH (VW W MS S VS ES)	DEPTH	RL	SAMPLES	METHOD	TCR (%) (25 50 75)	RQD (%) (25 50 75)	INSITU TESTING (SPT 'N' Vane shear strength)	DISCONTINUITIES DESCRIPTION	WATER	INSTALLATION	CORE BOXES
Holocene Alluvium	[CONT] Sandy SILT; grey; Soft; Low plasticity; wet; sand, fine to medium.				11	1.0		SNC	100						
	Clayey SILT; grey. Soft; high plasticity; wet. 10.50m - 11.40m: Core Loss														
	Gravelly SAND; grey. Dense; saturated; sand, medium to coarse; gravel, fine, angular to subangular.					0.0		SNC	40						
	Sandy GRAVEL; grey. Dense; saturated; gravel, fine to medium; sand, fine to coarse.				12	-1.0		SNC	83						
	EOH: 13.05m				13			SPT	100		5, 8 / 9, 9, 12, 10 N=40			Bentonite 13.05m	Box 5, 9.9-13.1m

REMARKS:
Groundwater encountered at 2.3m after drilling.

Checked By:

CORE PHOTOS

HOLE NO.: **BH02**

JOB NO.: P-000821

Box 1, 0.0-2.9m

Box 2, 2.9-5.2m

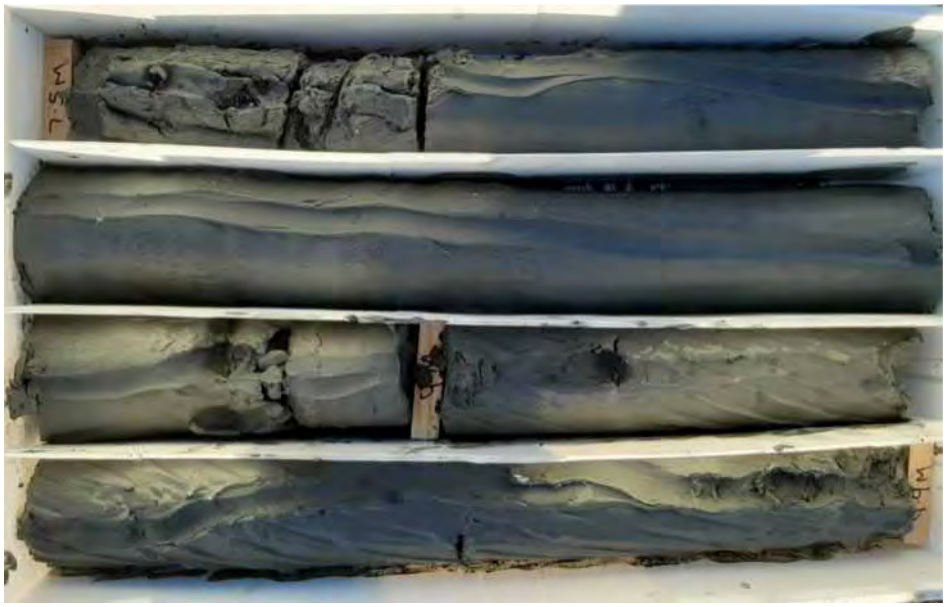
Box 3, 5.2-7.5m

CORE PHOTOS

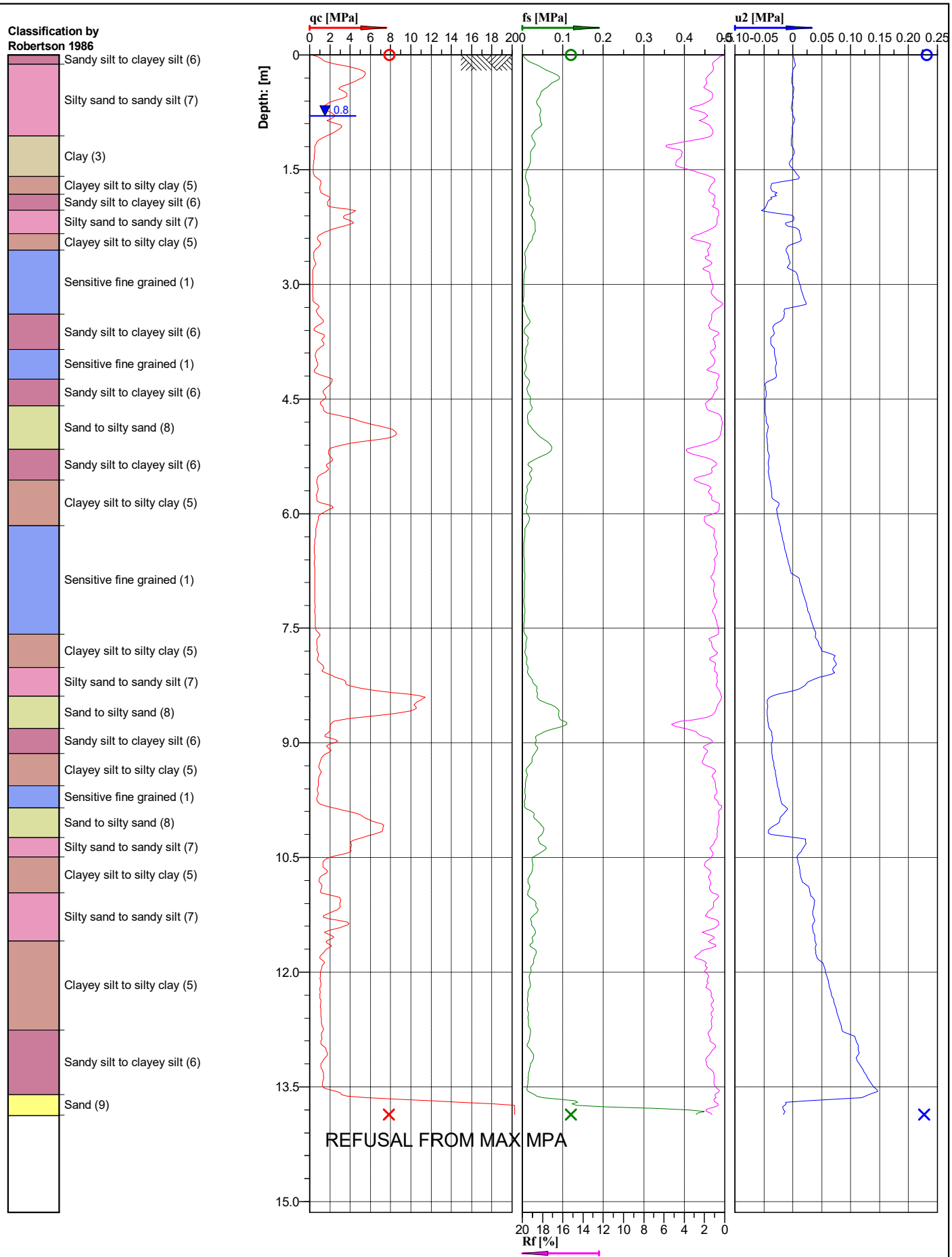
HOLE NO.: BH02

JOB NO.: P-000821

Box 4, 7.5-9.9m



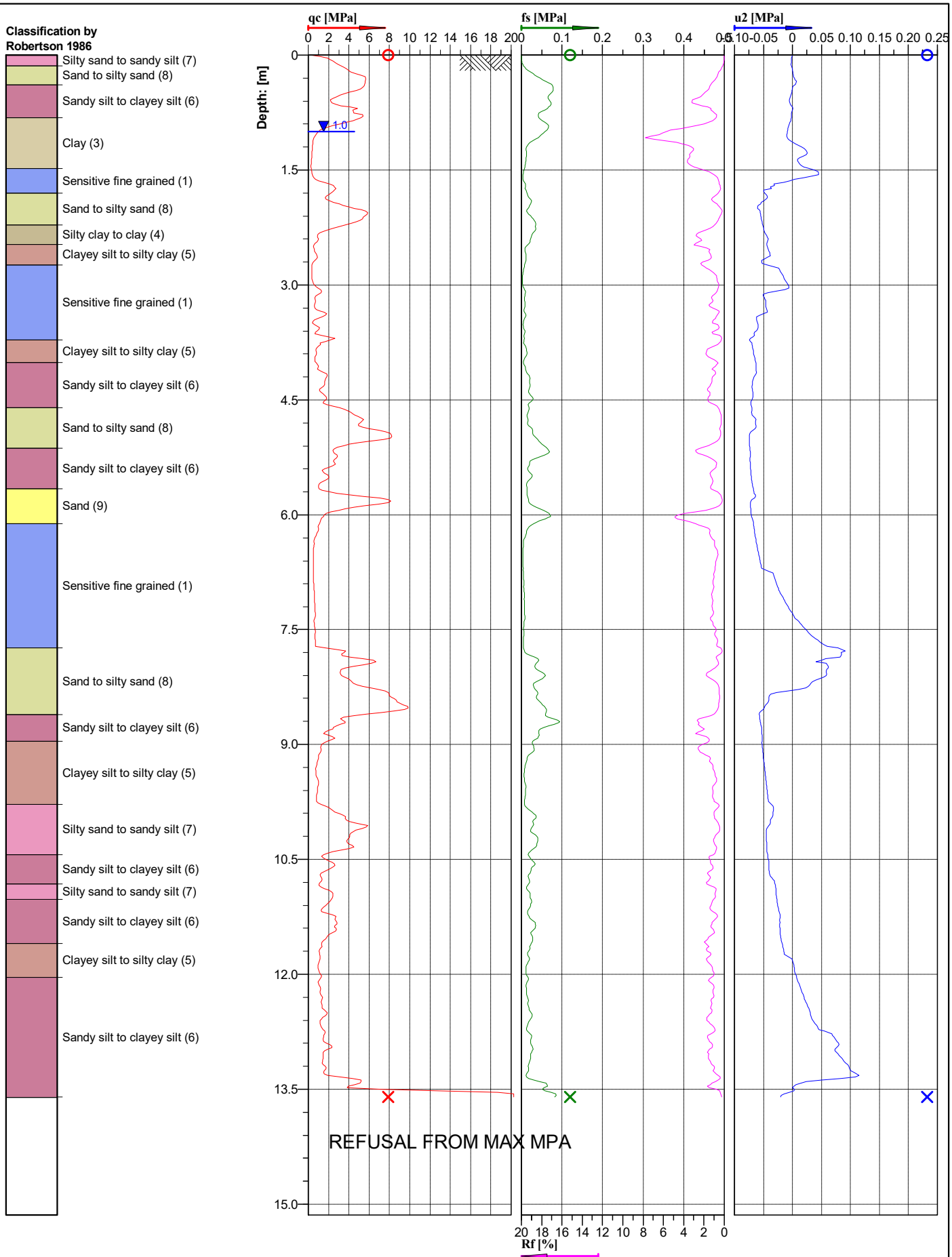
Box 5, 9.9-13.1m



GEOTECH DRILLING

Cone No: 5332
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT01
Project ID:	Client: INITIA	Date: 20/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52673 E 176.91153		File: CPT01.cpt	

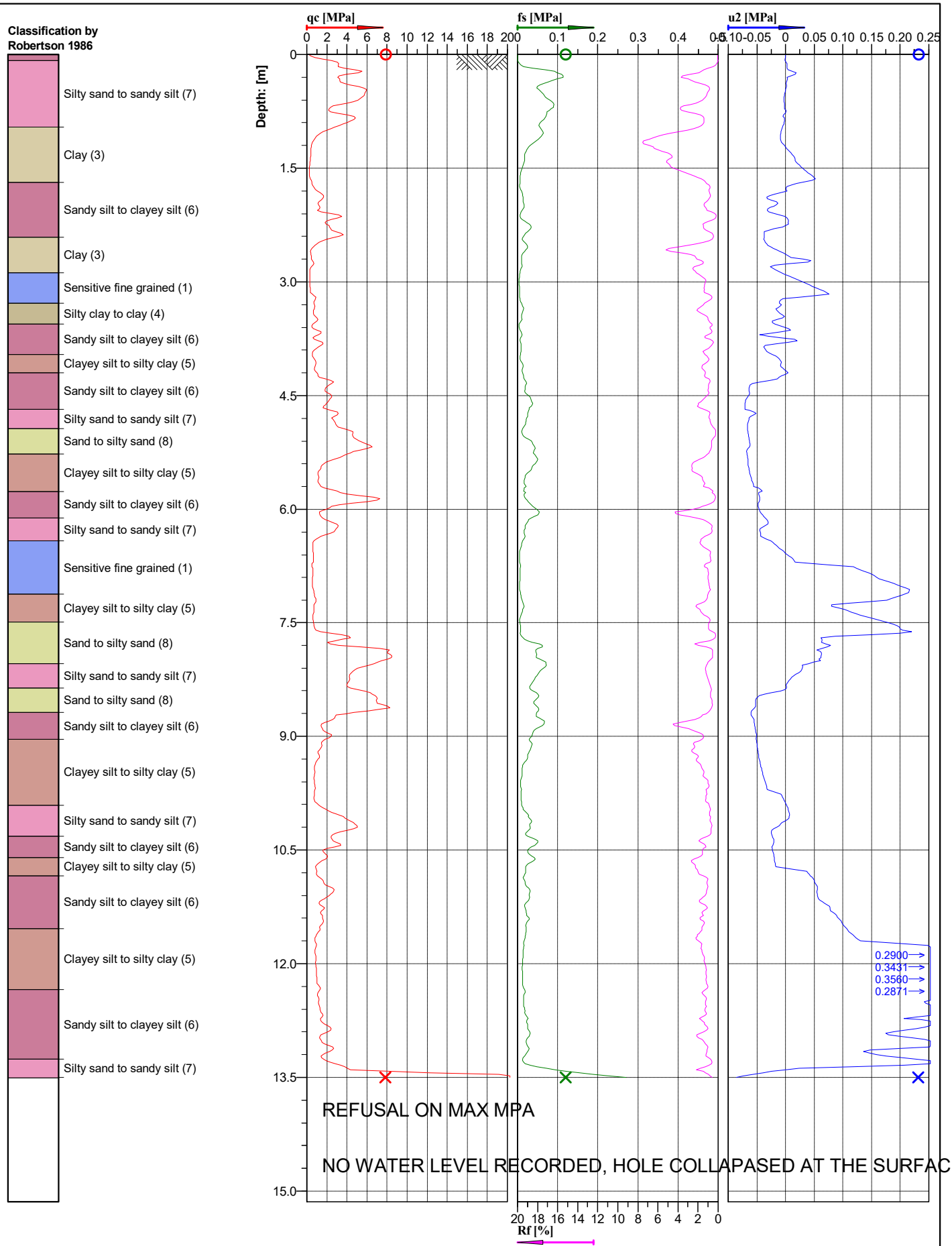


GEOTECH DRILLING

u2

Cone No: 5332
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT02
Project ID:	Client: INITIA	Date: 20/05/2020	Scale: 1 : 67
Project: TEAWA KENNY RD		Page: 1/1	Fig.:
S 39.52644 E 176.91150		File: CPT02.cpt	

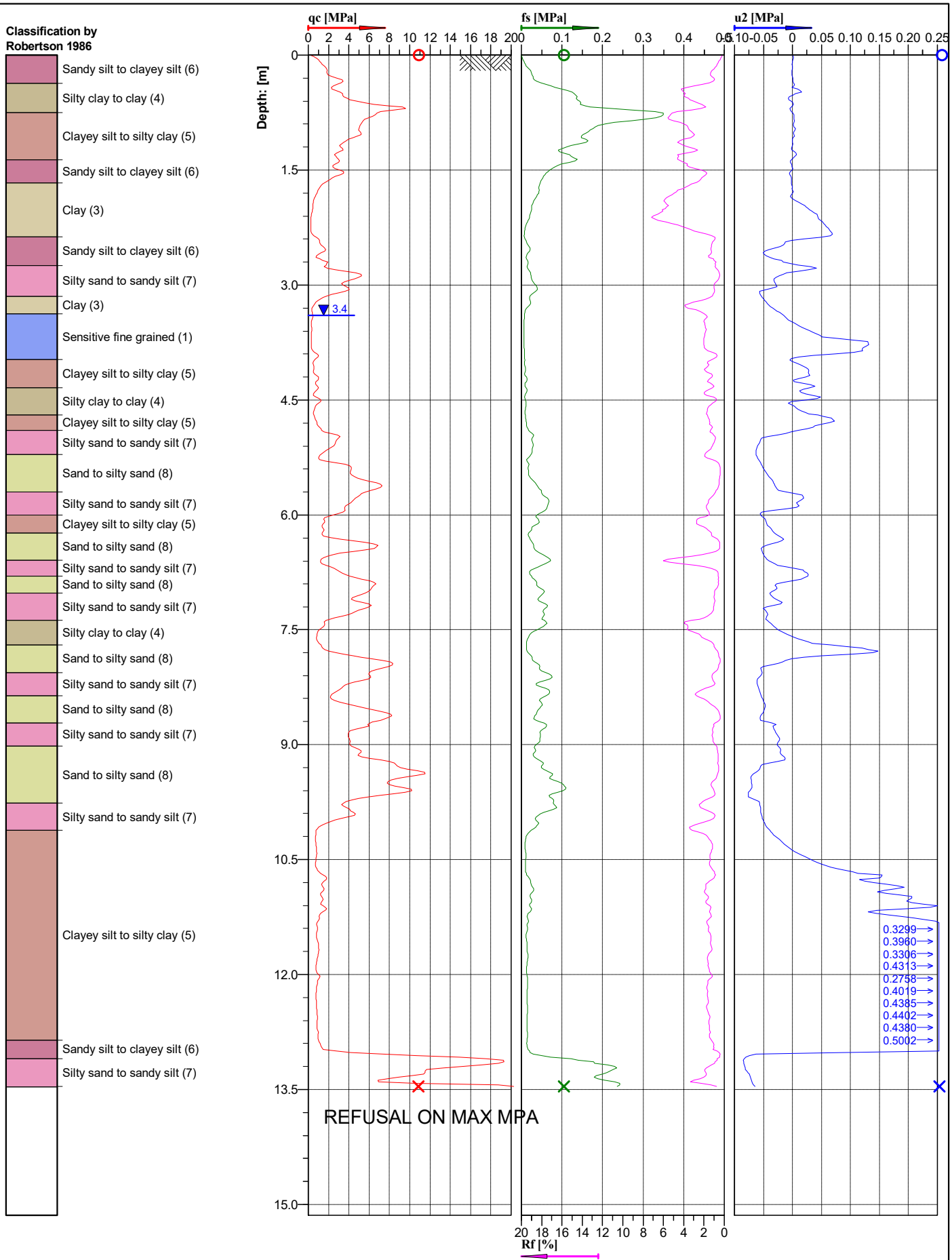


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT03
Project ID:	Client: INITIA	Date: 20/05/2020	Scale: 1 : 67
Project: TEAWA KENNY RD		Page: 1/1	Fig.:
S 39.52620 E 176.91150		File: CPT03.cpt	

GEOTECH DRILLING

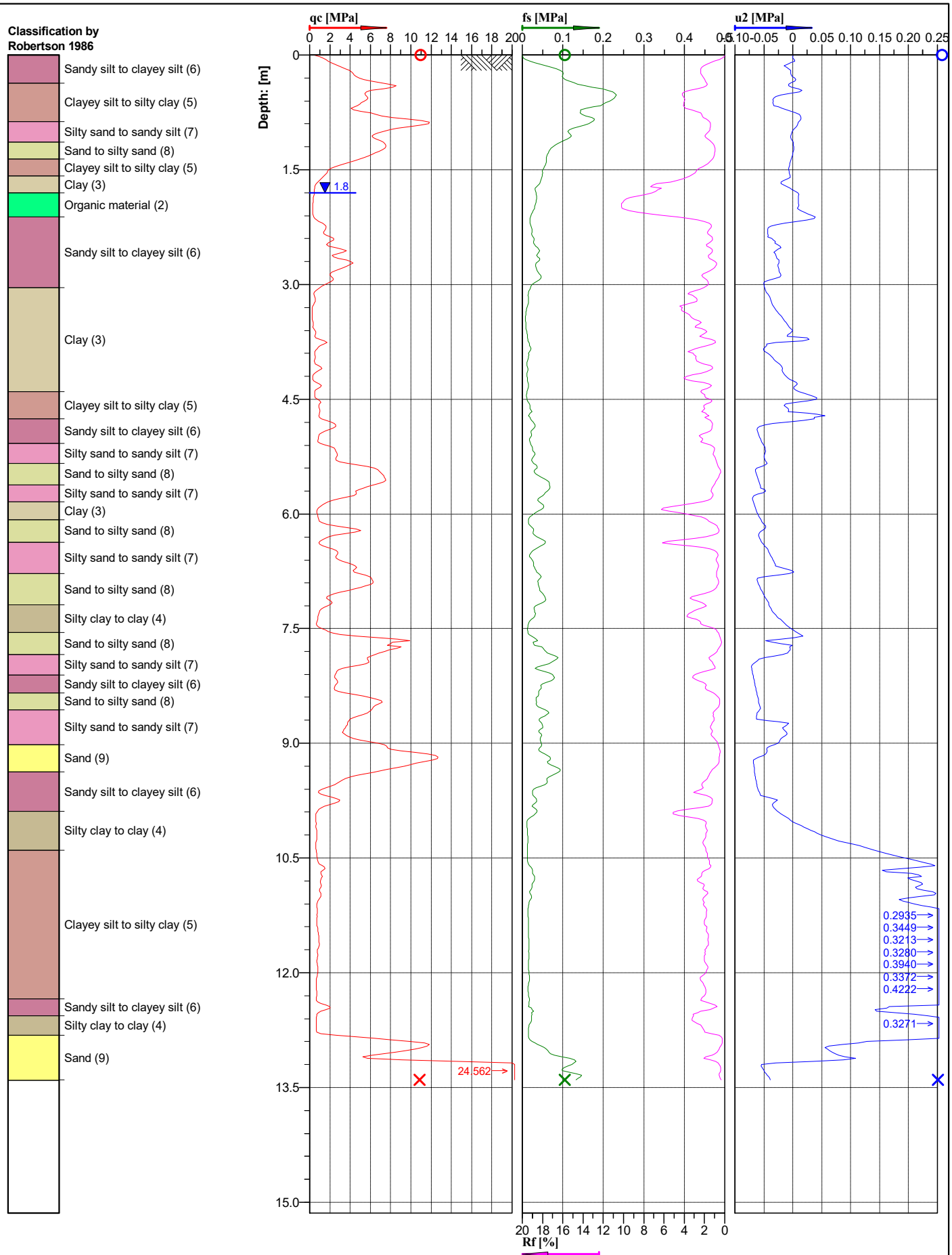
u2

Cone No: 5332
Tip area [cm2]: 10
Sleeve area [cm2]: 150



Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT04
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52569 E 176.91202		File: CPT04.cpt	

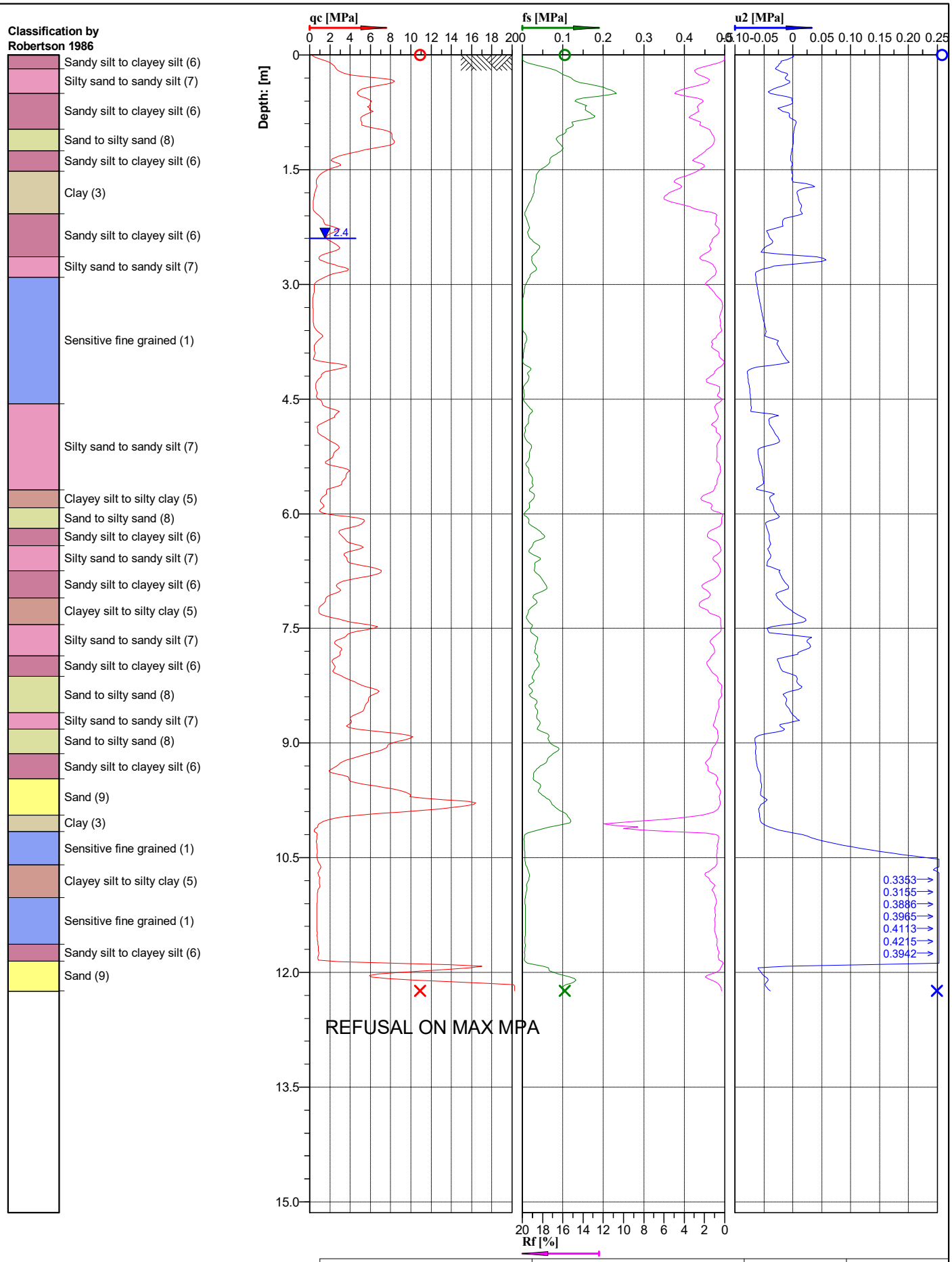


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT05
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52532 E 176.91216		File: CPT05.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

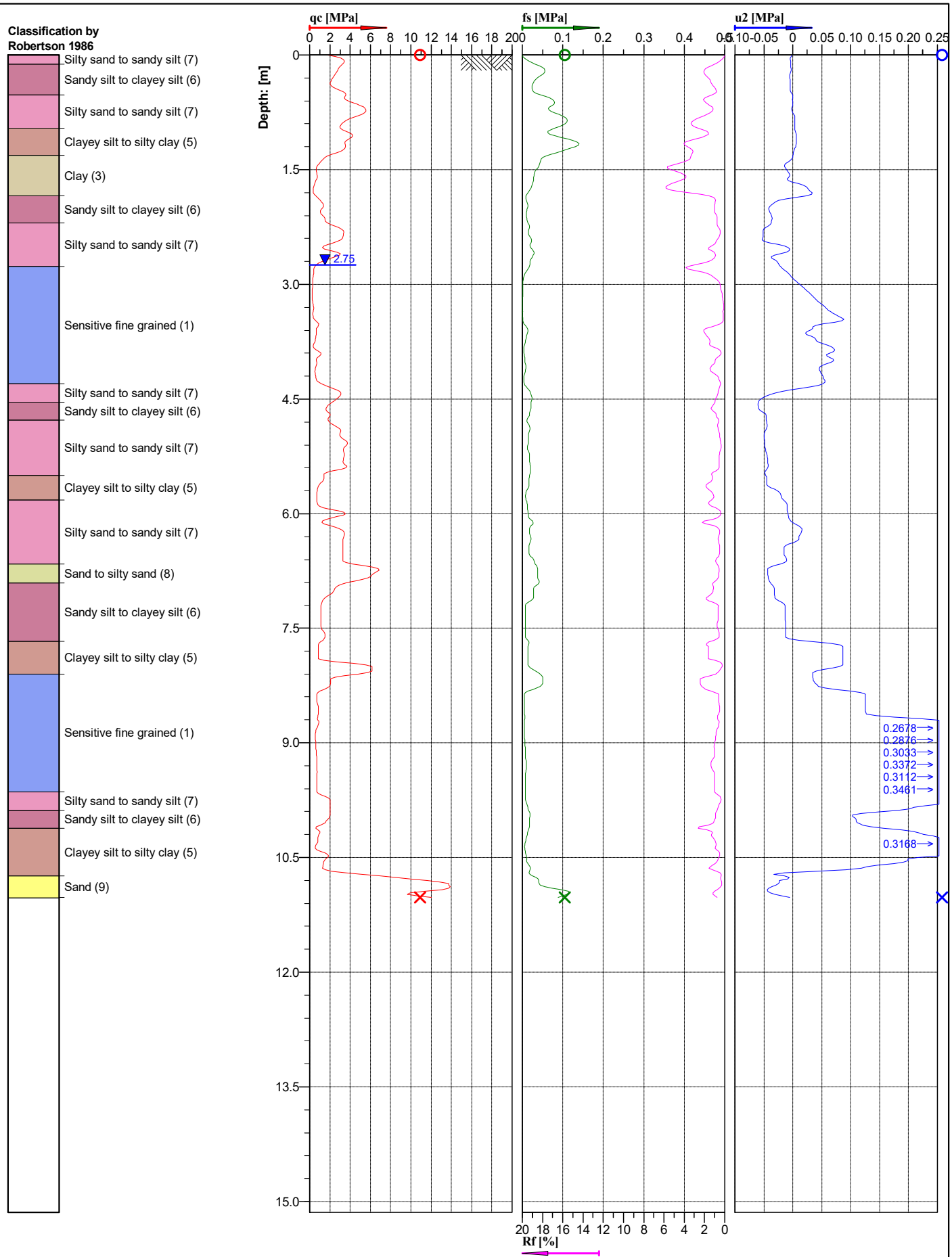


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT06
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52534 E 176.91267		File: CPT06.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

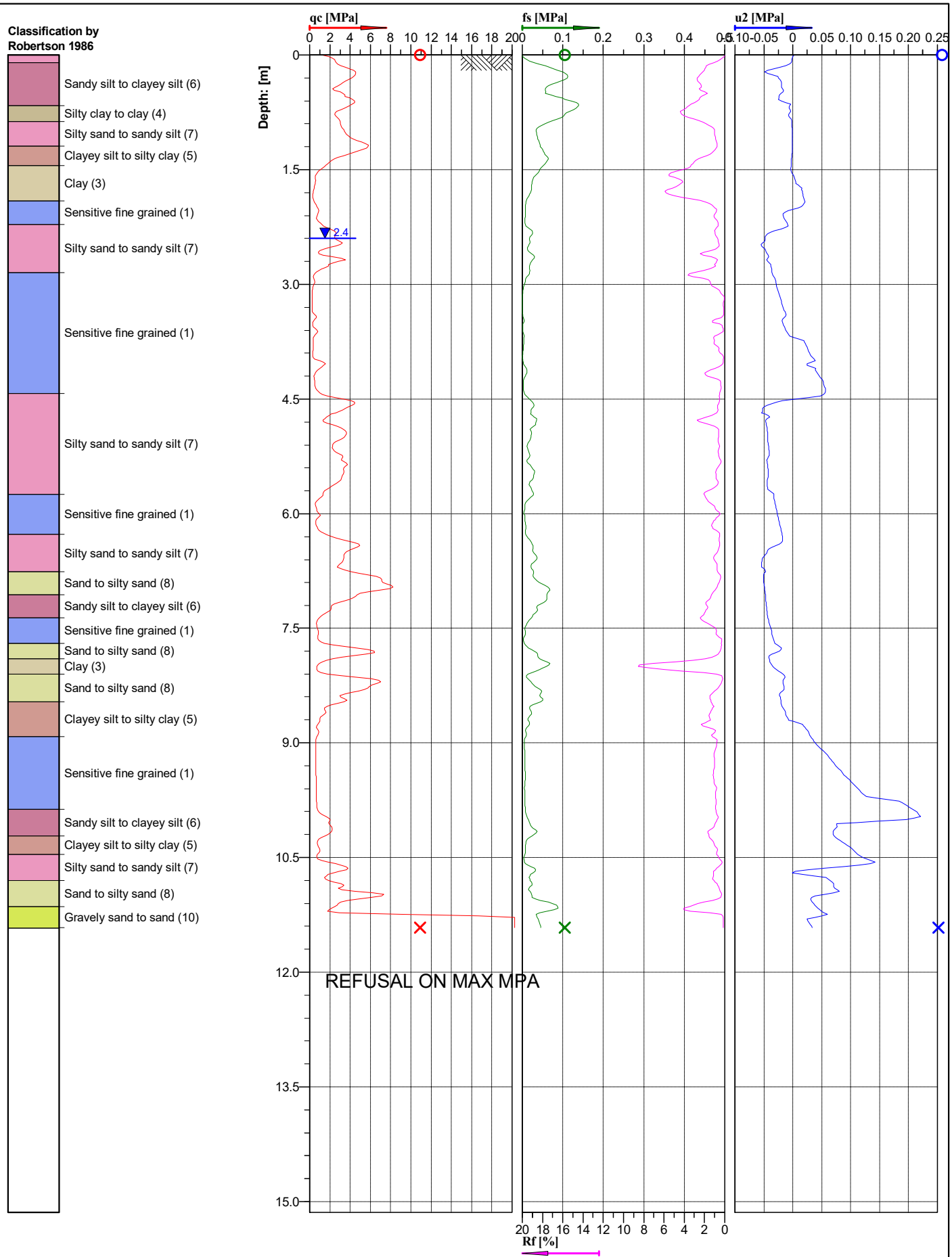


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT07
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.525331 E 176.91333		File: CPT07.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

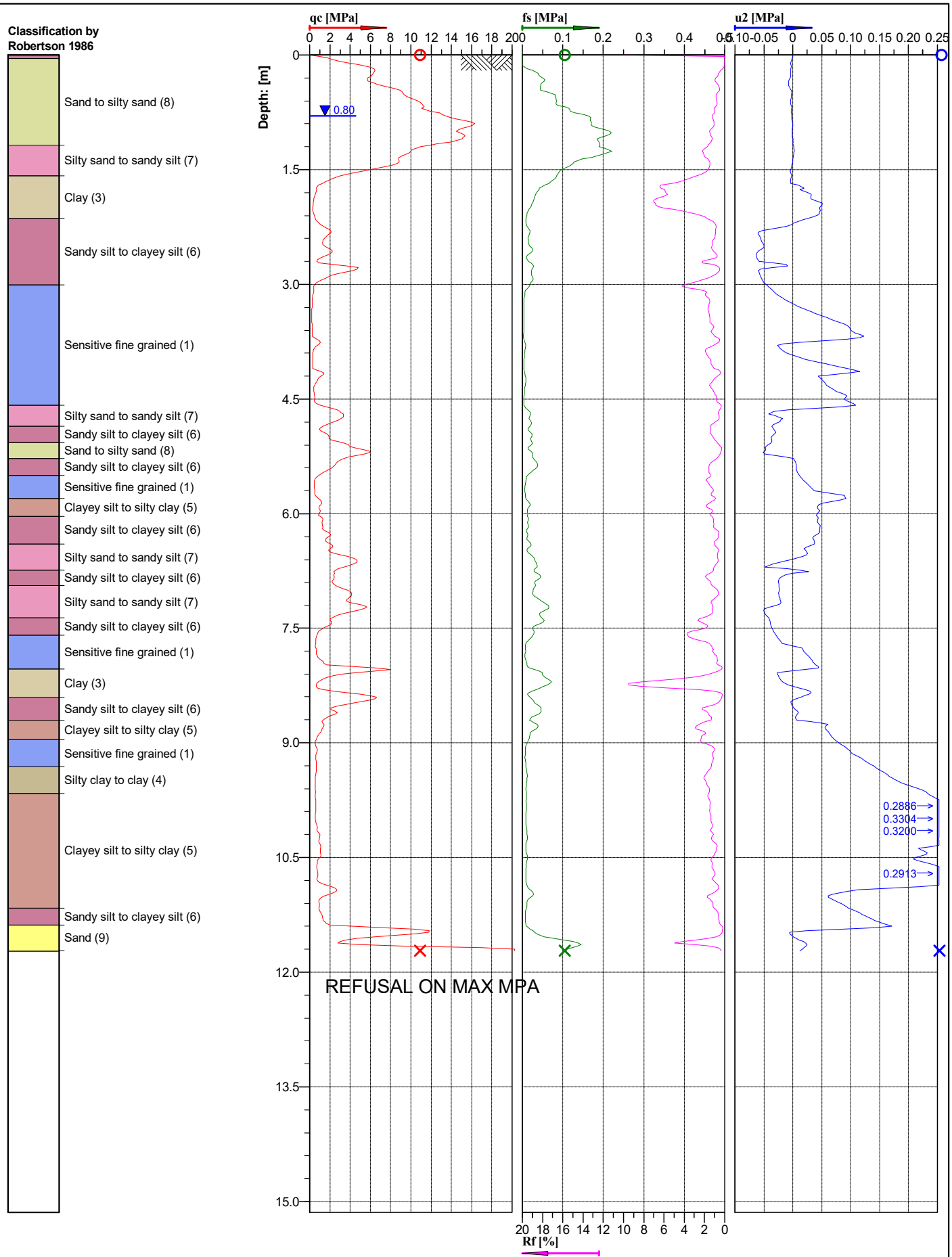


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT08
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52561 E 176.91335		File: CPT08.cpt	

GEOTECH DRILLING

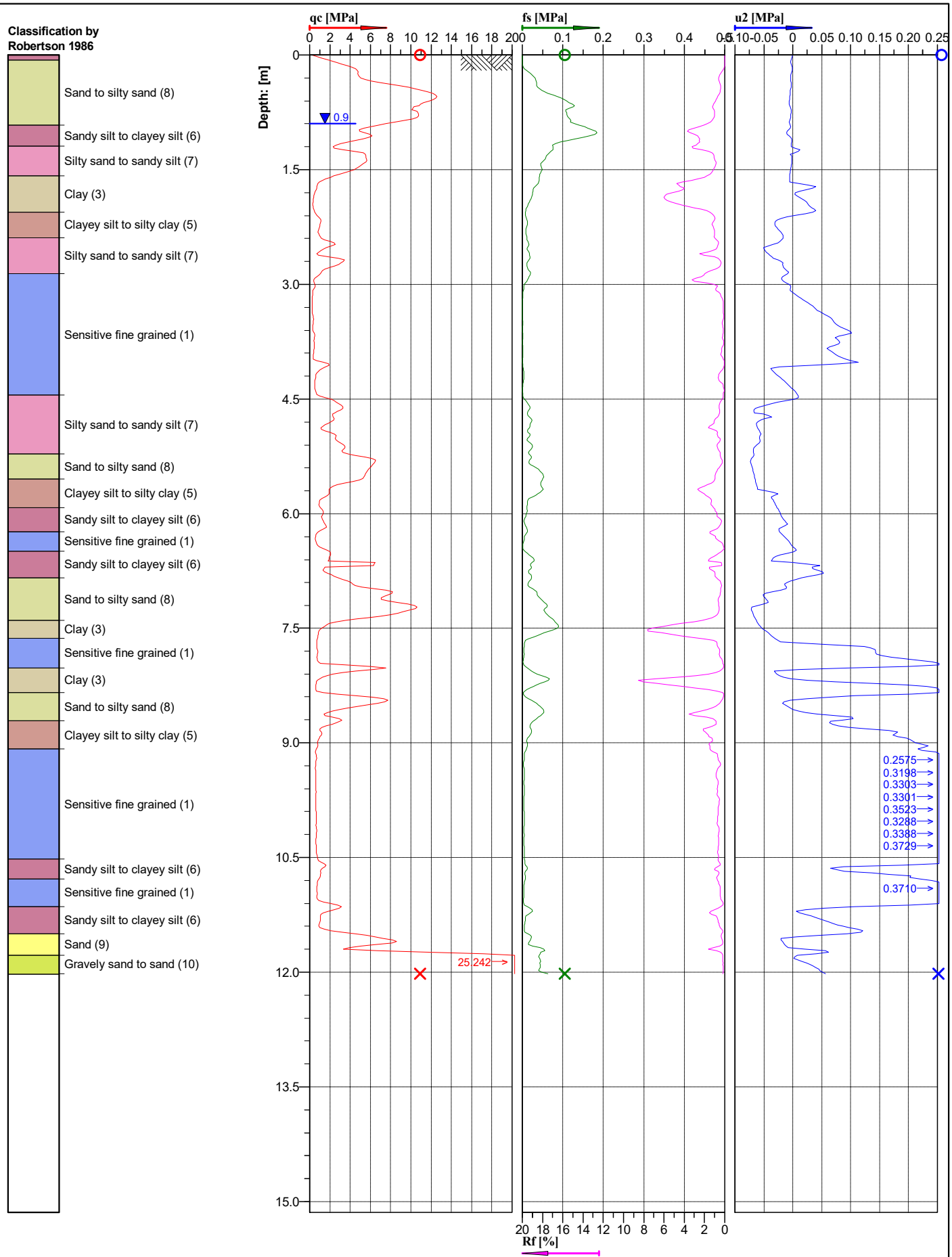
u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150



Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT09
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52592 E 176.91335		File: CPT09.cpt	

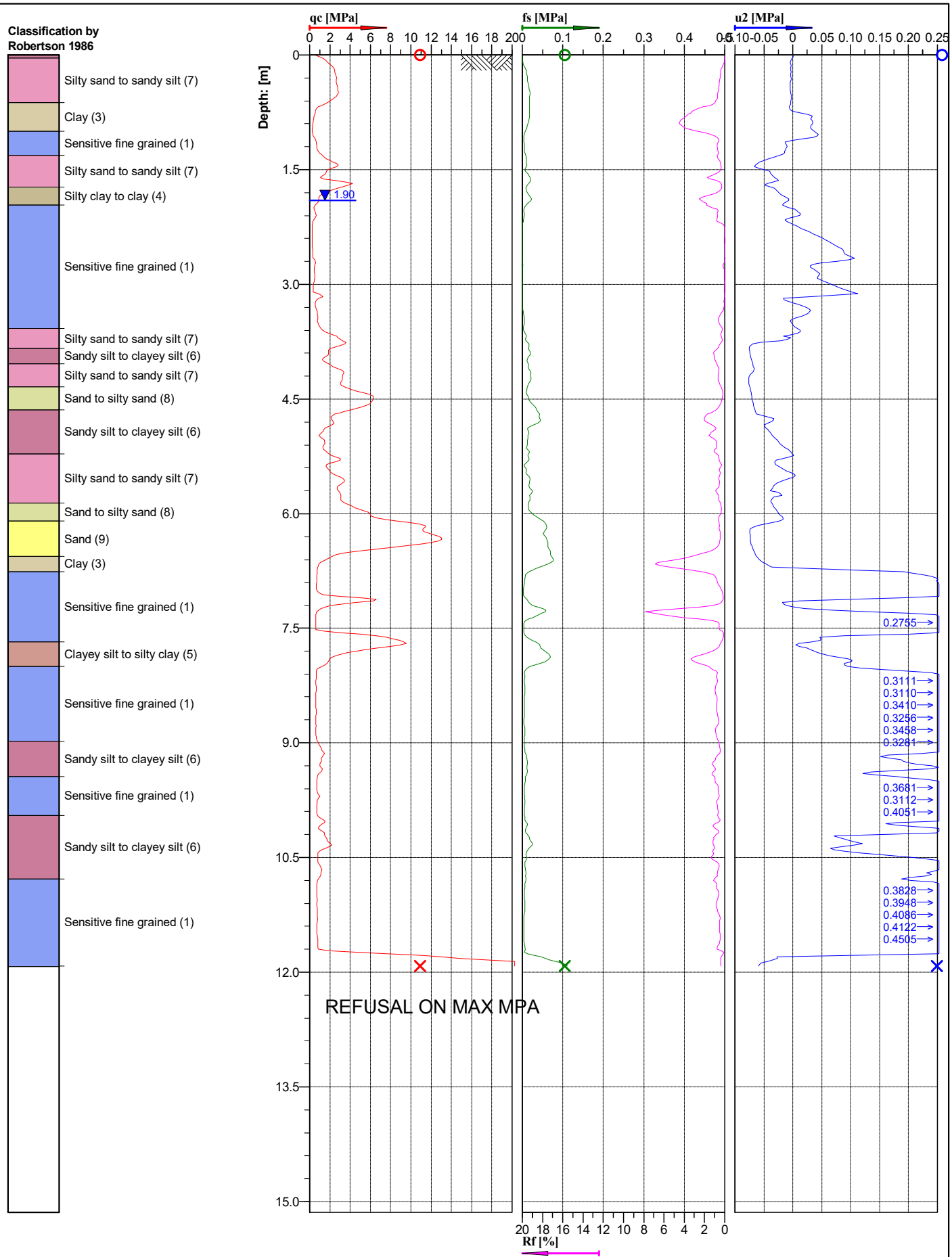


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT10
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52627 E 176.91335		File: CPT10.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150



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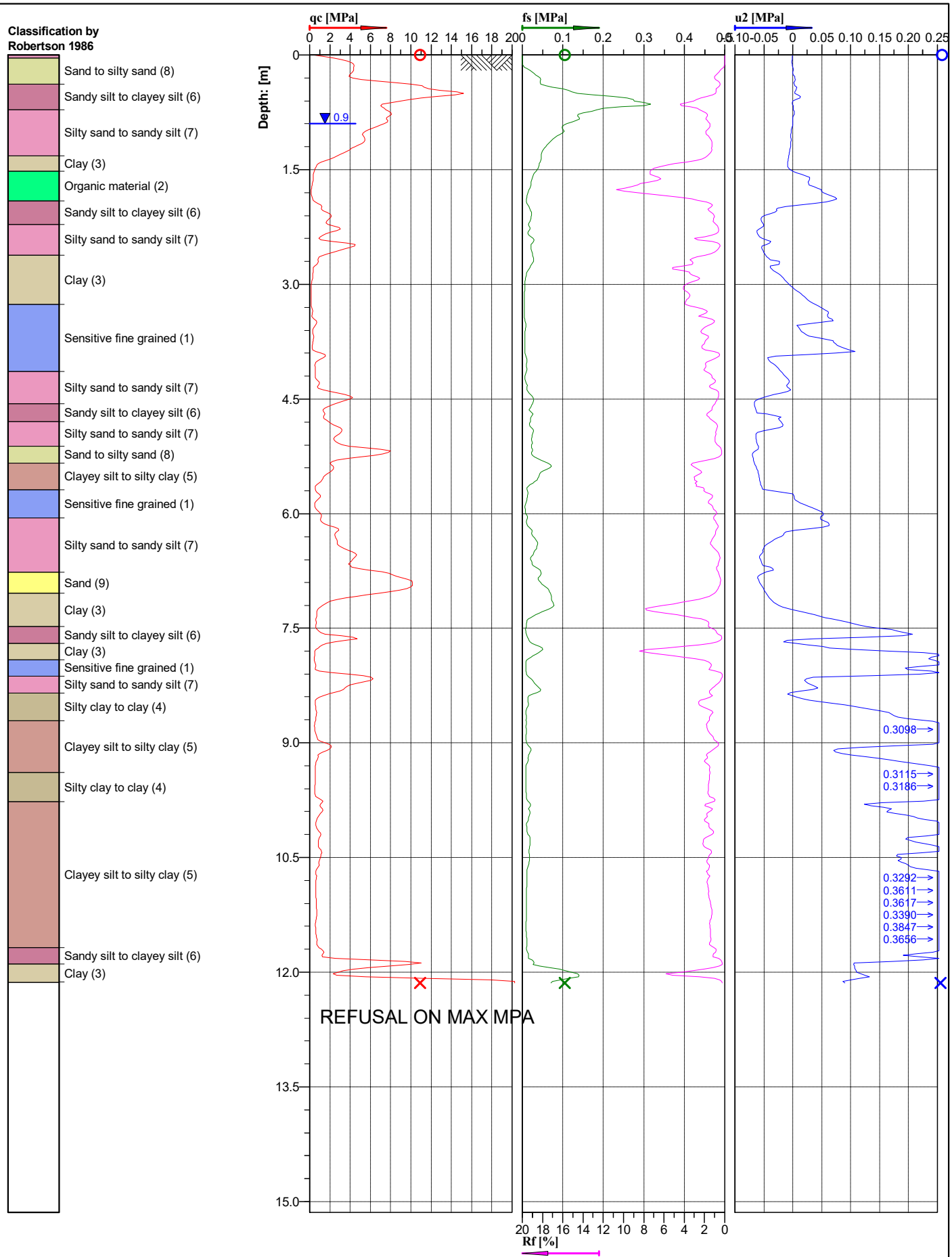
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52670 E 176.91299		File: CPT11.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150



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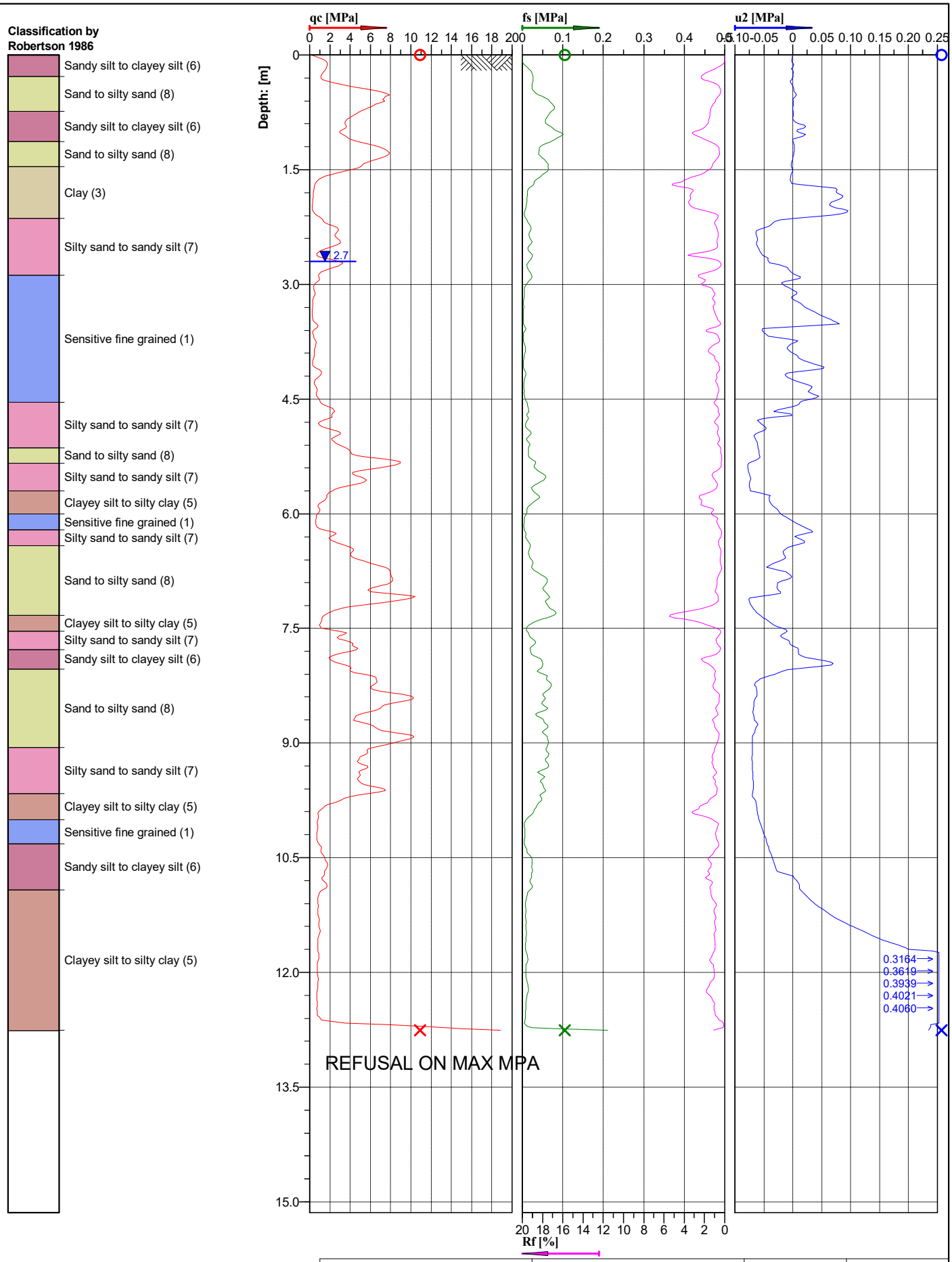
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52636 E 176.91293		File: CPT12.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

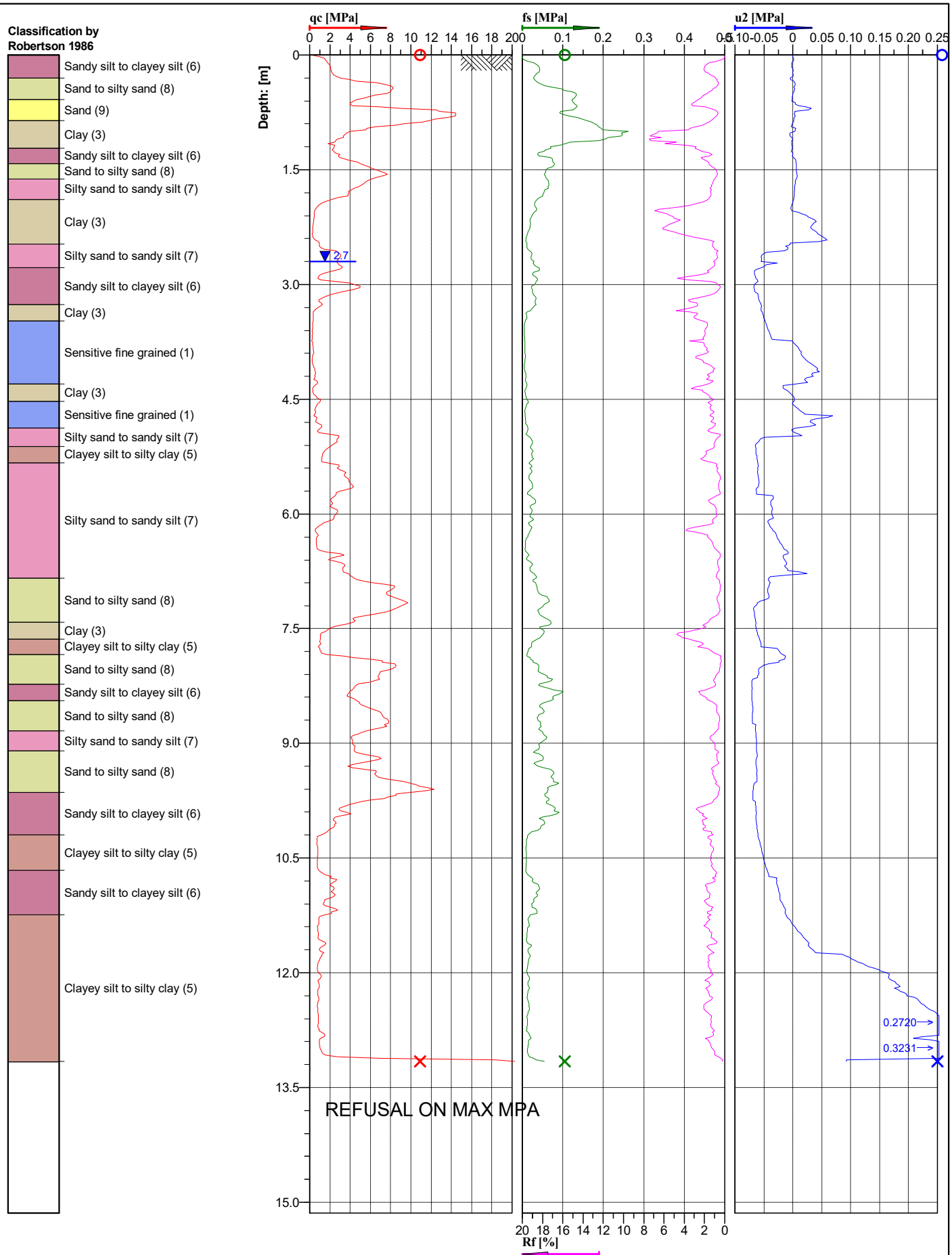


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT13
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52627 E 176.91258		File: CPT13.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

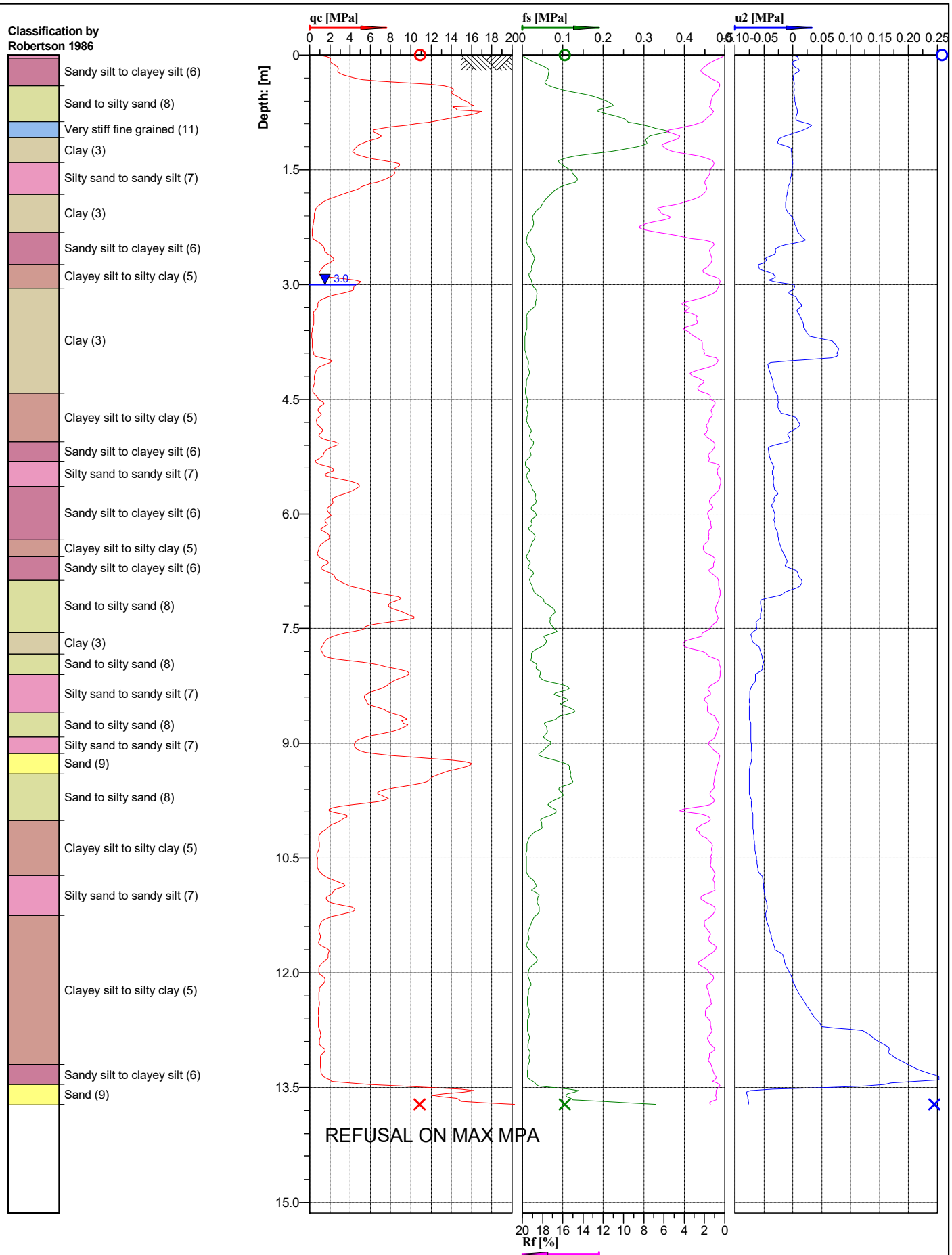


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT14
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52620 E 176.91228		File: CPT14.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

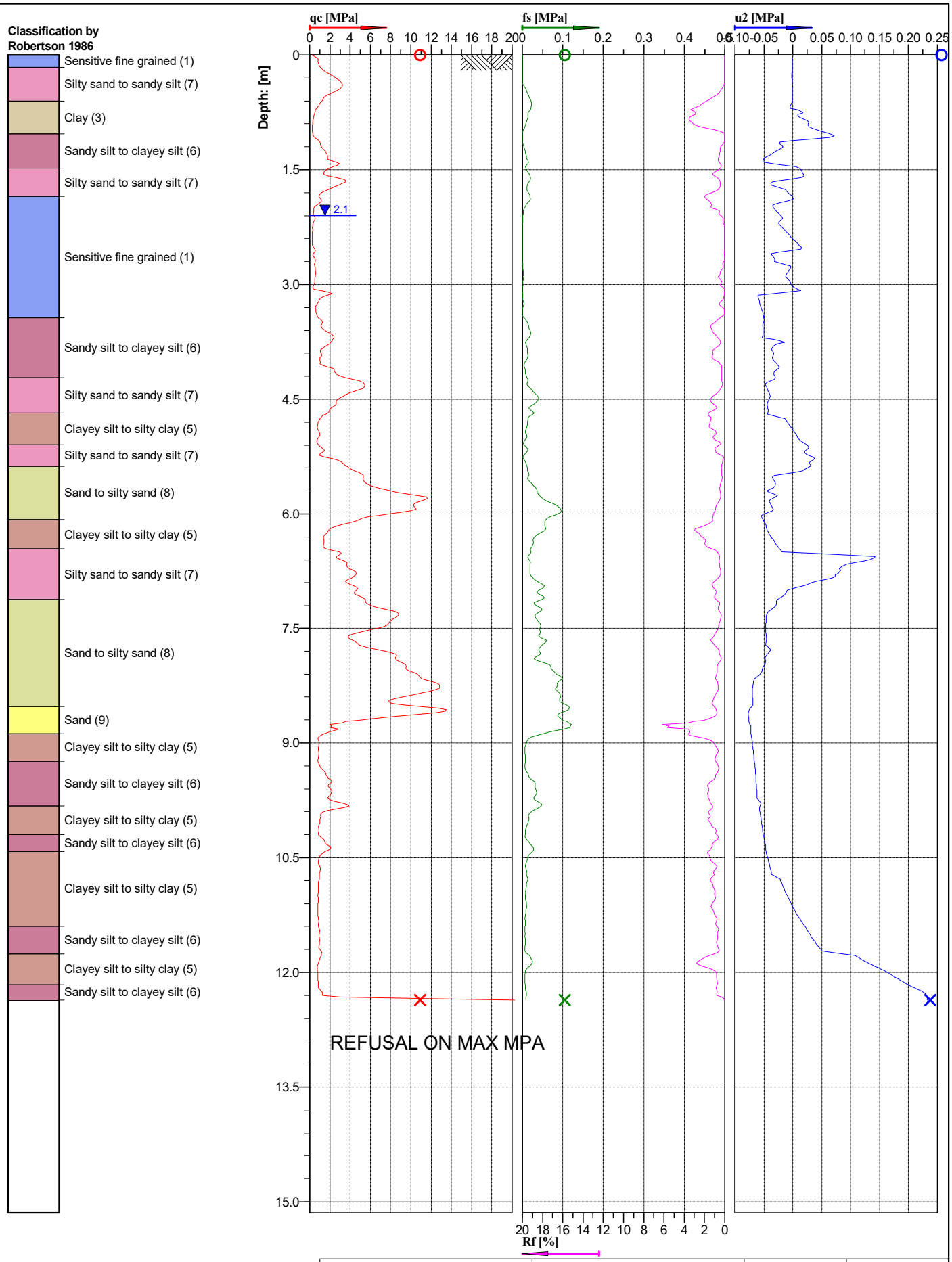


GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT15
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52625 E 176.91200		File: CPT15.cpt	

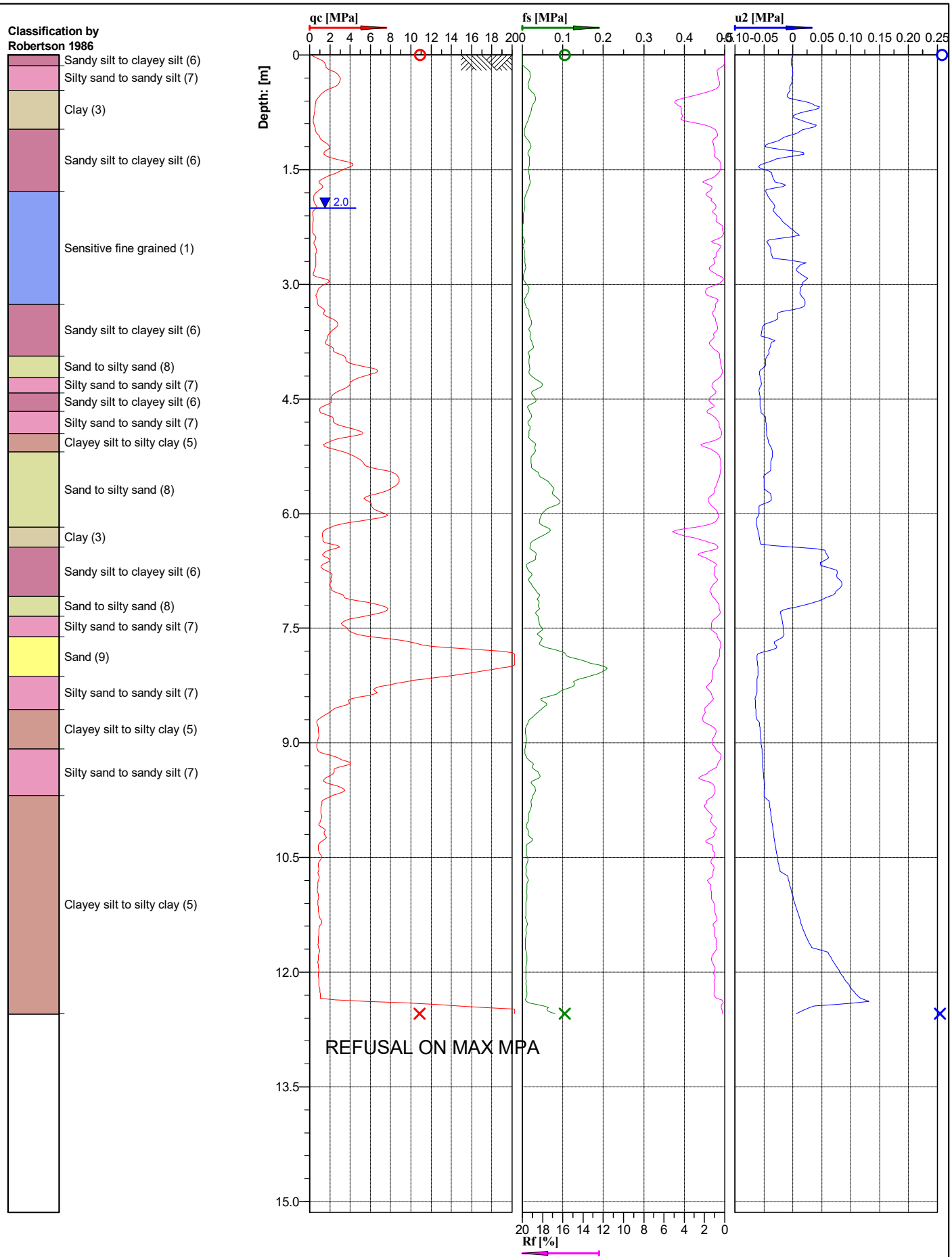


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT16
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52676 E 176.91240		File: CPT16.cpt	

GEOTECH DRILLING

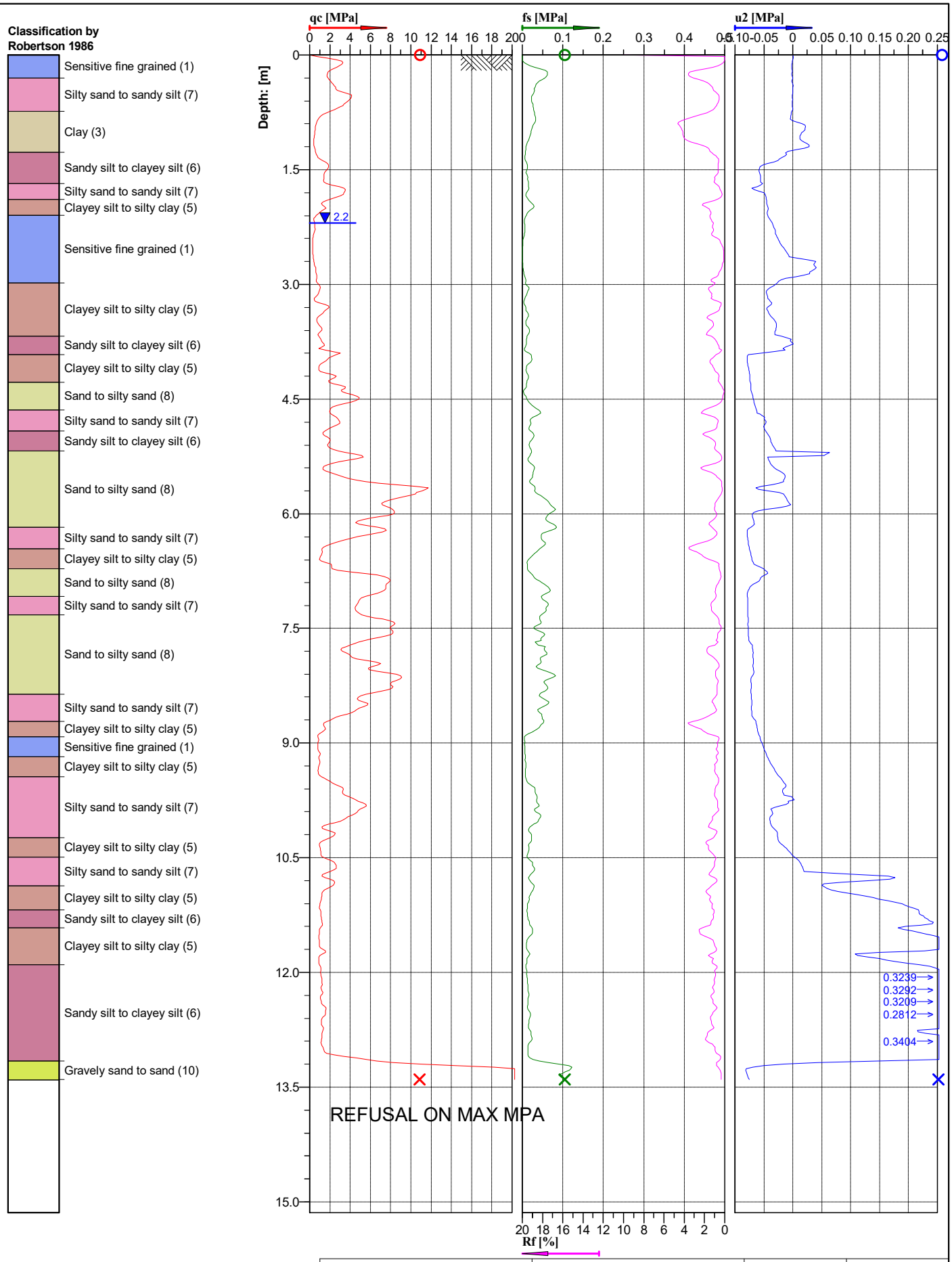
u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150



Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT17
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52707 E 176.91245		File: CPT17.cpt	

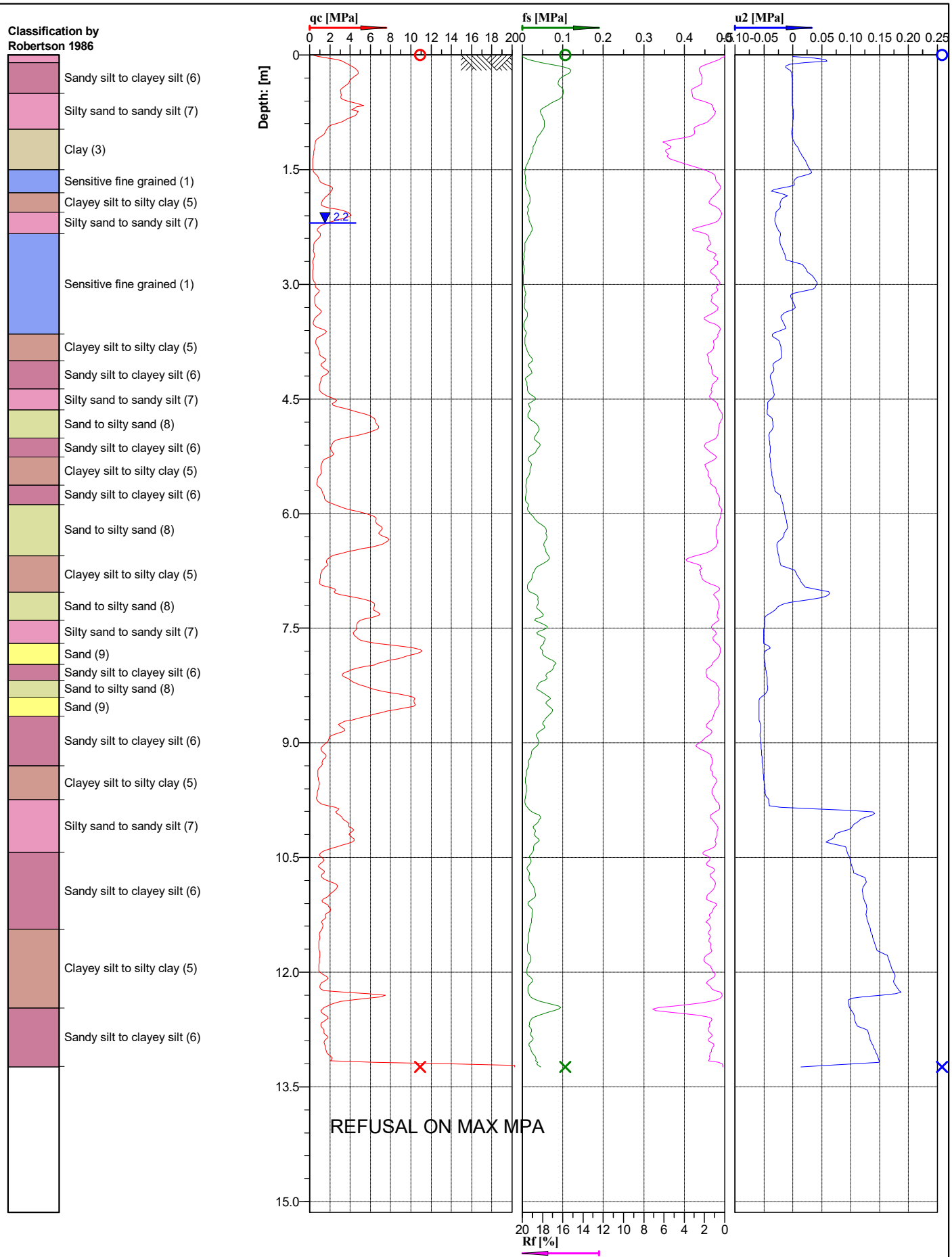


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT18
Project ID:	Client: INITIA	Date: 21/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52708 E 176.91197		File: CPT18.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

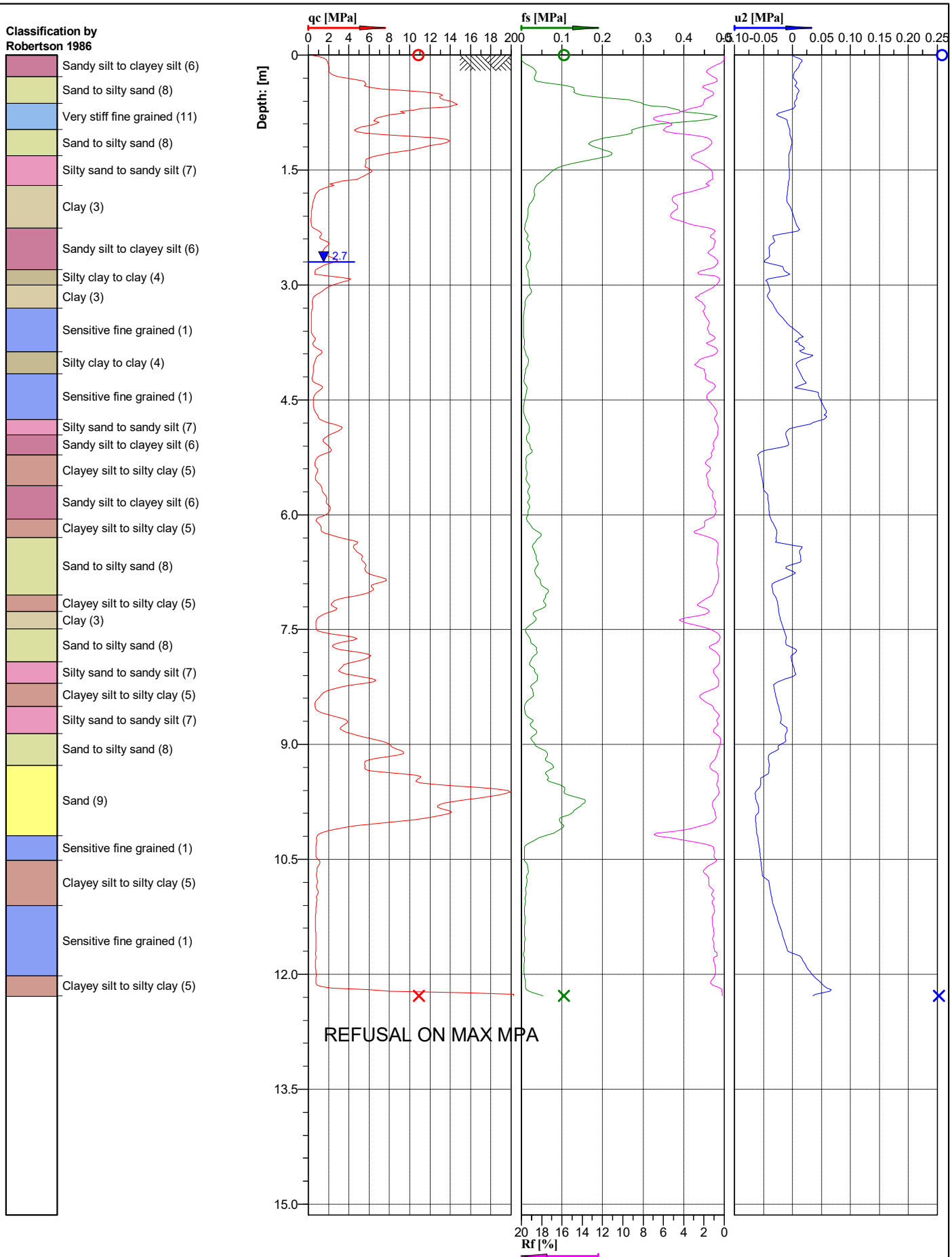


GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT19
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52673 E 176.91190		File: CPT19.cpt	

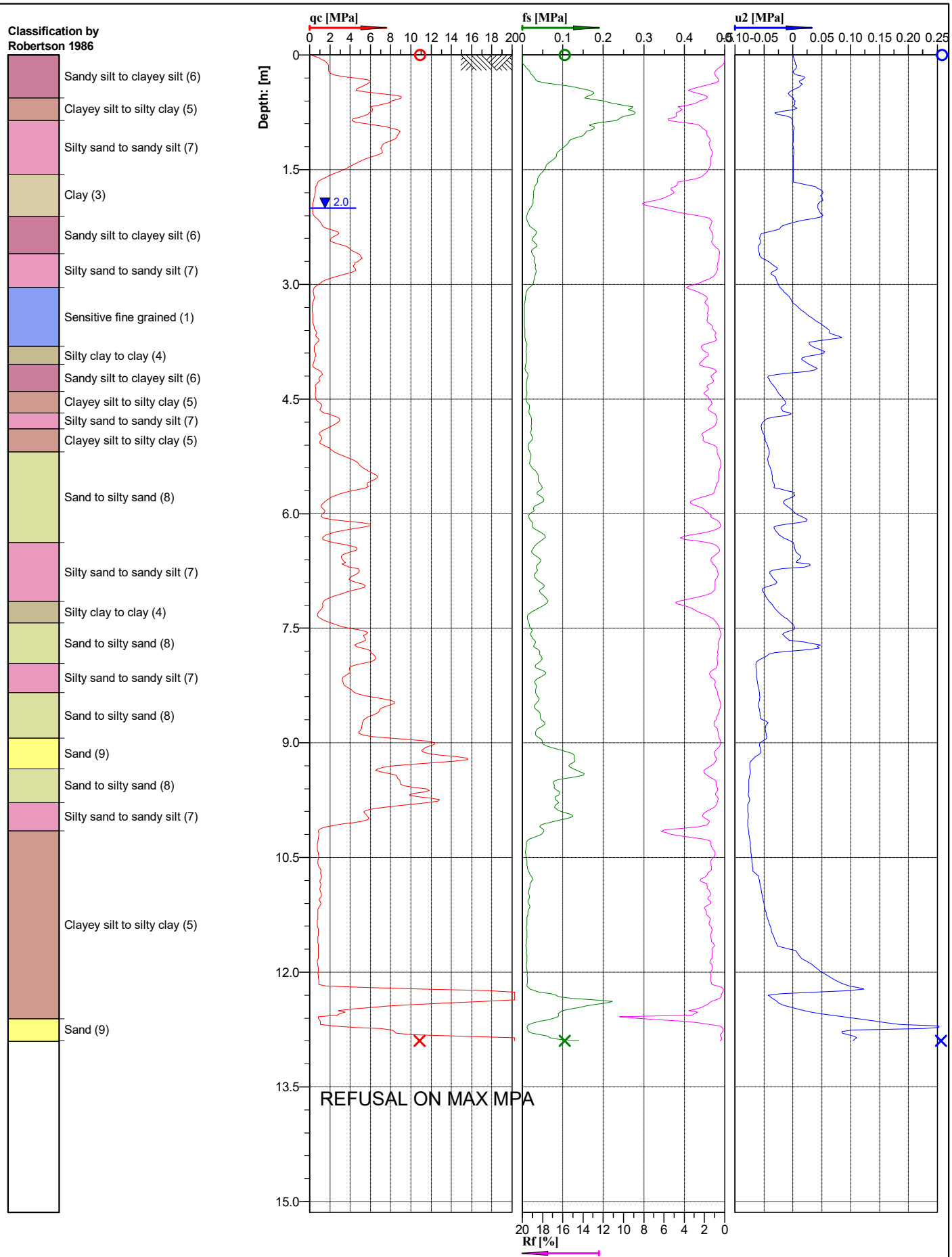


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT20
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52590 E 176.91278		File: CPT20.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

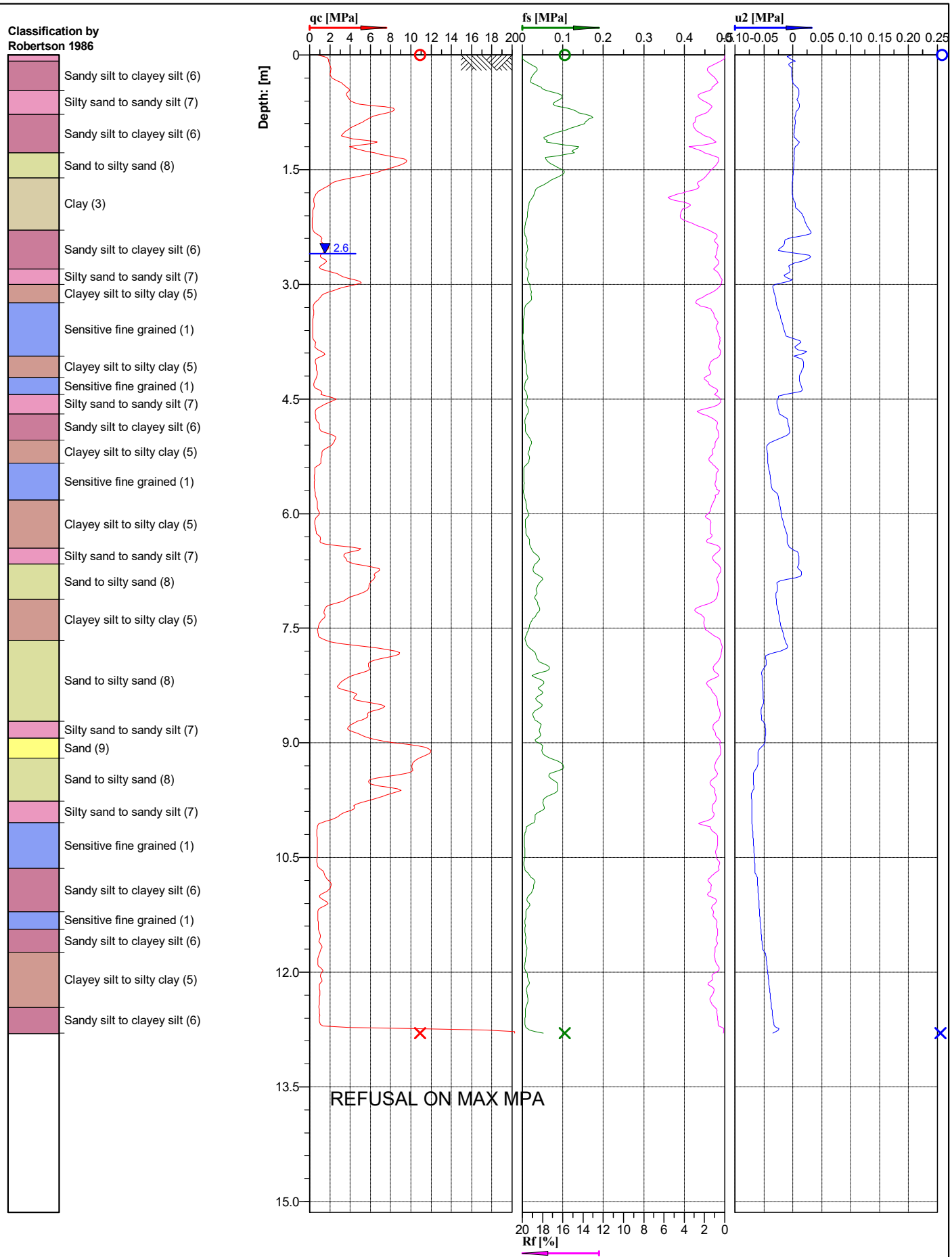


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT21
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52559 E 176.91254		File: CPT21.cpt	

GEOTECH DRILLING

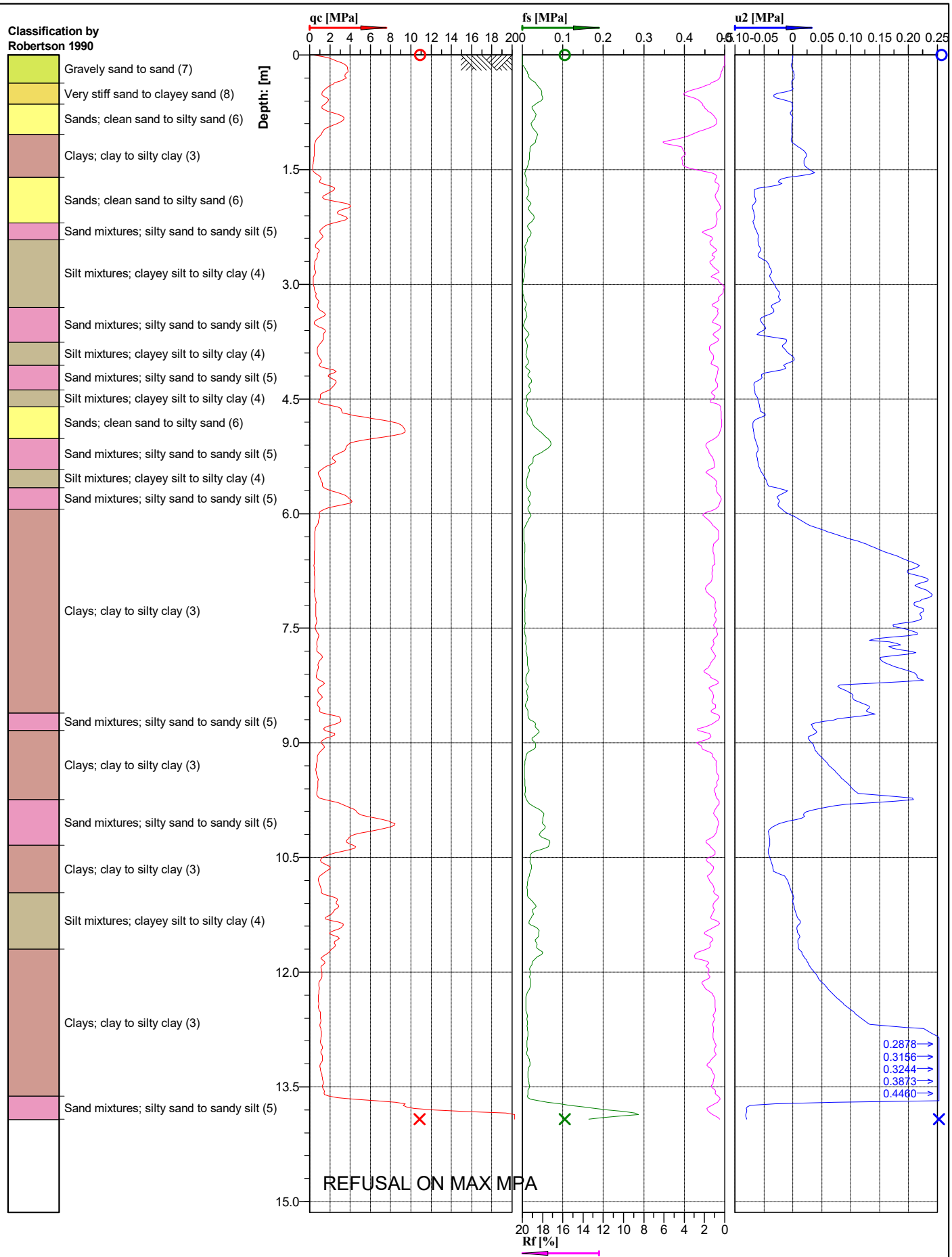
u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150



Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT22
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52594 E 176.91226		File: CPT22.cpt	

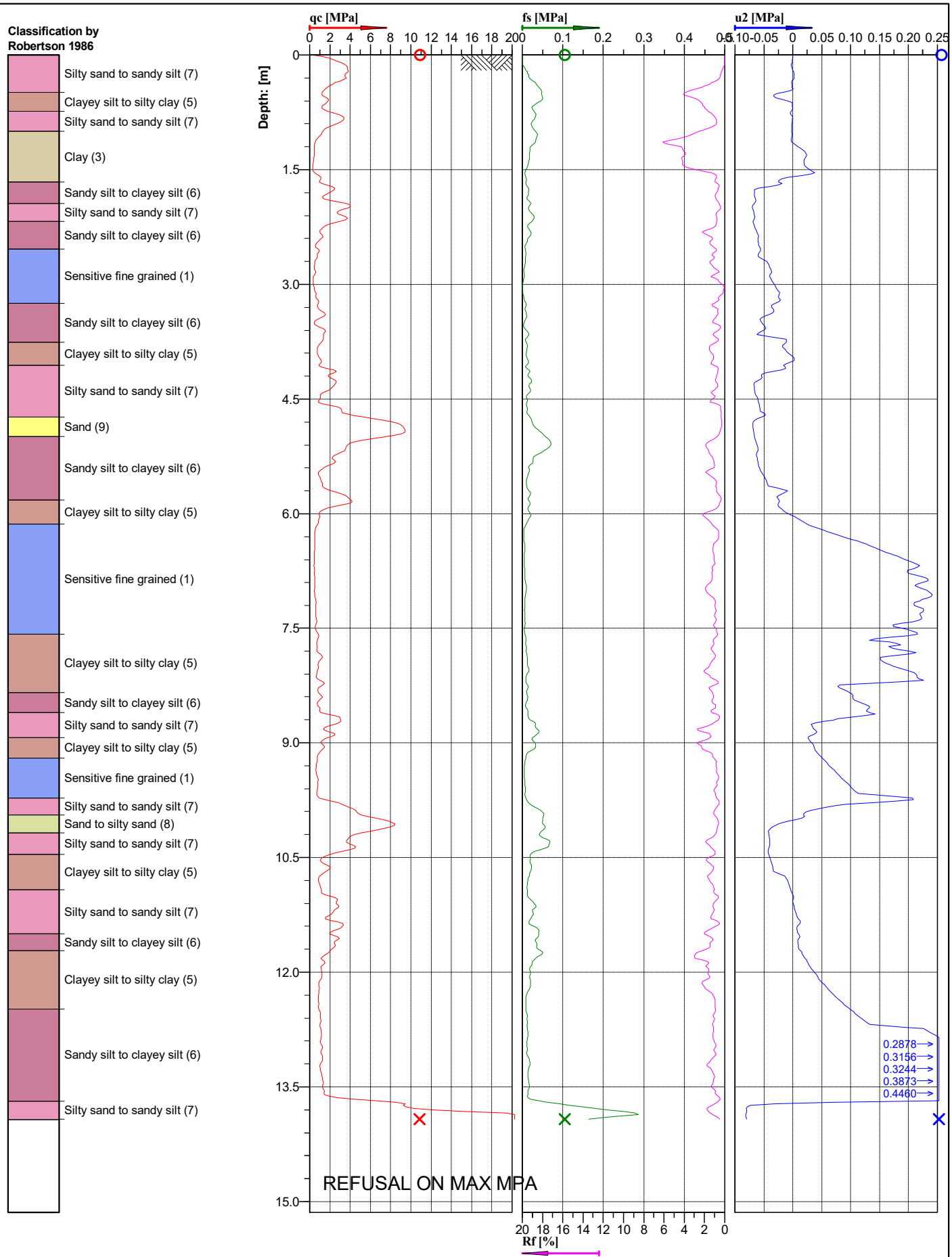


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT23
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52699 E 176.91153		File: CPT23.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

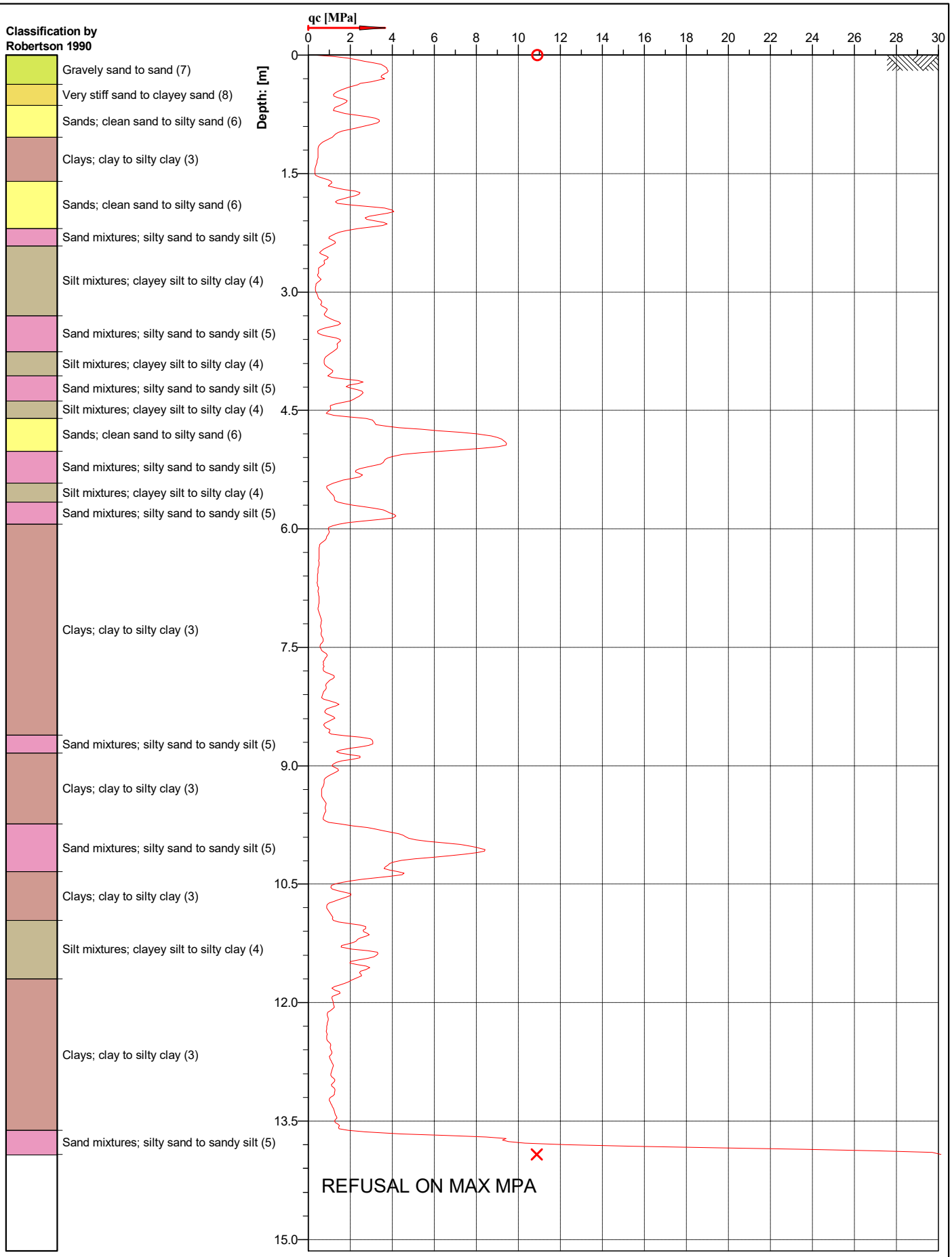


Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT23
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 67
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52699 E 176.91153		File: CPT23.cpt	

GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

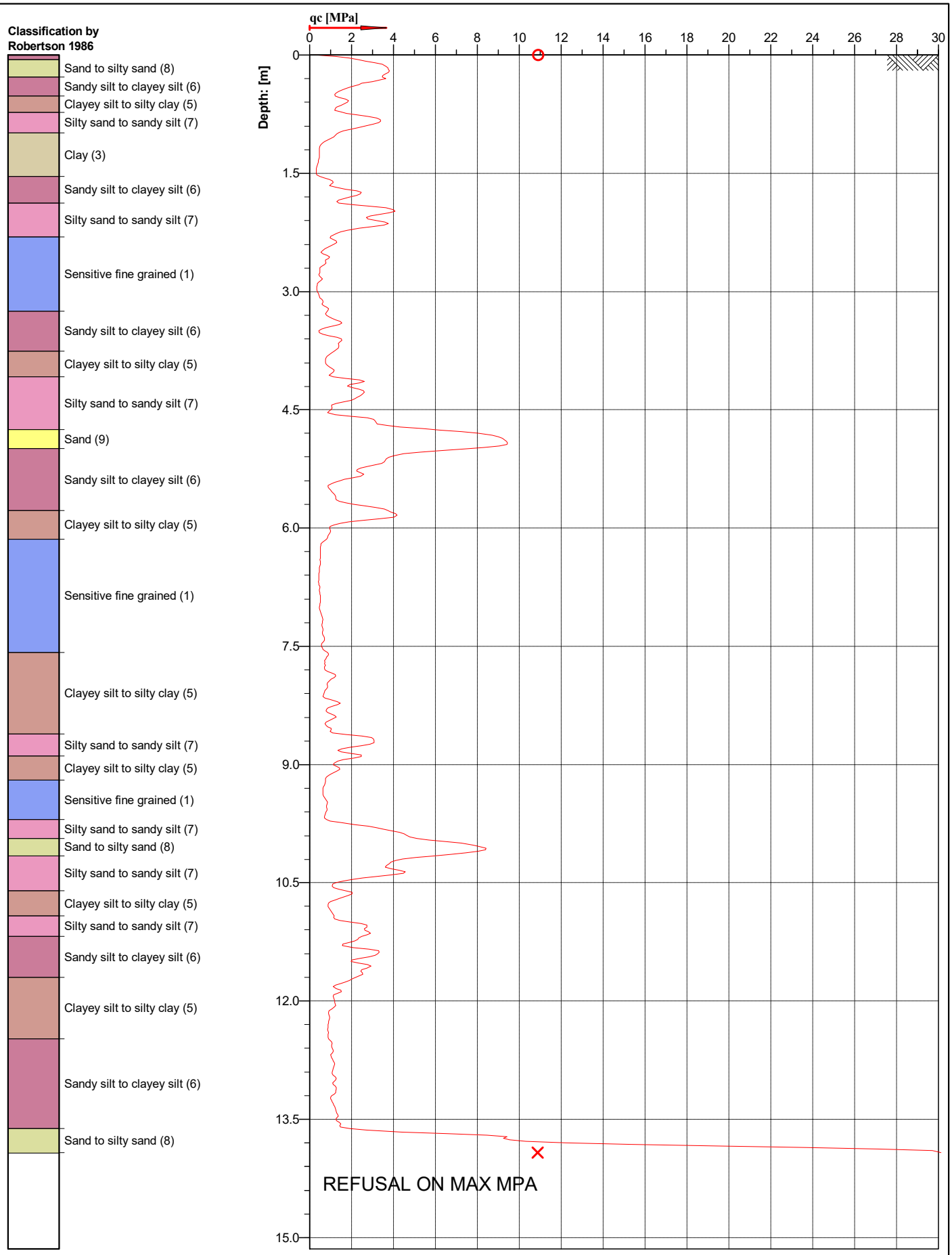


GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT23
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 65
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52699 E 176.91153		File: CPT23.cpt	

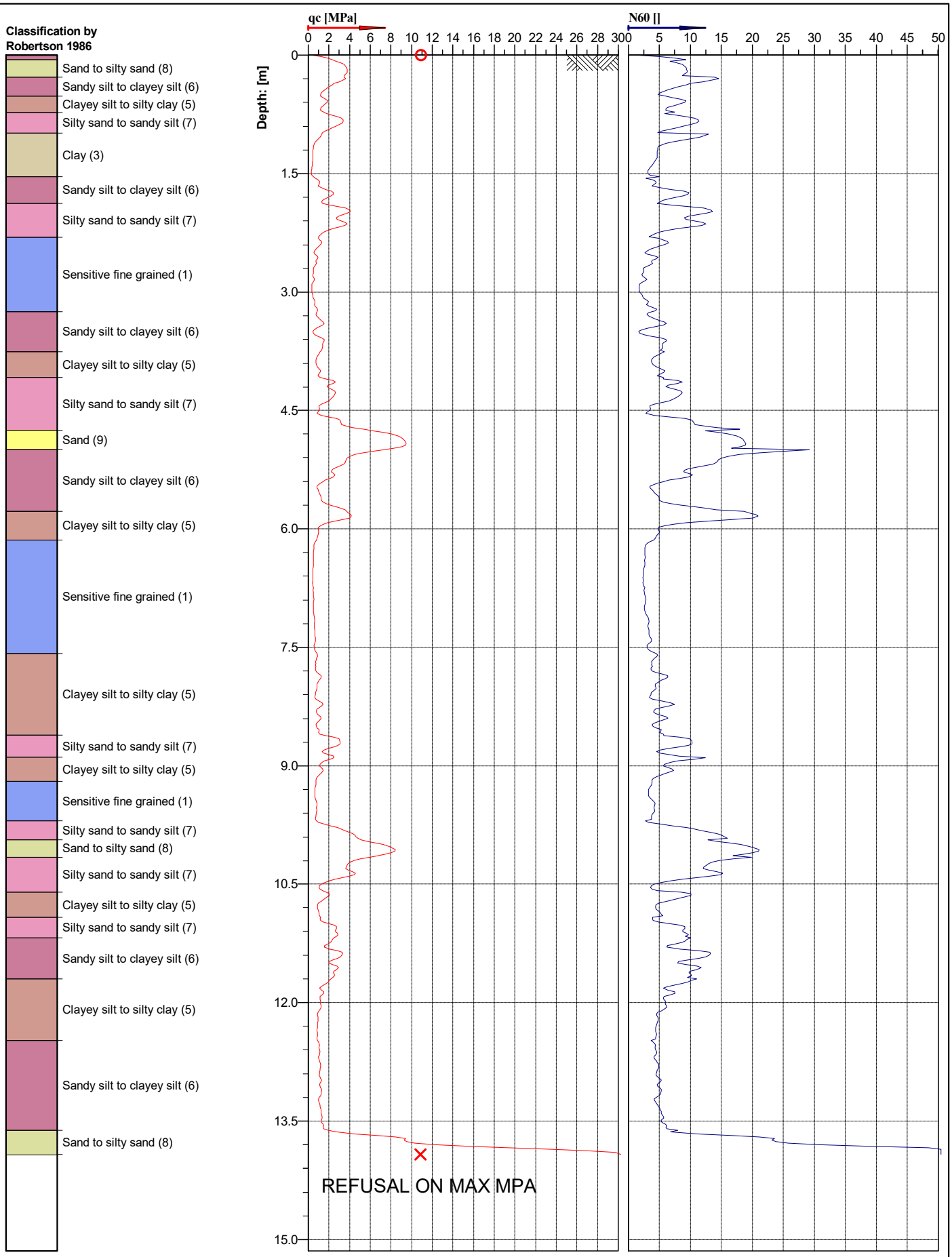


GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT23
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 65
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52699 E 176.91153		File: CPT23.cpt	



GEOTECH DRILLING

u2

Cone No: 5447
Tip area [cm2]: 10
Sleeve area [cm2]: 150

Location: NAPIER	Position: X: 0.00 m, Y: 0.00 m	Ground level: 0.00	Test No.: CPT23
Project ID:	Client: INITIA	Date: 22/05/2020	Scale: 1 : 65
Project: TE AWA KENNY RD		Page: 1/1	Fig.:
S 39.52699 E 176.91153		File: CPT23.cpt	

Appendix D Laboratory and Earthworks Testing Results

Babbage Geotechnical Laboratory
Level 4
68 Beach Road
Auckland 1010
Telephone
E-mail

P O Box 2027
New Zealand
64-9-367 4954
wec@babbage.co.nz

Please reply to: W.E. Campton

INITIA LTD.
PO Box 47647,
Ponsonby,
Auckland 1144

Attention: **LUKE WILLIAMS**

Job Number: 63548#L
BGL Registration Number: 2808
Checked by: WEC

29th May 2020

ATTERBERG LIMITS TESTING

Dear Sir,

Re: KENNY ROAD, AWATOTO, NAPIER

Report Number: 63548#L/AL

The following report presents the results of Atterberg Limits testing at BGL of soil samples delivered to this laboratory on the 25th of May 2020. Test results are summarised below, with page 3 showing where the samples plot on the Unified Soil Classification System (Casagrande) Chart. Test standards used were:

Water Content:	NZS4402:1986:Test 2.1
Liquid Limit:	NZS4402:1986:Test 2.2
Plastic Limit:	NZS4402:1986:Test 2.3
Plasticity Index:	NZS4402:1986:Test 2.4

Borehole Number	Sample Number	Depth (m)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
BH01	Sample 1	3.00 – 3.10	33.1	28 ◆	26 ◆	2 ◆
BH01	Sample 2	7.00 – 7.10	35.9	39	24	15
BH01	Sample 3	11.80 – 11.90	32.6	38	23	15
BH02	Sample 4	3.00 – 3.20	51.9	50	25	25
BH02	Sample 5	7.20 – 7.40	38.3	40 ◆	24 ◆	16 ◆
BH02	Sample 6	8.90 – 9.00	52.4	45	20	25

◆ = ***The soil fraction passing a 425μm sieve was used for the liquid limit and plastic limit tests.***

The whole soil was used for all water content tests (the soils were in a natural state), and for the liquid limit and plastic limit tests without a diamond beside them. The soil fraction passing a 425µm sieve was used for the liquid limit and plastic limit tests with a diamond (◆) beside them. The soil was wet up and dried where required for the liquid limit and plastic limit tests.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.2: liquid limit and test 2.3: plastic limit are reported to the nearest whole number.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

Justin Franklin
Signatory (Assistant Laboratory Manager)
Babbage Geotechnical Laboratory

IANZ
ACCREDITED LABORATORY
ACCREDITATION Nº: 126

Babbage Geotechnical Laboratory	Job Number: 63548#L	Sheet 1 of 1	Page 3 of 3
	Reg. Number: 2808	Version No:	6
	Report No: 63548#L/AL	Version Date:	September 2018
	Project:	**KENNY ROAD, AWATOTO, NAPIER**	

DETERMINATION OF THE LIQUID LIMIT, PLASTIC LIMIT & THE PLASTICITY INDEX

Test Methods: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4

Tested By:	JW / TH / WC	May 2020
Compiled By:	JF	29/05/2020
Checked By:	JF	29/05/2020

SUMMARY OF TESTING

Borehole Number	Sample Number	Depth (m)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification Based on USCS Chart Below
BH01	Sample 1	3.00 - 3.10	28	26	2	ML
BH01	Sample 2	7.00 - 7.10	39	24	15	CL
BH01	Sample 3	11.80 - 11.90	38	23	15	CL
BH02	Sample 4	3.00 - 3.20	50	25	25	CL / CH
BH02	Sample 5	7.20 - 7.40	40	24	16	CL
BH02	Sample 6	8.90 - 9.00	45	20	25	CL

The chart below & soil classification terminology is taken from ASTM D2487-17 "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)", January 2018, & is based on the classification scheme developed by A. Casagrande in the 1940's (Casagrande, A., 1948: Classification and identification of soil. Transactions of the American Society of Civil Engineers, v. 113, p. 901-930). The chart below & the soil classification given in the table above are included for your information only, and are not included in the IANZ endorsement for this report.

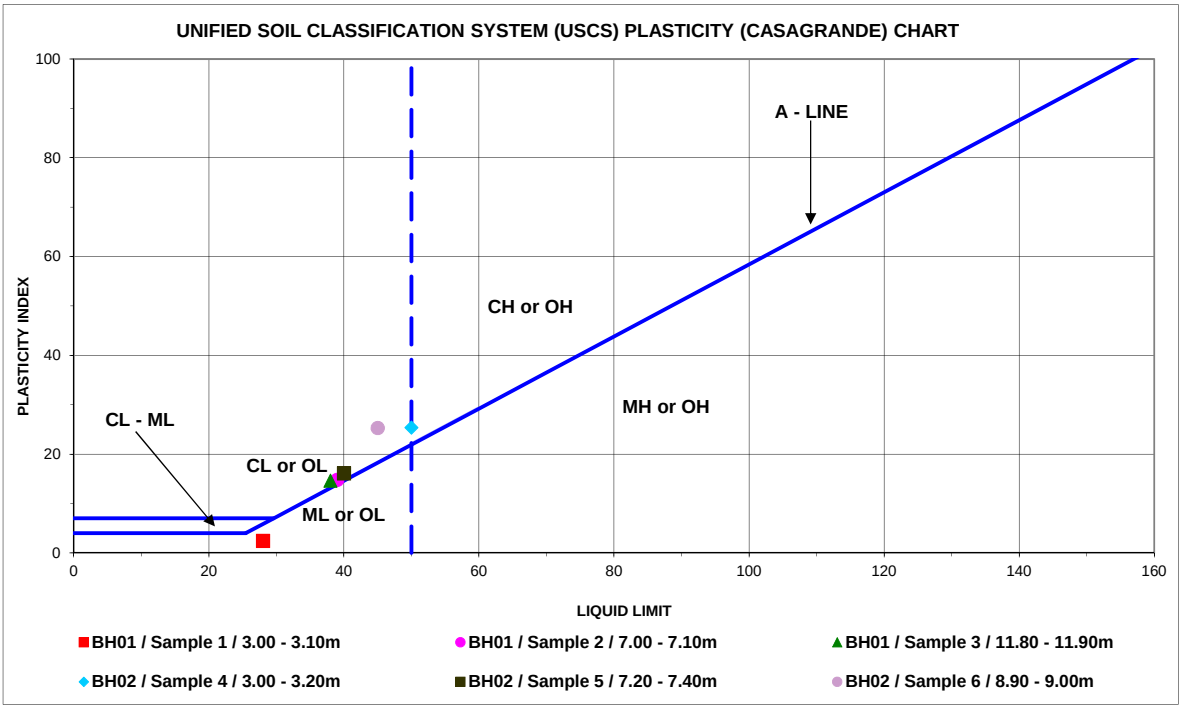


CHART LEGEND

CL = CLAY, low plasticity ('lean' clay)
OL = ORGANIC CLAY or ORGANIC SILT, low liquid limit
ML = SILT, low liquid limit
CL - ML = SILTY CLAY
CH = CLAY, high plasticity ('fat' clay)
OH = ORGANIC CLAY or ORGANIC SILT, high liquid limit
MH = SILT, high liquid limit ('elastic silt')

EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	**Greenstone Developments**	Sample description :	**Silt**	
Location :	**Kenny Rd - Napier**			
Client :	**H.Satherley, 248 Station Rd,Takapau**	Nuclear densometer no :	**76860**	
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³
Tested by :	**A.Ching**	Max dry density (tested) :	**1.68**	t/m³
Date tested :	**01/05/20**	Opt. water content (tested) :	**20**	%

Project No :	**2-L0301.15**
Lab Ref No :	**NA3330 / A**
Client Ref No :	

Nuclear Densometer Test Results

Lot Number	38		39		40		41		42		43			
Test Position	Front	Back	Front	Back	Front	Back	Front	Back	Front	Back	Front	Back		
Probe Depth (mm)	200	200	200	200	200	200	200	200	200	200	200	200		
Wet Density (t/m³)	1.72	2.01	1.79	1.95	1.90	1.80	1.84	1.88	1.84	1.86	1.72	1.82		
Dry Density (t/m³)	1.49	1.75	1.61	1.77	1.67	1.58	1.65	1.69	1.63	1.66	1.45	1.63		
Water Content (%)	16.0	14.5	10.6	10.0	13.6	14.1	11.6	11.4	12.9	11.9	18.8	11.7		
Air Voids (%)	19	7	21	14	13	17	17	16	17	16	17	18		
% of MDD	88	104	96	106	100	94	98	101	97	99	86	97		

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Fill height at finish level

Approved

Designation : *Laboratory Manager*

Date reported : 04/05/20

Date : 04/05/20

WSP
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Napier, New Zealand

Telephone +64 6 833 5590
Website www.wsp.com/nz

EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone Developments	Sample description :	Silt		
Location :	Kenny Rd - Napier				
Client :	H.Satherley, 248 Station Rd,Takapau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.6	t/m³	
Tested by :	A.Ching	Max dry density (tested) :	1.68	t/m³	
Date tested :	01/05/20	Opt. water content (tested) :	20	%	

Project No :	2-L0301.15
Lab Ref No :	NA3330 / A
Client Ref No :	

Nuclear Densometer Test Results

Lot Number	38		39		40		41		42		43			
Test Position	Front	Back	Front	Back	Front	Back	Front	Back	Front	Back	Front	Back		
Probe Depth (mm)	200	200	200	200	200	200	200	200	200	200	200	200		
Wet Density (t/m³)	1.72	2.01	1.79	1.95	1.90	1.80	1.84	1.88	1.84	1.86	1.72	1.82		
Dry Density (t/m³)	1.49	1.75	1.61	1.77	1.67	1.58	1.65	1.69	1.63	1.66	1.45	1.63		
Water Content (%)	16.0	14.5	10.6	10.0	13.6	14.1	11.6	11.4	12.9	11.9	18.8	11.7		
Air Voids (%)	19	7	21	14	13	17	17	16	17	16	17	18		
% of MDD	88	104	96	106	100	94	98	101	97	99	86	97		

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Fill height at finish level

Approved

Designation : *Laboratory Manager*

Date reported : 04/05/20

Date : 04/05/20

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Website www.wsp.com/nz

DRY DENSITY / WATER CONTENT RELATIONSHIP
STANDARD COMPACTION

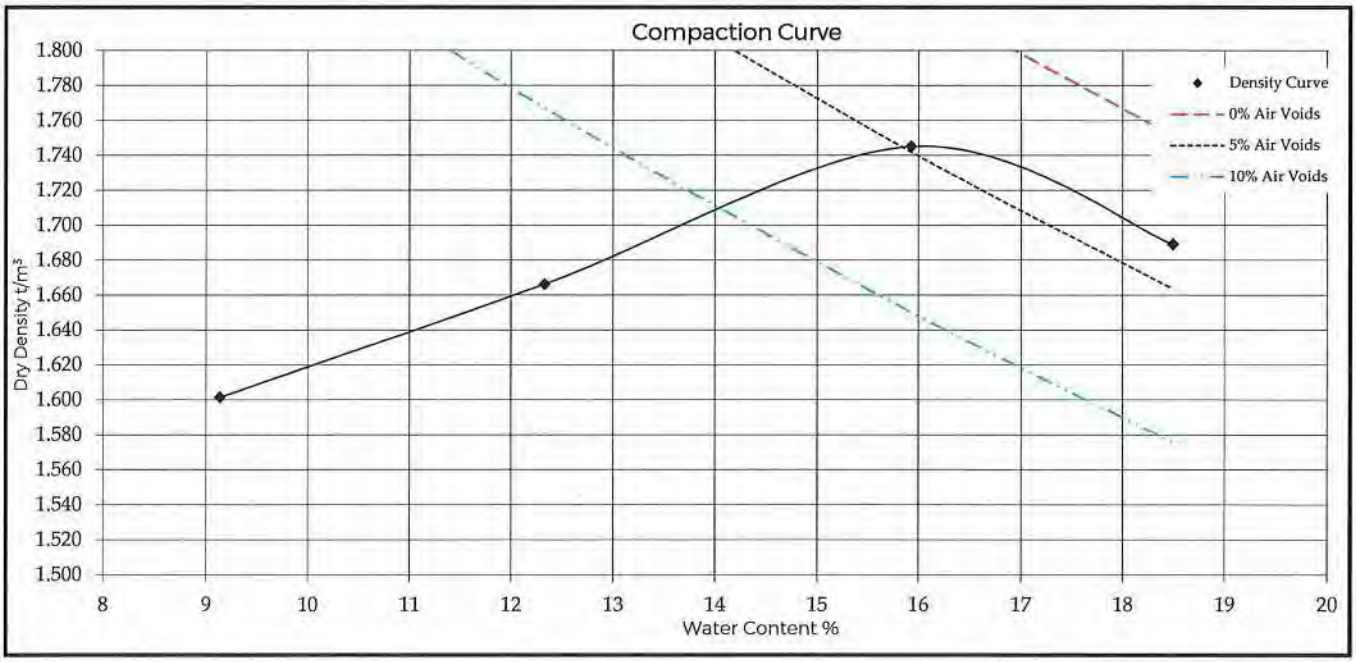
Project :	Summerset Village
Location :	Kenny Ave - Napier
Client :	H.Satherley, 240 Station Road, Waipukurau
Contractor :	HES Contracting
Sampled by :	Joe
Date sampled :	27/01/20
Sampling method :	Client Sampled
Sample description :	Brown Silt-Minor Gravel
Sample condition :	Dry
Solid density :	2.59 t/m³ (Assumed)
Source :	HB Gun Club

Project No :	2-L0301.15
Lab Ref No :	NA3247/2
Client Ref No :	Gun Club

Test Results

Maximum dry density	1.74 t/m³	Natural water content	12.3 %	
Optimum water content	15.9 %	Fraction tested	Passing 19mm test sieve	

Sample ID		2	Nat	3	4			
Bulk density	t/m³	1.748	1.872	2.023	2.002			
Water content	%	9.1	12.3	15.9	18.5			
Dry density	t/m³	1.601	1.666	1.745	1.689			
Sample condition		Dry Firm	Dry Firm	Moist Stiff	Wet Soft			



Test Methods		Notes
Compaction	NZS 4402 : 1986 Test 4.1.1 (Standard)	

Date tested : 14.02.20
Date reported : 17/02/20

Approved

J.Crichton

Designation : *Assistant Laboratory Manager*
Date : 17/02/20

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Silt**	
Location :	**Kenny Rd - Napier**			
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**	
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³
Tested by :	**A.Ching**	Max dry density (tested) :	**1.68**	t/m³
Date tested :	**28/02/20**	Opt. water content (tested) :	**20**	%

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / A**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	1	2	3	4		5	6	7	8					
Test Position	LOT 11					LOT 33								
Probe Depth (mm)	200	200	200	200		200	200	200	200					
Wet Density (t/m³)	1.98	1.87	1.96	1.95		1.94	2.02	2.03	1.98					
Dry Density (t/m³)	1.73	1.63	1.67	1.65		1.62	1.72	1.75	1.65					
Water Content (%)	14.5	15.0	17.0	18.5		19.5	17.5	16.5	20.0					
Air Voids (%)	8.5	13.1	7.1	6.2		5.9	4.0	4.1	3.6					
% of MDD	103	97	100	98		97	102	104	98					

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	**Notes**
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved

Designation : *Laboratory Manager*

Date reported : 03/03/20 Date : 03/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**A.Ching**
Date tested :	**28/02/20**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / A**
Client Ref No :	

Approved

Designation : *Laboratory Manager*

Date reported : 03/03/20 Date : 03/03/20

WSP
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Telephone +64 6 833 5590
Website www.wsp.com/nz

EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand	
Location :	Kenny Rd - Napier			
Client :	H.Satherly, 248 Station Rd, Waipukura	Nuclear densometer no :	76860	
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³
Date tested :	6/03/2020	Opt. water content (tested) :	18	%

Project No :	2-L0301.15
Lab Ref No :	NA3291 / B
Client Ref No :	

Nuclear Densometer Test Results

Test Number	1	2	3	4		5	6	7	8		9	10	11	12
Test Position	LOT 12					LOT 32					Lot 31			
Probe Depth (mm)	150	150	150	150		150	150	150	150		150	150	150	150
Wet Density (t/m³)	1.82	1.77	1.89	1.84		1.89	1.91	1.88	2.07		1.85	1.83	1.76	1.82
Dry Density (t/m³)	1.60	1.59	1.70	1.63		1.66	1.59	1.61	1.76		1.62	1.60	1.58	1.61
Water Content (%)	13.2	11.6	10.9	12.7		13.8	19.6	16.7	17.8		14.1	14.1	11.5	13.0
Air Voids (%)	15.7	19.0	14.4	15.2		11.9	6.0	9.7	-0.4		13	14	20	16
% of MDD	99	98	105	101		102	98	99	108		100	99	98	99

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Arthur Ching

Designation : *Laboratory Manager*

Date reported : 09/03/20 Date : 09/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**6/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / B**
Client Ref No :	

Approved

Designation : *Laboratory Manager*

Date reported : 09/03/20 Date : 09/03/20

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Fine Sand**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.54**	t/m³	
Tested by :	**J.Hammond**	Max dry density (tested) :	**1.62**	t/m³	
Date tested :	**10/03/2020**	Opt. water content (tested) :	**18**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	27	28	29	30		31	32	33						
Test Position	LOT 11					LOT 12								
Probe Depth (mm)	150	150	150	150		150	150	150						
Wet Density (t/m³)	1.86	1.84	2.00	1.91		2.00	1.91	1.87						
Dry Density (t/m³)	1.64	1.61	1.68	1.64		1.72	1.68	1.65						
Water Content (%)	13.8	14.2	19.3	16.3		16.6	13.8	13.3						
Air Voids (%)	13.0	13.5	1.5	8.8		3.9	10.7	13.2						
% of MDD	101	100	104	101		106	104	102						

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukura	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	10/03/2020	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / C
Client Ref No :	

Nuclear Densometer Test Results

Test Number	17	18	19			20	21	22	23		24	25	26	
Test Position	LOT 33					Lot 32					Lot 31			
Probe Depth (mm)	150	150	150			150	150	150	150		150	150	150	
Wet Density (t/m³)	1.92	1.84	1.92			1.94	1.82	1.88	1.97		1.90	1.96	2.01	
Dry Density (t/m³)	1.61	1.61	1.69			1.68	1.63	1.64	1.69		1.67	1.62	1.68	
Water Content (%)	19.5	14.8	13.9			15.5	11.6	14.7	16.3		13.9	21.0	19.9	
Air Voids (%)	5.5	13.0	10.1			7.8	17.0	11.3	5.8		11	2	0	
% of MDD	99	99	104			104	101	101	104		103	100	104	

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Arthur Ching

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Brown Silt**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³	
Tested by :	**J.Hammond**	Max dry density (tested) :	**1.68**	t/m³	
Date tested :	**10/03/2020**	Opt. water content (tested) :	**20**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	13	14	15	16										
Test Position	LOT 45													
Probe Depth (mm)	150	150	150	150										
Wet Density (t/m³)	2.04	2.10	2.08	2.02										
Dry Density (t/m³)	1.69	1.78	1.75	1.67										
Water Content (%)	20.3	17.4	19.2	21.5										
Air Voids (%)	0.4	0.3	-0.7	0.2										
% of MDD	101	106	104	99										

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	**Notes**
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Brown Silt**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³	
Tested by :	**J.Hammond**	Max dry density (tested) :	**1.68**	t/m³	
Date tested :	**10/03/2020**	Opt. water content (tested) :	**20**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	1	2	3	4		5	6	7	8		9	10	11	12
Test Position	LOT 48					LOT 47					LOT 46			
Probe Depth (mm)	150	150	150	150		150	150	150	150		150	150	150	150
Wet Density (t/m³)	2.03	2.07	2.05	2.03		2.03	2.03	2.04	2.08		1.98	2.00	2.03	2.11
Dry Density (t/m³)	1.72	1.74	1.76	1.73		1.70	1.72	1.73	1.75		1.65	1.66	1.68	1.77
Water Content (%)	18.1	18.6	16.4	17.5		19.7	17.7	17.8	18.5		19.6	20.6	20.7	19.4
Air Voids (%)	2.8	0.6	3.4	3.3		1.4	3.1	2.6	0.3		4	2	1	-2
% of MDD	102	104	105	103		101	103	103	104		98	99	100	105

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**10/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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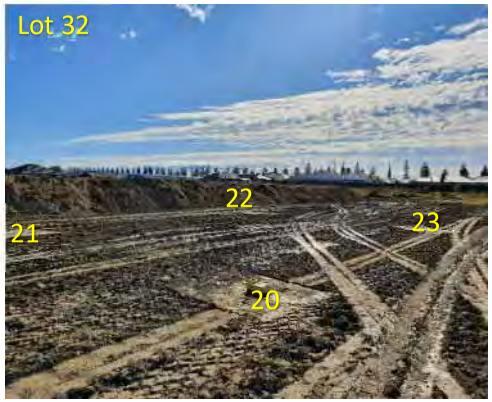
EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Summerset - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**10/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	



Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**10/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Brown Silt		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.6	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.68	t/m³	
Date tested :	11/03/2020	Opt. water content (tested) :	20	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / D
Client Ref No :	Finish Level

Nuclear Densometer Test Results

Test Number	1	2		3	4		5	6		7	8			
Test Position	LOT 48			LOT 47			LOT 46			LOT 45				
Probe Depth (mm)	150	150		150	150		150	150		150	150			
Wet Density (t/m³)	1.84	1.90		1.99	2.06		1.97	1.95		2.07	2.07			
Dry Density (t/m³)	1.60	1.65		1.67	1.75		1.72	1.69		1.76	1.78			
Water Content (%)	14.9	15.4		18.9	17.4		14.8	15.0		17.8	16.1			
Air Voids (%)	14.6	11.2		3.9	2.2		8.4	9.6		1	3			
% of MDD	95	98		100	104		102	101		105	106			

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 11/03/2020 Date : 11/03/2020

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**11/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / D**
Client Ref No :	

Approved **Jason Crichton**

Designation : *Assistant Laboratory Manager*

Date reported : 11/03/20 Date : 11/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Brown Silt - Minor Gravel		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.59	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.74	t/m³	
Date tested :	19/03/2020	Opt. water content (tested) :	15.9	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Number	North	South		North	South		North	South		North	South			
Test Position	Lot 38			Lot 39			Lot 40			Lot 41				
Probe Depth (mm)	150	150		150	150		150	150		150	150			
Wet Density (t/m³)	2.02	2.08		2.01	2.04		1.89	2.05		2.04	2.07			
Dry Density (t/m³)	1.66	1.78		1.77	1.74		1.68	1.74		1.72	1.77			
Water Content (%)	21.6	16.5		13.8	17.3		12.2	17.9		18.9	16.7			
Air Voids (%)	0.2	1.8		7.3	2.6		14.5	1.6		1	2			
% of MDD	95	102		102	100		97	100		99	102			

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	Greenstone- Te Awa	Sample description :	Brown Silt		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.6	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.68	t/m³	
Date tested :	19/03/2020	Opt. water content (tested) :	20	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Number	West	East		West	East		West	East						
Test Position	Lot 25			Lot 26			Lot 27							
Probe Depth (mm)	150	150		150	150		150	150						
Wet Density (t/m³)	1.98	1.96		1.99	1.97		1.97	1.98						
Dry Density (t/m³)	1.65	1.65		1.63	1.65		1.60	1.62						
Water Content (%)	20.5	18.6		22.0	19.1		22.9	22.3						
Air Voids (%)	2.9	5.9		1.6	4.7		1.7	1.8						
% of MDD	98	98		97	99		95	96						

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Silty Gravel	
Location :	Kenny Rd - Napier			
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860	
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.65	t/m³
Tested by :	J.Hammond	Max dry density (assumed) :	2.2	t/m³
Date tested :	19/03/2020	Opt. water content (assumed	6.9	%

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Location	"Hole"		"Hole"											
Lift	1st		2nd											
Probe Depth (mm)	150		150											
Wet Density (t/m³)	2.23		2.19											
Dry Density (t/m³)	2.12		2.08											
Water Content (%)	5.0		5.0											
Air Voids (%)	9.3		10.9											
% of MDD	96		95											

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	% of DD from: NA3335 / A

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Brown Silt - Minor Gravel**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukurau**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.59**	t/m³	
Tested by :	**J.Hammond**	Max dry density (assumed) :	**1.74**	t/m³	
Date tested :	**19/03/2020**	Opt. water content (assumed	**15.9**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / E**
Client Ref No :	

Nuclear Densometer Test Results

Test Location	"Hole" 3rd			"Hole 4th			"Hole" 5th			"Hole" 6th			"Hole" 7th	
Test Position	North	South		North	South		North	South		North	South		North	South
Probe Depth (mm)	150	150		150	150		150	150		150	150		150	150
Wet Density (t/m³)	1.98	1.96		1.87	1.99		1.99	2.00		1.96	2.02		2.06	1.99
Dry Density (t/m³)	1.73	1.68		1.66	1.71		1.71	1.75		1.67	1.74		1.76	1.71
Water Content (%)	14.5	16.1		12.2	16.3		16.6	14.6		17.2	16.1		16.9	16.6
Air Voids (%)	8.3	7.8		15.5	6.0		5.7	7.0		7	5		2	6
% of MDD	99	97		96	98		98	100		96	100		101	98

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Jason Crichton**

Designation : *Assistant Laboratory Manager*

Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Silt with minor gravel		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.59	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.84	t/m³	
Date tested :	19/03/2020	Opt. water content (tested) :	13	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Number	West	East		North	South		North	South						
Test Position	Lot 42			Lot 43			Lot 44							
Probe Depth (mm)	150	150		150	150		150	150						
Wet Density (t/m³)	2.10	2.13		2.09	2.07		2.03	2.07						
Dry Density (t/m³)	1.81	1.85		1.86	1.85		1.80	1.83						
Water Content (%)	15.7	15.0		12.1	12.0		12.5	13.2						
Air Voids (%)	1.7	0.6		5.5	6.4		7.8	5.2						
% of MDD	98	101		101	101		98	99						

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	MDD from: NA3330

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 23/03/2020 Date : 23/03/2020

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Silt**	
Location :	**Kenny Rd - Napier**			
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**	
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³
Tested by :	**A.Ching**	Max dry density (tested) :	**1.68**	t/m³
Date tested :	**28/02/20**	Opt. water content (tested) :	**20**	%

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / A**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	1	2	3	4		5	6	7	8					
Test Position	LOT 11					LOT 33								
Probe Depth (mm)	200	200	200	200		200	200	200	200					
Wet Density (t/m³)	1.98	1.87	1.96	1.95		1.94	2.02	2.03	1.98					
Dry Density (t/m³)	1.73	1.63	1.67	1.65		1.62	1.72	1.75	1.65					
Water Content (%)	14.5	15.0	17.0	18.5		19.5	17.5	16.5	20.0					
Air Voids (%)	8.5	13.1	7.1	6.2		5.9	4.0	4.1	3.6					
% of MDD	103	97	100	98		97	102	104	98					

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	**Notes**
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved

Designation : *Laboratory Manager*

Date reported : 03/03/20 Date : 03/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**A.Ching**
Date tested :	**28/02/20**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / A**
Client Ref No :	

Approved

Designation : *Laboratory Manager*

Date reported : 03/03/20 Date : 03/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand	
Location :	Kenny Rd - Napier			
Client :	H.Satherly, 248 Station Rd, Waipukura	Nuclear densometer no :	76860	
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³
Date tested :	6/03/2020	Opt. water content (tested) :	18	%

Project No :	2-L0301.15
Lab Ref No :	NA3291 / B
Client Ref No :	

Nuclear Densometer Test Results

Test Number	1	2	3	4		5	6	7	8		9	10	11	12
Test Position	LOT 12					LOT 32					Lot 31			
Probe Depth (mm)	150	150	150	150		150	150	150	150		150	150	150	150
Wet Density (t/m³)	1.82	1.77	1.89	1.84		1.89	1.91	1.88	2.07		1.85	1.83	1.76	1.82
Dry Density (t/m³)	1.60	1.59	1.70	1.63		1.66	1.59	1.61	1.76		1.62	1.60	1.58	1.61
Water Content (%)	13.2	11.6	10.9	12.7		13.8	19.6	16.7	17.8		14.1	14.1	11.5	13.0
Air Voids (%)	15.7	19.0	14.4	15.2		11.9	6.0	9.7	-0.4		13	14	20	16
% of MDD	99	98	105	101		102	98	99	108		100	99	98	99

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Arthur Ching

Designation : *Laboratory Manager*

Date reported : 09/03/20 Date : 09/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**6/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / B**
Client Ref No :	

Approved

Designation : *Laboratory Manager*

Date reported : 09/03/20 Date : 09/03/20

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Fine Sand**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.54**	t/m³	
Tested by :	**J.Hammond**	Max dry density (tested) :	**1.62**	t/m³	
Date tested :	**10/03/2020**	Opt. water content (tested) :	**18**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	27	28	29	30		31	32	33						
Test Position	LOT 11					LOT 12								
Probe Depth (mm)	150	150	150	150		150	150	150						
Wet Density (t/m³)	1.86	1.84	2.00	1.91		2.00	1.91	1.87						
Dry Density (t/m³)	1.64	1.61	1.68	1.64		1.72	1.68	1.65						
Water Content (%)	13.8	14.2	19.3	16.3		16.6	13.8	13.3						
Air Voids (%)	13.0	13.5	1.5	8.8		3.9	10.7	13.2						
% of MDD	101	100	104	101		106	104	102						

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukura	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	10/03/2020	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / C
Client Ref No :	

Nuclear Densometer Test Results

Test Number	17	18	19			20	21	22	23		24	25	26	
Test Position	LOT 33					Lot 32					Lot 31			
Probe Depth (mm)	150	150	150			150	150	150	150		150	150	150	
Wet Density (t/m³)	1.92	1.84	1.92			1.94	1.82	1.88	1.97		1.90	1.96	2.01	
Dry Density (t/m³)	1.61	1.61	1.69			1.68	1.63	1.64	1.69		1.67	1.62	1.68	
Water Content (%)	19.5	14.8	13.9			15.5	11.6	14.7	16.3		13.9	21.0	19.9	
Air Voids (%)	5.5	13.0	10.1			7.8	17.0	11.3	5.8		11	2	0	
% of MDD	99	99	104			104	101	101	104		103	100	104	

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Arthur Ching

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Brown Silt**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³	
Tested by :	**J.Hammond**	Max dry density (tested) :	**1.68**	t/m³	
Date tested :	**10/03/2020**	Opt. water content (tested) :	**20**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	13	14	15	16										
Test Position	LOT 45													
Probe Depth (mm)	150	150	150	150										
Wet Density (t/m³)	2.04	2.10	2.08	2.02										
Dry Density (t/m³)	1.69	1.78	1.75	1.67										
Water Content (%)	20.3	17.4	19.2	21.5										
Air Voids (%)	0.4	0.3	-0.7	0.2										
% of MDD	101	106	104	99										

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	**Notes**
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Brown Silt**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukura**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.6**	t/m³	
Tested by :	**J.Hammond**	Max dry density (tested) :	**1.68**	t/m³	
Date tested :	**10/03/2020**	Opt. water content (tested) :	**20**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Nuclear Densometer Test Results

Test Number	1	2	3	4		5	6	7	8		9	10	11	12
Test Position	LOT 48					LOT 47					LOT 46			
Probe Depth (mm)	150	150	150	150		150	150	150	150		150	150	150	150
Wet Density (t/m³)	2.03	2.07	2.05	2.03		2.03	2.03	2.04	2.08		1.98	2.00	2.03	2.11
Dry Density (t/m³)	1.72	1.74	1.76	1.73		1.70	1.72	1.73	1.75		1.65	1.66	1.68	1.77
Water Content (%)	18.1	18.6	16.4	17.5		19.7	17.7	17.8	18.5		19.6	20.6	20.7	19.4
Air Voids (%)	2.8	0.6	3.4	3.3		1.4	3.1	2.6	0.3		4	2	1	-2
% of MDD	102	104	105	103		101	103	103	104		98	99	100	105

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)														
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**10/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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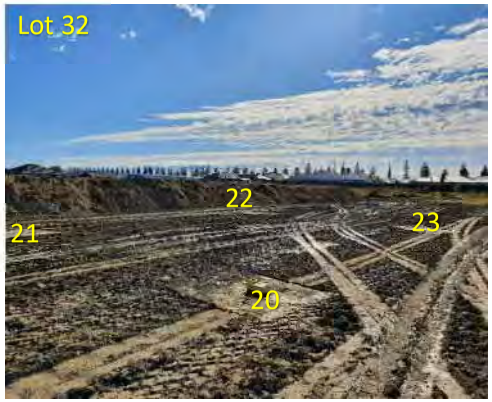
EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Summerset - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**10/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	



Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**10/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / C**
Client Ref No :	

Approved **Arthur Ching**

Designation : *Laboratory Manager*

Date reported : 10/03/20 Date : 10/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Brown Silt		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.6	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.68	t/m³	
Date tested :	11/03/2020	Opt. water content (tested) :	20	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / D
Client Ref No :	Finish Level

Nuclear Densometer Test Results

Test Number	1	2		3	4		5	6		7	8			
Test Position	LOT 48			LOT 47			LOT 46			LOT 45				
Probe Depth (mm)	150	150		150	150		150	150		150	150			
Wet Density (t/m³)	1.84	1.90		1.99	2.06		1.97	1.95		2.07	2.07			
Dry Density (t/m³)	1.60	1.65		1.67	1.75		1.72	1.69		1.76	1.78			
Water Content (%)	14.9	15.4		18.9	17.4		14.8	15.0		17.8	16.1			
Air Voids (%)	14.6	11.2		3.9	2.2		8.4	9.6		1	3			
% of MDD	95	98		100	104		102	101		105	106			

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 11/03/2020 Date : 11/03/2020

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EARTHWORKS COMPACTION CONTROL
SITE PHOTO - TEST AREAS

Project :	**Greenstone - Te Awa**
Location :	**Kenny Rd - Napier**
Client :	**H.Satherly, 248 Station Rd, Waipukurau**
Contractor :	**HES Earthmoving Ltd**
Tested by :	**J.Hammond**
Date tested :	**11/03/2020**

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / D**
Client Ref No :	

Approved **Jason Crichton**

Designation : *Assistant Laboratory Manager*

Date reported : 11/03/20 Date : 11/03/20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Brown Silt - Minor Gravel		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.59	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.74	t/m³	
Date tested :	19/03/2020	Opt. water content (tested) :	15.9	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Number	North	South		North	South		North	South		North	South			
Test Position	Lot 38			Lot 39			Lot 40			Lot 41				
Probe Depth (mm)	150	150		150	150		150	150		150	150			
Wet Density (t/m³)	2.02	2.08		2.01	2.04		1.89	2.05		2.04	2.07			
Dry Density (t/m³)	1.66	1.78		1.77	1.74		1.68	1.74		1.72	1.77			
Water Content (%)	21.6	16.5		13.8	17.3		12.2	17.9		18.9	16.7			
Air Voids (%)	0.2	1.8		7.3	2.6		14.5	1.6		1	2			
% of MDD	95	102		102	100		97	100		99	102			

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL
TEST RESULTS

Project :	Greenstone- Te Awa	Sample description :	Brown Silt		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.6	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.68	t/m³	
Date tested :	19/03/2020	Opt. water content (tested) :	20	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Number	West	East		West	East		West	East						
Test Position	Lot 25			Lot 26			Lot 27							
Probe Depth (mm)	150	150		150	150		150	150						
Wet Density (t/m³)	1.98	1.96		1.99	1.97		1.97	1.98						
Dry Density (t/m³)	1.65	1.65		1.63	1.65		1.60	1.62						
Water Content (%)	20.5	18.6		22.0	19.1		22.9	22.3						
Air Voids (%)	2.9	5.9		1.6	4.7		1.7	1.8						
% of MDD	98	98		97	99		95	96						

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

Approved Jason Crichton

Designation : *Assistant Laboratory Manager*

Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Silty Gravel	
Location :	Kenny Rd - Napier			
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860	
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.65	t/m³
Tested by :	J.Hammond	Max dry density (assumed) :	2.2	t/m³
Date tested :	19/03/2020	Opt. water content (assumed	6.9	%

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Location	"Hole"		"Hole"											
Lift	1st		2nd											
Probe Depth (mm)	150		150											
Wet Density (t/m³)	2.23		2.19											
Dry Density (t/m³)	2.12		2.08											
Water Content (%)	5.0		5.0											
Air Voids (%)	9.3		10.9											
% of MDD	96		95											

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	% of DD from: NA3335 / A

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	**Greenstone - Te Awa**	Sample description :	**Brown Silt - Minor Gravel**		
Location :	**Kenny Rd - Napier**				
Client :	**H.Satherly, 248 Station Rd, Waipukurau**	Nuclear densometer no :	**76860**		
Contractor :	**HES Earthmoving Ltd**	Solid density (assumed) :	**2.59**	t/m³	
Tested by :	**J.Hammond**	Max dry density (assumed) :	**1.74**	t/m³	
Date tested :	**19/03/2020**	Opt. water content (assumed	**15.9**	%	

Project No :	**2-L0301.15**
Lab Ref No :	**NA3291 / E**
Client Ref No :	

Nuclear Densometer Test Results

Test Location	"Hole" 3rd			"Hole 4th			"Hole" 5th			"Hole" 6th			"Hole" 7th	
Test Position	North	South		North	South		North	South		North	South		North	South
Probe Depth (mm)	150	150		150	150		150	150		150	150		150	150
Wet Density (t/m³)	1.98	1.96		1.87	1.99		1.99	2.00		1.96	2.02		2.06	1.99
Dry Density (t/m³)	1.73	1.68		1.66	1.71		1.71	1.75		1.67	1.74		1.76	1.71
Water Content (%)	14.5	16.1		12.2	16.3		16.6	14.6		17.2	16.1		16.9	16.6
Air Voids (%)	8.3	7.8		15.5	6.0		5.7	7.0		7	5		2	6
% of MDD	99	97		96	98		98	100		96	100		101	98

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

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Date reported : 20/03/2020 Date : 20/03/2020

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Silt with minor gravel		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.59	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.84	t/m³	
Date tested :	19/03/2020	Opt. water content (tested) :	13	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / E
Client Ref No :	

Nuclear Densometer Test Results

Test Number	West	East		North	South		North	South						
Test Position	Lot 42			Lot 43			Lot 44							
Probe Depth (mm)	150	150		150	150		150	150						
Wet Density (t/m³)	2.10	2.13		2.09	2.07		2.03	2.07						
Dry Density (t/m³)	1.81	1.85		1.86	1.85		1.80	1.83						
Water Content (%)	15.7	15.0		12.1	12.0		12.5	13.2						
Air Voids (%)	1.7	0.6		5.5	6.4		7.8	5.2						
% of MDD	98	101		101	101		98	99						

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)		**Results have not been oven dry corrected**												
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	MDD from: NA3330

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	11/05/20	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / F
Client Ref No :	

Nuclear Densometer Test Results

Test Number	West	East		West	East		West	East		South	North		South	North
Test Position	Lot 16			Lot 29			Lot 28			Lot 30			Lot 15	
Probe Depth (mm)	200	200		200	200		200	200		200	200		200	200
Wet Density (t/m³)	1.88	1.92		1.81	1.87		1.80	1.92		1.90	1.88		1.95	1.92
Dry Density (t/m³)	1.66	1.64		1.62	1.63		1.61	1.71		1.63	1.66		1.74	1.66
Water Content (%)	13.1	17.6		11.8	15.2		12.0	12.2		16.7	13.3		12.1	15.8
Air Voids (%)	12.9	6.8		17.2	11.3		17.3	11.7		9	12		10	8
% of MDD	102	101		100	100		99	106		101	103		108	103

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)	Results have not been oven dry corrected													
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Chesterhope Material First Lift

Approved J.Hammond

Designation : *Civil Engineering Technician*

Date reported : 15-05-20 Date : 15-05-20

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	11/05/20	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / F
Client Ref No :	

Nuclear Densometer Test Results

Test Number	South	North		South	North									
Test Position	Lot 14			Lot 13										
Probe Depth (mm)	200	200		200	200									
Wet Density (t/m³)	1.85	1.89		1.86	1.87									
Dry Density (t/m³)	1.66	1.64		1.61	1.63									
Water Content (%)	11.9	15.1		15.6	14.4									
Air Voids (%)	15.1	10.6		11.7	12.2									
% of MDD	102	101		99	101									

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)	Results have not been oven dry corrected													
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Chesterhope Material First Lift

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	11/05/20	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / F
Client Ref No :	

Nuclear Densometer Test Results

Test Number	West	East		West	East		West	East		South	North		South	North
Test Position	Lot 16			Lot 29			Lot 28			Lot 30			Lot 15	
Probe Depth (mm)	200	200		200	200		200	200		200	200		200	200
Wet Density (t/m³)	1.88	1.92		1.81	1.87		1.80	1.92		1.90	1.88		1.95	1.92
Dry Density (t/m³)	1.66	1.64		1.62	1.63		1.61	1.71		1.63	1.66		1.74	1.66
Water Content (%)	13.1	17.6		11.8	15.2		12.0	12.2		16.7	13.3		12.1	15.8
Air Voids (%)	12.9	6.8		17.2	11.3		17.3	11.7		9	12		10	8
% of MDD	102	101		100	100		99	106		101	103		108	103

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)	Results have not been oven dry corrected													
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Chesterhope Material First Lift

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	11/05/20	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / F
Client Ref No :	

Nuclear Densometer Test Results

Test Number	South	North		South	North									
Test Position	Lot 14			Lot 13										
Probe Depth (mm)	200	200		200	200									
Wet Density (t/m³)	1.85	1.89		1.86	1.87									
Dry Density (t/m³)	1.66	1.64		1.61	1.63									
Water Content (%)	11.9	15.1		15.6	14.4									
Air Voids (%)	15.1	10.6		11.7	12.2									
% of MDD	102	101		99	101									

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)	Results have not been oven dry corrected													
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Chesterhope Material First Lift

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	15/05/20	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / G
Client Ref No :	Second Lift

Nuclear Densometer Test Results

Test Number	West	East		West	East		West	East		South	North		South	North
Test Position	Lot 16			Lot 29			Lot 28			Lot 30			Lot 15	
Probe Depth (mm)	200	200		200	200		200	200		200	200		200	200
Wet Density (t/m³)	1.85	1.89		1.89	1.91		1.92	1.94		1.92	1.83		1.90	1.89
Dry Density (t/m³)	1.64	1.67		1.68	1.67		1.70	1.71		1.65	1.59		1.67	1.61
Water Content (%)	12.9	13.3		12.5	14.1		12.9	13.1		16.3	15.0		13.8	17.2
Air Voids (%)	14.2	12.0		13.0	10.6		11.2	10.2		8	13		11	9
% of MDD	101	103		103	103		105	106		102	98		103	99

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)	Results have not been oven dry corrected													
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Chesterhope Material Second Lift

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Fine Sand		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.54	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.62	t/m³	
Date tested :	15/05/20	Opt. water content (tested) :	18	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / G
Client Ref No :	

Nuclear Densometer Test Results

Test Number	South	North		South	North										
Test Position	Lot 14			Lot 13											
Probe Depth (mm)	200	200		200	200										
Wet Density (t/m³)	1.84	1.82		1.81	1.82										
Dry Density (t/m³)	1.62	1.56		1.56	1.60										
Water Content (%)	14.1	16.5		15.7	13.3										
Air Voids (%)	13.6	12.9		13.8	15.6										
% of MDD	100	96		97	99										

Oven Corrected Test Results

Dry Density (t/m³)															
Water Content (%)	Results have not been oven dry corrected														
Air Voids (%)															
% of MDD															

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	Chesterhope Material Second Lift

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EARTHWORKS COMPACTION CONTROL TEST RESULTS

Project :	Greenstone - Te Awa	Sample description :	Gravelly Sand "Limesand - stone"		
Location :	Kenny Rd - Napier				
Client :	H.Satherly, 248 Station Rd, Waipukurau	Nuclear densometer no :	76860		
Contractor :	HES Earthmoving Ltd	Solid density (assumed) :	2.62	t/m³	
Tested by :	J.Hammond	Max dry density (tested) :	1.69	t/m³	
Date tested :	15/05/20	Opt. water content (tested) :	12	%	

Project No :	2-L0301.15
Lab Ref No :	NA3291 / G
Client Ref No :	

Nuclear Densometer Test Results

Test Details	"Rubbish hole"													
Test Position	Lot 36													
Probe Depth (mm)	200													
Wet Density (t/m³)	1.98													
Dry Density (t/m³)	1.79													
Water Content (%)	10.7													
Air Voids (%)	12.5													
% of MDD	106													

Oven Corrected Test Results

Dry Density (t/m³)														
Water Content (%)	Results have not been oven dry corrected													
Air Voids (%)														
% of MDD														

Test Methods	Notes
Insitu Density : NZS 4407 : 2015, Test 4.2 for Direct Transmission Mode	

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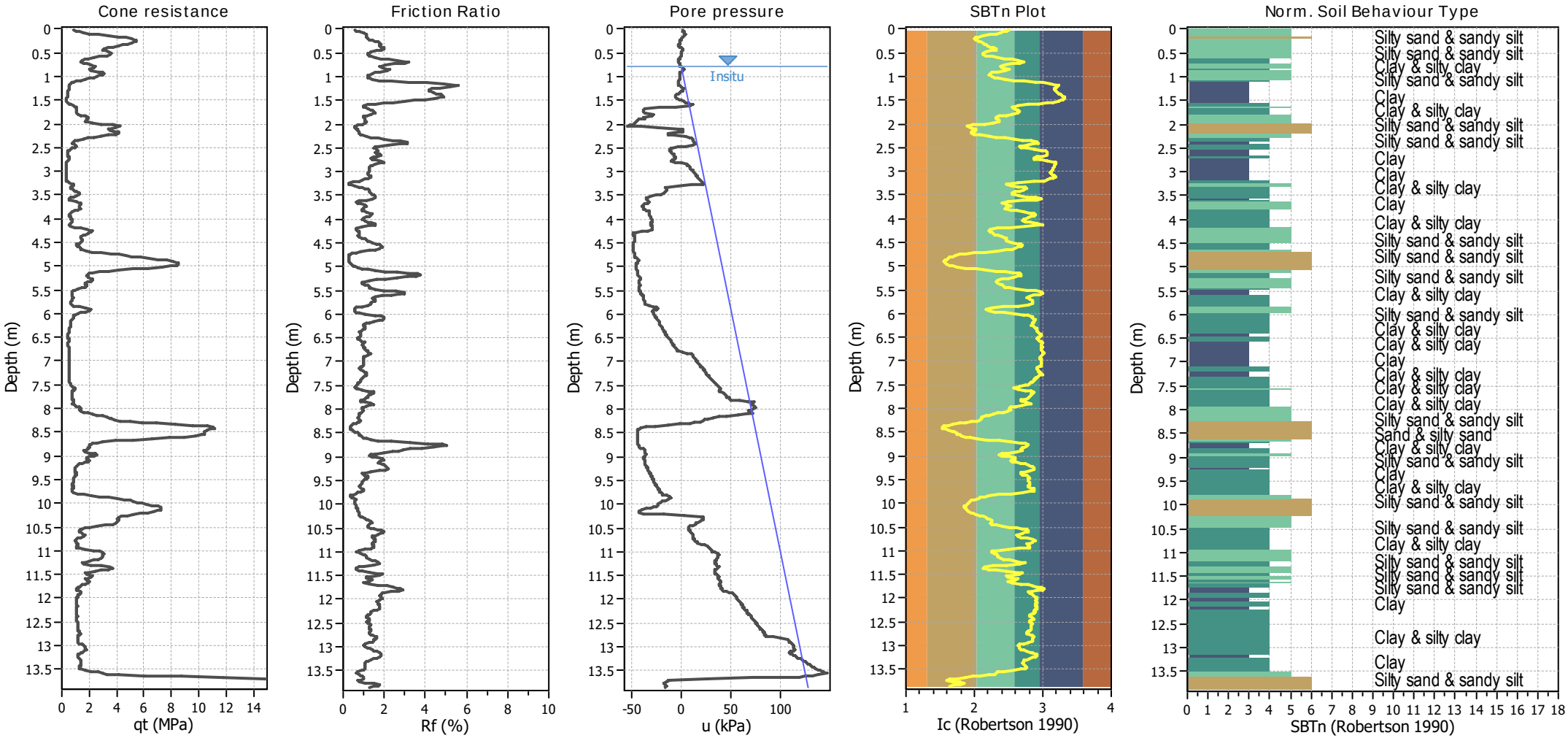
Appendix E Liquefaction Analysis

Initia
Geotechnical Specialists
Unit 13, 114 St Georges Bay Rd, Parnell, 1052
www.Initia.co.nz

Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT01_ULS
Total depth: 13.86 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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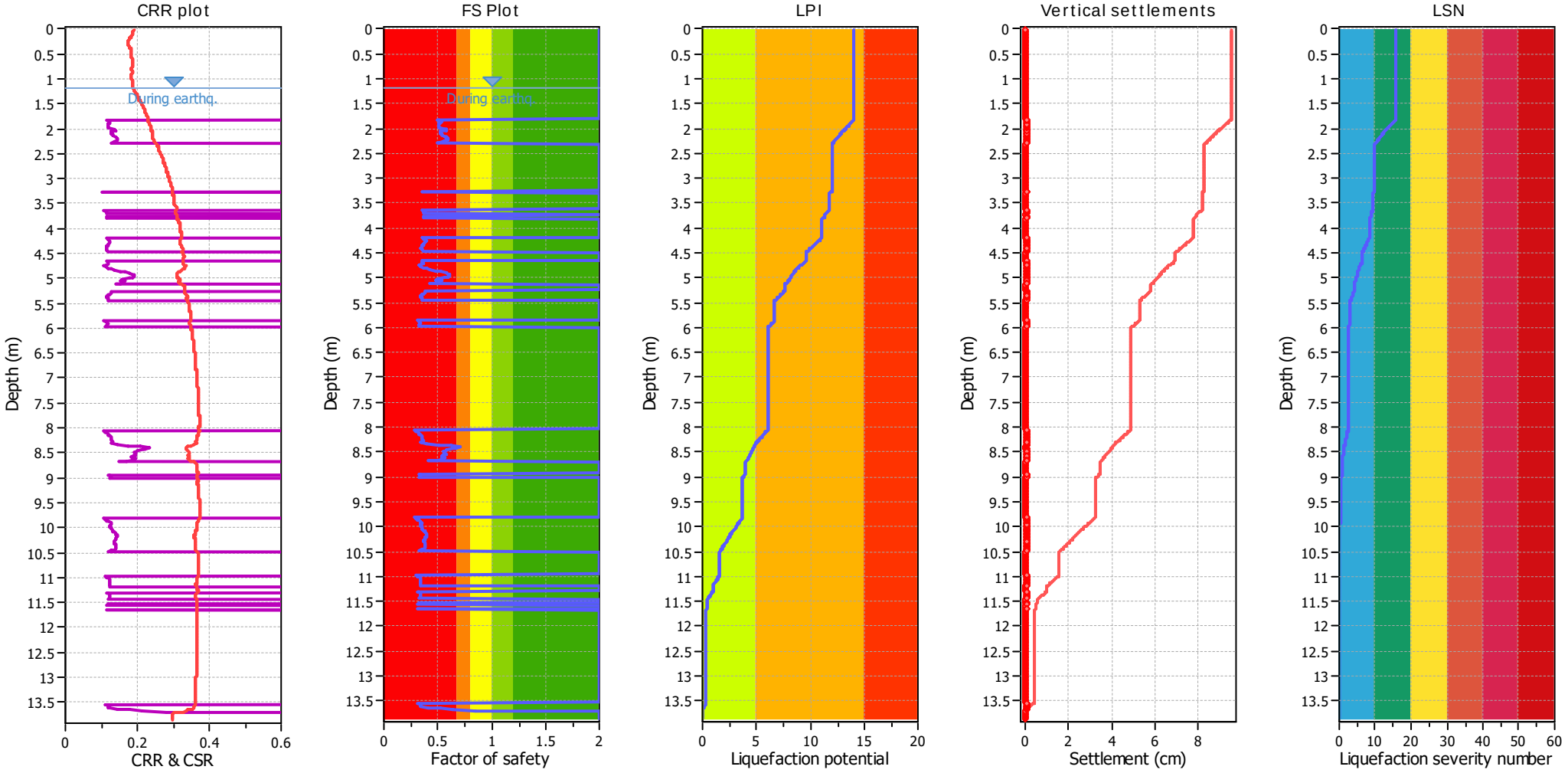
Unit 13, 114 St Georges Bay Rd, Parnell, 1052
www.Initia.co.nz

Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT01_ULS
Total depth: 13.86 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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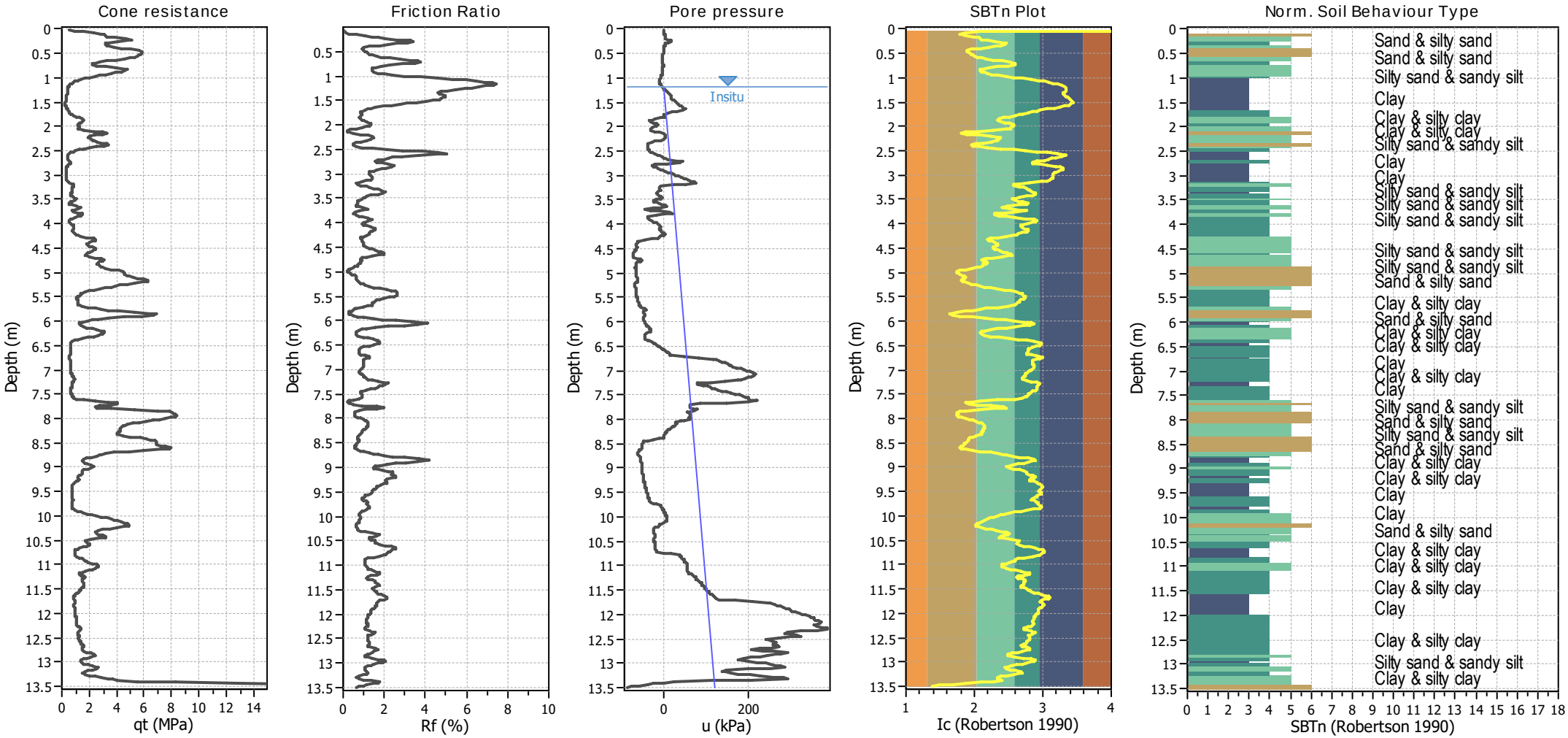
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT03_ULS
Total depth: 13.50 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.20 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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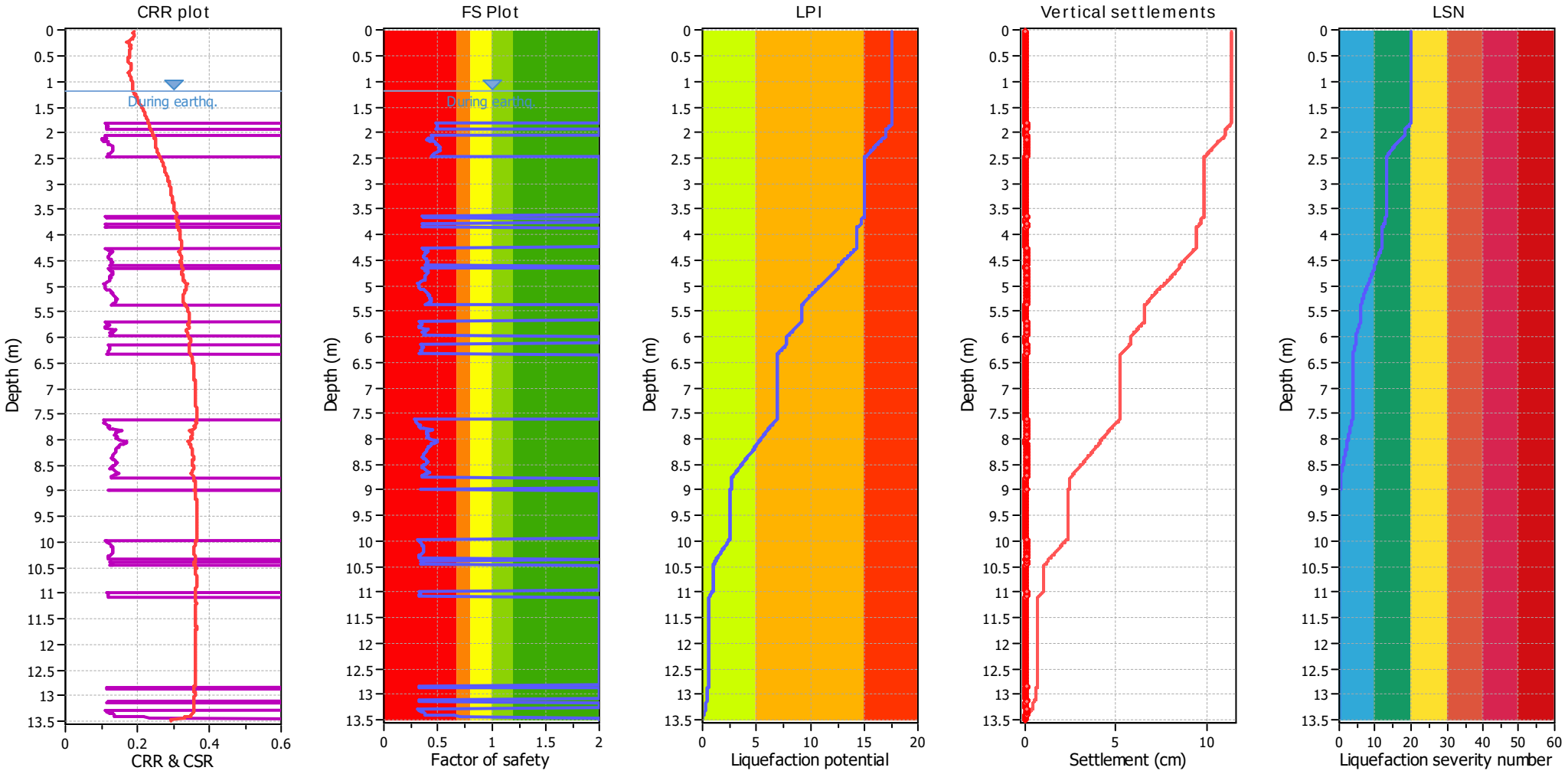
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT03_ULS
Total depth: 13.50 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.20 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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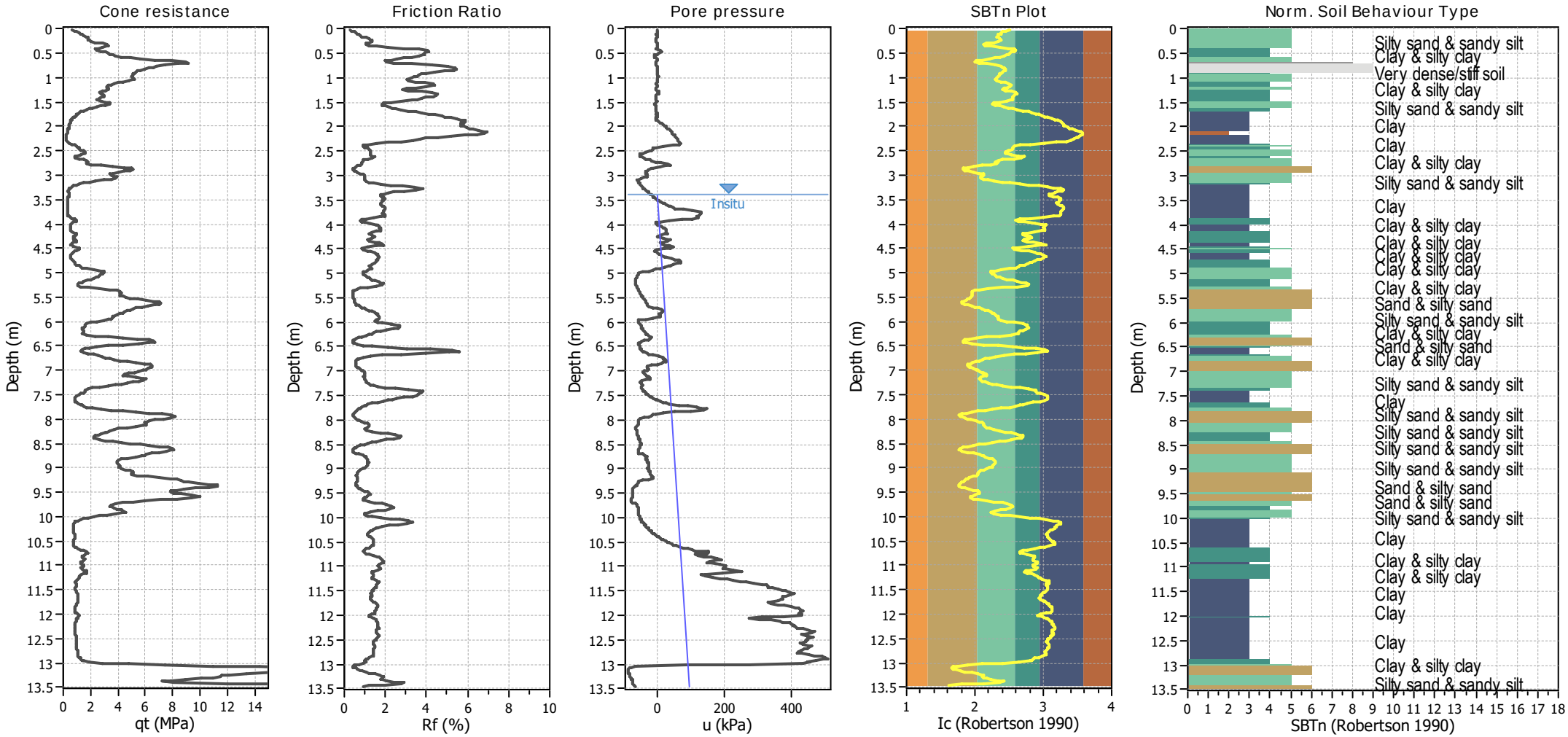
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT04_ULS
Total depth: 13.46 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.40 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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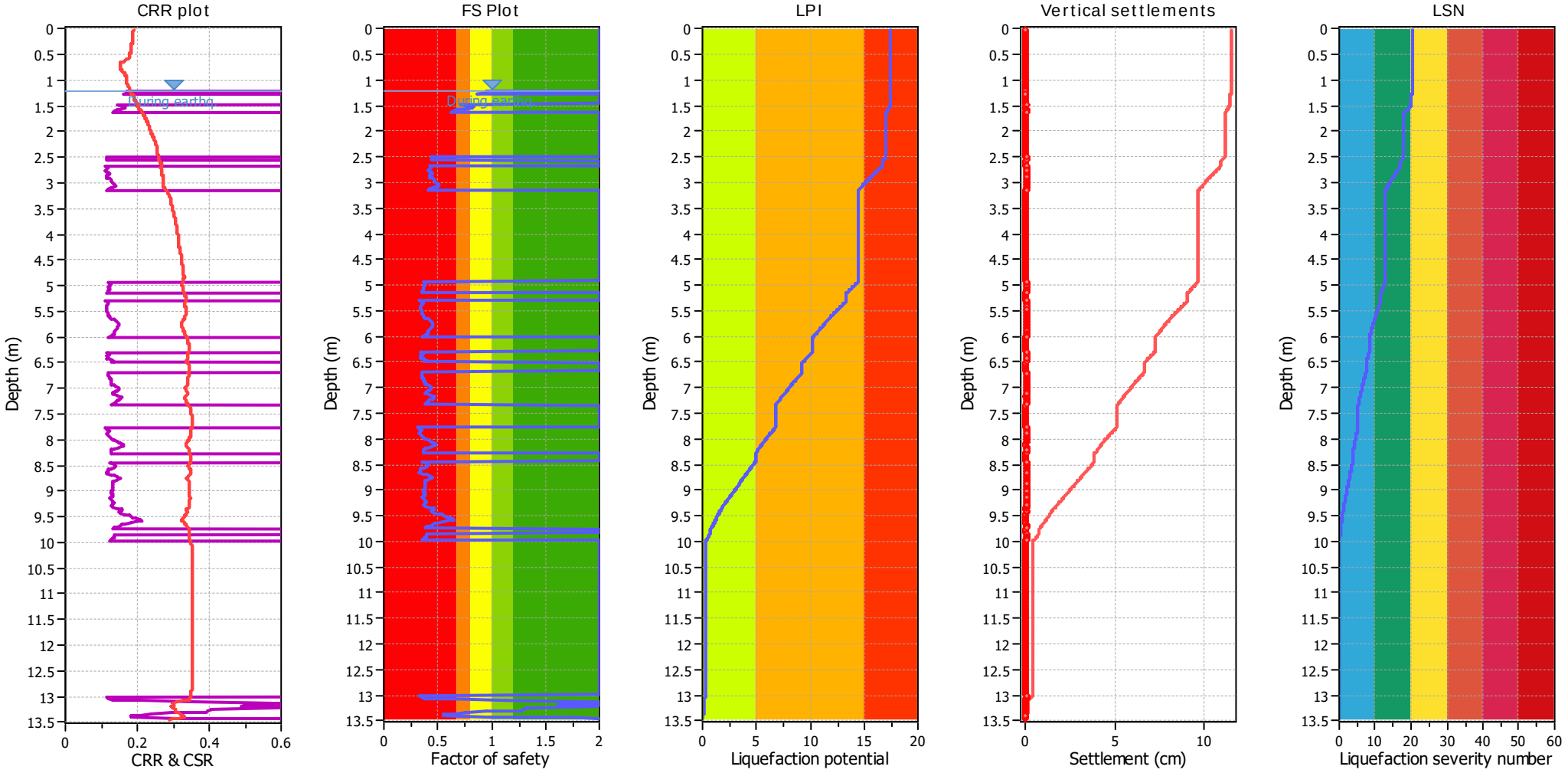
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT04_ULS
Total depth: 13.46 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.40 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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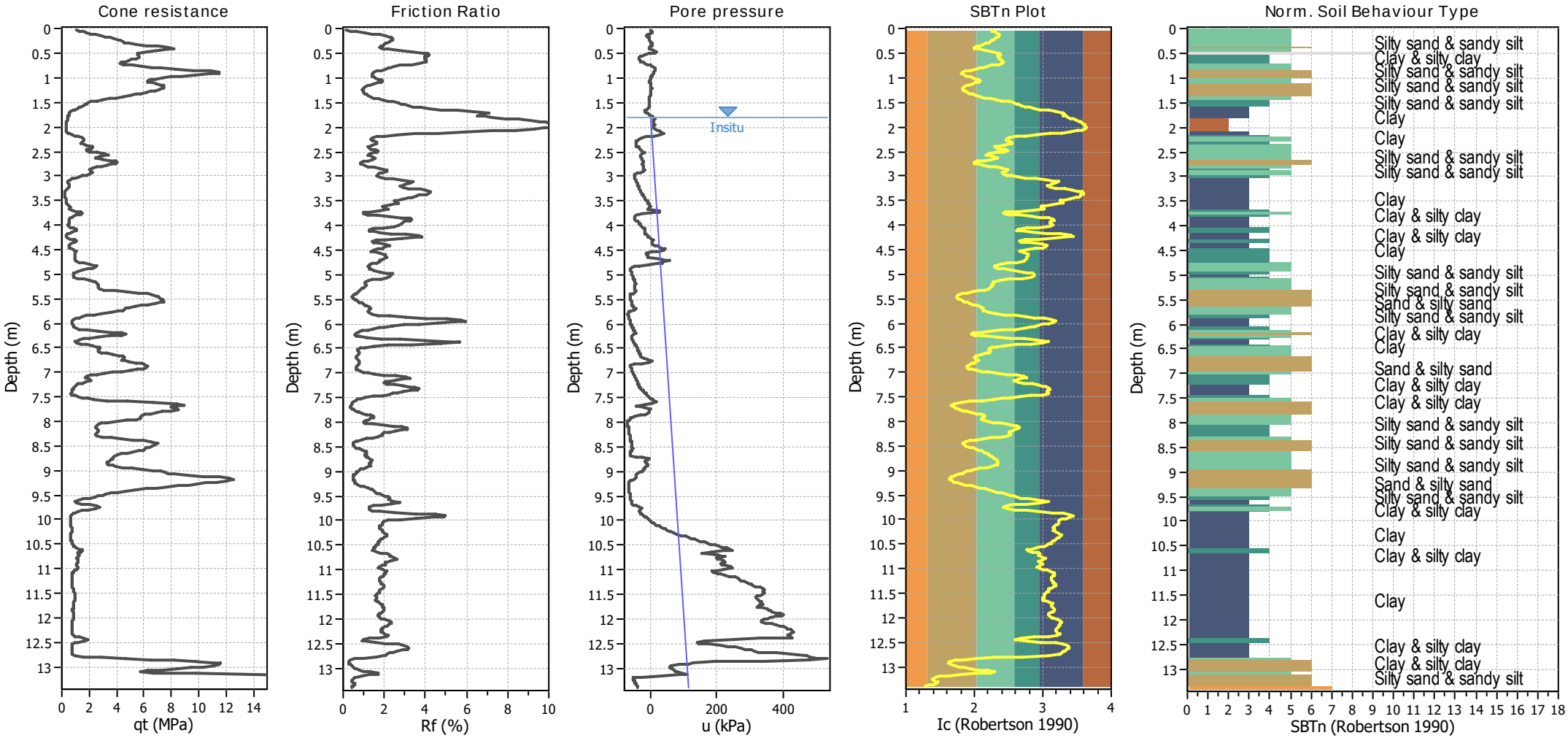
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT05_ULS
Total depth: 13.40 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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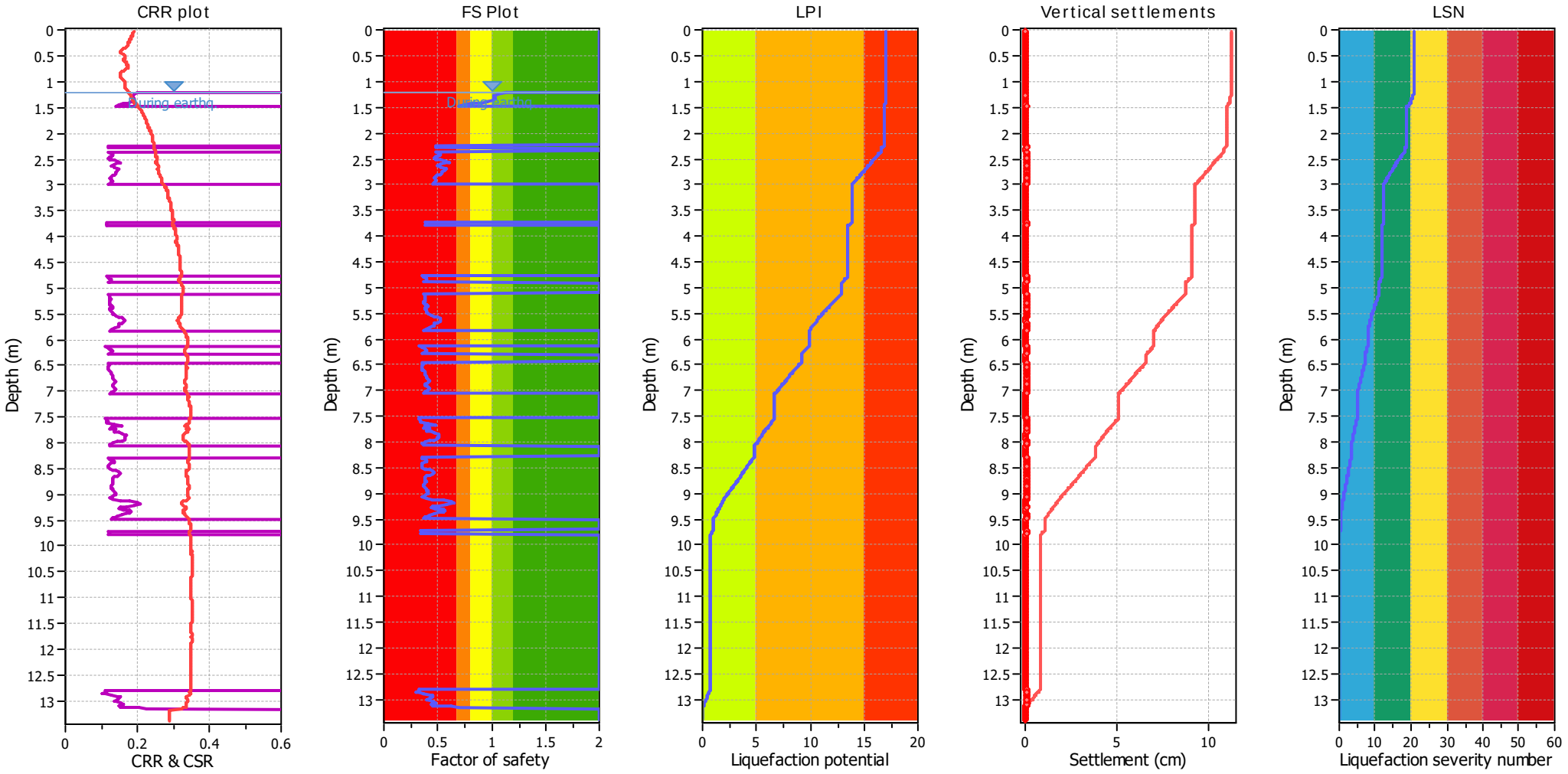
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT05_ULS
Total depth: 13.40 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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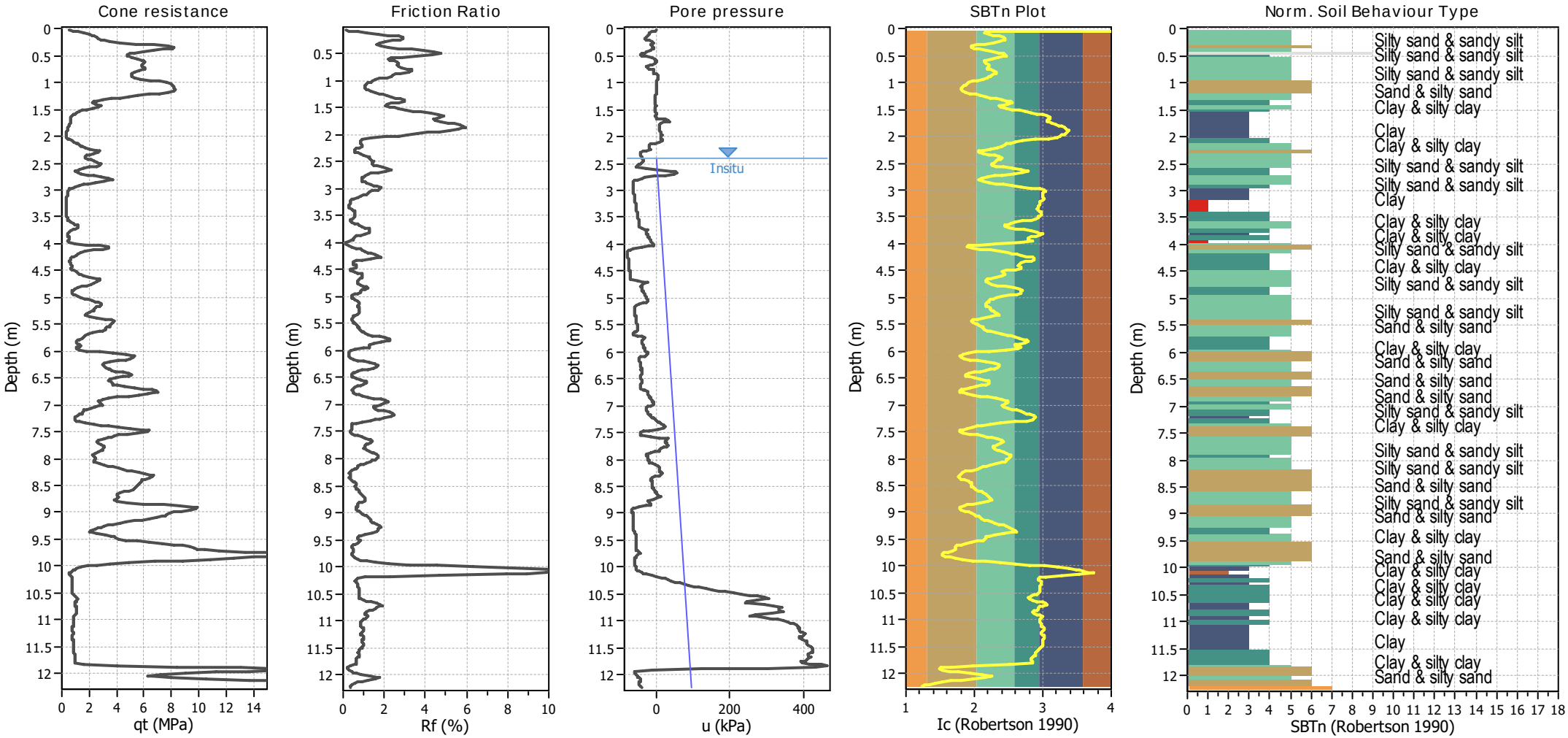
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT06_ULS
Total depth: 12.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.40 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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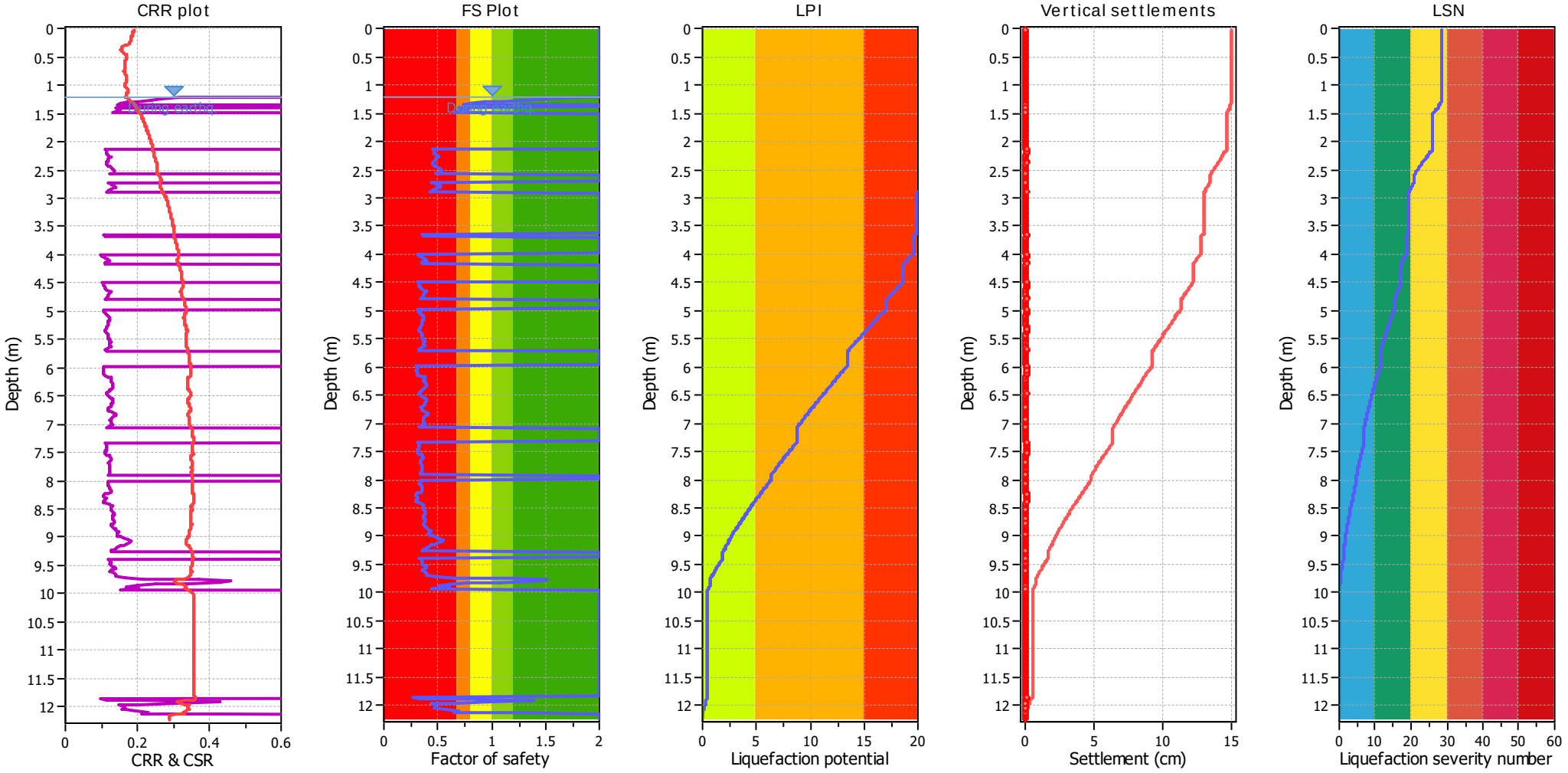
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT06_ULS
Total depth: 12.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.40 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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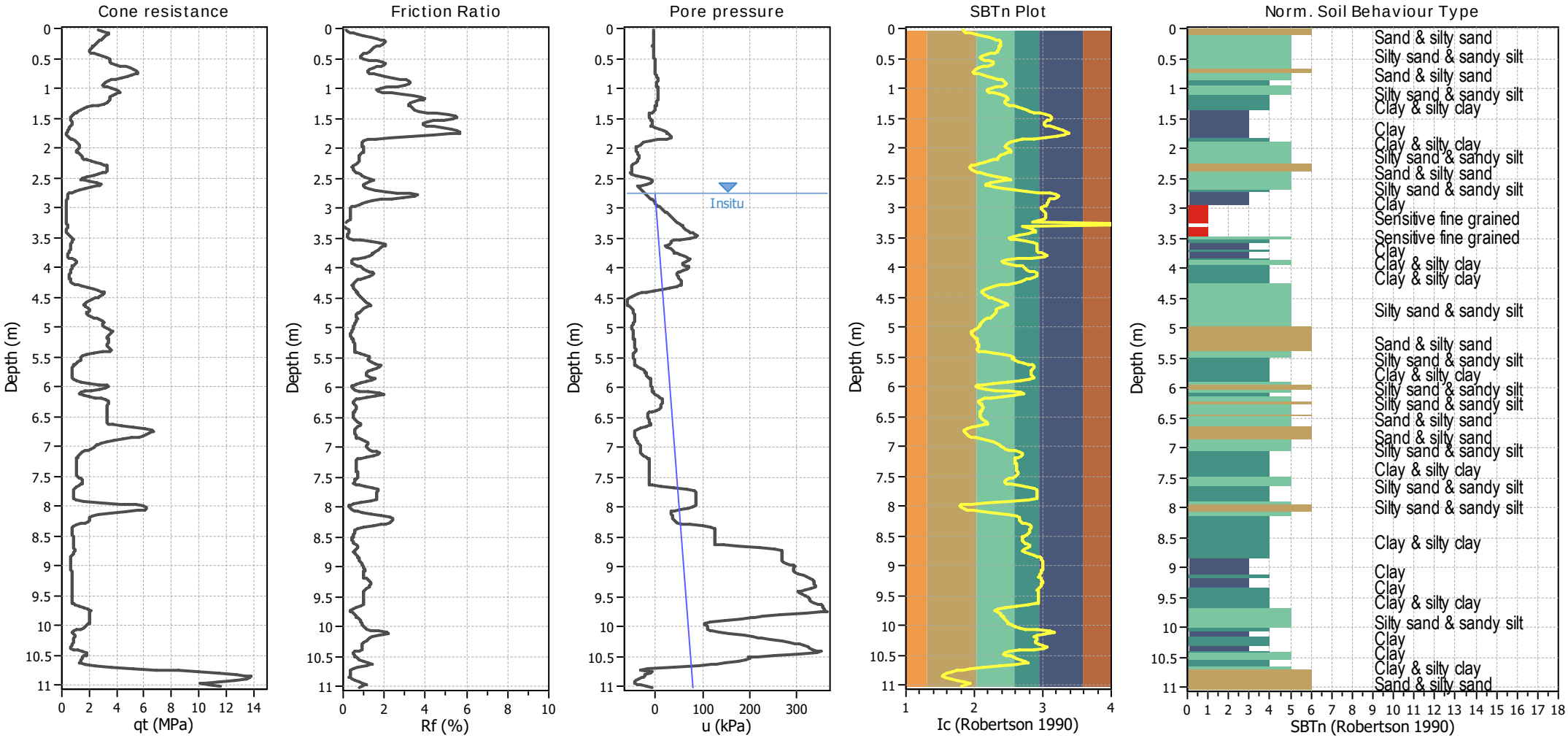
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT07_ULS
Total depth: 11.02 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.75 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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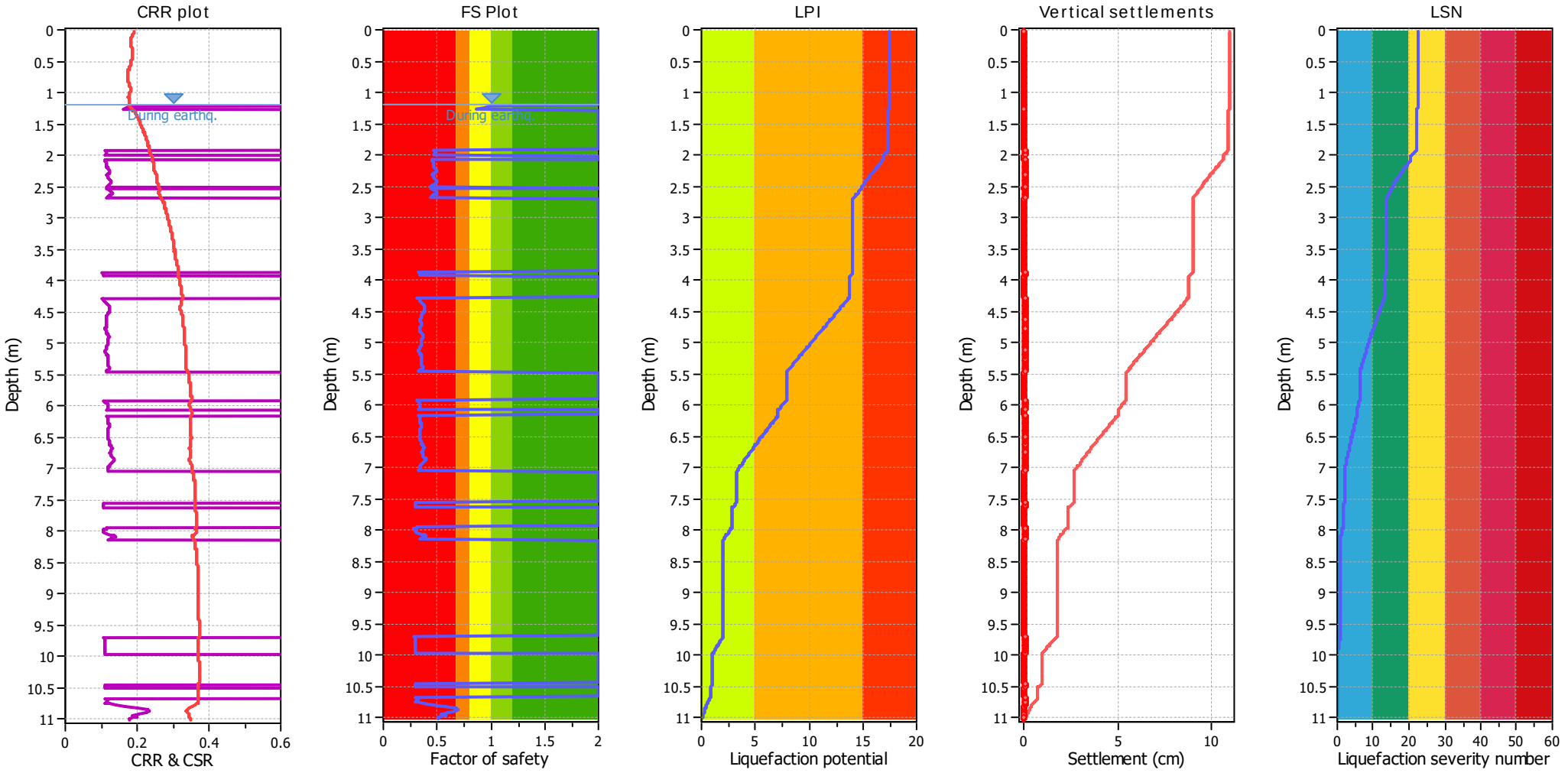
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT07_ULS
Total depth: 11.02 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.75 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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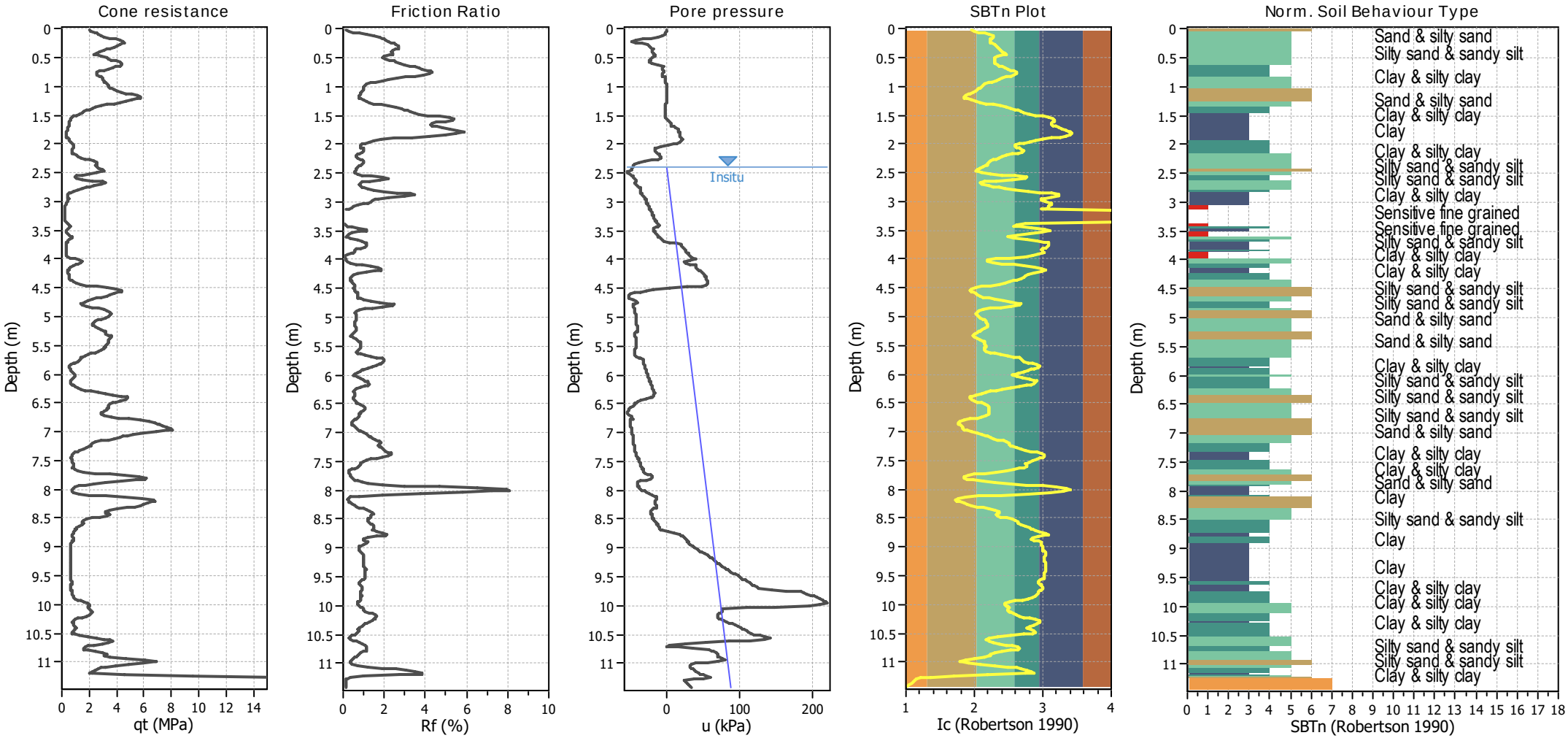
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT08_ULS
Total depth: 11.42 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.40 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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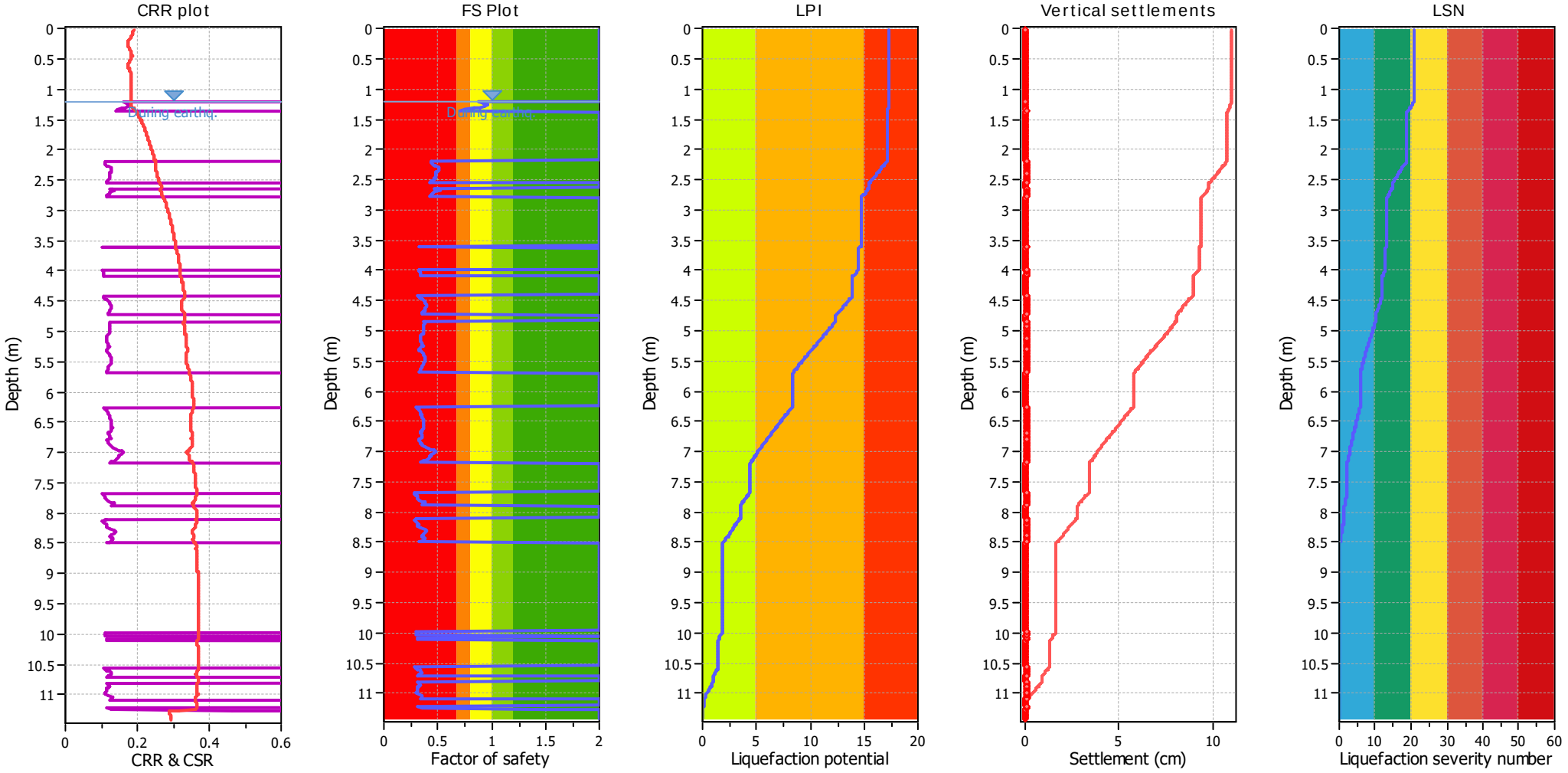
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT08_ULS
Total depth: 11.42 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.40 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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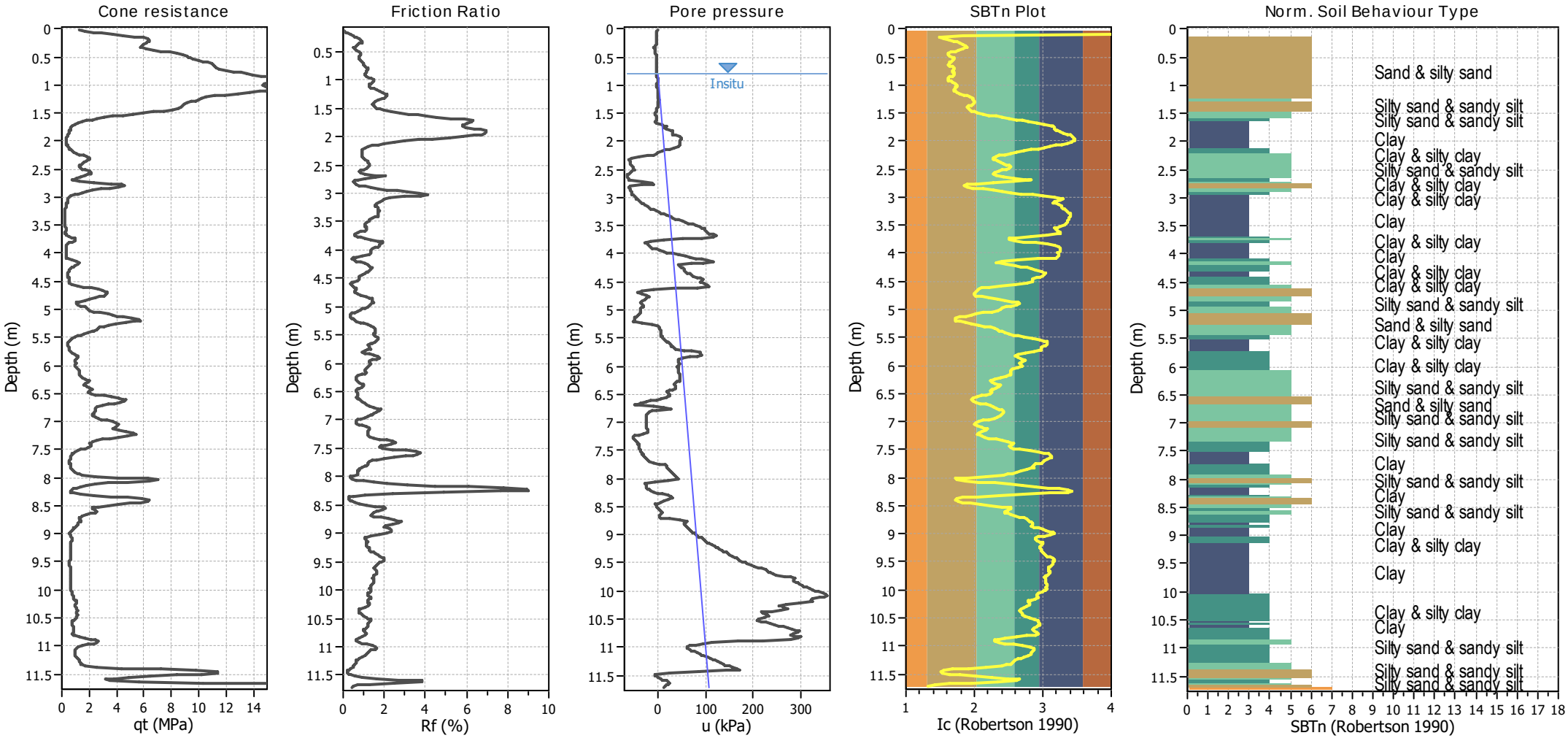
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT09_ULS
Total depth: 11.72 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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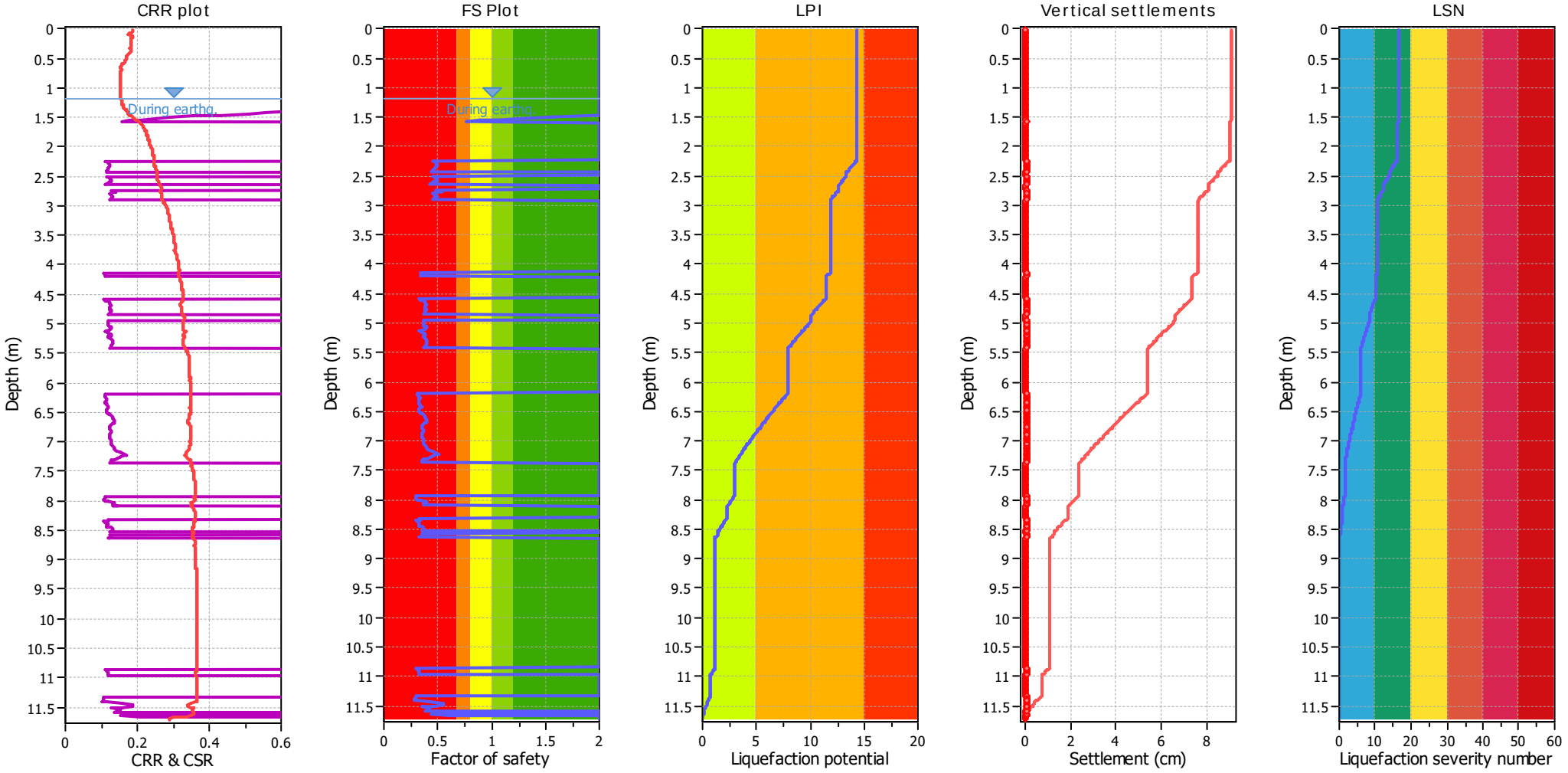
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT09_ULS
Total depth: 11.72 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.80 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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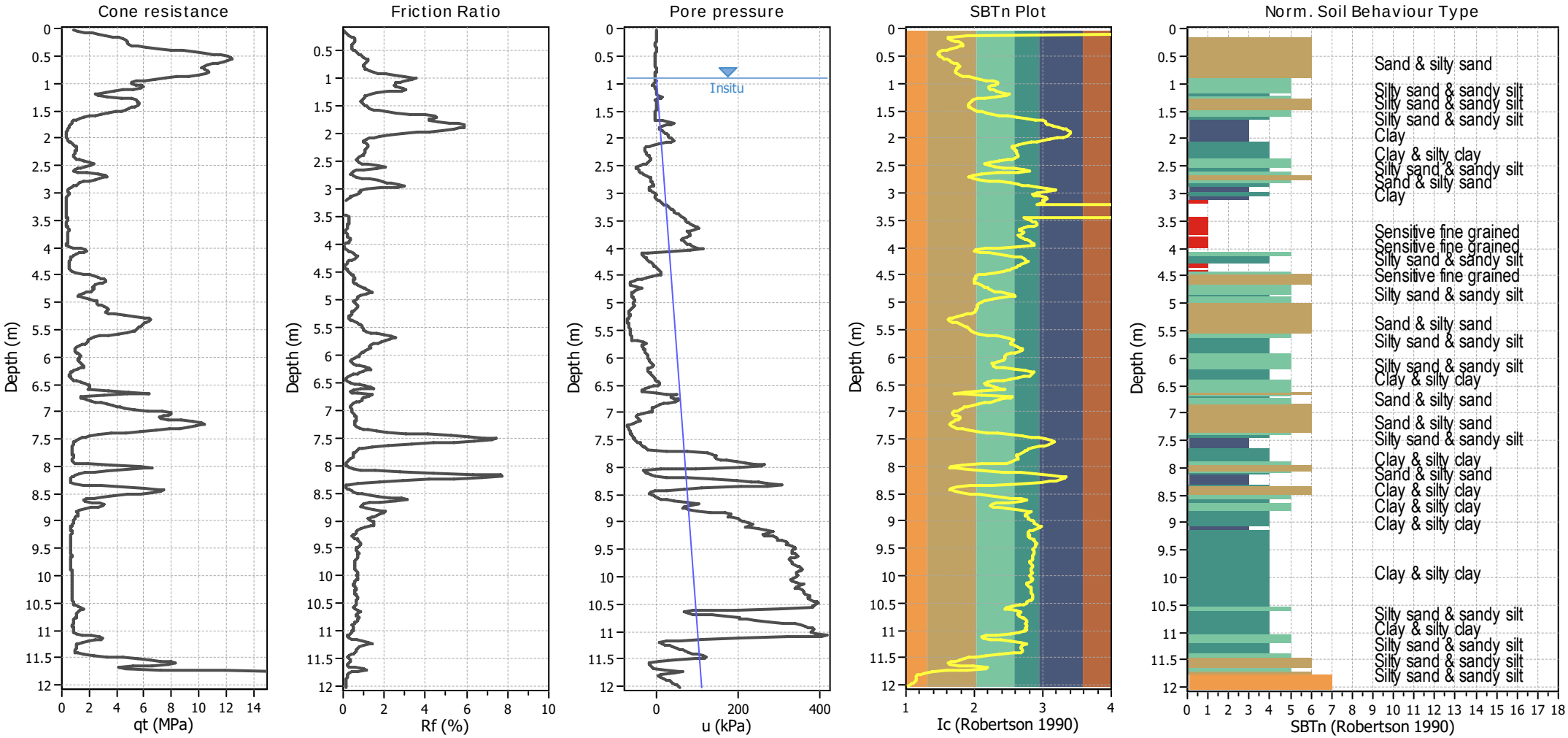
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT10_ULS
Total depth: 12.02 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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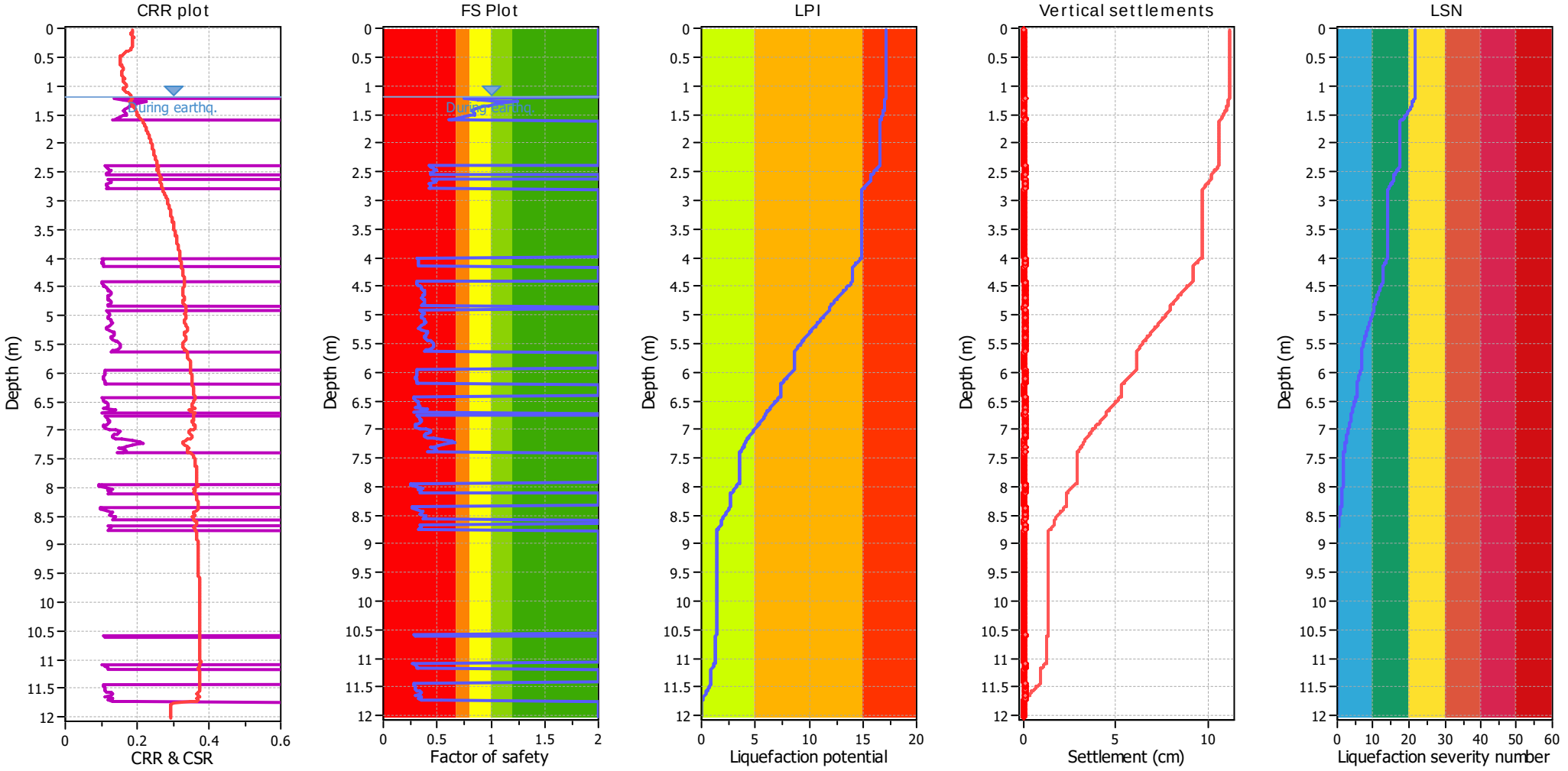
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT10_ULS
Total depth: 12.02 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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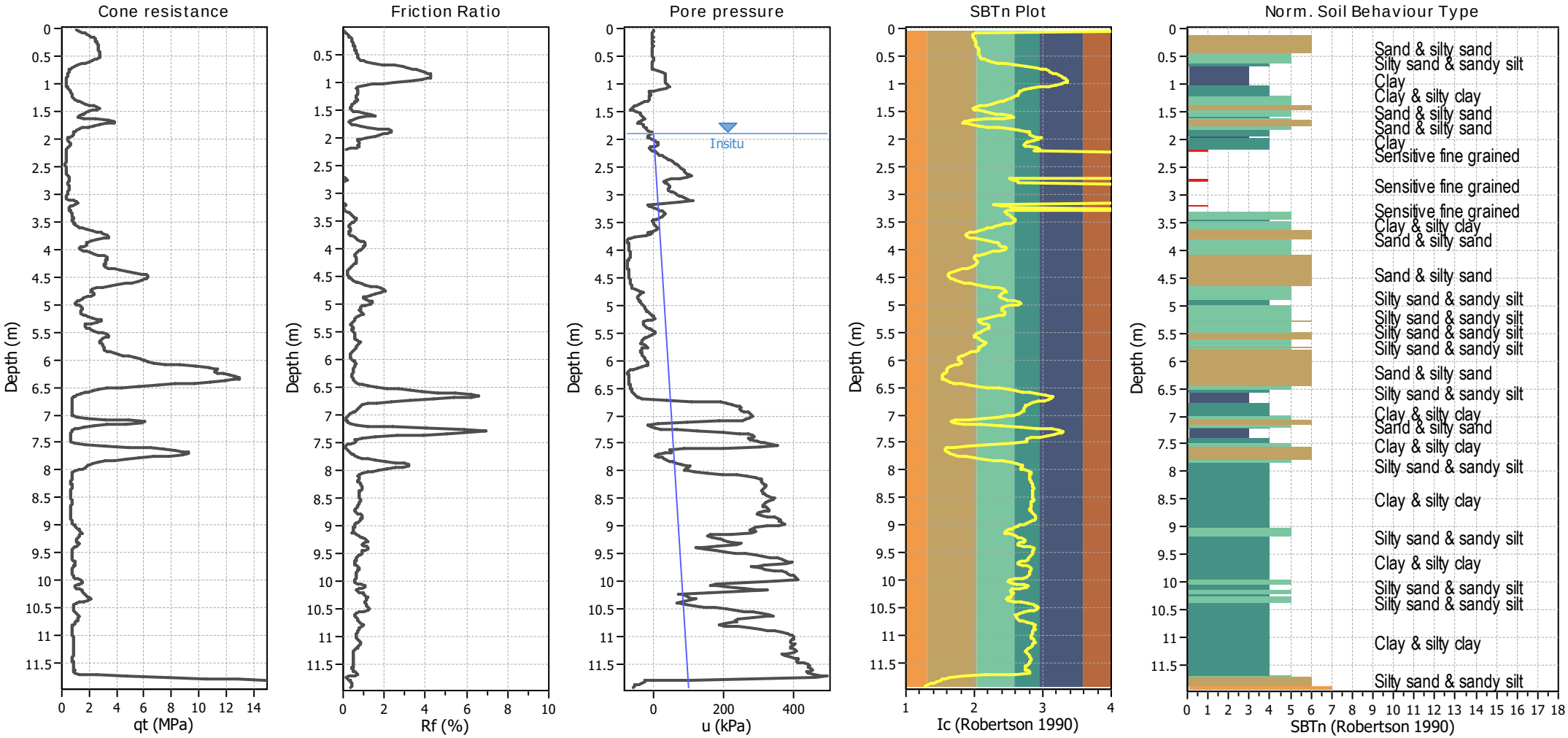
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT11_ULS
Total depth: 11.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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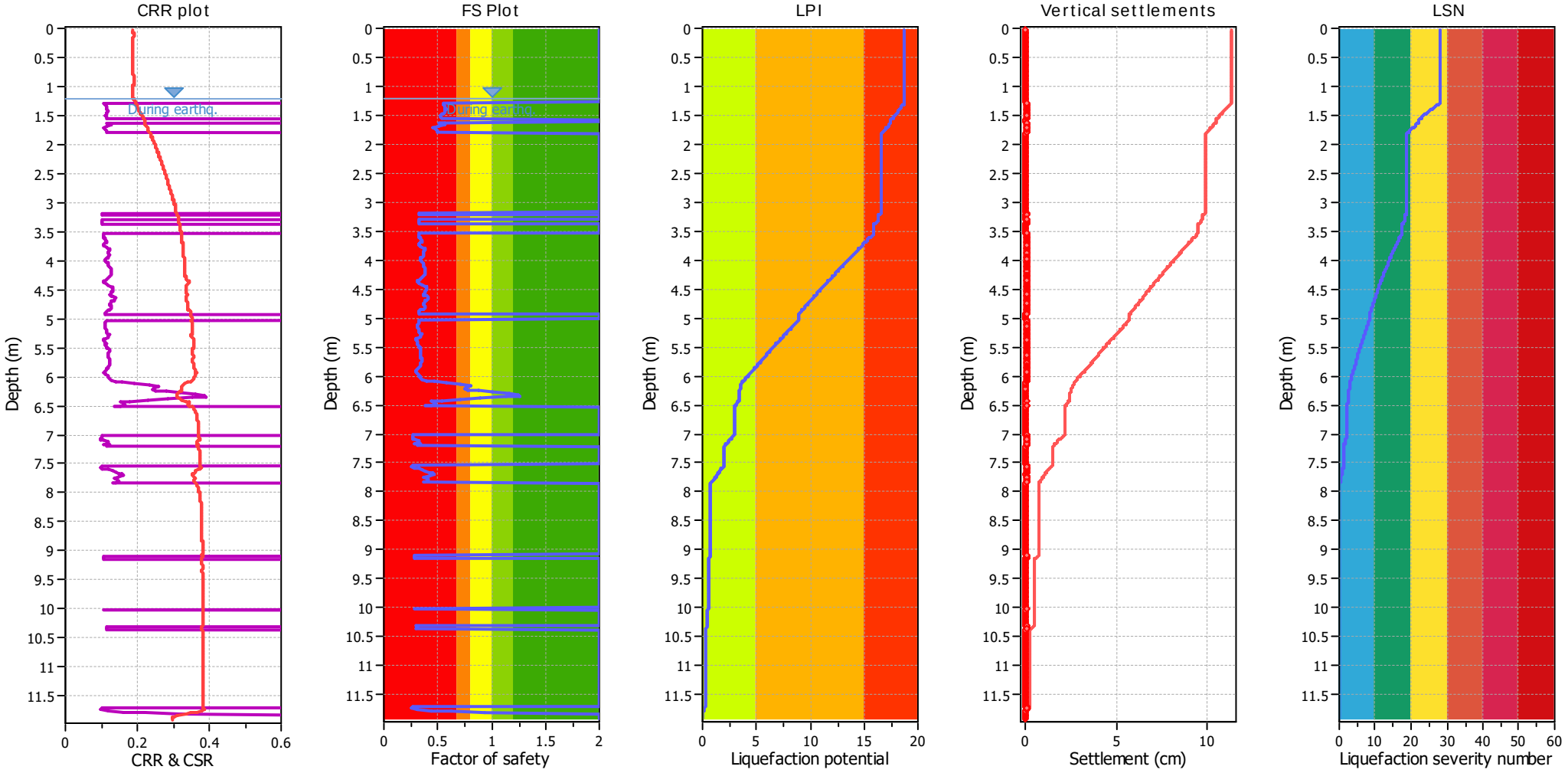
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT11_ULS
Total depth: 11.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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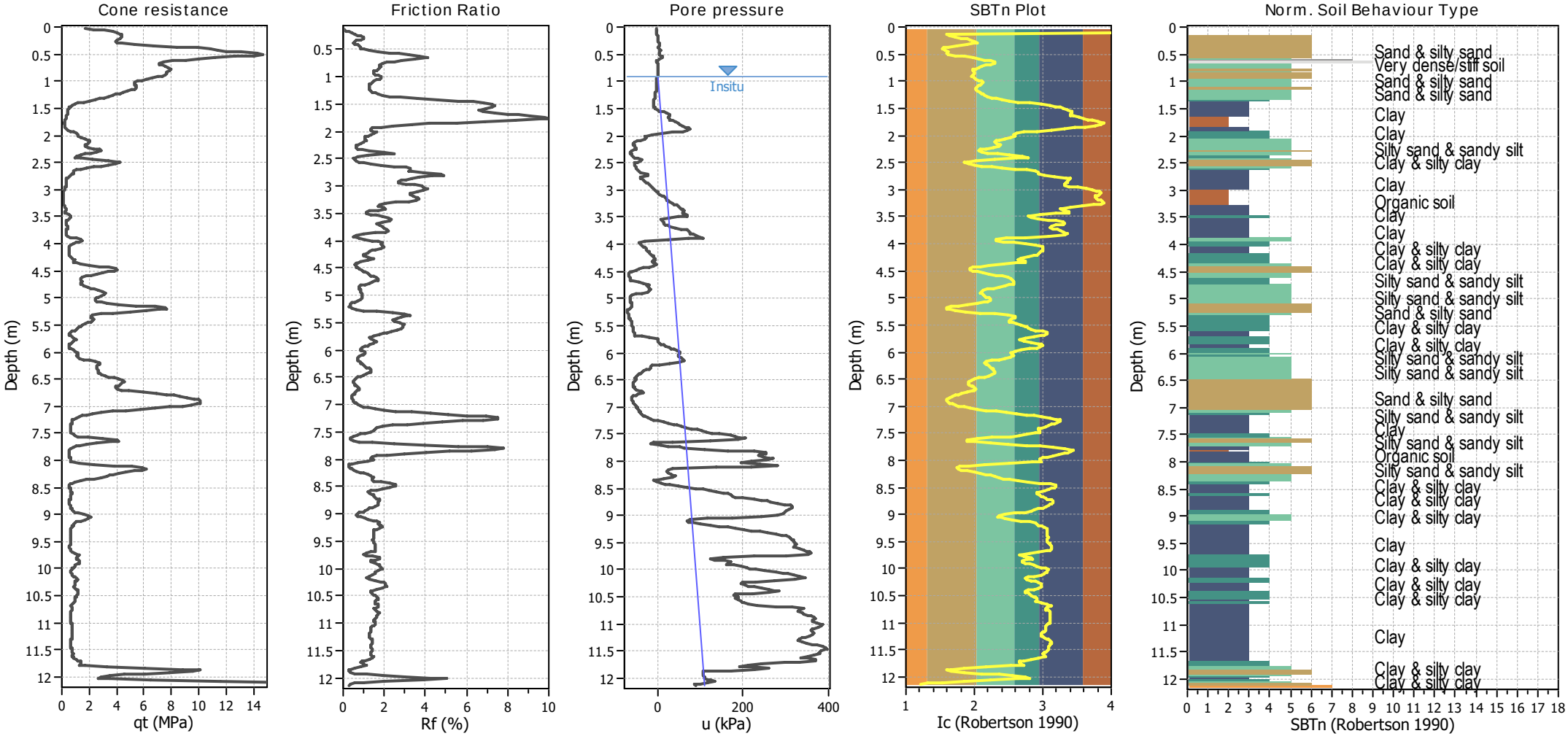
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT12_ULS
Total depth: 12.14 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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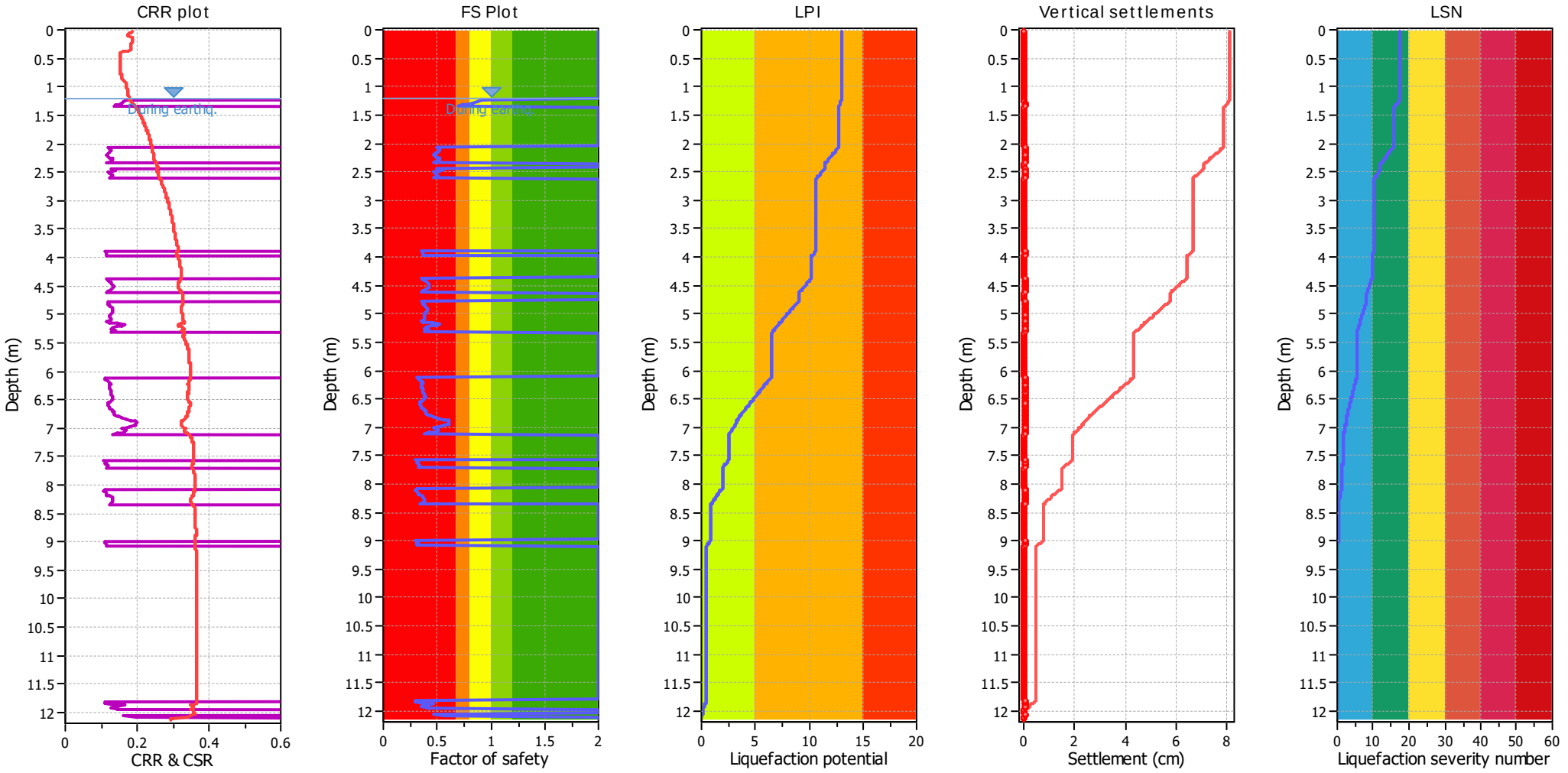
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT12_ULS
Total depth: 12.14 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	0.90 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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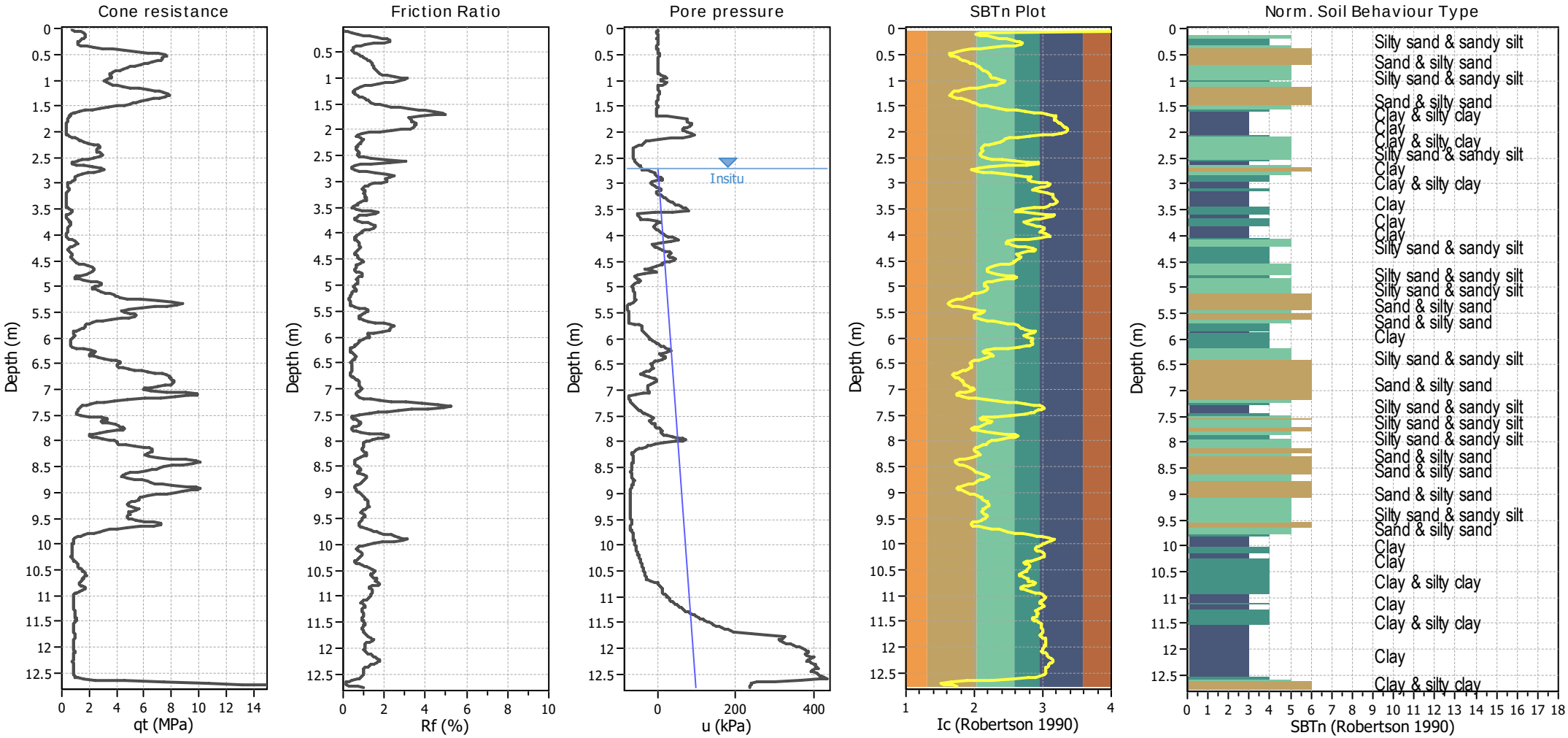
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT13_ULS
Total depth: 12.76 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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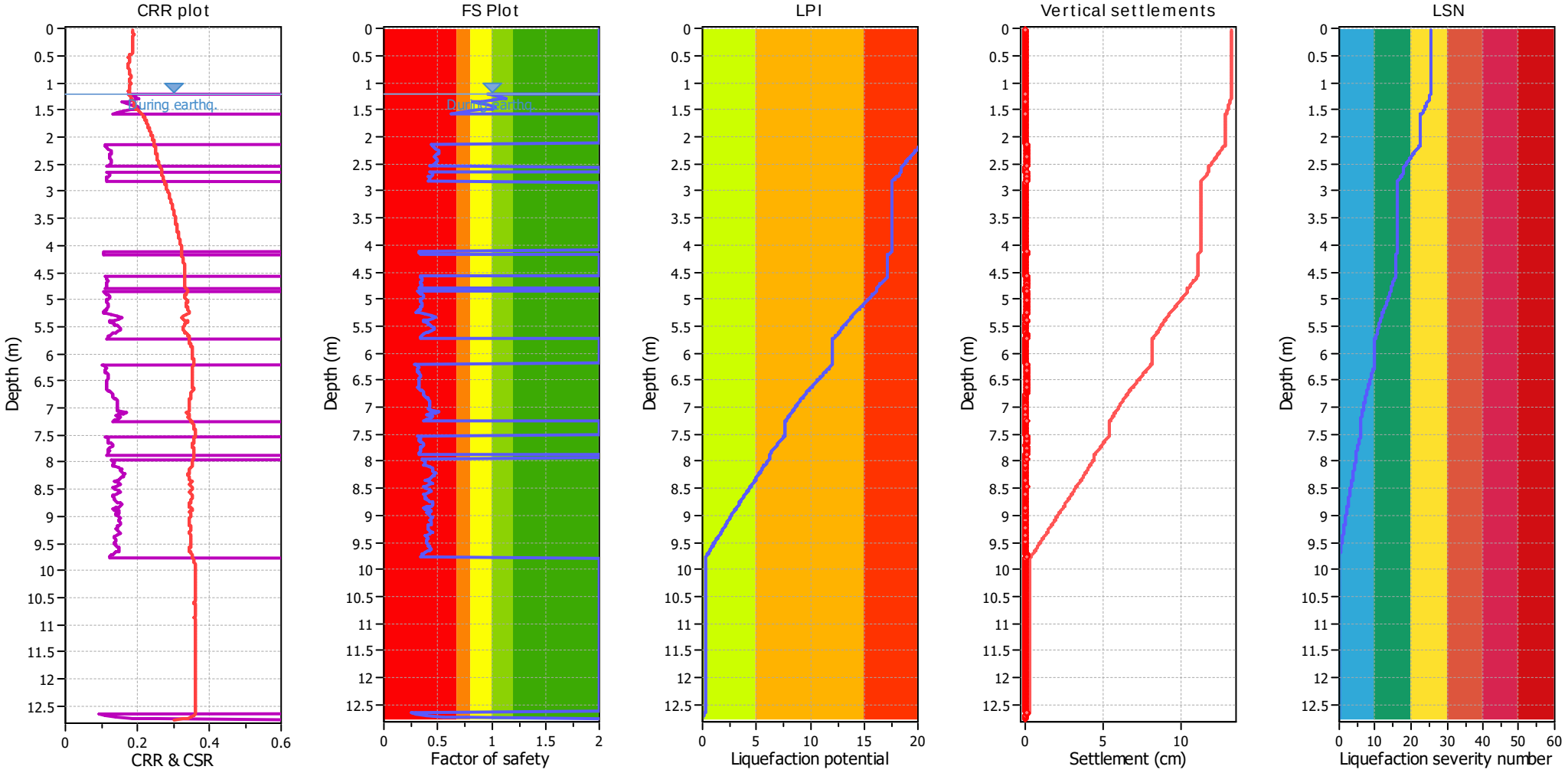
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT13_ULS
Total depth: 12.76 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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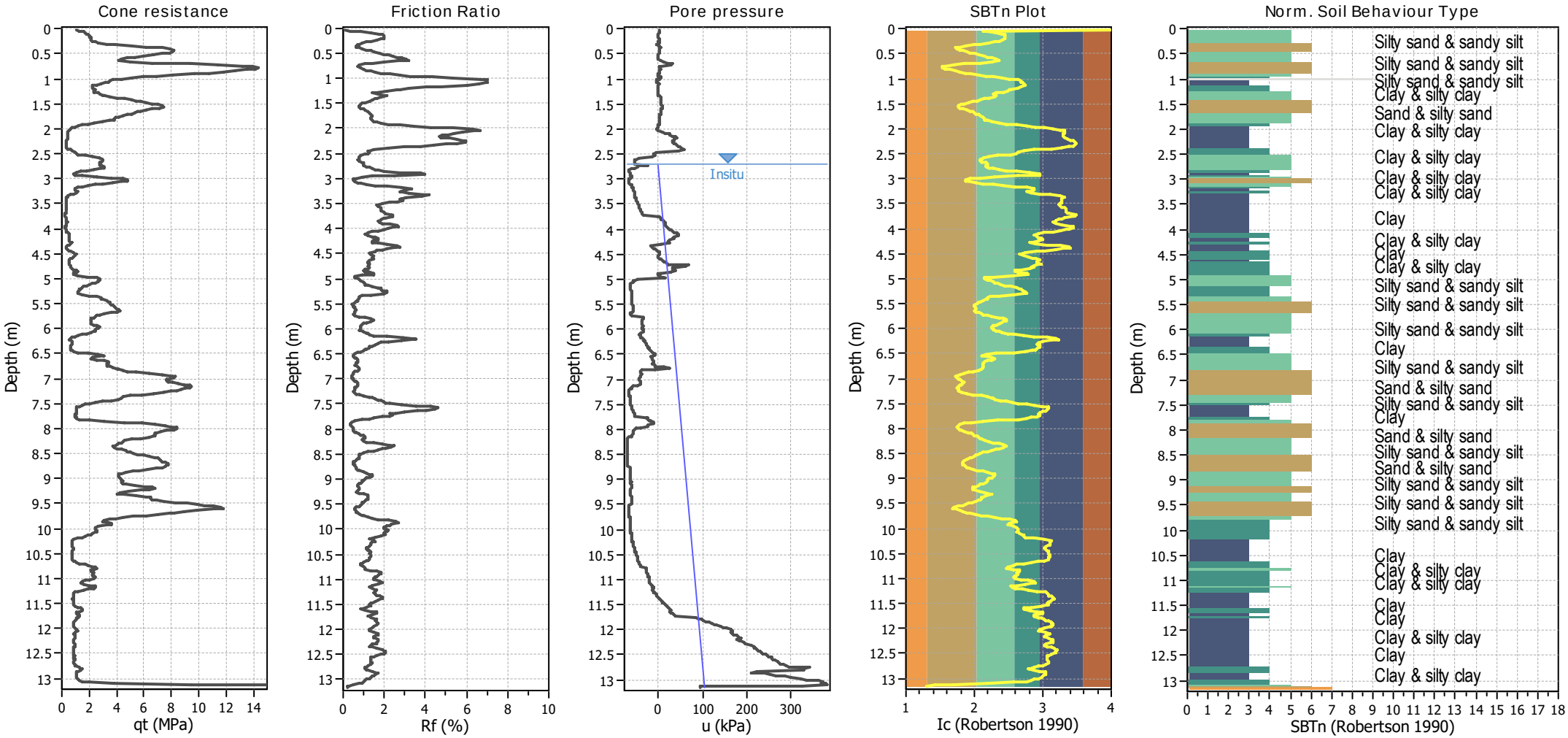
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT14_ULS
Total depth: 13.16 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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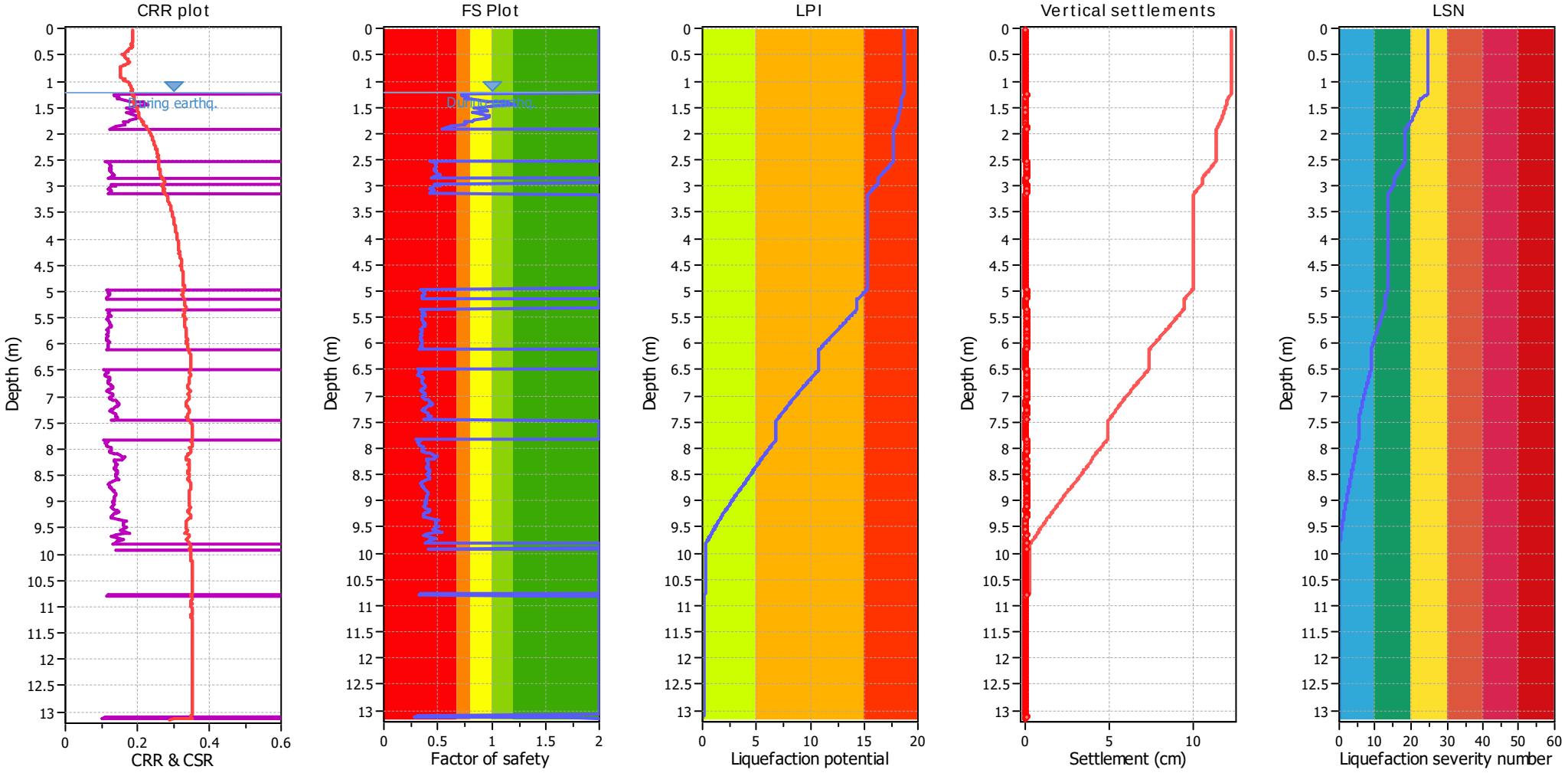
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT14_ULS
Total depth: 13.16 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

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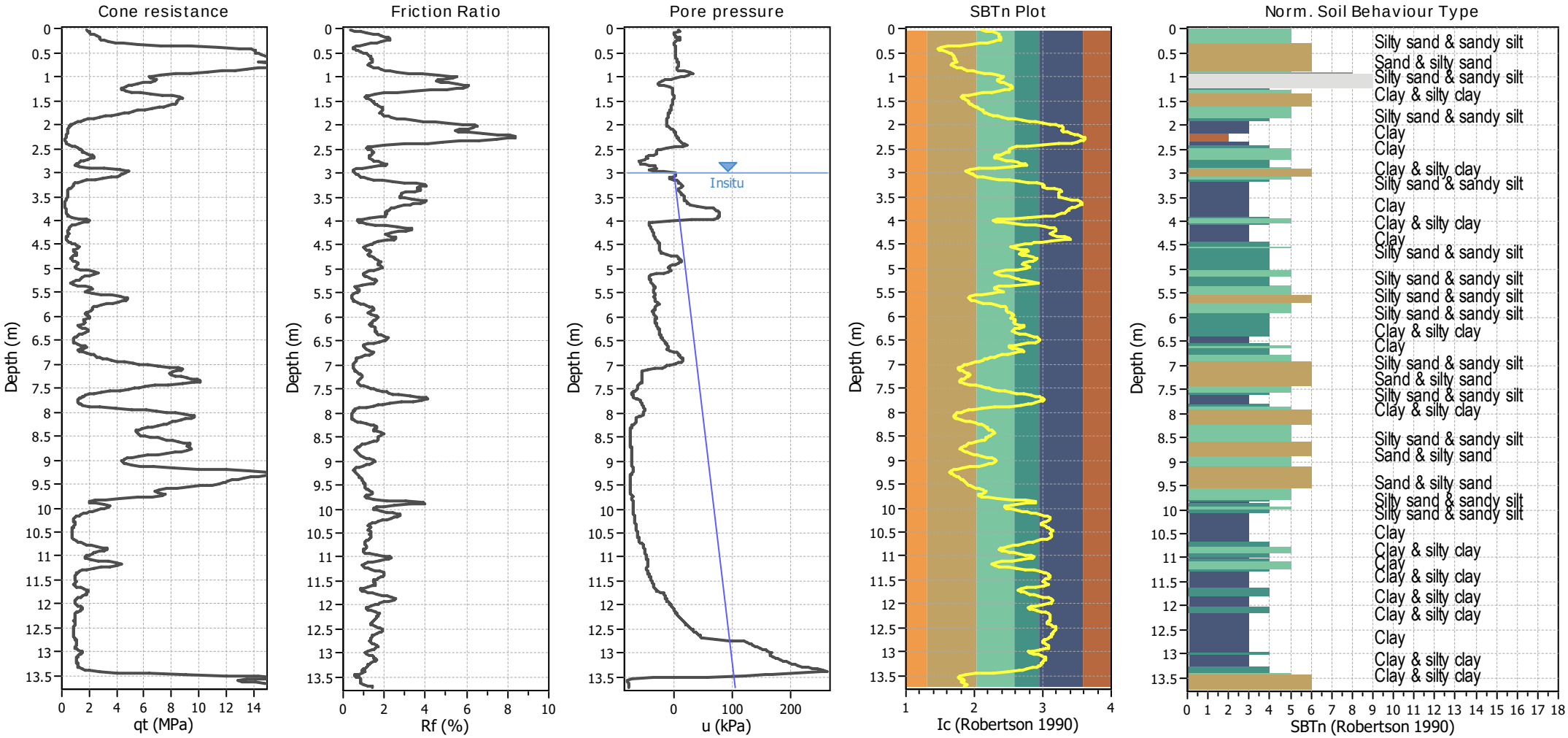
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT15_ULS
Total depth: 13.72 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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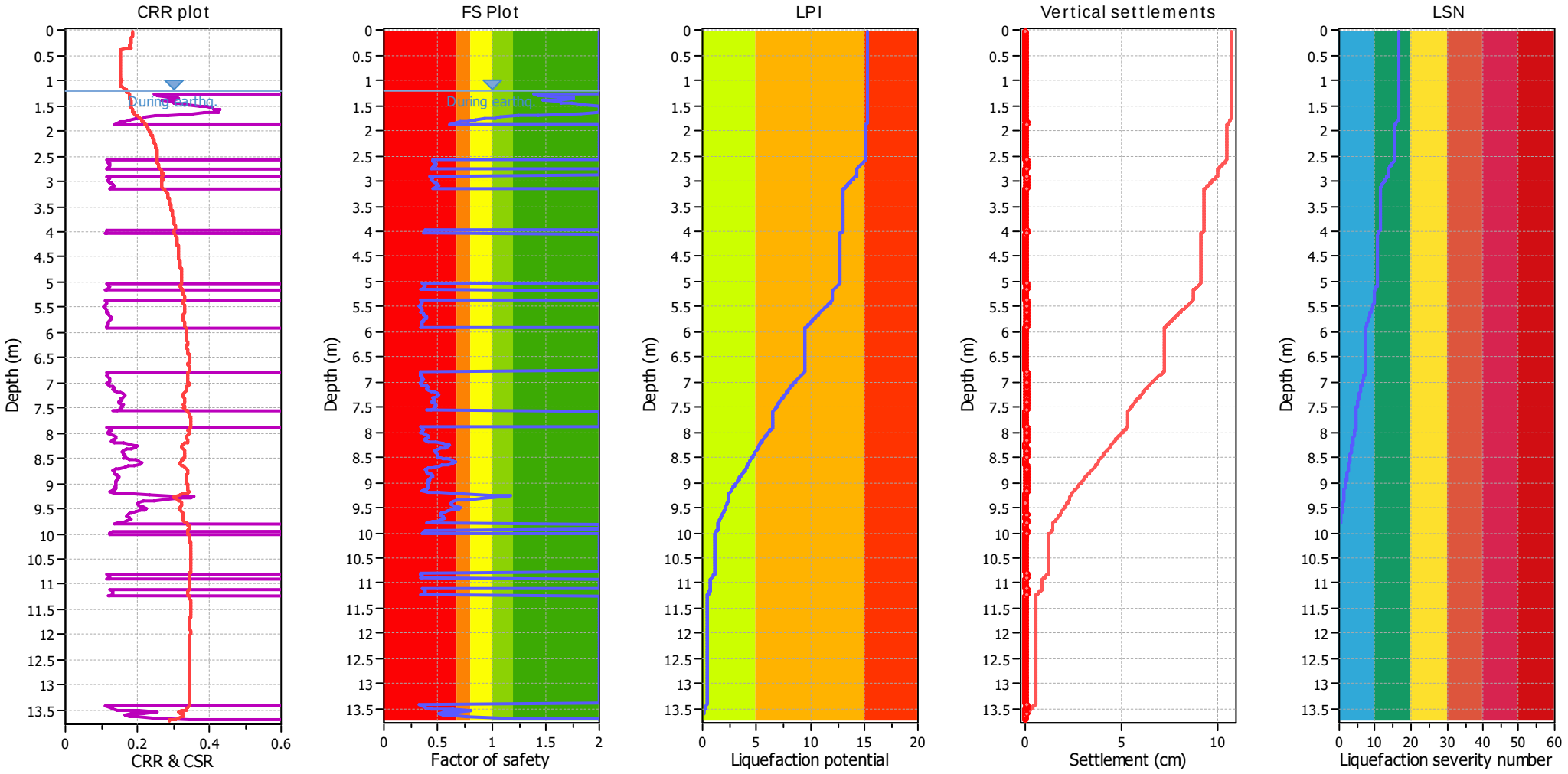
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT15_ULS
Total depth: 13.72 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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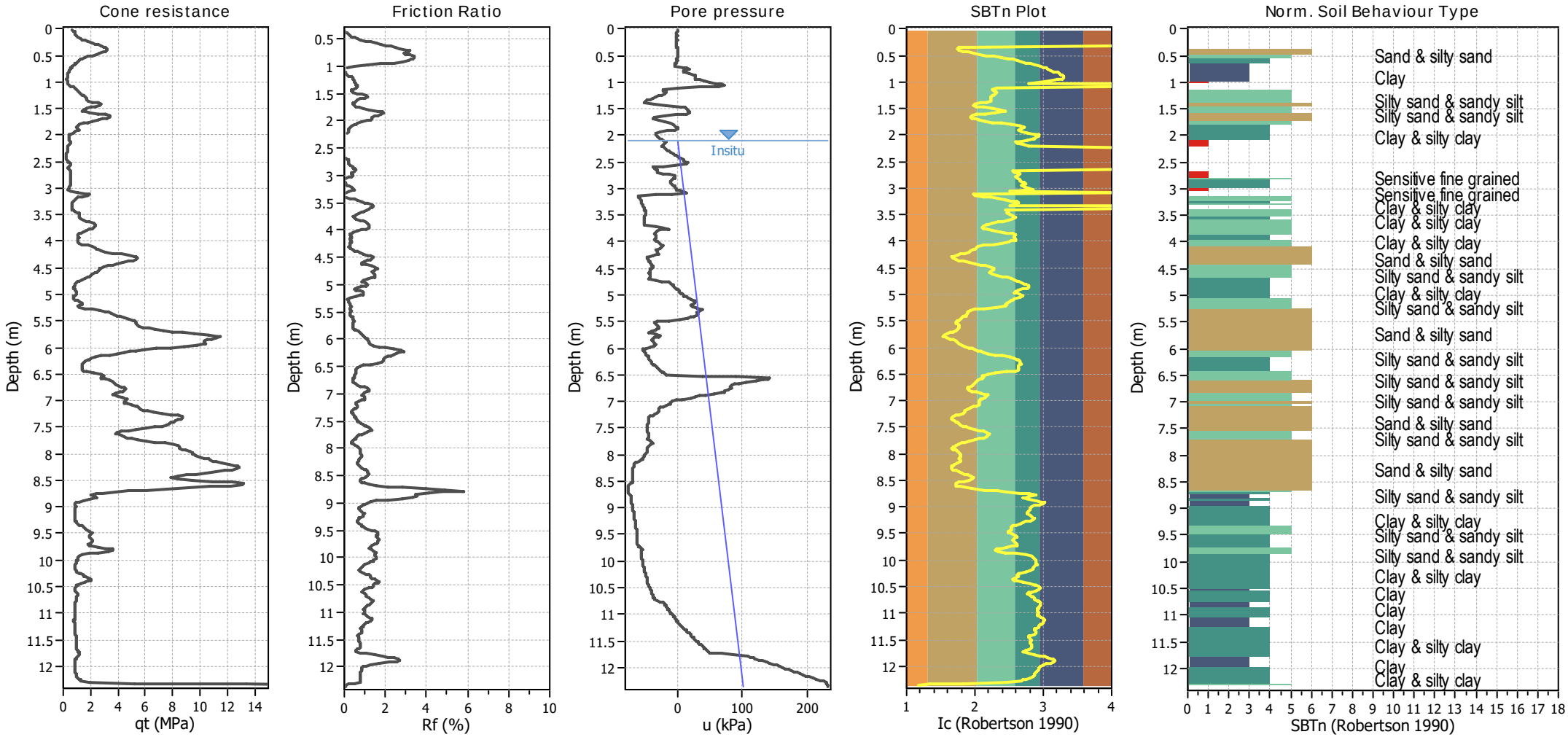
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT16_ULS
Total depth: 12.36 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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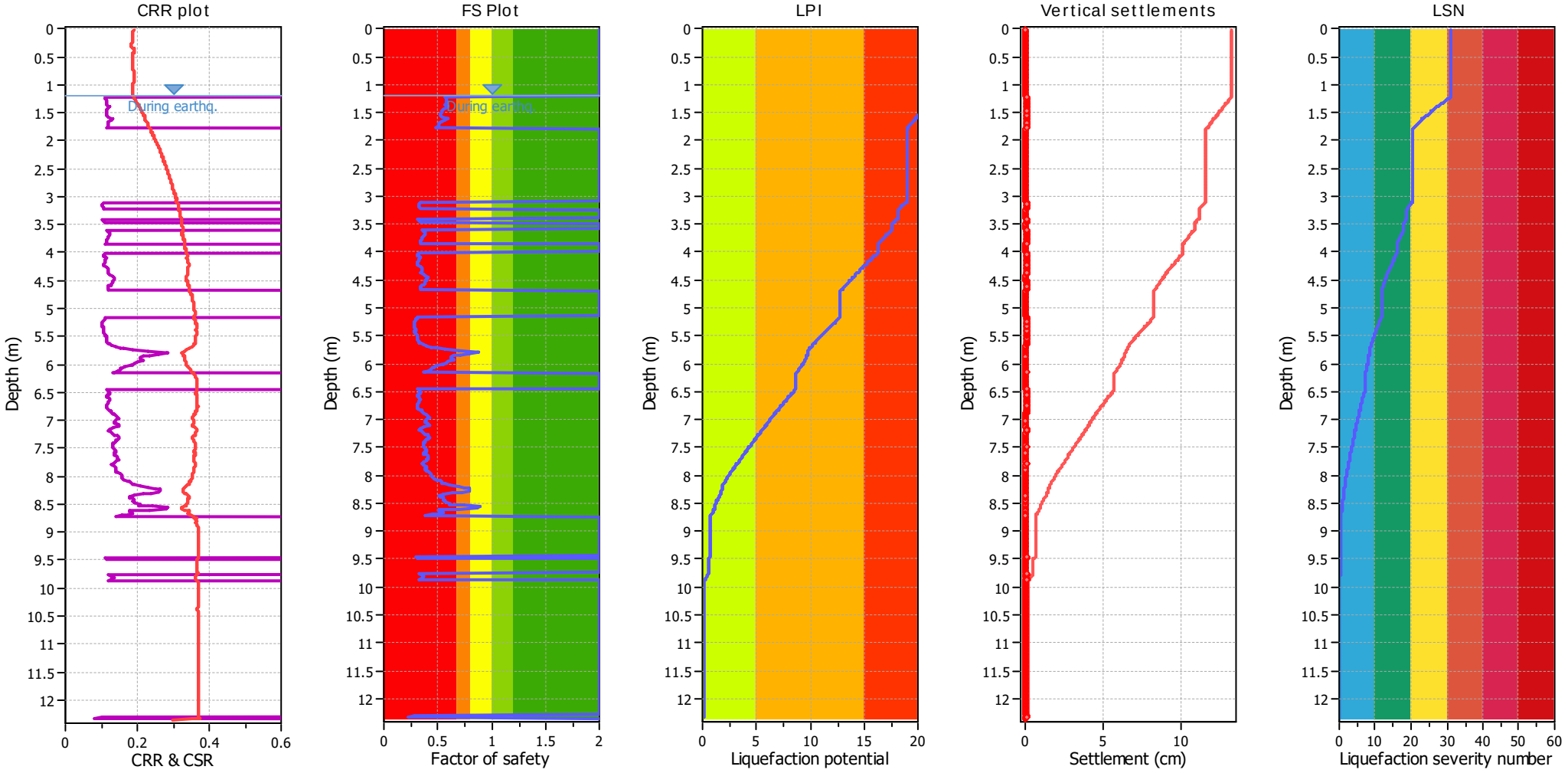
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT16_ULS
Total depth: 12.36 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.10 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

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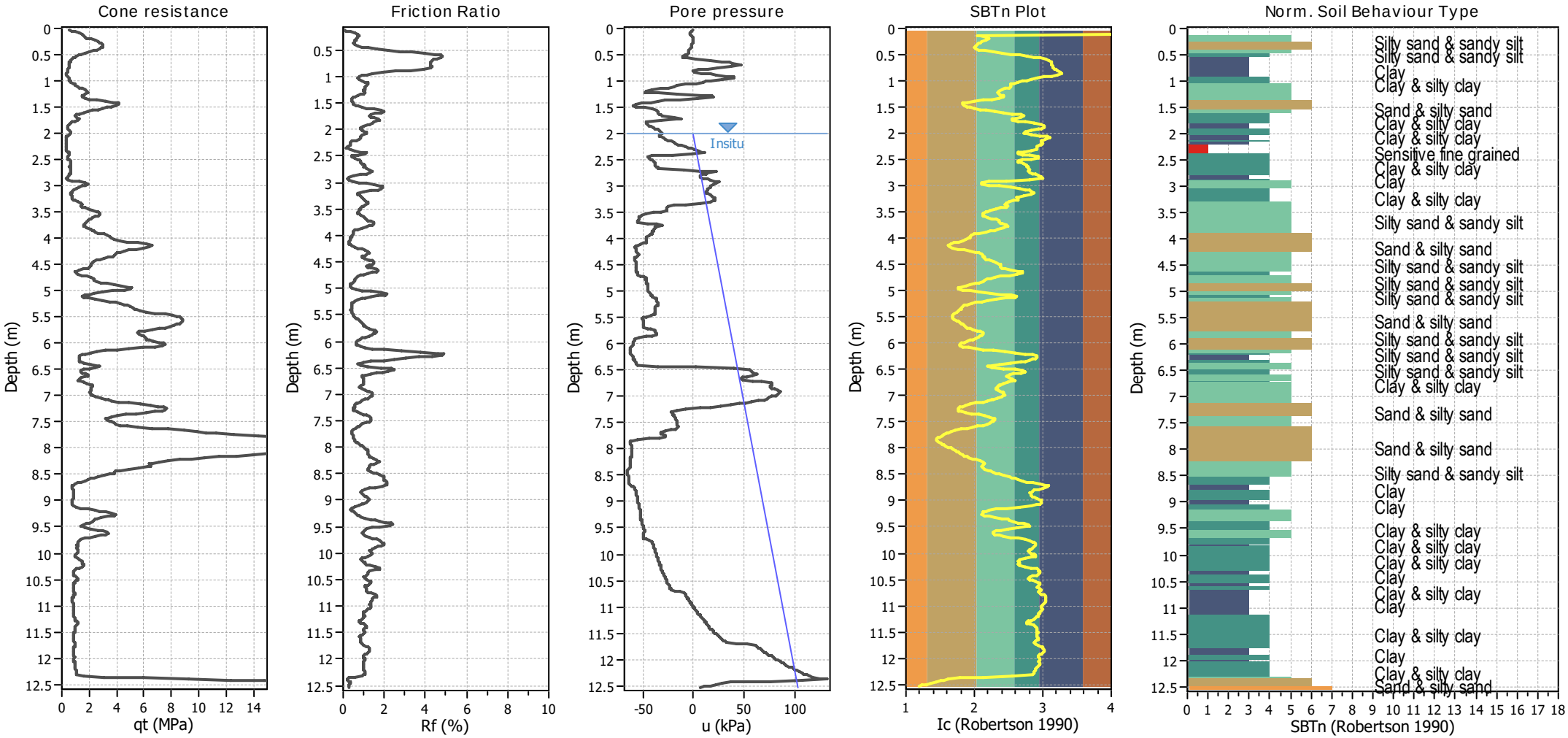
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT17_ULS
Total depth: 12.54 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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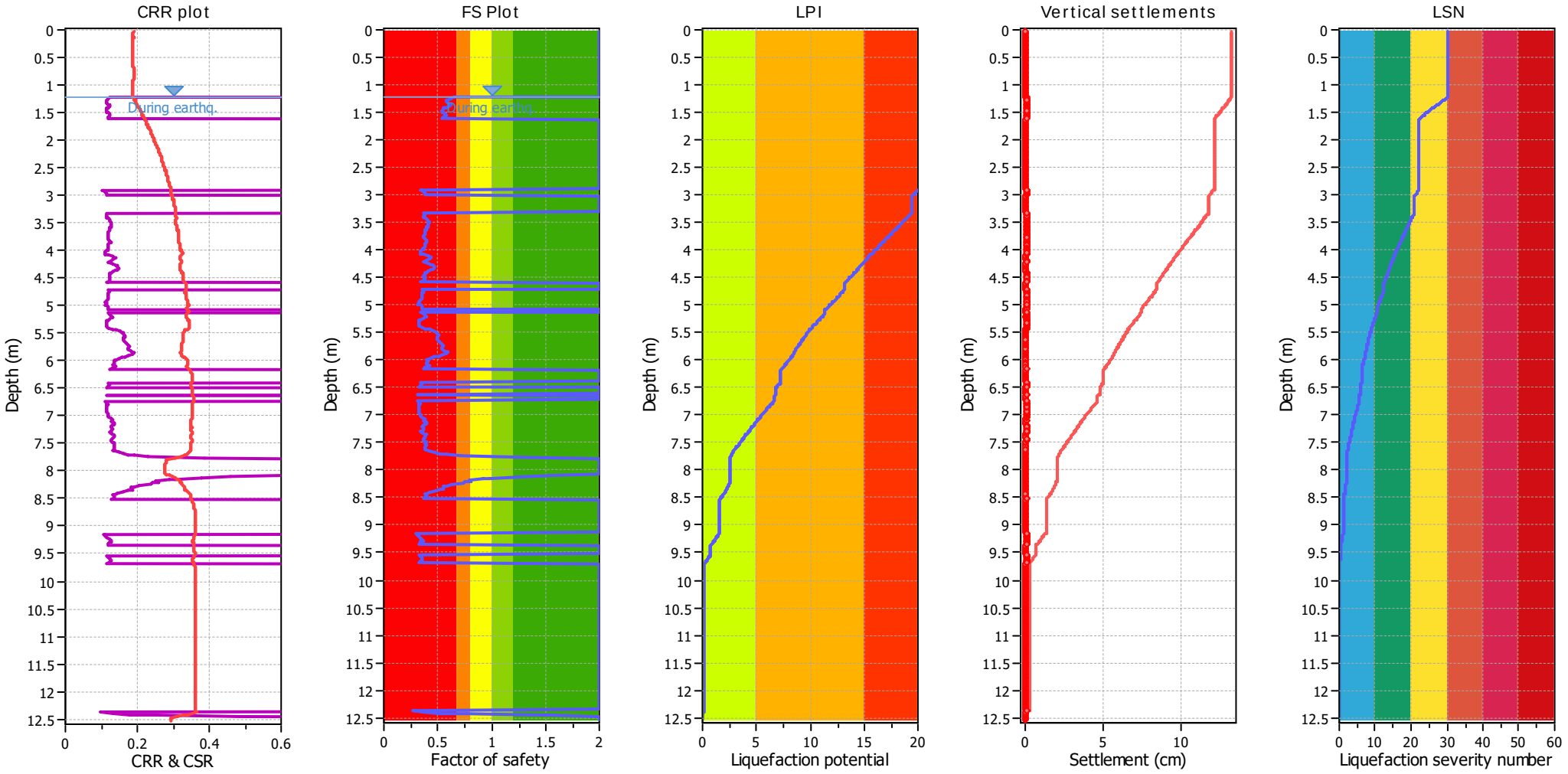
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT17_ULS
Total depth: 12.54 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

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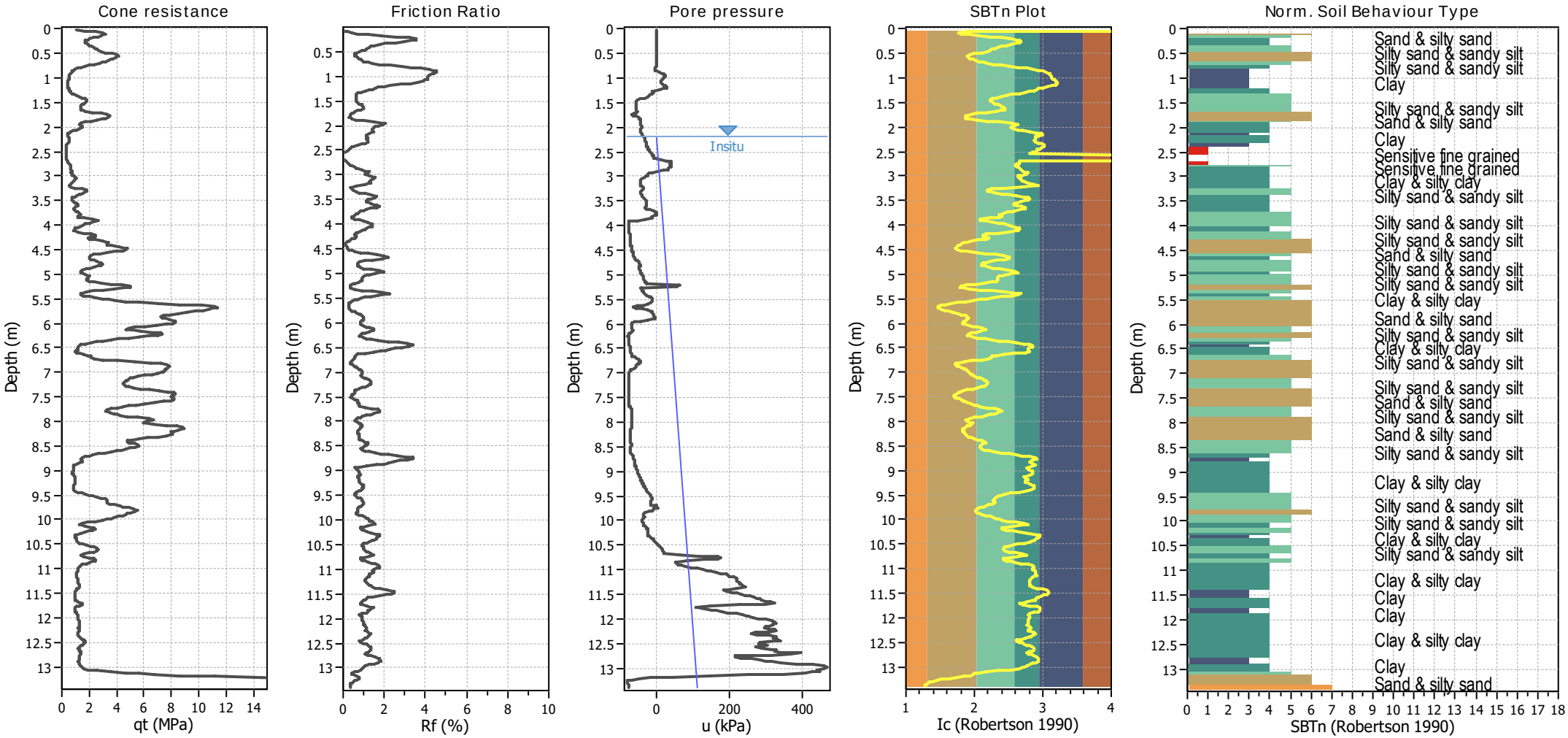
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT18_ULS
Total depth: 13.40 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.20 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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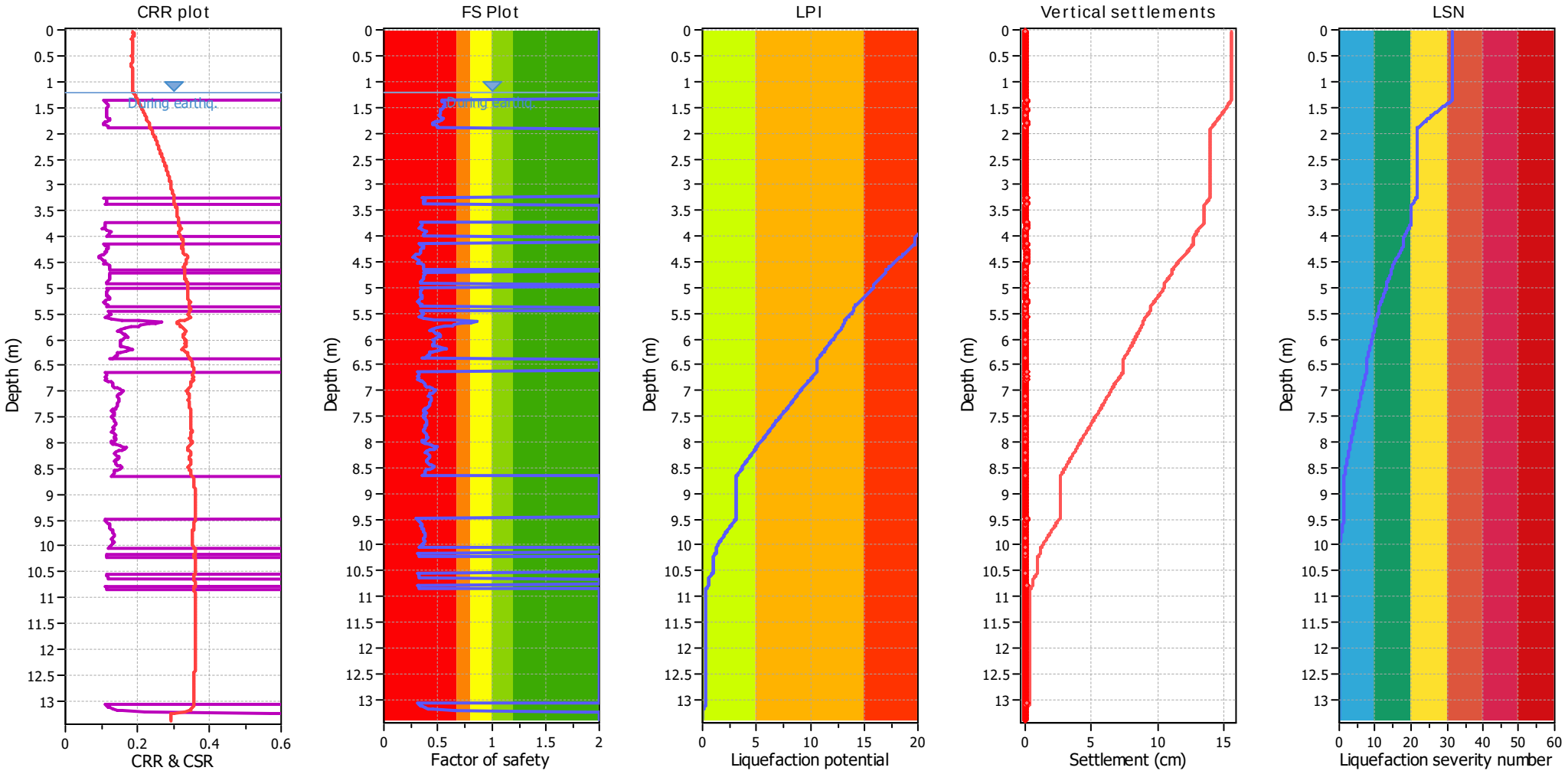
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT18_ULS
Total depth: 13.40 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.20 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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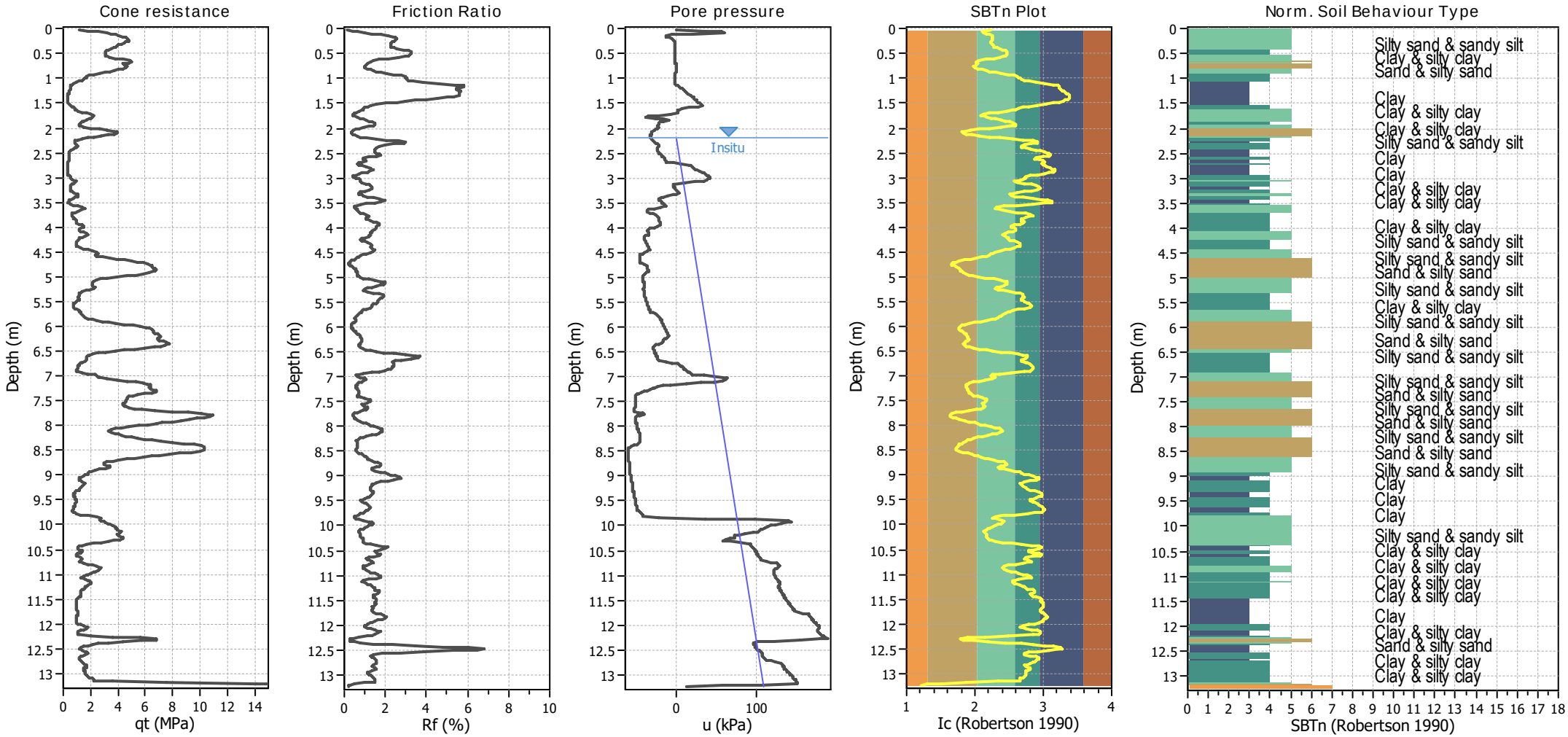
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT19_ULS
Total depth: 13.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.20 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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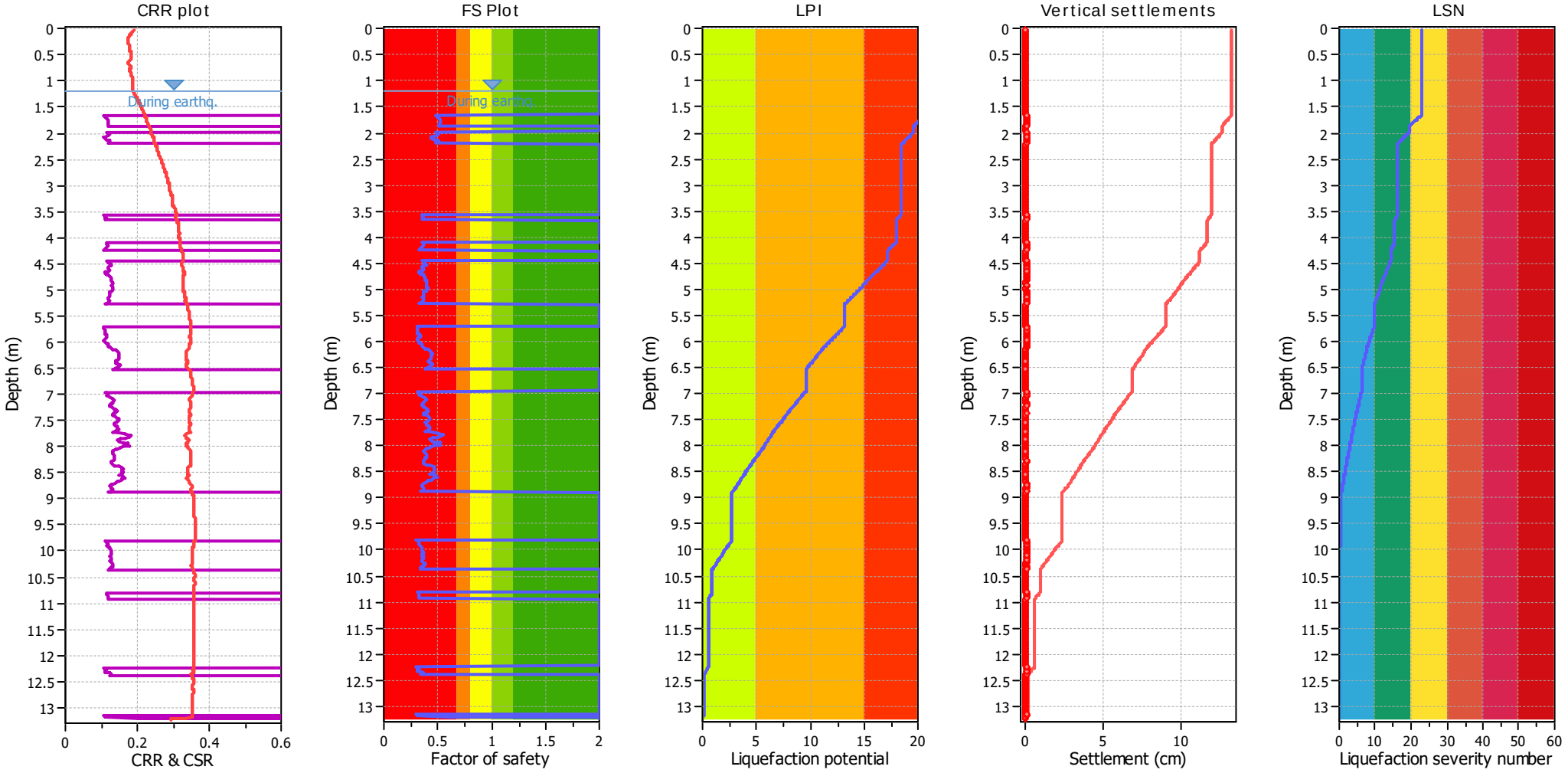
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT19_ULS
Total depth: 13.24 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.20 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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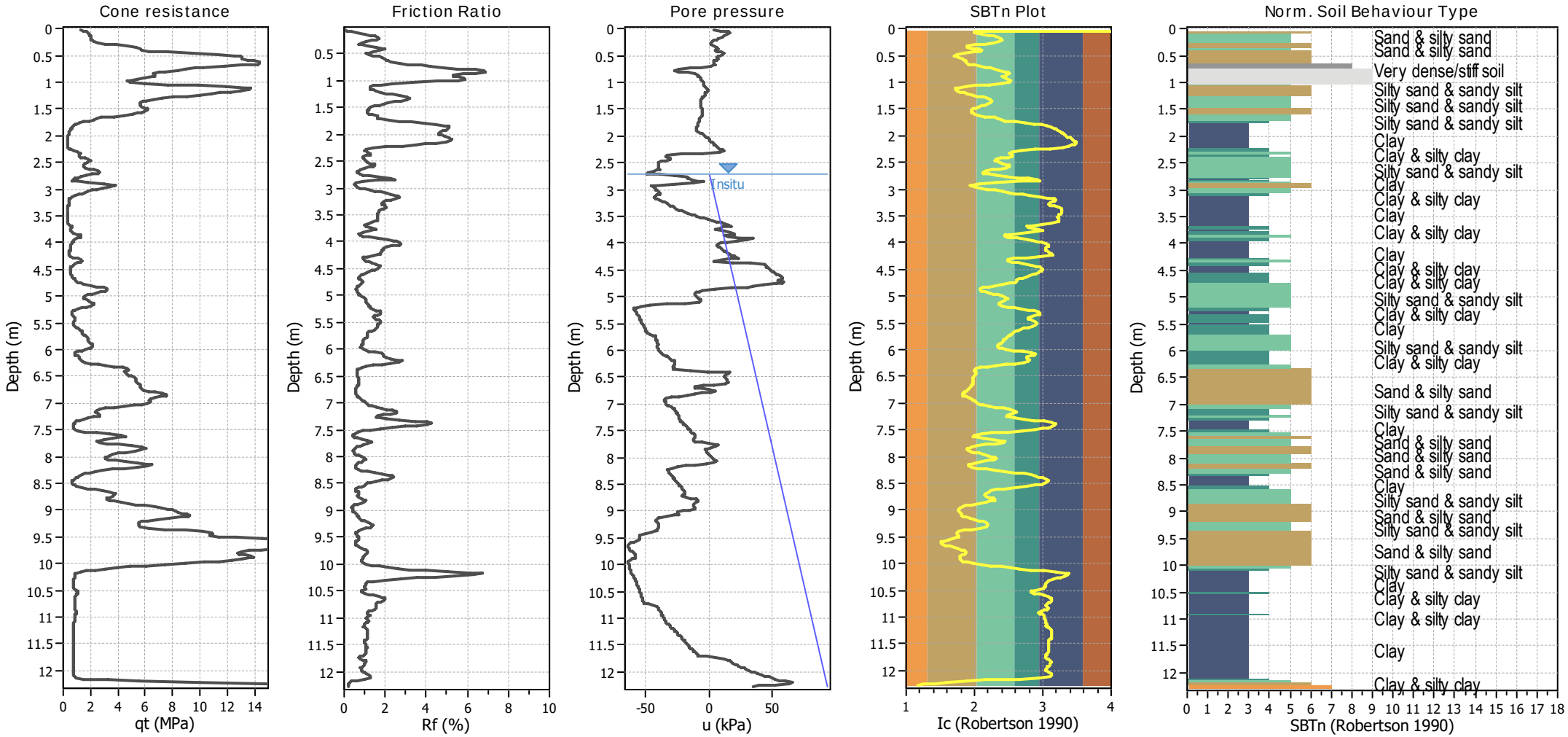
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT20_ULS
Total depth: 12.28 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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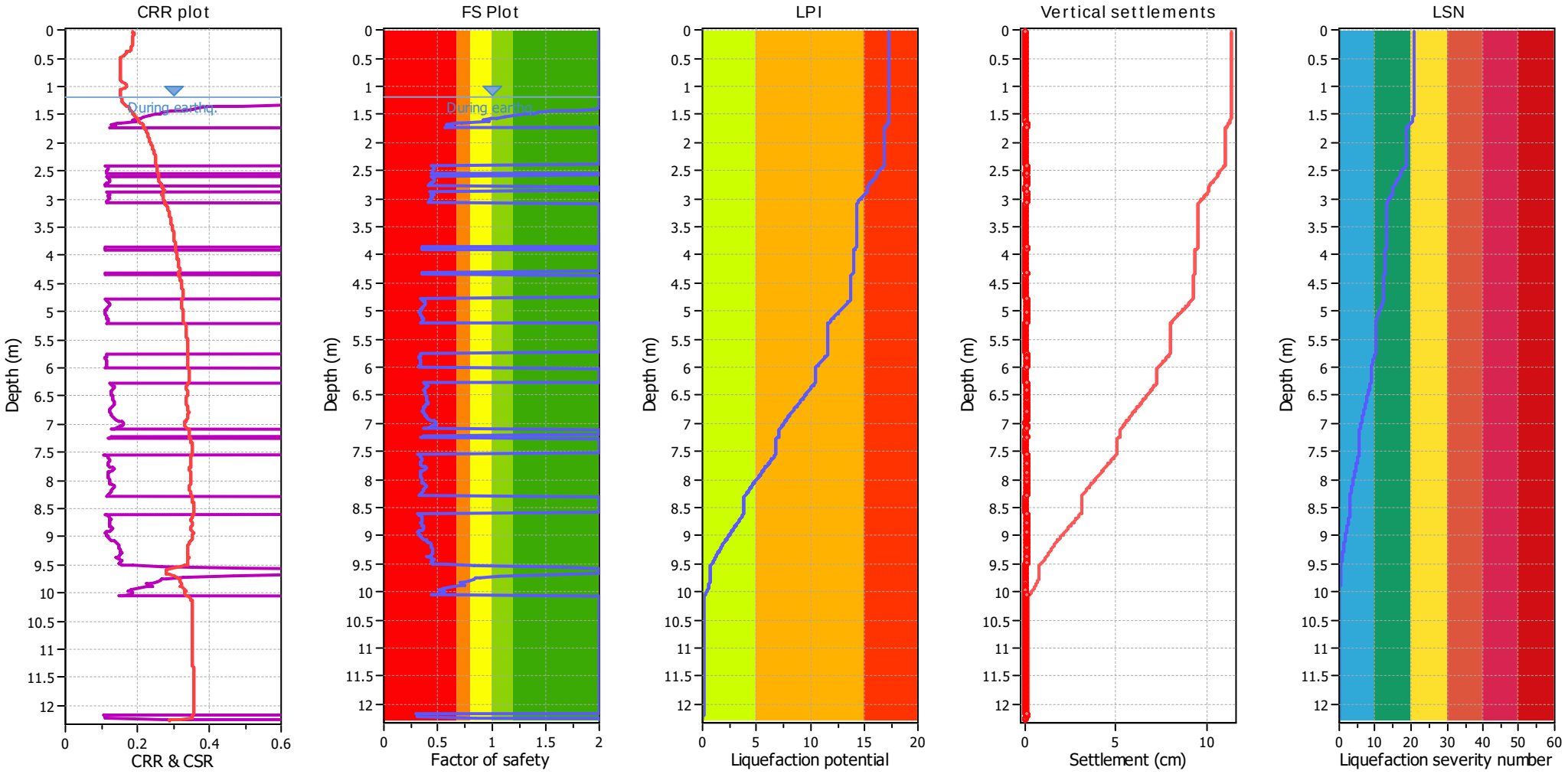
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT20_ULS
Total depth: 12.28 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.70 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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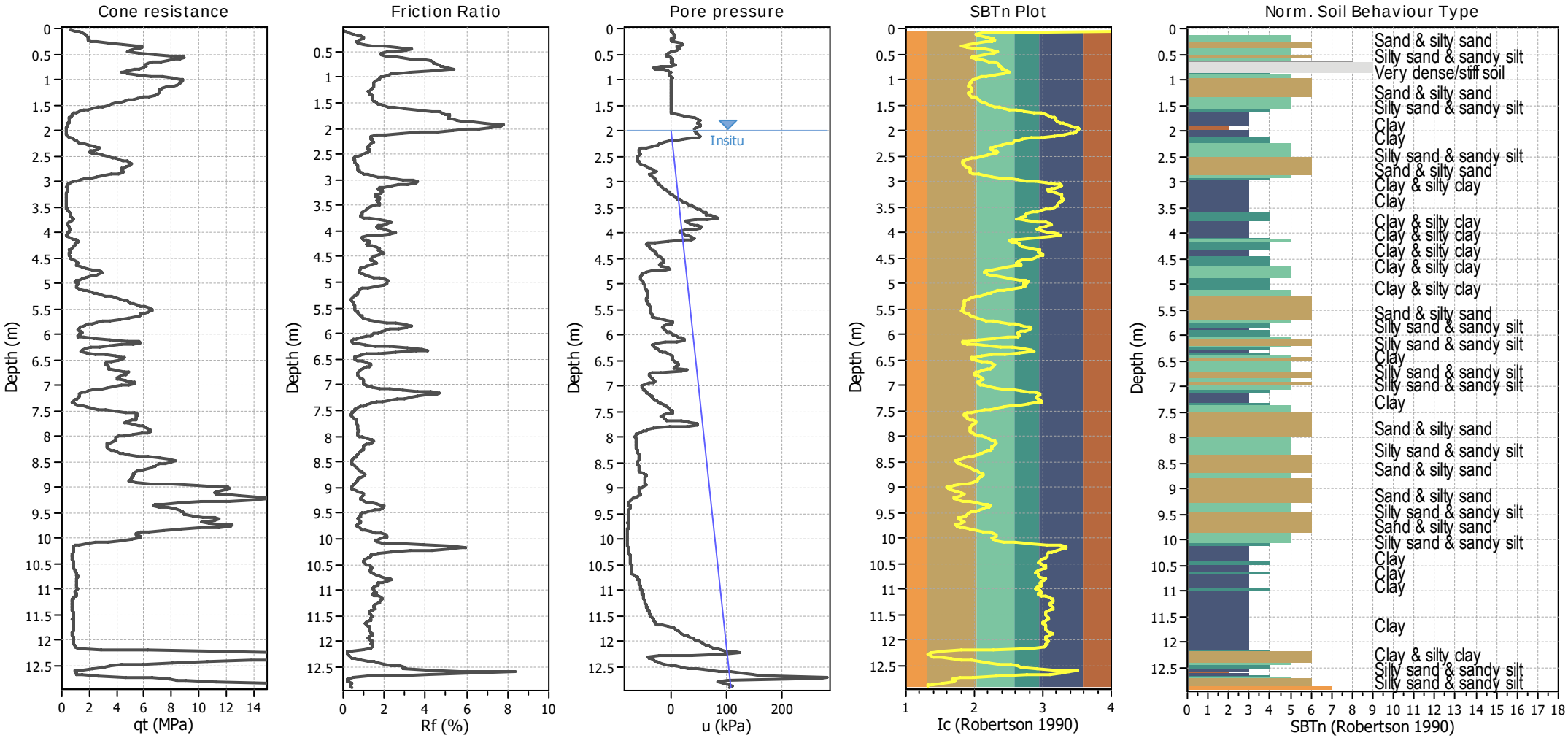
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT21_ULS
Total depth: 12.90 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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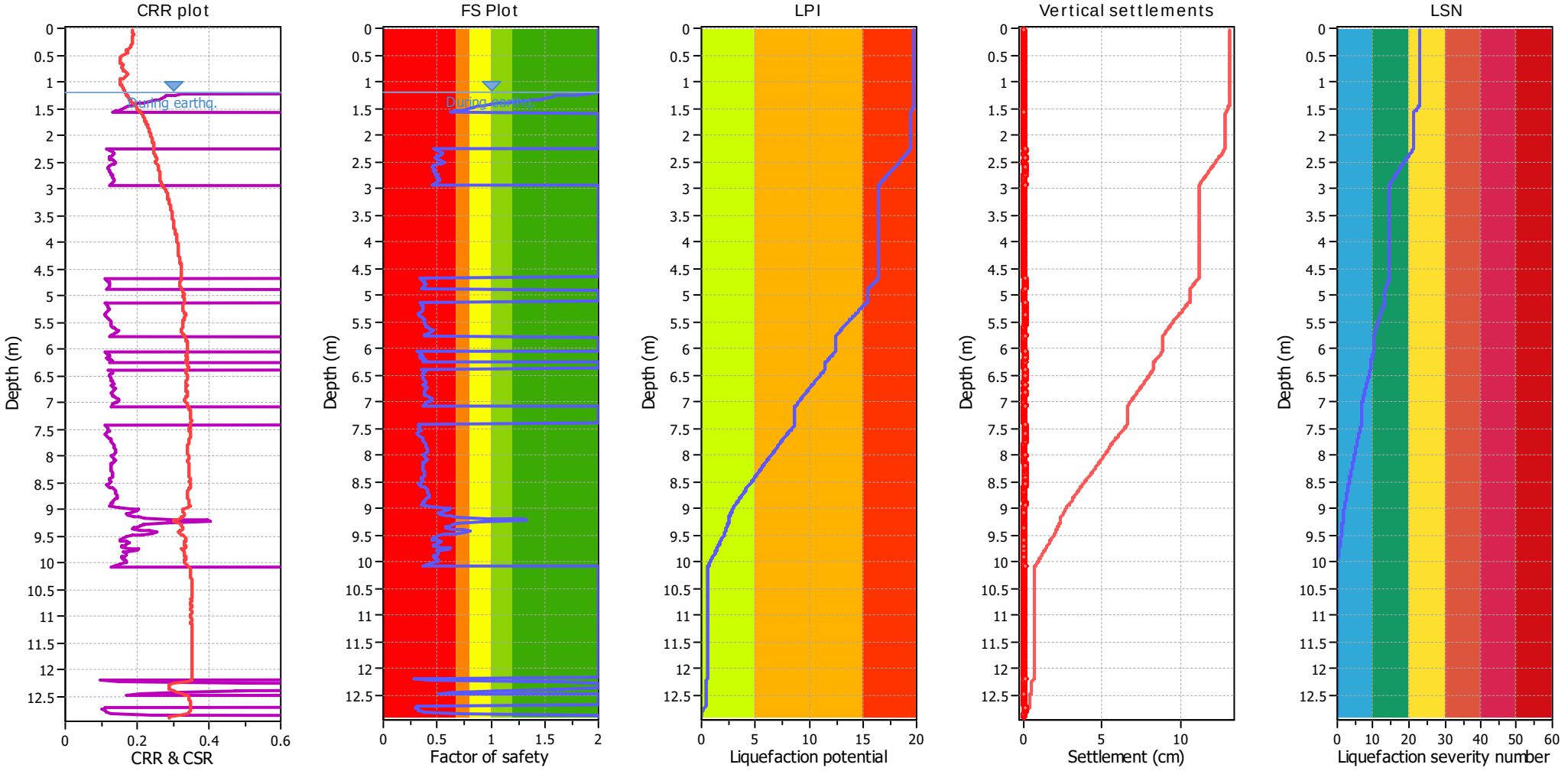
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT21_ULS
Total depth: 12.90 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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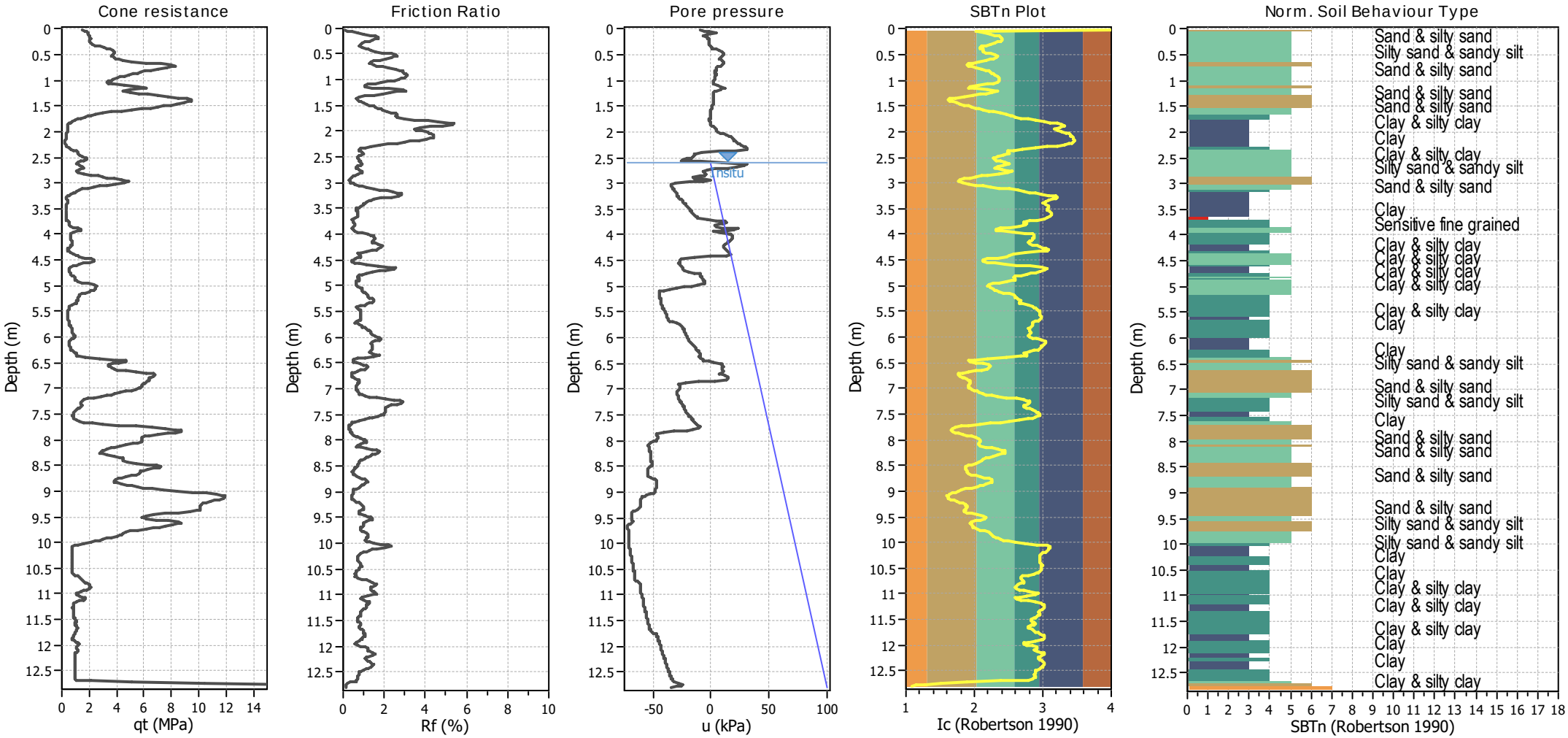
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT22_ULS
Total depth: 12.80 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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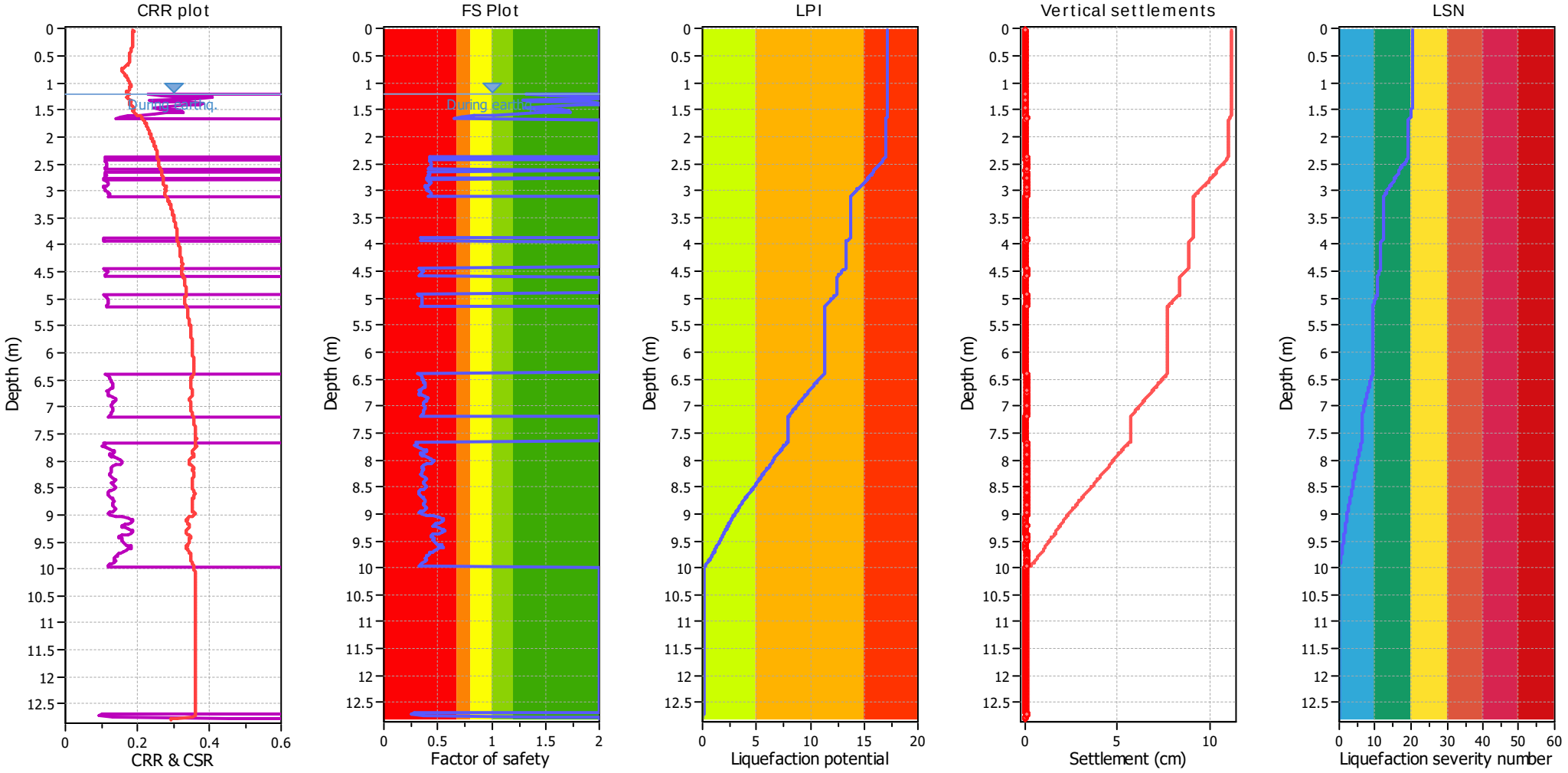
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT22_ULS
Total depth: 12.80 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	2.60 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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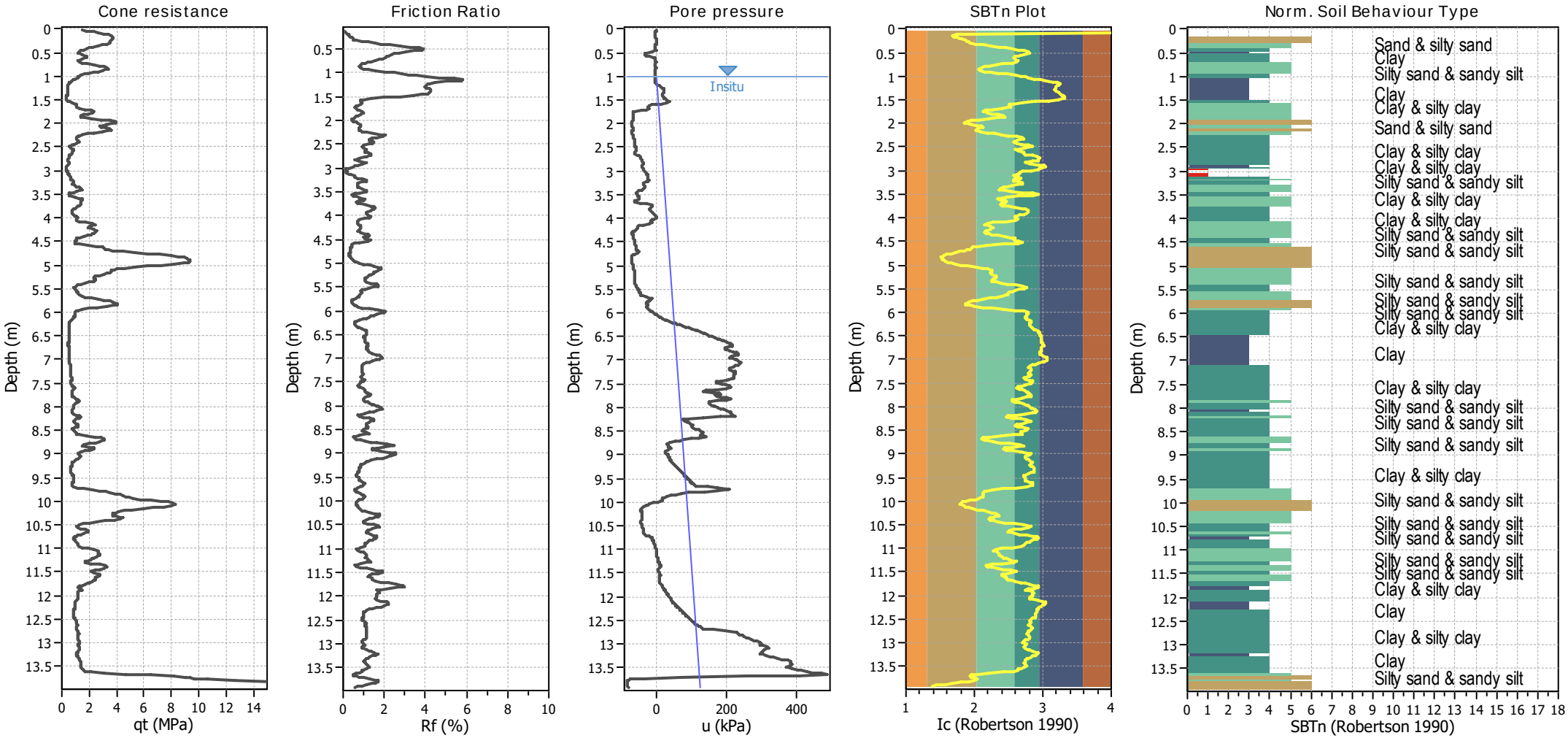
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT23_ULS
Total depth: 13.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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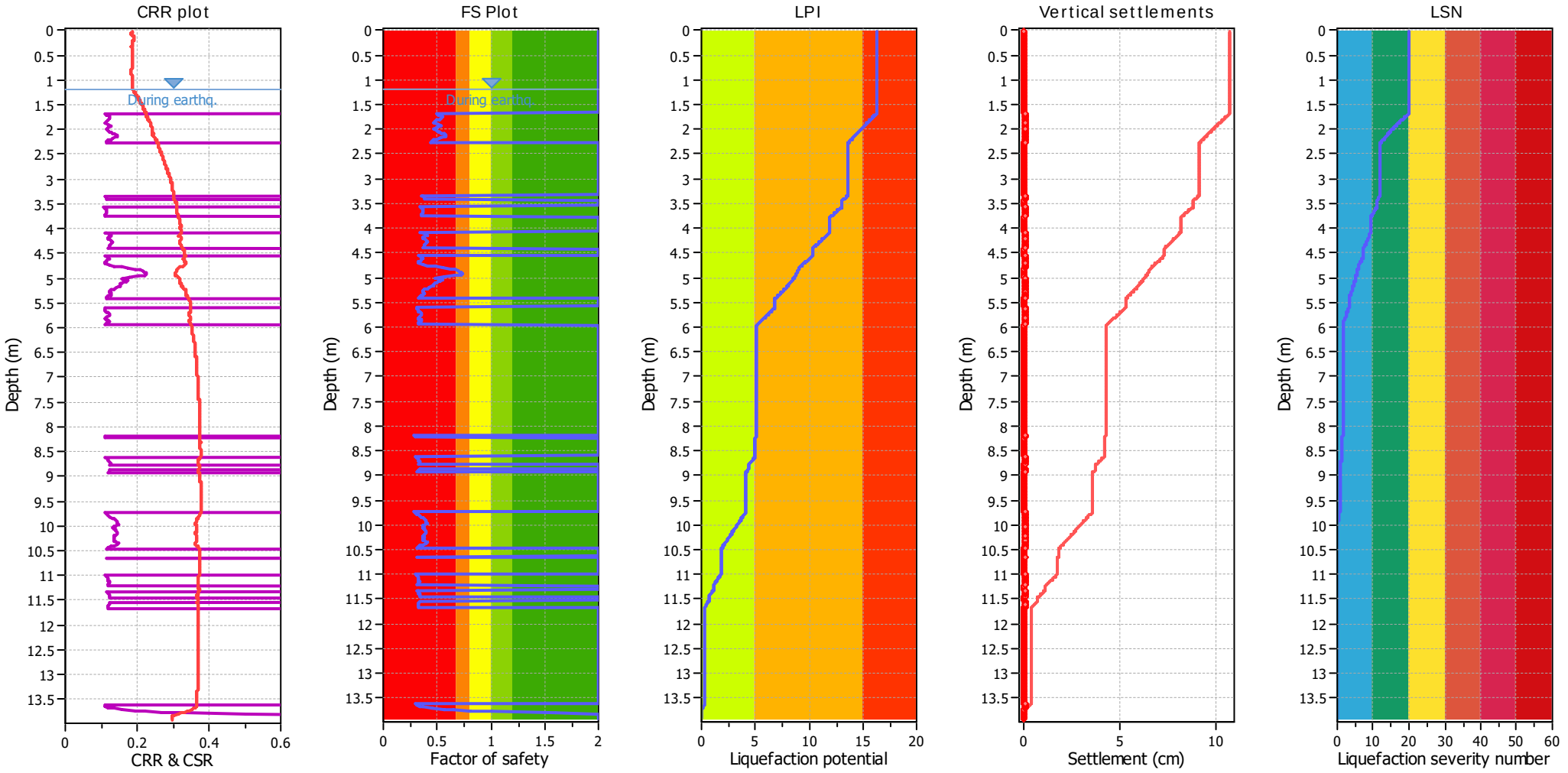
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT23_ULS
Total depth: 13.92 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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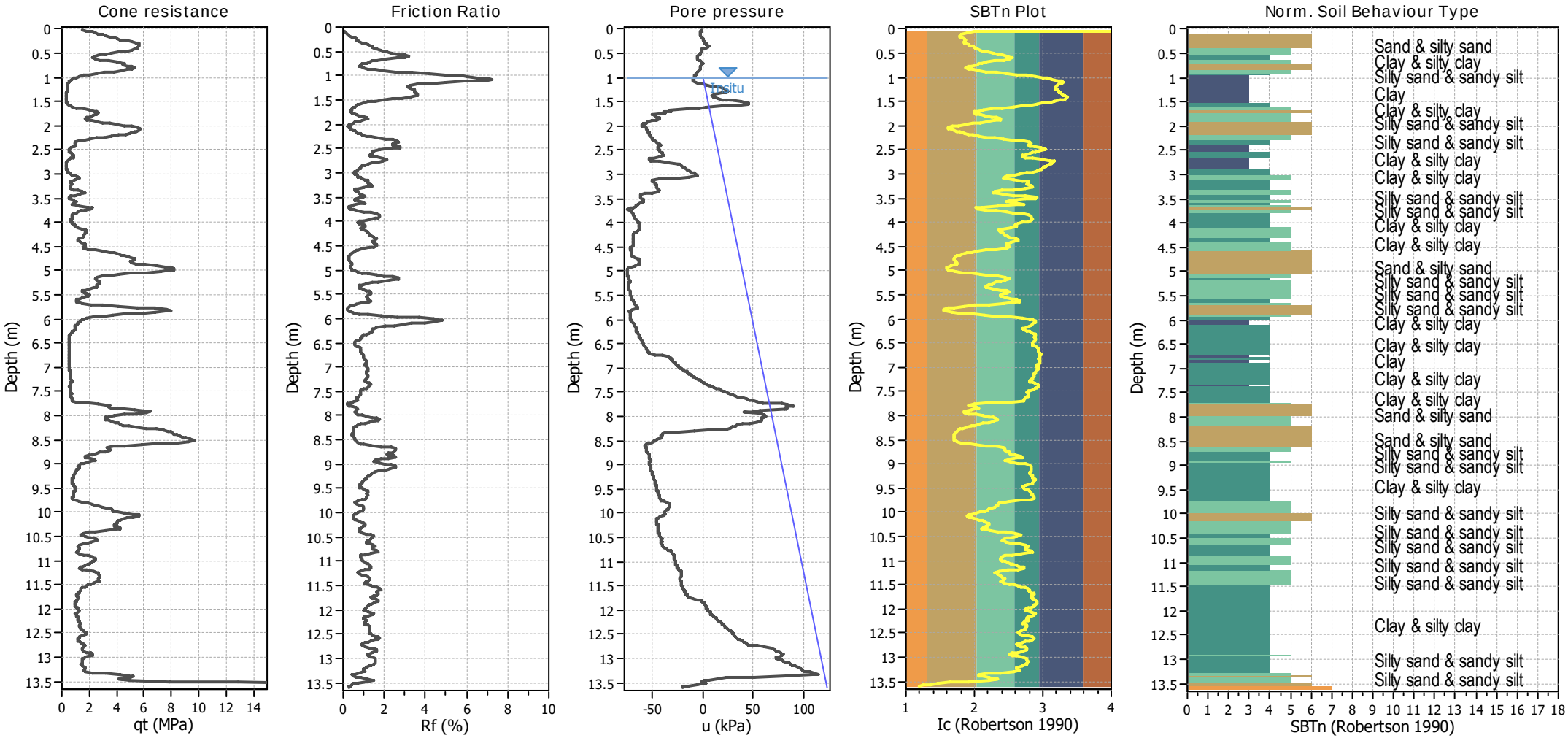
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT02_ULS
Total depth: 13.60 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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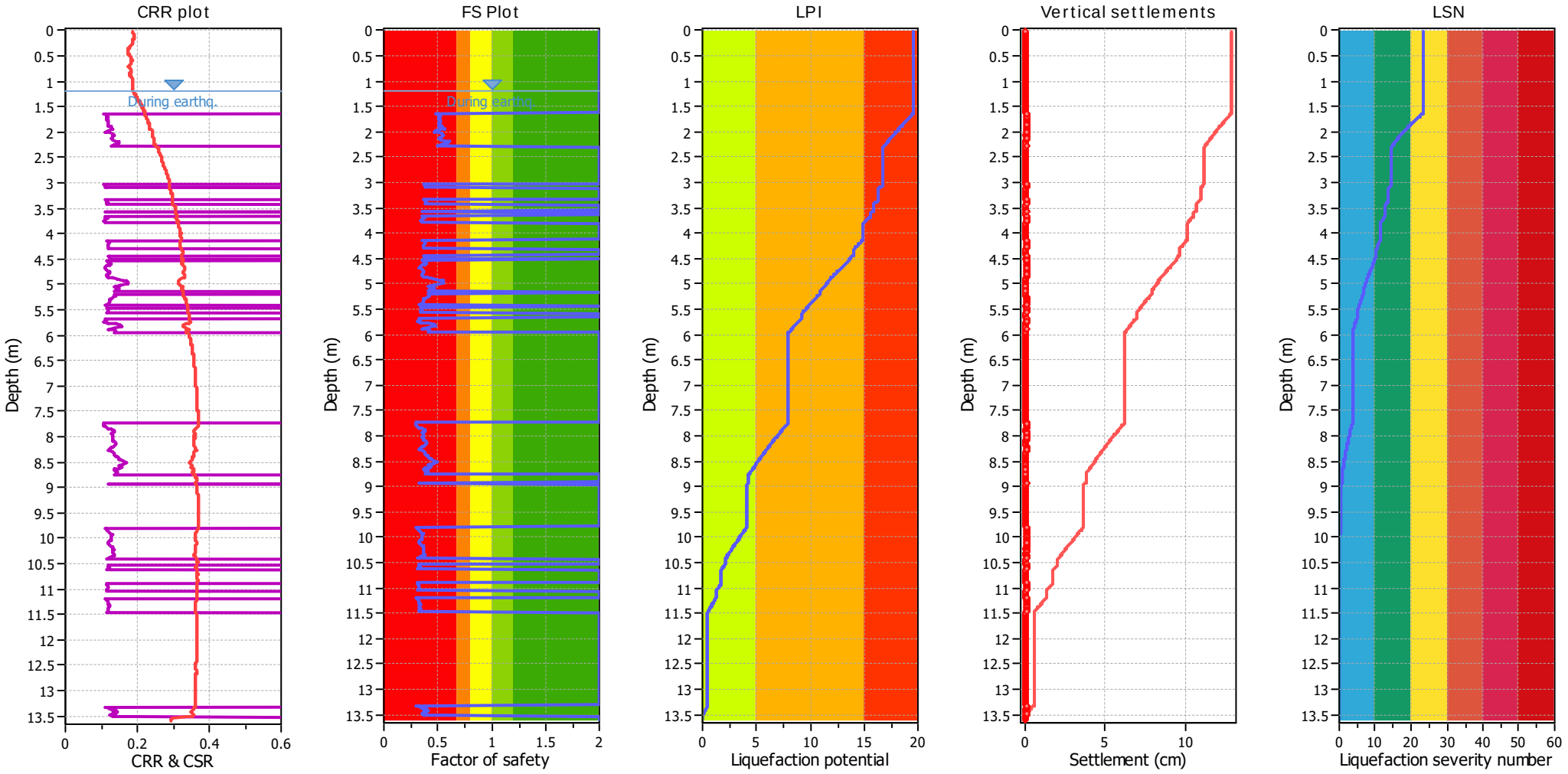
Project: P-000821 (56 Kenny Road, Napier)
Location: ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

CPT: CPT02_ULS
Total depth: 13.60 m



Analysis method:	B&I (2014)	G.W.T. (in-situ):	1.00 m	Use fill:	No	Clay like behavior applied:	.
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	1.20 m	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.90	Ic cut-off value:	2.50	Trans. detect. applied:	No	MSF method:	Method based
Peak ground acceleration:	0.33	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

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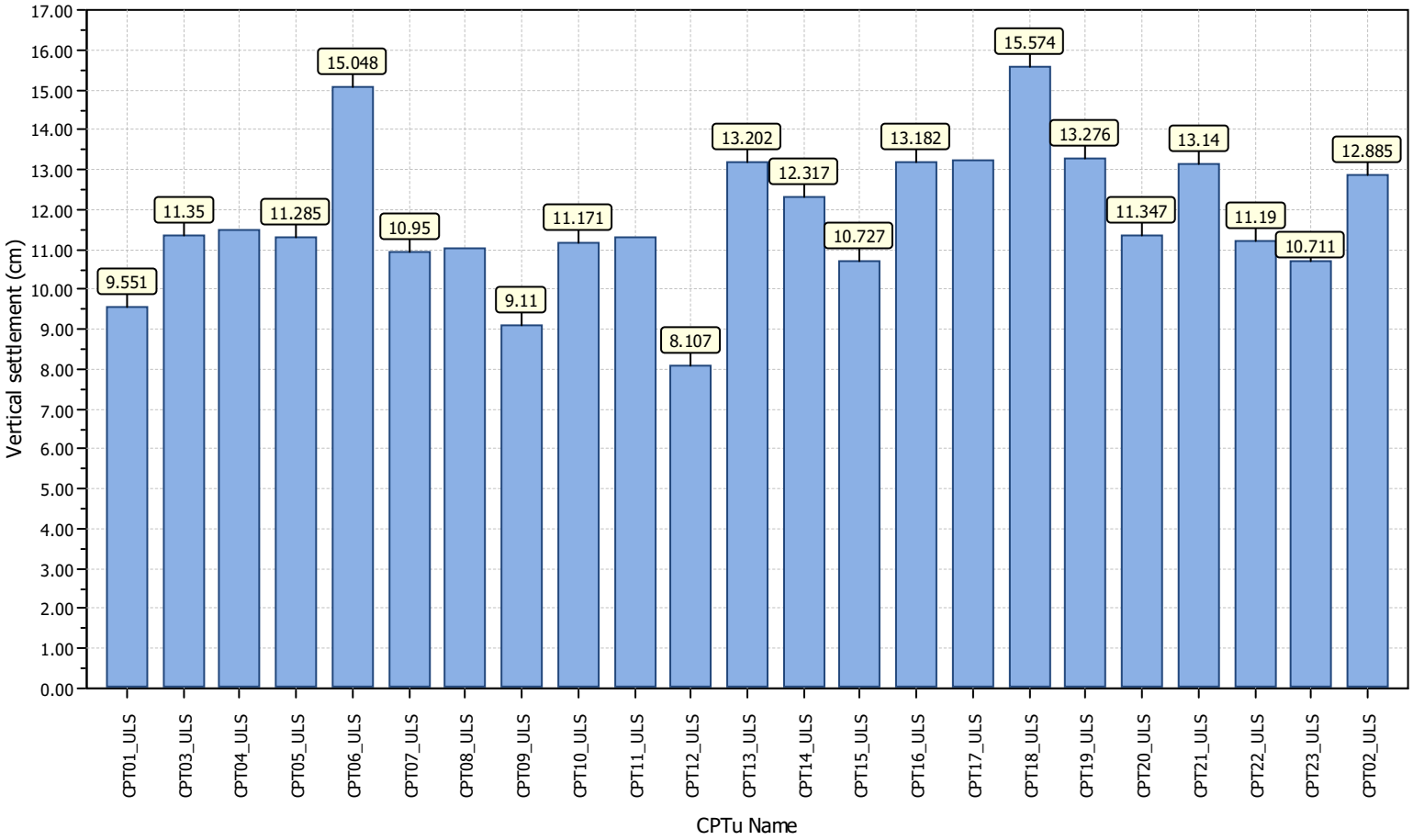
Project title : P-000821 (56 Kenny Road, Napier)

Location : ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

Overall vertical settlements report



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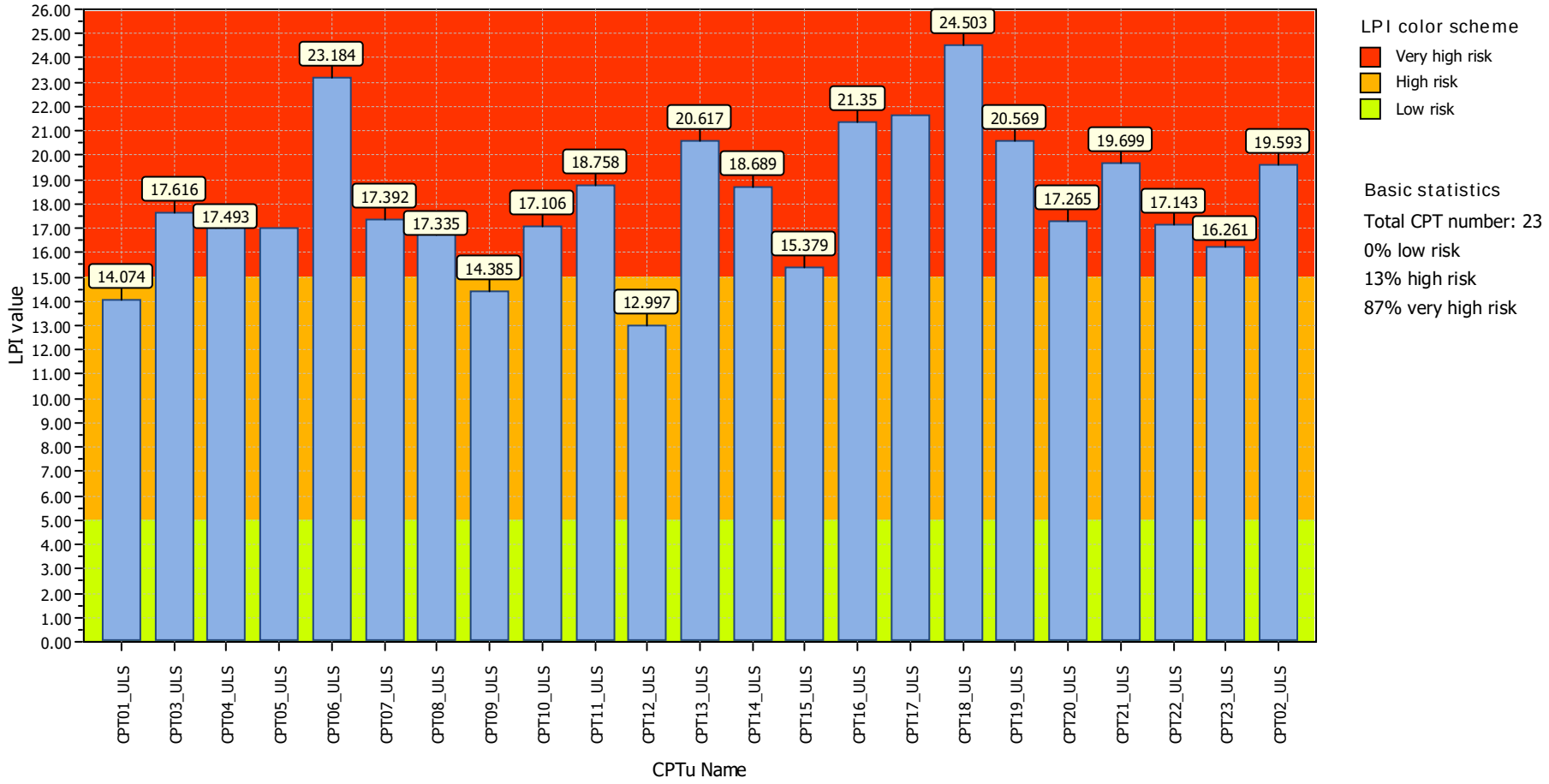
Project title : P-000821 (56 Kenny Road, Napier)

Location : ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

Overall Liquefaction Potential Index report



LPI color scheme

- Very high risk
- High risk
- Low risk

Basic statistics

Total CPT number: 23

0% low risk

13% high risk

87% very high risk

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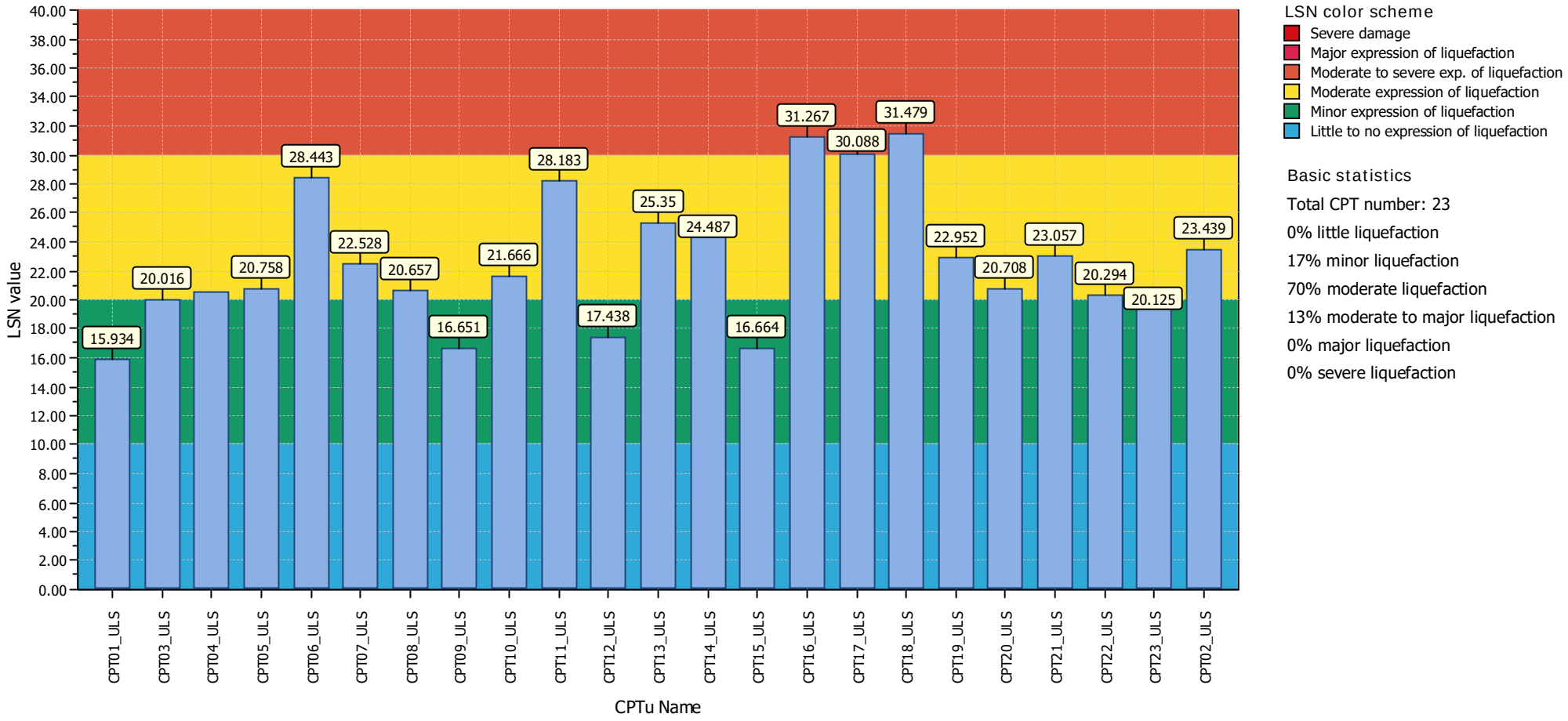
Project title : P-000821 (56 Kenny Road, Napier)

Location : ULS (PGA=0.33g, M=6.9, GWL=1.2m, no fill)

Overall Liquefaction Severity Number report



Basic statistics

Total CPT number: 23

0% little liquefaction

17% minor liquefaction

70% moderate liquefaction

13% moderate to major liquefaction

0% major liquefaction

0% severe liquefaction

Appendix F Settlement Monitoring Results

WAIMAKARIRI ROAD

OBP L DP 497573
RL = 11.242

OMA A DP 497573
RL = 11.320

N

293 DP 505589
292 DP 505589
291 DP 500192
290 DP 500192
289 DP 500192
288 DP 500192
287 DP 500192
286 DP 497573
285 DP 497573
284 DP 497573
283 DP 472702
273 DP 361394
272 DP 361394
269 DP 361394
268 DP 361394
266 DP 361394

Surveyed Monitoring Points (25/06/20)
Surveyed Monitoring Points (05/08/20)
Approximate Position of Monitoring Points to be placed once Earthworks complete

Lot 1 DP 475547
Lot 1 DP 532863
Lot 2 DP 475547

ERIKSEN ROAD

ONYX PLACE

KENNY ROAD

Site Levels in Terms of Bolt 10 (EVQ6)
RL = 11.2081
Napier Vertical Datum 1962 (MSL+10m)

OIS II DP 438483
RL = 11.337

C/O GLDL
KENNY ROAD SITE
TE AWA, NAPIER
SETTLEMENT MONITORING
POINTS LOCATION DIAGRAM

DATE	: 25/06/2020 & 05/08/2020
SCALE	: 1:1000 @ A3
DRAWN BY	: R.Mac
JOB NO.	: J001387
PLAN NO.	: MP250620&050820

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PO Box 1006 Napier
Phone 06 835 2360
Web www.zornsurveying.co.nz
Email ryan@zornsurveying.co.nz

GLDL Kenny Rd Development
Monitoring Points Surveyed RLs

Date	25/06/2020	3/07/2020	Difference	10/07/2020	Difference	24/07/2020	Difference
Bolt 10	11.2081	11.2081	0	11.2081	0	11.2081	0
OIS II	11.337	11.335	-0.002	11.337	0	11.339	0.002
OBP L	11.242	11.237	-0.005	11.242	0	11.241	-0.001
OMA A	11.32	11.315	-0.005	11.321	0.001	11.319	-0.001
MP 1	11.534	11.529	-0.005	11.534	0	11.534	0
MP 2	11.607	11.604	-0.003	11.607	0	11.608	0.001
MP 3	11.787	11.784	-0.003	11.787	0	11.788	0.001
MP 4	11.687	11.683	-0.004	11.687	0	11.688	0.001
MP 5	11.688	11.684	-0.004	11.688	0	11.689	0.001
MP 6	11.839	11.836	-0.003	11.839	0	11.84	0.001
MP 7							
MP 8							
MP 9	11.841	11.837	-0.004	11.84	-0.001	11.843	0.002
MP 10	11.721	11.718	-0.003	11.72	-0.001	11.722	0.001
MP 11	11.801	11.797	-0.004	11.8	-0.001	11.803	0.002
MP 12	11.653	11.649	-0.004	11.653	0	11.653	0
MP 13	11.745	11.743	-0.002	11.745	0	11.747	0.002
MP 14	11.604	11.601	-0.003	11.603	-0.001	11.604	0
MP 15	11.758	11.755	-0.003	11.758	0	11.76	0.002
MP 16							
MP 17							
MP 18							
MP 19							
MP 20							
MP 21							
MP 22							
MP 23							
MP 24							
ZSL Level Book	LB40 P49&50	LB40 P51&52	**	LB40 P53&54		LB40 P55&56	

Notes:
Difference colum always related back to original base survey on 25/06/2020
** While the differences are still minor we beleave adverse weather conditions played apart in these results.

Levels are in Terms of Bolt 10 (EVQ6) RL 11.2081
Napier Vertical Datum 1962 (MSL + 10m)

ZSL Ref: J001387

GLDL Kenny Rd Development
Monitoring Points Surveyed RLs

Date	25/06/2020	5/08/2020	Difference
Bolt 10	11.2081	11.2081	0
OIS II	11.337	11.338	0.001
OBP L	11.242	11.242	0
OMA A	11.32	11.32	0
MP 1	11.534	11.535	0.001
MP 2	11.607	11.608	0.001
MP 3	11.787	11.789	0.002
MP 4	11.687	11.687	0
MP 5	11.688	11.688	0
MP 6	11.839	11.84	0.001
MP 7		12.118	
MP 8		12.102	
MP 9	11.841	11.842	0.001
MP 10	11.721	11.723	0.002
MP 11	11.801	11.799	-0.002
MP 12	11.653	11.654	0.001
MP 13	11.745	11.747	0.002
MP 14	11.604	11.606	0.002
MP 15	11.758	11.759	0.001
MP 16		11.88	
MP 17		11.771	
MP 18		11.7	
MP 19		11.455	
MP 20			
MP 21			
MP 22		11.225	
MP 23		11.222	
MP 24		11.402	
ZSL Level Book	LB40 P49&50	LB40 P57-59	

Notes:
Difference colum always related back to original base survey on 25/06/2020 (red) and 05/08/2020 (blue)
** While the differences are still minor we beleave adverse weather conditions played apart in these results.

Levels are in Terms of Bolt 10 (EVQ6) RL 11.2081
Napier Vertical Datum 1962 (MSL + 10m)

ZSL Ref: J001387