Woolston Family Trust

107 YORKE ROAD, HARURU

SITE SUITABILITY GEOTECHNICAL REPORT

Vision Project Ref: 13050

10/08/2017

1 GENERAL

Vision Consulting Engineers Limited (VISION) was engaged to undertake geotechnical investigations, analysis and reporting to support an application to subdivide 107 Yorke Road, Haruru, being Lot 1 DP166269, to create an additional lot.

The scope of this report is given in the agreed services proposal dated 24 April 2017 and comprises a geotechnical investigation to determine the ground conditions at the site and provide recommendations regarding earthworks and foundation design.

This report is suitable to accompany an application for Resource Consent.

2 SITE SETTING AND CONDITIONS

The property is located at 107 Yorke Road, Haruru and covers an area of 6,782m^2. The site is bounded by Waitangi River to the north and residential lots in all other directions. The approximate location of the site is presented below on Figure 1.

The site is current occupied by an existing dwelling, shed/garage, car parking area located in the northern portion of the property and a gravel/concrete access way from Yorke Road. A gully/creek feature is present immediately to the south of the existing dwelling, which appears to be tidal. The gully appears to have been infilled to create the car parking area and access way, with a concrete culvert passing beneath. The banks of the gully appear to be over steepened and show signs of minor erosion.

The access way is gravel from Yorke Road to adjacent to the dwelling at 103 Yorke Road where it becomes a concrete surface and the gradient of the access way increases to up to approximately 14 degrees. The concrete surface continues to the north to adjacent to the dwelling of 105 Yorke Road, where it becomes gravel for the remainder of its length

The southern portion of the property (accessway) has a significant change in elevation (in the order of 19 metres) from Yorke Road sloping gently to moderately down to the alluvial flats below. Cut slopes up to approximately 1.0m in height are present where the access passes to the north of 103 Yorke Road.

The northern portion of the property is located on alluvial flats adjacent to the Waitangi River. This portion of the site is typically at an elevation of 1.8 to 2m OTP. The northern portion of the site is covered in grass, with some mature trees present near the existing dwelling,

adjacent to the north-eastern boundary and adjacent to the access way in the southern portion of the site. An undulating surface profile was observed in the grassed area between 105 Yorke Road and the existing dwelling at 107 Yorke Road, where surface water is considered likely to pond and an overland flow path flowing to the north-east is present. Where the overland flow path meets the gravel access way, a plastic pipe directs flows to an open drain running along the north-eastern site boundary.

Stormwater pipes appear to have been installed in the northern portion of the site, adjacent to eastern boundary near the driveway which discharges to an open drain and along the western boundary of the site which discharges into the gully/creek.

Figure 1: Site location (not to scale, north at top of page)

3 PROPOSED SUBDIVISION

The client wishes to carry out a subdivision of the existing lot and create two new lots as shown on the attached DMS Surveyors Limited survey plan included in Appendix A. The existing lot will be subdivided approximately create Lot 1 being 4,640m^2 and Lot 2 being 2,145m^2.

A concrete and gravel right of way providing access to both lots is located as shown on the attached subdivision plan in Appendix A.

4 GEOLOGY

The 1:250,000 geological map, Geology of the Whangarei Area (Edbrooke et al 2009) indicates that the site is underlain by the Greywacke of the Waipapa Group, consisting of massive to thin bedded, lithic volcaniclastic sandstone and argillite.

Due to the proximity to the Waitangi River, the site was expected to be underlain by estuarine and alluvial deposits underlain by the Waipapa Group.

5 GROUND INVESTIGATION

The ground conditions were investigated on the 19 and 26 June 2017 and involved the drilling of four hand augured boreholes (BH1 to BH4) to a maximum depth of 1.5 metres below ground level (m bgl) and two Cone Penetrometer Tests (CPTs) (CPT1 to 2) with pore pressure measurements to up to 24.83mbgl. Measurements of the undrained shear strength were taken in cohesive materials at 200 - 600mm intervals at the auger locations using a calibrated shear vane.

The approximate location of the hand auger boreholes and penetrometers tests are shown on Figure 2 below. Field testing logs and CPT logs are included in Appendix B.

Figure 2: Geotechnical test locations

6 SUBSURFACE CONDITIONS

6.1 Ground conditions

The subsurface conditions at the site were found to consist of dark brown clayey silt topsoil containing rootlets and organics to depths of between 0.2 and 0.4m bgl. Beneath the topsoil, variable alluvial deposits typically comprising silty clay, clayey silt, gravelly silt and silty gravel were encountered in the hand auger boreholes. Undrained shear strengths measured to a depth of 1.5mbgl ranged from 26 to greater than 170kPa.

The two CPT's indicate that the upper 4.5 to 5m of the ground profile consist of variable alluvial deposits typically comprising silty clay, silty sand and sandy silts. Undrained shear strengths in the cohesive materials typically range from 10 to 70kPa and friction angles of 32 to 37 degrees in non-cohesive materials.

Beneath the upper variable alluvial layer, soft to firm silty clay is present to depths of 19 to 20m below ground level (bgl). Undrained shear strengths estimated from the CPT's using an N_k value of 15 range from 20 to 50kPa, typically increasing with depth. Below 20mbgl, the strength of the silty clay increases to being stiff, greater than 50kPa.

At a depth of 21.5 to 23.2mbgl, very stiff sandy silt and clayey silt was found to underlie the site which is inferred to be weathered Waipapa Group. Refusal of the CPT's was reached at depths of 23.68 and 24.83 on what is inferred to be bedrock.

6.2 Groundwater

Groundwater was encountered in the CPT's completed at the site. Groundwater levels were measured at a depth of 0.82m bgl in CPT1 and 1.45m bgl in CPT2.

Groundwater levels at the site are likely to vary with the tidal Waitangi River level. Groundwater levels are expected to rise to near ground surface level during winter months or extended periods of heavy rainfall.

6.3 Site subsoil class

The site subsoil class is considered to be Class D shallow soil site as defined by NZS 1170.5 (2004) "Structural Design Actions: Part 5: Earthquake actions – New Zealand" based on our database of deep investigation data and published geological information.

6.4 Soil shrink-swell potential

The near surface soils are considered to be slightly to moderately expansive soils with a likely liquid limit above 50% based on their physical characteristics observed during testing and relevant project experience. We note that no laboratory testing of the material to confirm the liquid limit or presence of clay swelling minerals has been undertaken, however material characteristics indicate that they are potentially expansive.

6.5 Liquefaction Potential

The effects of seismic induced liquefaction and lateral spreading have not been specifically assessed. GNS guidance (GNS Science Series 47) indicates that hazards associated with liquefaction should be evaluated for certain ground conditions and where sites are likely to experience peak ground accelerations (PGAs) in excess of 0.1g.

Site PGAs, calculated in accordance with NZS1170.5 (for a Class D subsoil site) are 0.04g. This PGA value is considered to be too low for seismic induced liquefaction to be a risk for the proposed development and no further assessment is considered necessary.

7 ENGINEERING EVALUATION

7.1 Natural Hazards

The property is mapped by the Far North District Council (FNDC) and Northland Regional Council (NRC) as being subject to the natural hazard of inundation. The FNDC and NRC hazard maps indicate that the property is affected by the 1 in 10 year and the 1 in 100 year inland flood. The NRC hazard maps also indicate that the site is affected by the predicted 50 and 100 year coastal flooding level.

Further information regarding the inundation hazard and recommended finished floor levels is presented in the VISION Flood Assessment Report, reference 13050 dated 10 August 2017.

In order to meet the minimum floor level required, bulk site filling is required.

7.2 Settlement of Fill

Due to the inundation hazard present at the property, site filling is likely to be required meet the minimum floor level.

Conceptual settlement analysis for bulk filling has been carried out using CPeT-IT version 2.0.1.55. In the analysis the following assumptions have been made:

- Fill footprint is 30m by 30m
- Fill has been assumed to act as a non-rigid footing
- Fill height of 1.5m equivalent of 30kPa vertical load (fill weight 20kN/m^3)

Settlement analysis of the bulk filling has considered both short term (primary consolidation) and long term (creep) settlement. The results of the conceptual settlement analysis are presented in Tables 1 and 2 below.

Table 1 – Short Term (primary consolidation) Settlement

CPT No	Primary Settlement (mm)
1	176
2	143

Table 2 – Long term (creep) Settlement

CPT No	Time Period (post construction)	Creep Settlement (mm) (post construction)
1	6 months	11
	12 months	17
	18 months	22
	10 years	48
	50 years	72
2	6 months	12
	12 months	19
	18 months	24
	10 years	53
	50 years	81

The concept settlement analysis indicates that primary consolidation occurs within 6 months of placing the fill. However, creep settlements due to the placement of 1.5m of compacted hardfill (GAP65 or equivalent) result in the long term settlements (creep) occurring for the design life (50 years). Long term creep settlements are predicted to be in the order of 80mm, which is in-excess of the 25mm limit imposed by the New Zealand Building Code.

In order to reduce long term (creep) settlements to within the 25mm limit, light weight fill such as geofoam is required to reduce the imposed load on the underlying alluvial deposits. A conceptual solution is to undercut the proposed filling area by 1.3m and replace with 1.5m of geofoam, before placing 1.3m of hardfill over the geofoam to achieve a fill height of 1.5m above current ground surface level. The final design will need to consider uplift pressures on the geofoam due to flooding and is likely to require geotextile to resist uplift pressures.

8 ENGINEERING RECOMMENDATIONS

The site is considered to be suitable for the proposed subdivision scheme plan depicted on the DMS Surveyor Limited subdivision plan presented in Appendix A provided that the following engineering design considerations are adopted.

8.1 Earthworks

8.1.1 Unsuitable material

The topsoil present will need to be removed where any site filling is proposed. Topsoil is expected to extend approximately 0.4m bgl.

8.1.2 Fill

It is recommended that all fill to be placed at the site is assessed by a chartered professional engineer experienced in geotechnical engineering as the placement of fill is likely to result in settlement at the site. Undercutting and the use of light weight fill may be required to limit settlements to tolerable levels as discussed in Section 7.2.

Where the proposed filling is to support the loads of the building it will need to be certified by a Chartered Professional Engineer in accordance with NZS4431:1989, as required by NZS3604:2011 “Timber Framed Buildings” and NZS4229 (1999) “Concrete Masonry Buildings Not Requiring Specific Engineering Design”. If certification is not achieved, specific engineering design will be required to comply with the NZ Building Code.

Where filling is proposed and on removal of topsoil /unsuitable materials an inspection of the base of the excavation by the certifying Engineer or their representative is required prior to the commencement of filling. The fill should comprise suitable well graded granular material (GAP65 or similar approved) or light weight fill (as required), placed uniformly into the excavation in layers not exceeding 150mm in thickness. The fill should be placed at its optimum moisture content. The material should be inspected and approved as suitable material by the certifying Engineer or their representative. Material which is wet or saturated should not be placed into the excavation unless that is the optimum moisture content for the fill.

The fill should be compacted to achieve the minimum strengths given in the following table:

Undrained shear strength (cohesive fill)	
Average not less than	140kPa
Minimum single value	110kPa
Dynamic Cone Penetrometer (non-cohesive fill)	
Average value not less than	2 blows/50mm
Minimum single value	1.5blows/50mm

Compaction should be carried out using several passes over each lift with a steel drum roller for non-cohesive fill (sand or gravel) or a sheeps foot roller for cohesive fill (silt and clay). Compaction using a Bobcat, excavator, truck or other vehicle other than a compactor is not likely to achieve the required strength for the fill to be certified.

Provision should be made to ensure that the earth works are conducted with due respect for the weather, particularly due to the low permeability of the underlying ground. The fill should not be placed into a saturated excavation, especially if ponded water is present.

Vibration compaction should not be used if the base of the excavation is wet or if the fill is above optimum moisture content otherwise the fill strength may be significantly reduced from the resultant moisture uptake until the excess pore pressures have dissipated. The time for this to occur is variable, but is likely to take more than one day.

8.1.3 Site cuts

At the time of writing this report, no site cutting is anticipated other than the stripping of topsoil and temporary cuts associated with potential undercutting of the proposed building area. It is recommended that temporary cut slopes up to 1.5m in depth are no steeper than 1H:2V.

8.1.4 Ground contouring

The building areas should be graded so that water cannot pond against, beneath or around the building for the economic life of the structure. To achieve this it will be important that the soils beneath the topsoil grade away from the buildings.

Contouring should avoid the potential for concentration and discharge of surface water over point locations which could result in soil erosion or instability.

8.2 Foundations

8.2.1 Slab-on grade footings founded on engineered fill

Where foundations are located on non-cohesive engineered fill greater than 1.0m in thickness, NZS3604 (2011) footings are considered to be suitable for the site. Alternatively, a waffle slab (rib-raft of similar) could be adopted.

It is recommended site specific analysis is carried out at each building area to confirm the requirements for foundation design and to assess settlement of the fill platform. Undercutting and the use of light weight fill may be required to limit settlements to tolerable levels.

8.3 Stormwater & Drainage recommendations

All surface water should be collected and diverted in a controlled manner. All stormwater collected from the site not retained for domestic use should be piped to the existing swale drains and water ways. Soakage pits are not recommended.

9 LIMITATIONS

This report has been completed exclusively for the Woolston Family Trust and their professional advisors with respect to the particular brief given to us for the particular purpose given above. Information, opinions and recommendations contained in this report cannot be used for any other purpose or by any other entity without our review and written consent. Vision Consulting Engineer Ltd accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report by any third party.

The ground conditions given in this report are based on visual methods and investigations at discrete locations. The nature and continuity of the subsurface conditions are inferred and it must be appreciated that actual conditions could vary from that described herein.

We should be contacted immediately if variations are encountered for those assumed in this report. It is possible that further investigation or modification of recommendations is required.

For and on behalf of VISION CONSULTING ENGINEERS LTD

Report prepared by:

Dan Simmonds
Senior Geotechnical Engineer
BEng (Civil)

Report reviewed and authorised by:

Ben Perry
Managing Director
MIPENZ, CPEng

Appendices

Appendix A: DMS Surveyors Limited Subdivision Plan.
Appendix B: Site investigation results:
Borehole logs 1 – 4
CPT logs CPT1 and CPT2
Appendix C: Settlement assessment results

Appendix A

DMS Surveyors Limited Subdivision Plan

PROPOSED EASEMENTS			
Purpose	Shown	Servient Tenement	Dominant Tenement
Right of Way Right to convey electricity Right to convey water Right to drain sewage	(A)	Lot 1	Lot 2
Right to convey telecommunications and computer media	(B)		

EXISTING EASEMENTS			
Purpose	Shown	Servient Tenement	Created by
Right of Way Right to transmit electricity and telecommunications Right to convey water Right to drain sewage	(A)	Lot 1	EC C842264.4
Right to drain water	(C)	Lot 1	T C869127.3

6
DP333811
(Esplanade Reserve)

LOT 1
4640m2
(2690m2 net)

LOT 2
2145m2

4
DP333811

3
DP333811

2
DP333811

2
DP 46802

2
DP166269

3
DP166269

4
DP166269

4
DP 46802
(Esplanade Reserve)

Waitangi River
(Tidal)

YORKE ROAD
Legal 20.12 wide Sealed

18.45 54.77 5.00 13.77EB 13.88EB 6.45EB 48.0EB 5.35EB 51.0EB 5.29EB 64.56EB 5.58 6.48EB 12.94 22.51 73.06 20.92 30.62 35.0 32.6EB 18.39 36.20 21.86 8.62 12.35 26.81 12.45 10.1 31.7 67.6 31.71 9.42 3.35 10.77 16.87 4.72 6.39 6.52 4.10 57.26 53.57 59.04 7.87

NOTES

All areas and dimensions are approximate only and are subject to alteration on final survey

Proposal subject to receiving Consent from FNDC

Comprised in CT 100D/646 Total Area 6782m2

For location of existing house on Proposed Lot 1 refer to SO64627 and Aerial Photograph

LOTS 1 & 2 BEING A PROPOSED SUBDIVISION OF LOT 1 DP 166269

0 50 100

Scale 1 . 1000 (Original @ A3)

DMS SURVEYORS LIMITED - PAIHIA & KERIKERI

DWG Wool1dwg2 29/06/16

Appendix B

Site Investigation Results

BOREHOLE LOG

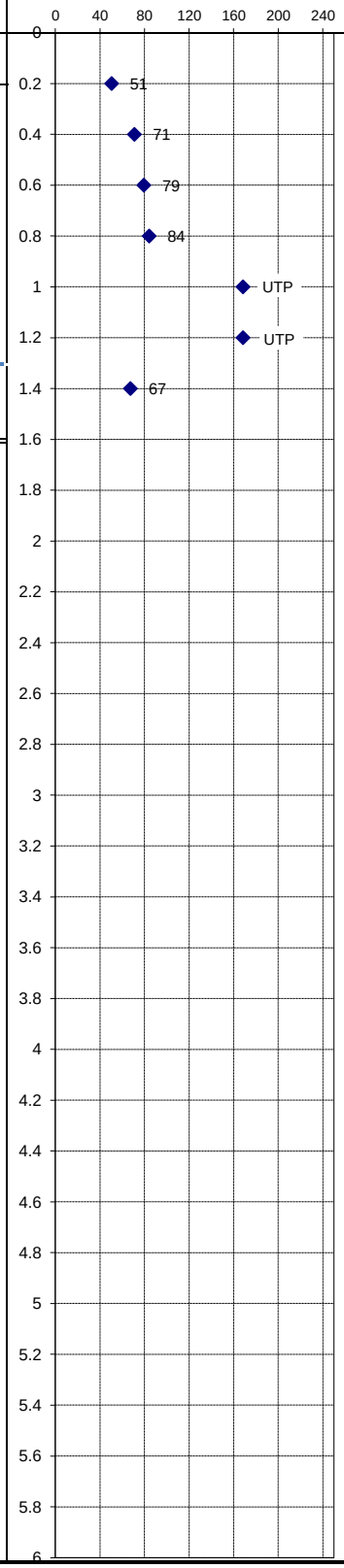
BOREHOLE No: BH1

VISION CONSULTING ENGINEERS

Client: Woolston Family Trust	**Project:** Geotech Investigation	**VCE Project No.:**	13050
Project Location: 107 Yorke Road, Haruru	**Borehole Location:** Refer to site plan	**Hole started:**	26/06/2017
		Hole completed:	26/06/2017
Drill method: 50mm handauger		**Drilled by:**	R.Daly
		Checked by:	D.Simmonds

Depth (m)	Graphic	Strength	Moisture	Soil Description	GEOLOGY & additional observations
0.0			W	Clayey SILT: Dark brown; Rootlets	TOPSOIL
0.2		F-St	W	Silty CLAY; Dark brown; some fine to medium gravel	ALLUVIUM
0.4		St	M	Silty CLAY: Light greyish brown, light grey, high plasticity trace rootlets	
0.8				trace orangish brown	
1.0		VSt	M	Clayey SILT: Light greyish brown, light grey, trace orange some fine to medium gravel	
1.2		St	M	fine to medium gravelly SILT: Light greyisy brown, trace fine to coarse	
1.3			W	sand	soil saturated
1.5			W	silty GRAVEL: Light greyish brown, fine angular gravel, loosely packed	
1.6				End of borehole at 1.6 metres Groundwater encountered at 1.3m	

Undrained Shear Strength (kPa)



Notes: Shear strength lines are indicative only.
Shear strength calibrated and adjusted for plasticity

BOREHOLE LOG

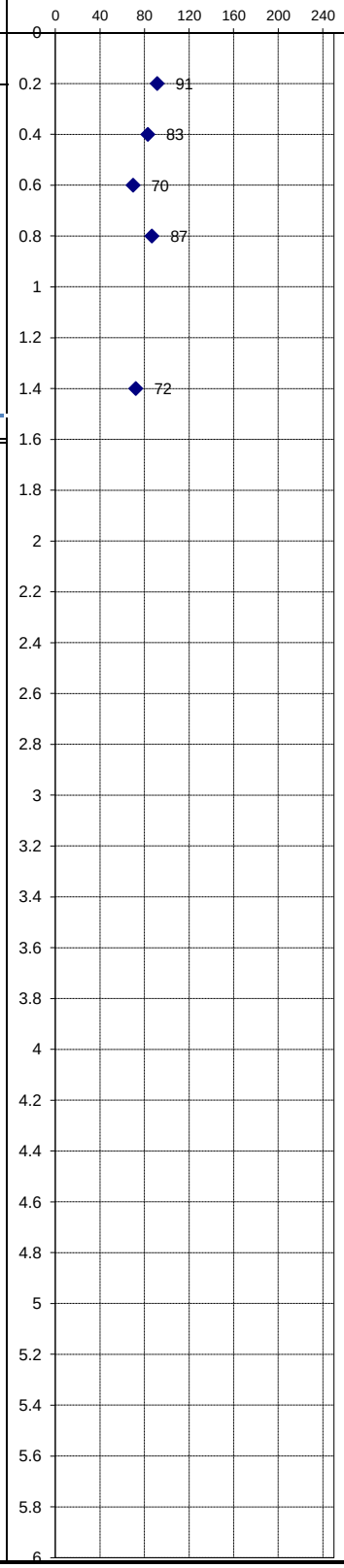
BOREHOLE No: BH2

VISION CONSULTING ENGINEERS

Client: Woolston Family Trust	**Project:** Geotech Investigation	**VCE Project No.:**	13050
Project Location: 107 Yorke Road, Haruru	**Borehole Location:** Refer to site plan	**Hole started:**	26/06/2017
		Hole completed:	26/06/2017
Drill method: 50mm handauger		**Drilled by:**	R.Daly
		Checked by:	D.Simmonds

Depth (m)	Graphic	Strength	Moisture	Soil Description	GEOLOGY & additional observations
0.0			M	Clayey SILT: Dark brown with trace orange; trace fine gravel; rootlets	TOPSOIL
0.2		St	M	Silty CLAY: Brownish orange; trace fine to medium gravel	ALLUVIUM
0.4				orangish brown streaked grey	
0.8			W	soil too wet to sample	soil too wet to sample
1.1			M/F	Gravelly SILT: brownish grey, fine subangular gravel with fine to coarse sand	
1.3			M	Fine to medium Silty GRAVEL: Grey with orange streaks, subangular	
1.5			W		
1.6				End of borehole at 1.6 metres Groundwater encountered at 1.5m	

Undrained Shear Strength (kPa)



Notes: Shear strength lines are indicative only.
Shear strength calibrated and adjusted for plasticity

BOREHOLE LOG

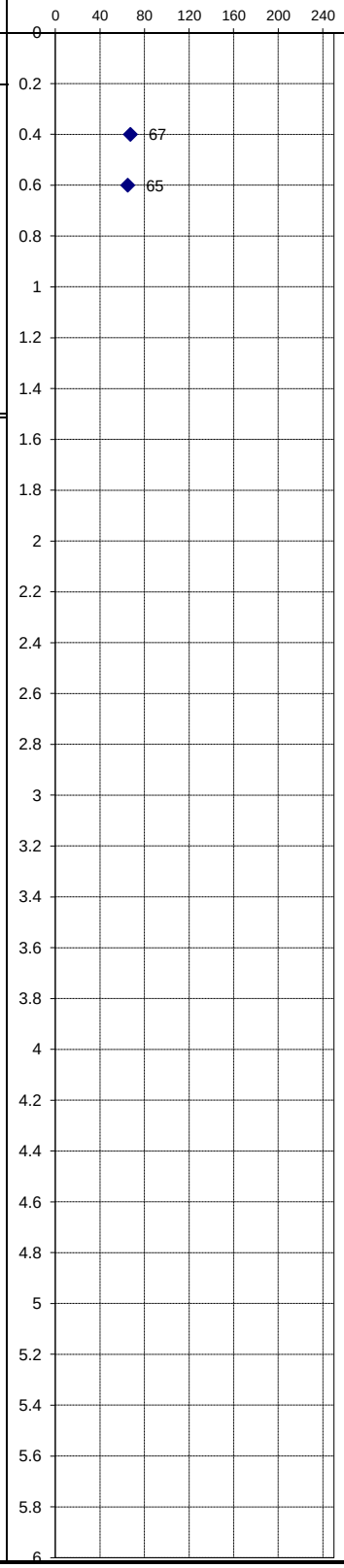
BOREHOLE No: BH3

VISION CONSULTING ENGINEERS

Client: Woolston Family Trust	**Project:** Geotech Investigation	**VCE Project No.:**	13050
Project Location: 107 Yorke Road, Haruru	**Borehole Location:** Refer to site plan	**Hole started:**	26/06/2017
		Hole completed:	26/06/2017
Drill method: 50mm handauger		**Drilled by:**	R.Daly
		Checked by:	D.Simmonds

Depth (m)	Graphic	Strength	Moisture	Soil Description	GEOLOGY & additional observations
0.0 – 0.1			M	CLAY: Dark brown with trace orange; some fine/medium gravel. Rootlets	TOPSOIL
0.2 – 0.5		St	M	Silty CLAY: Light brown; traces of fine/medium gravel	ALLUVIUM
0.6		St	M	Fine to medium gravelly CLAY: Light brown with traces of orange	
0.7 – 1.4			W	Fine to medium silty GRAVEL: Light brown with traces of orange with fine to coarse sand, subangular gravel, loosely packed Orangish brown	
1.5				End of borehole at 1.5 metres Groundwater not encountered	

Undrained Shear Strength (kPa)



Notes: Shear strength lines are indicative only.
Shear strength calibrated and adjusted for plasticity

BOREHOLE LOG

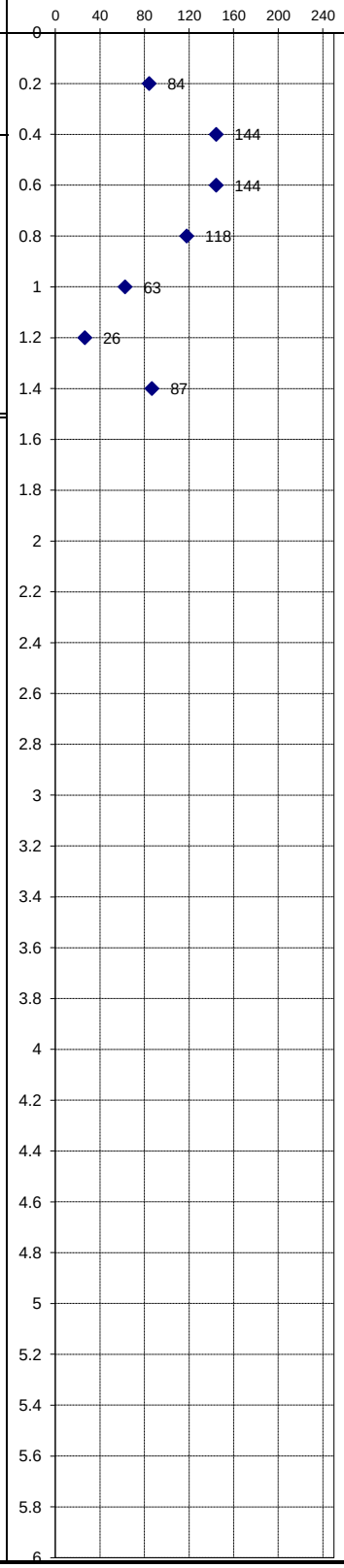
BOREHOLE No: BH4

VISION CONSULTING ENGINEERS

Client: Woolston Family Trust	**Project: Geotech Investigation**	**VCE Project No.:**	13050
Project Location: 107 Yorke Road, Haruru	**Borehole Location:** Refer to site plan	**Hole started:**	26/06/2017
		Hole completed:	26/06/2017
Drill method: 50mm handauger		**Drilled by:**	R.Daly
		Checked by:	D.Simmonds

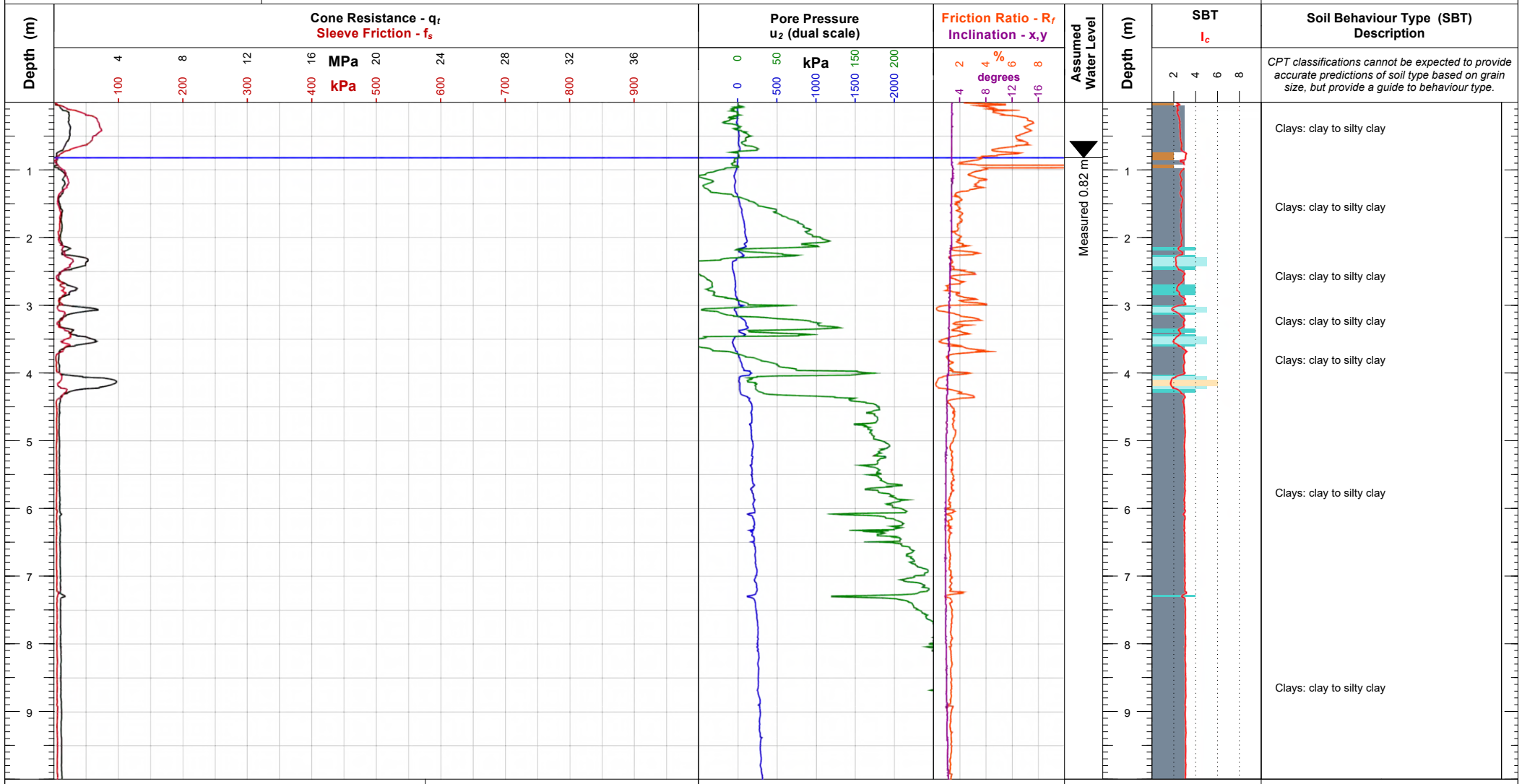
Depth (m)	Graphic	Strength	Moisture	Soil Description	GEOLOGY & additional observations
0.0 – 0.3			M	Clayey SILT: Dark brown, some fine to medium gravel; rootlets	TOPSOIL
0.4 – 0.7		VSt	M	Silty CLAY: Dark brown with orange traces brownish orange	ALLUVIUM
0.8 – 0.9			D	Clayey SILT: greyish brown with orange trace; trace fine gravel	
1.0 – 1.3			D M	fine to medium Gravelly SILT: greyish brown, subangular, trace fine to coarse sand	
1.4			W	Silty fine to medium GRAVEL: Brownish grey	
1.5				End of borehole at 1.5 metres Groundwater not encountered	

Undrained Shear Strength (kPa)



Notes: Shear strength lines are indicative only.
Shear strength calibrated and adjusted for plasticity

CONE PENETRATION TEST (CPT) LOG



Client: Vision Consulting Engineers
Project: 107 Yorke Street
Location: Haruru Falls, Northland
Engineer: Dan Simmonds
Contractor: Ground Investigation Ltd. www.g-i.co.nz

Operator: Tomas
Cone Ref: MKJ208
Cone Type: Compression Piezocone
Area Ratio: 0.8
Filter Type: u2

NZTM2000 N,E (m): 6095820.8, 1696004.06
WGS84, (deg): 174.055619, --35.276156
Location Method: Handheld GPS
Surveyor: N/A
Termination Reason: Limit of reaction force

Elevation (m): -
Date of Test: 19/06/2017
Depth (m): 24.83
Pre-Drill (m): N/A

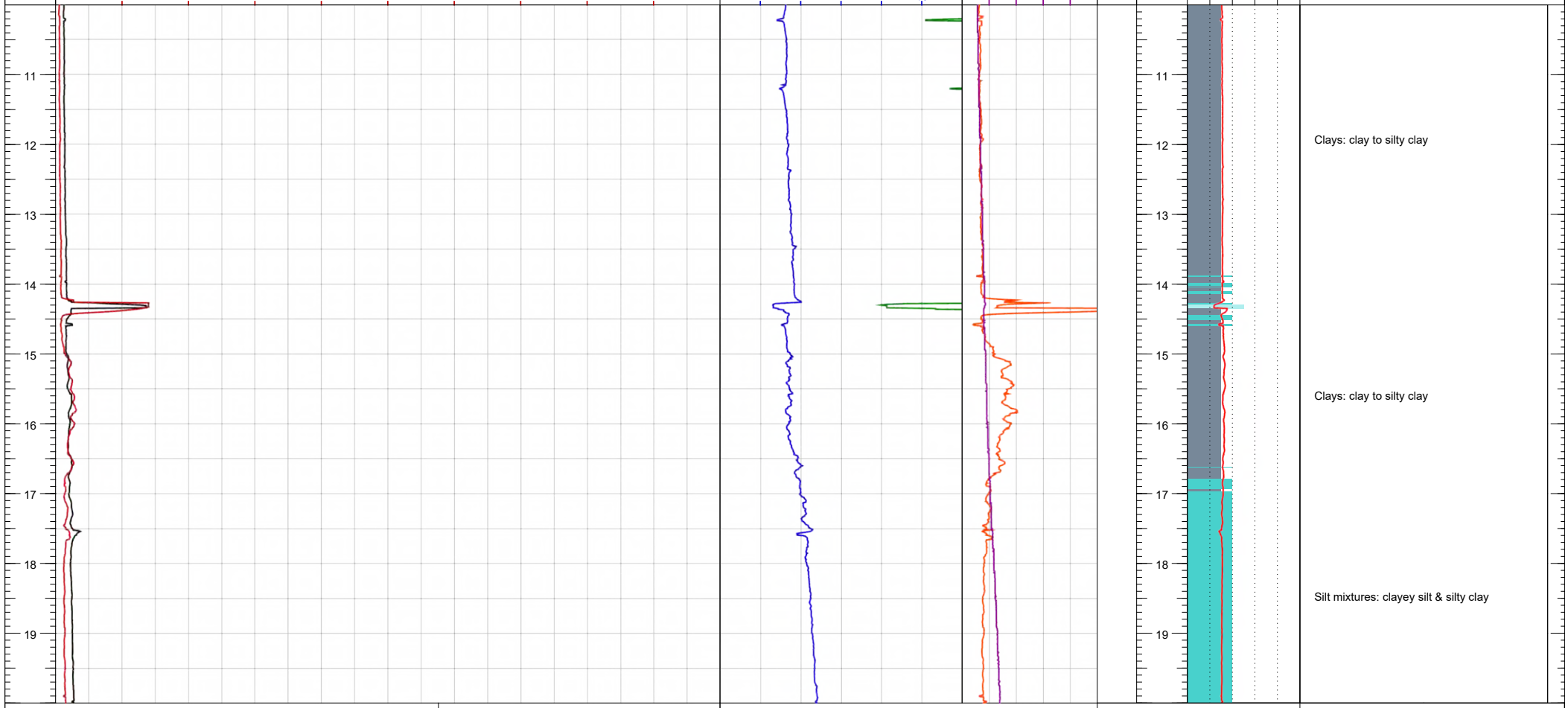
Client Job Ref:

CPT Number: CPT-01

G.I. Job Ref: 17-314

Remarks:

CONE PENETRATION TEST (CPT) LOG



Client: Vision Consulting Engineers
Project: 107 Yorke Street
Location: Haruru Falls, Northland
Engineer: Dan Simmonds
Contractor: Ground Investigation Ltd. www.g-i.co.nz

Operator: Tomas
Cone Ref: MKJ208
Cone Type: Compression Piezocone
Area Ratio: 0.8
Filter Type: u2

NZTM2000 N,E (m): 6095820.8, 1696004.06
WGS84, (deg): 174.055619, --35.276156
Location Method: Handheld GPS
Surveyor: N/A
Termination Reason: Limit of reaction force

Elevation (m): -
Date of Test: 19/06/2017
Depth (m): 24.83
Pre-Drill (m): N/A

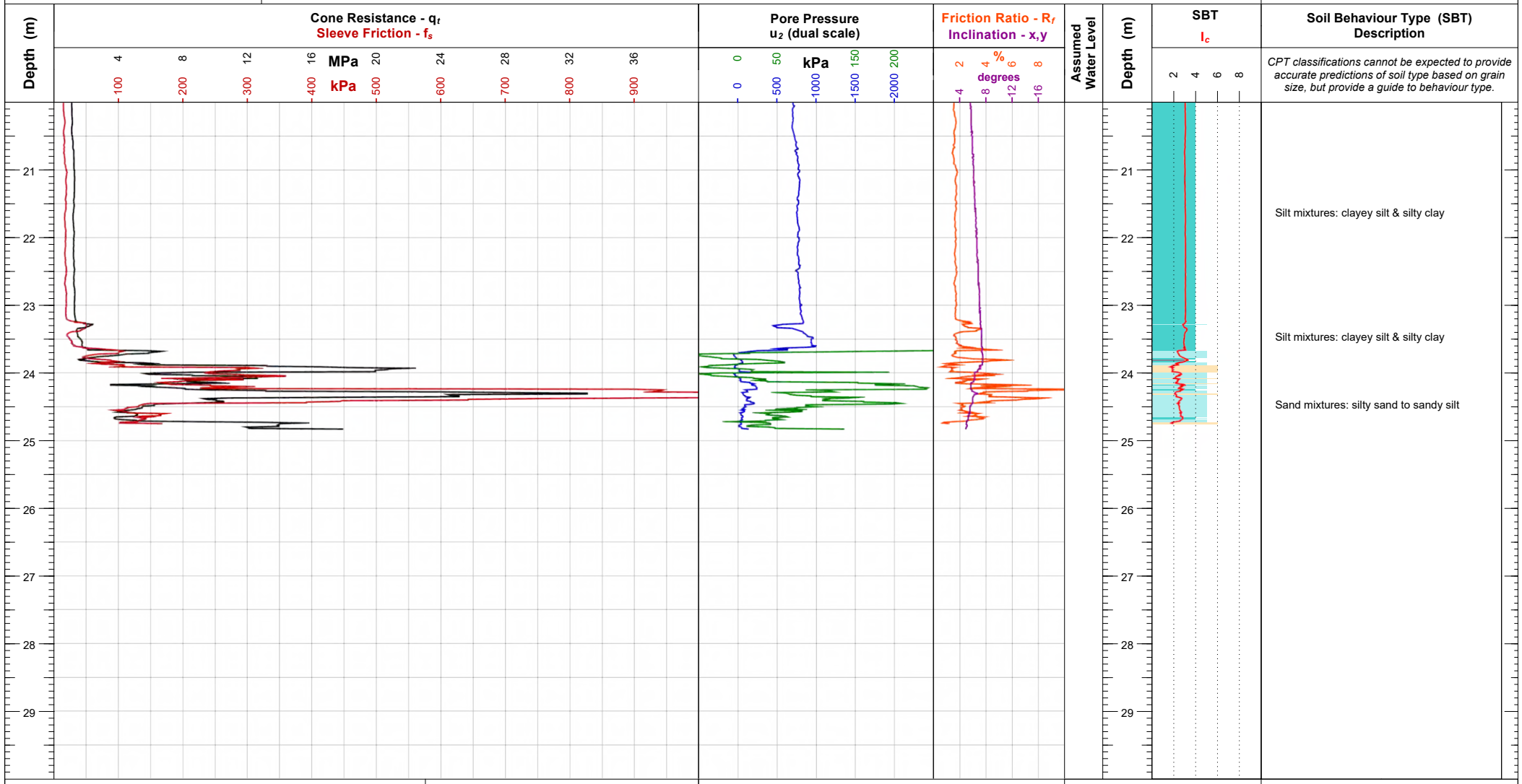
Client Job Ref:

CPT Number: **CPT-01**

G.I. Job Ref: **17-314**

Remarks:

CONE PENETRATION TEST (CPT) LOG



Client: Vision Consulting Engineers
Project: 107 Yorke Street
Location: Haruru Falls, Northland
Engineer: Dan Simmonds
Contractor: Ground Investigation Ltd. www.g-i.co.nz

Operator: Tomas
Cone Ref: MKJ208
Cone Type: Compression Piezocone
Area Ratio: 0.8
Filter Type: u2

NZTM2000 N,E (m): 6095820.8, 1696004.06
WGS84, (deg): 174.055619, --35.276156
Location Method: Handheld GPS
Surveyor: N/A
Termination Reason: Limit of reaction force

Elevation (m): -
Date of Test: 19/06/2017
Depth (m): 24.83
Pre-Drill (m): N/A

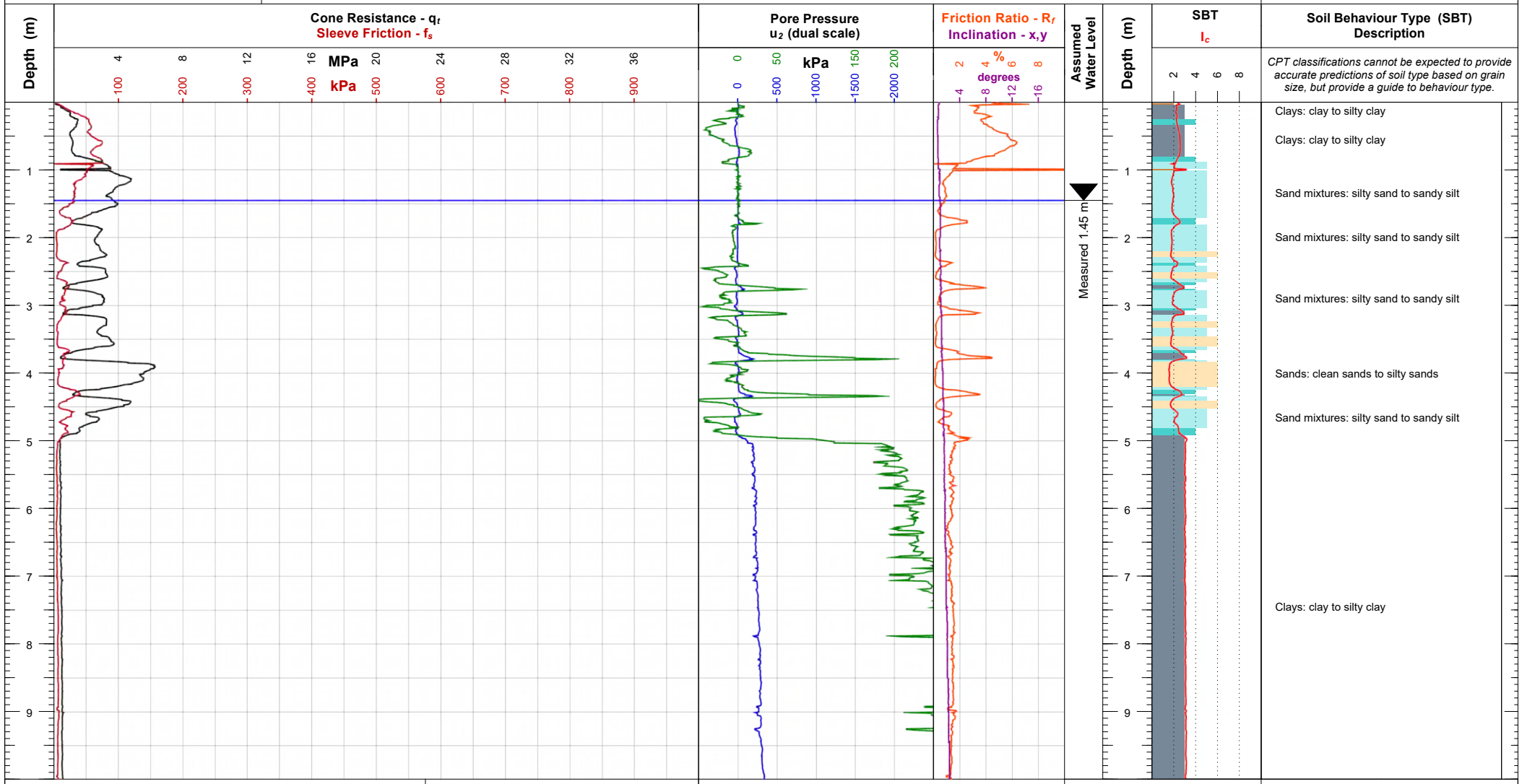
Client Job Ref:

CPT Number: **CPT-01**

G.I. Job Ref: **17-314**

Remarks:

CONE PENETRATION TEST (CPT) LOG



Client: Vision Consulting Engineers
Project: 107 Yorke Street
Location: Haruru Falls, Northland
Engineer: Dan Simmonds
Contractor: Ground Investigation Ltd. www.g-i.co.nz

Operator: marcelo
Cone Ref: MKJ333
Cone Type: Compression Piezocone
Area Ratio: 0.8
Filter Type: u2

NZTM2000 N,E (m): 6095857.54, 1695990.98
WGS84, (deg): 174.055471, --35.275826
Location Method: Handheld GPS
Surveyor: N/A
Termination Reason: Danger of buckling rods

Elevation (m): -
Date of Test: 19/06/2017
Depth (m): 23.64
Pre-Drill (m): N/A

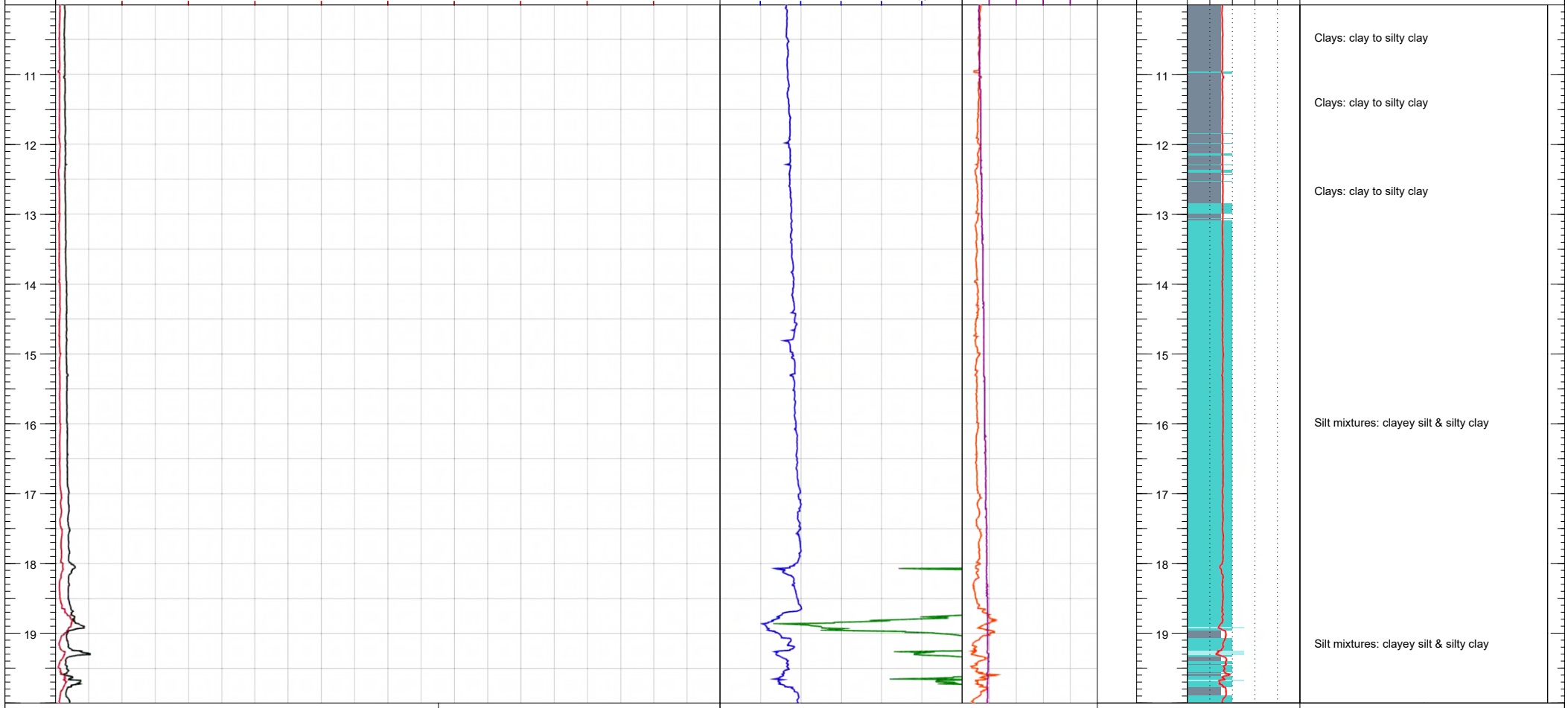
Client Job Ref:

CPT Number: **CPT-02**

G.I. Job Ref: **17-314**

Remarks:

CONE PENETRATION TEST (CPT) LOG



Client: Vision Consulting Engineers
Project: 107 Yorke Street
Location: Haruru Falls, Northland
Engineer: Dan Simmonds
Contractor: Ground Investigation Ltd. www.g-i.co.nz

Operator: marcelo
Cone Ref: MKJ333
Cone Type: Compression Piezocone
Area Ratio: 0.8
Filter Type: u2

NZTM2000 N,E (m): 6095857.54, 1695990.98
WGS84, (deg): 174.055471, --35.275826
Location Method: Handheld GPS
Surveyor: N/A
Termination Reason: Danger of buckling rods

Elevation (m): -
Date of Test: 19/06/2017
Depth (m): 23.64
Pre-Drill (m): N/A

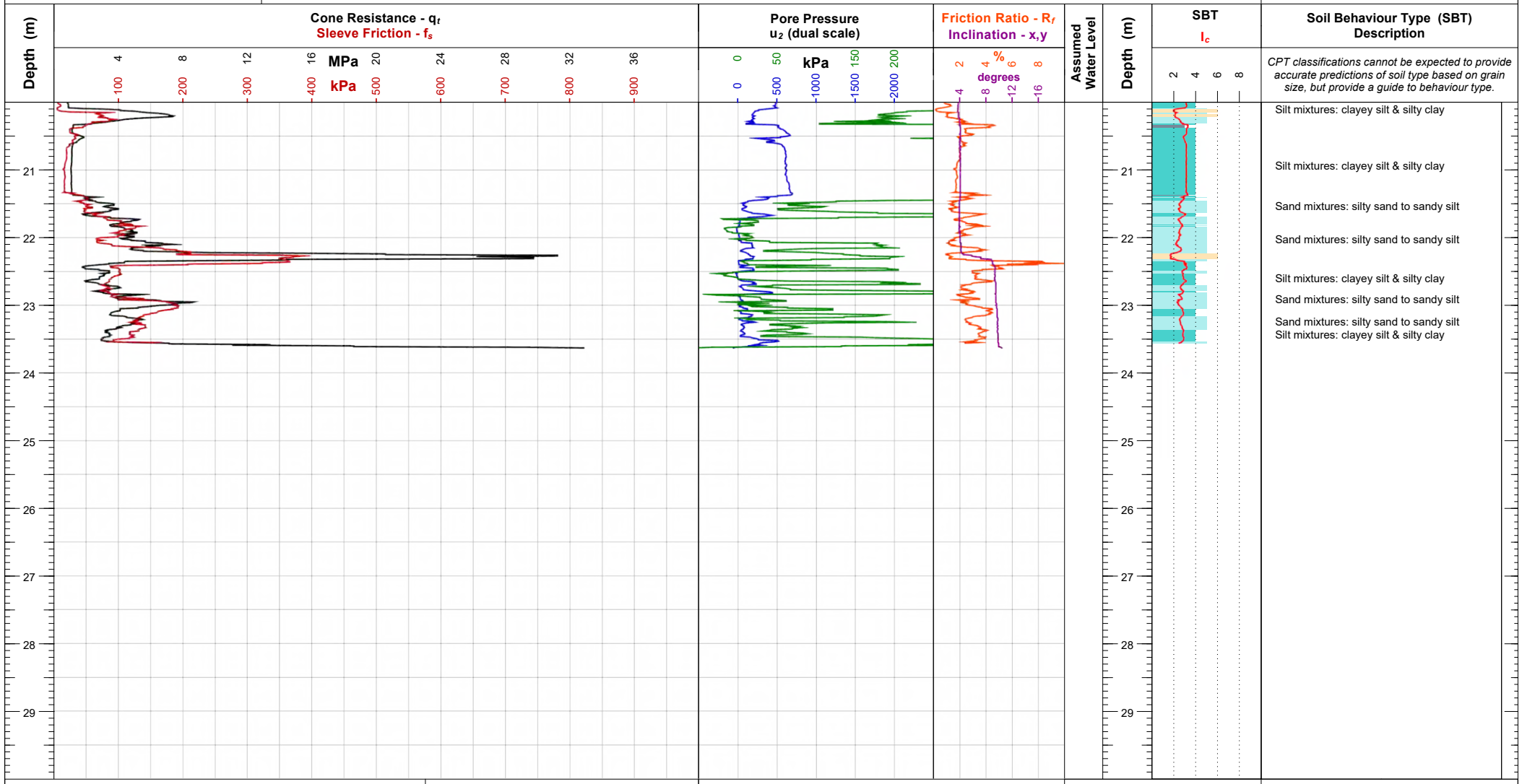
Client Job Ref:

CPT Number: **CPT-02**

G.I. Job Ref: **17-314**

Remarks:

CONE PENETRATION TEST (CPT) LOG



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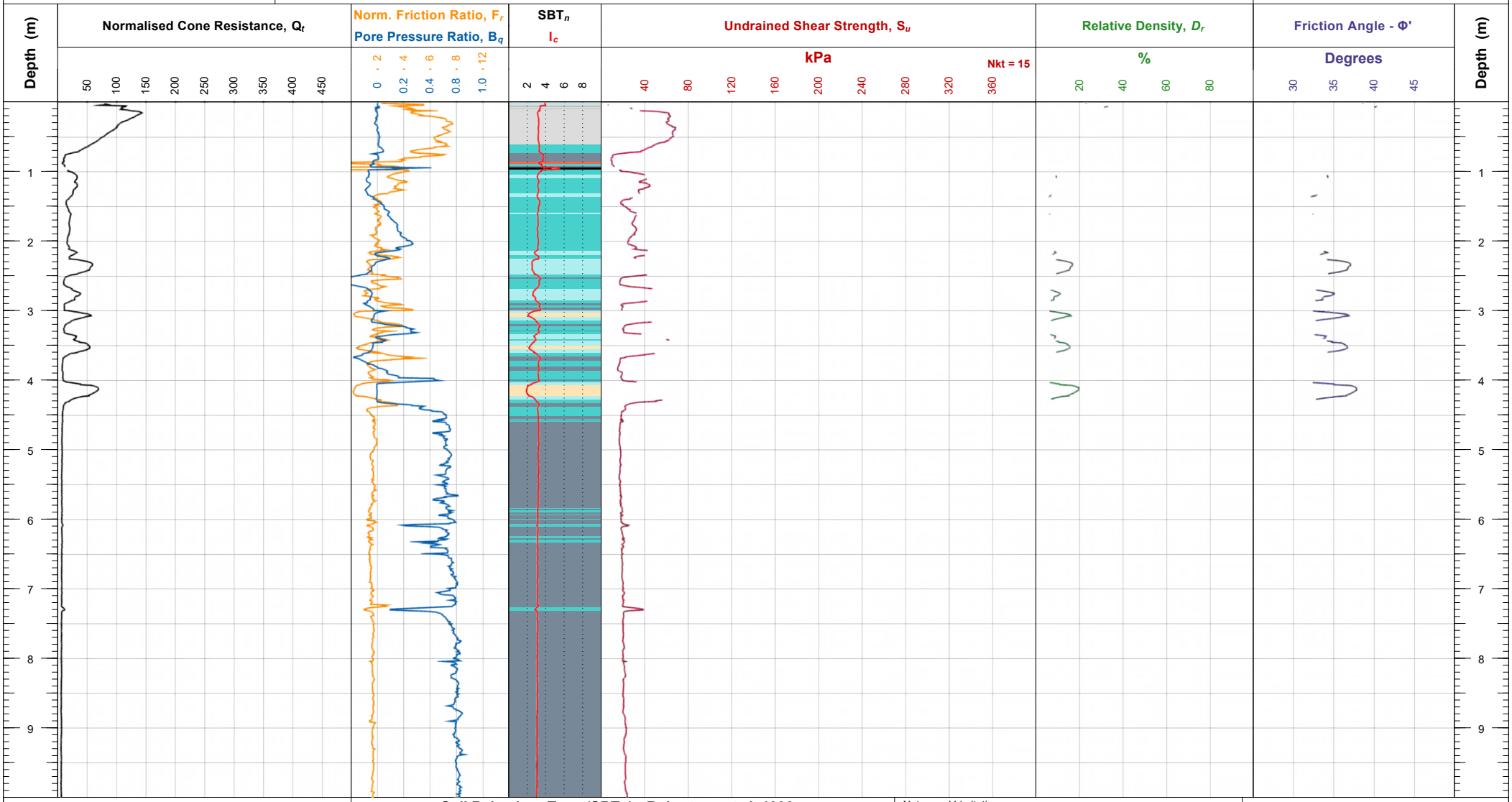
Client Job Ref:

CPT Number: **CPT-02**

G.I. Job Ref: **17-314**

Remarks:

CONE PENETRATION TEST (CPT) PARAMETER LOG



Client: Vision Consulting Engineers

Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

Contractor: Ground Investigation Ltd.

Soil Behaviour Type (SBTn) - Robertson et al. 1990

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 and 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. Ground Investigation Ltd does not warrant 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.

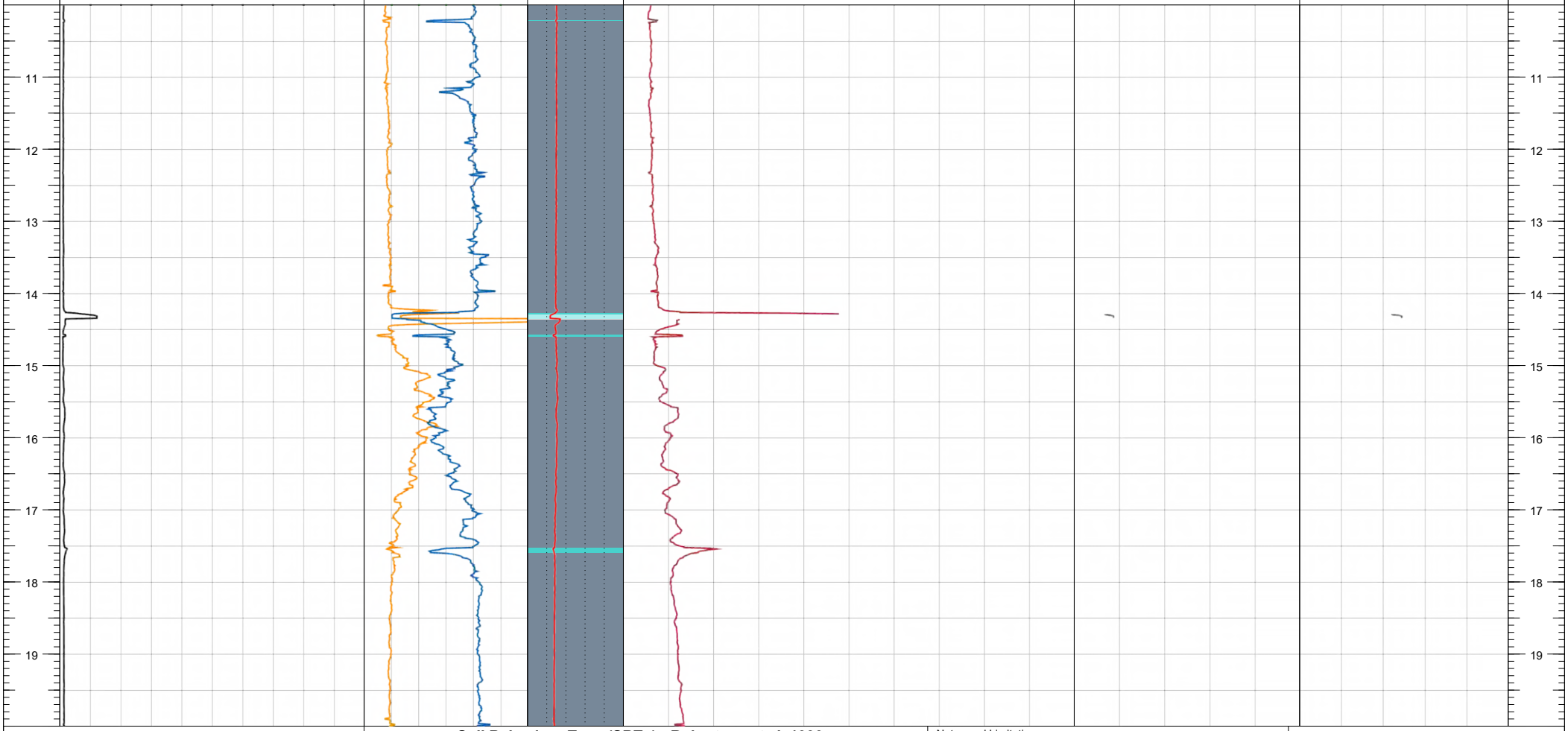
Client Job Ref:

CPT Number: **CPT-01**

G.I. Job Ref: **17-314**

Test Date: **19/06/2017**

CONE PENETRATION TEST (CPT) PARAMETER LOG



Client: Vision Consulting Engineers

Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

Contractor: Ground Investigation Ltd.

Soil Behaviour Type (SBTn) - Robertson et al. 1990

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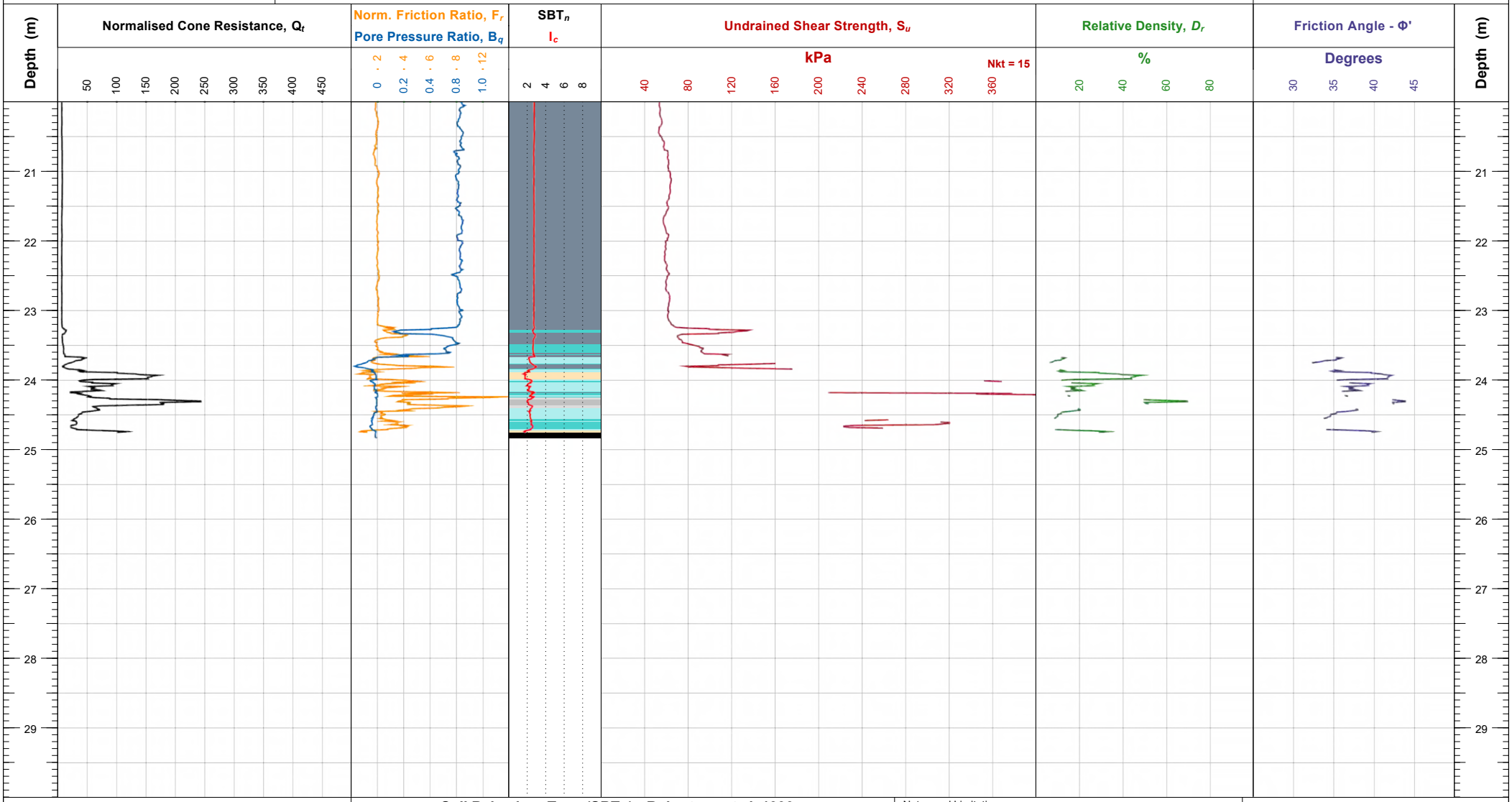
Client Job Ref:

CPT Number: **CPT-01**

G.I. Job Ref: **17-314**

Test Date: **19/06/2017**

CONE PENETRATION TEST (CPT) PARAMETER LOG



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Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

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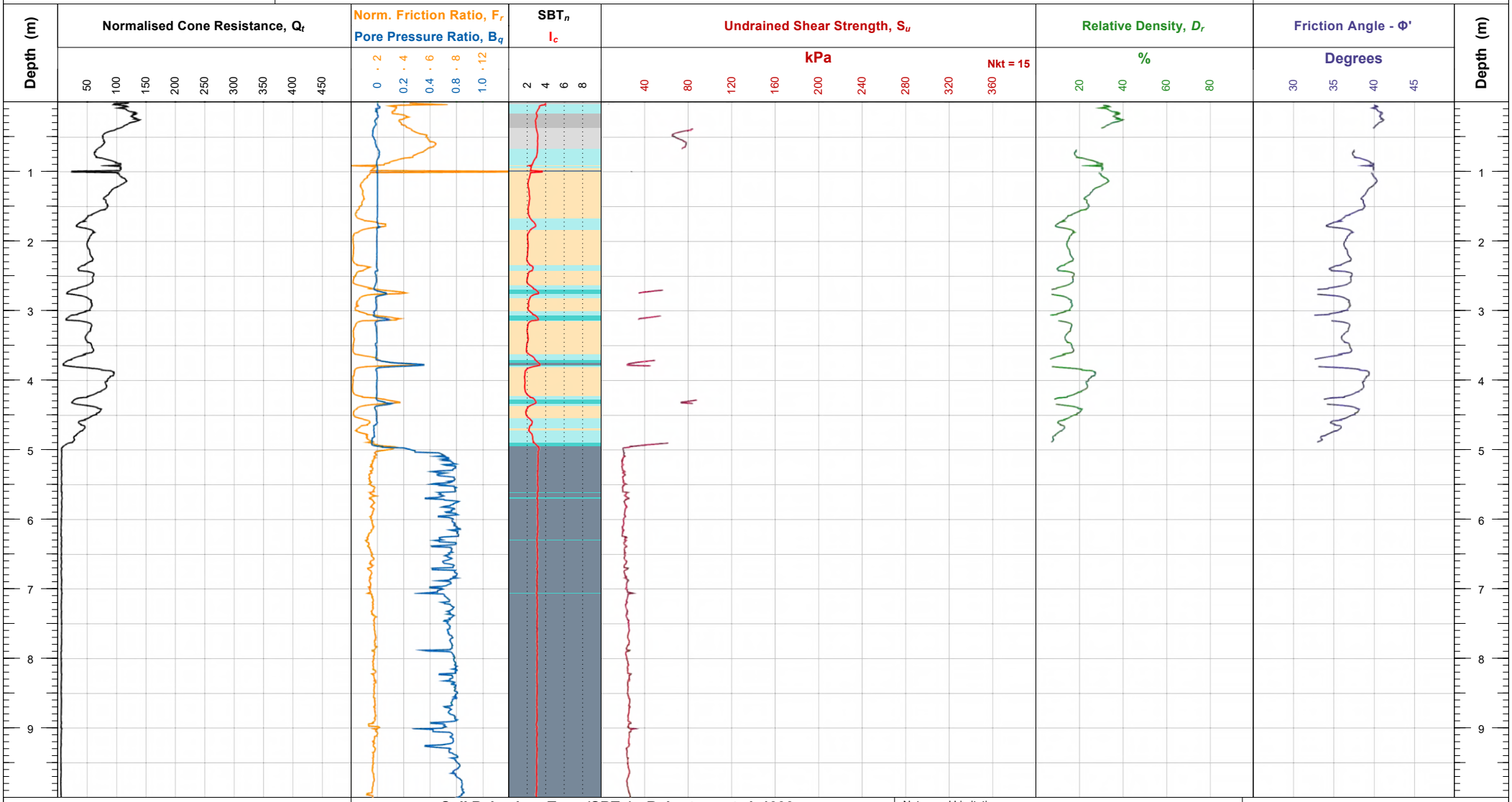
CPT Number: **CPT-01**

G.I. Job Ref: **17-314**

Test Date: **19/06/2017**

CONE PENETRATION TEST (CPT) PARAMETER LOG



Client: Vision Consulting Engineers

Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

Contractor: Ground Investigation Ltd.

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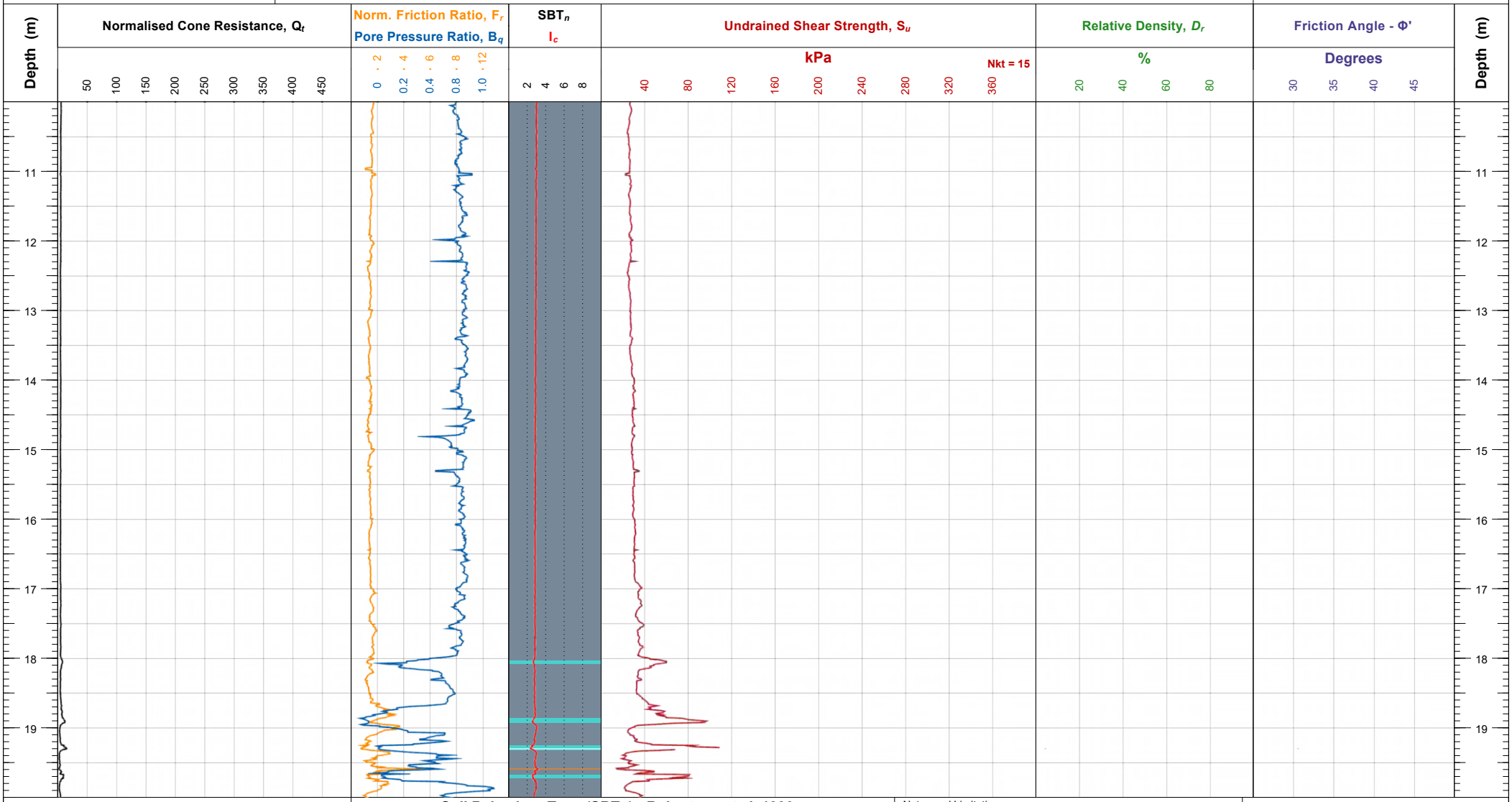
Client Job Ref:

CPT Number: **CPT-02**

G.I. Job Ref: **17-314**

Test Date: **19/06/2017**

CONE PENETRATION TEST (CPT) PARAMETER LOG



Client: Vision Consulting Engineers

Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

Contractor: Ground Investigation Ltd.

Soil Behaviour Type (SBTn) - Robertson et al. 1990

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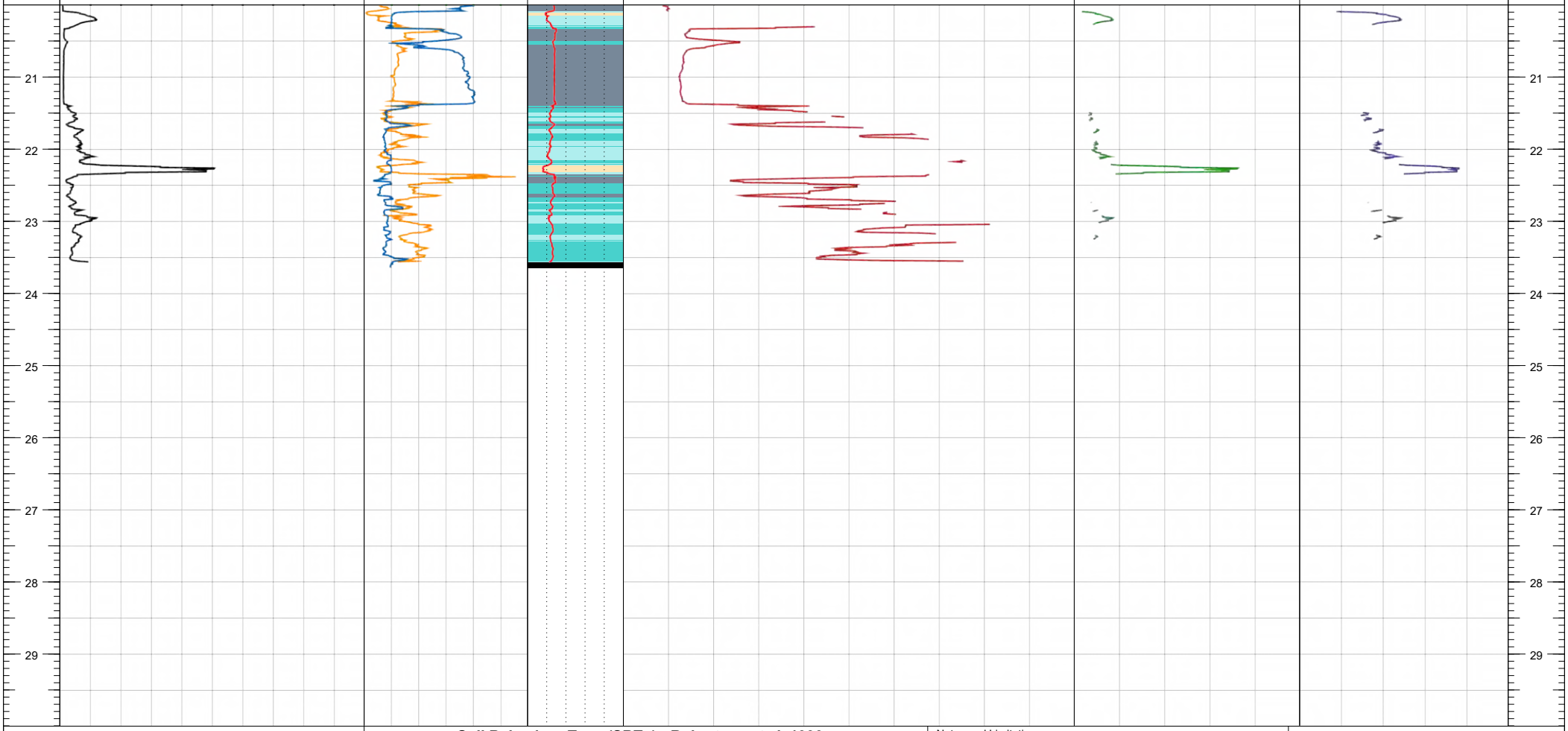
Client Job Ref:

CPT Number: **CPT-02**

G.I. Job Ref: **17-314**

Test Date: **19/06/2017**

CONE PENETRATION TEST (CPT) PARAMETER LOG



Client: Vision Consulting Engineers

Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

Contractor: Ground Investigation Ltd.

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Client Job Ref:

CPT Number: **CPT-02**

G.I. Job Ref: **17-314**

Test Date: **19/06/2017**

CPT ZEROS AND DRIFT

Client Ref: 17-314

107 Yorke Street

G.I. Ref: 17-314

Cone Reference	CPT Name	Tip Resistance			Local Friction			Pore Pressure		
		Initial (MPa)	Final (MPa)	Difference (%)	Initial (MPa)	Final (MPa)	Difference (%)	Initial (MPa)	Final (MPa)	Difference (%)
MKJ208	CPT-01	9.470	9.480	-0.02	0.132	0.132	-0.04	1.407	1.406	0.04
MKJ333	CPT-02	10.177	10.151	0.05	0.140	0.140	-0.02	0.960	0.960	0.02

Client: Vision Consulting Engineers

Project: 107 Yorke Street

Location: Haruru Falls, Northland

Engineer: Dan Simmonds

NOTE: Percentage Zero Difference calculated following ASTM D5778-12. Green indicates a difference between -1% and 1%; yellow shows either -1% to -2% or 1% to 2%; red shows below -2% or over 2%

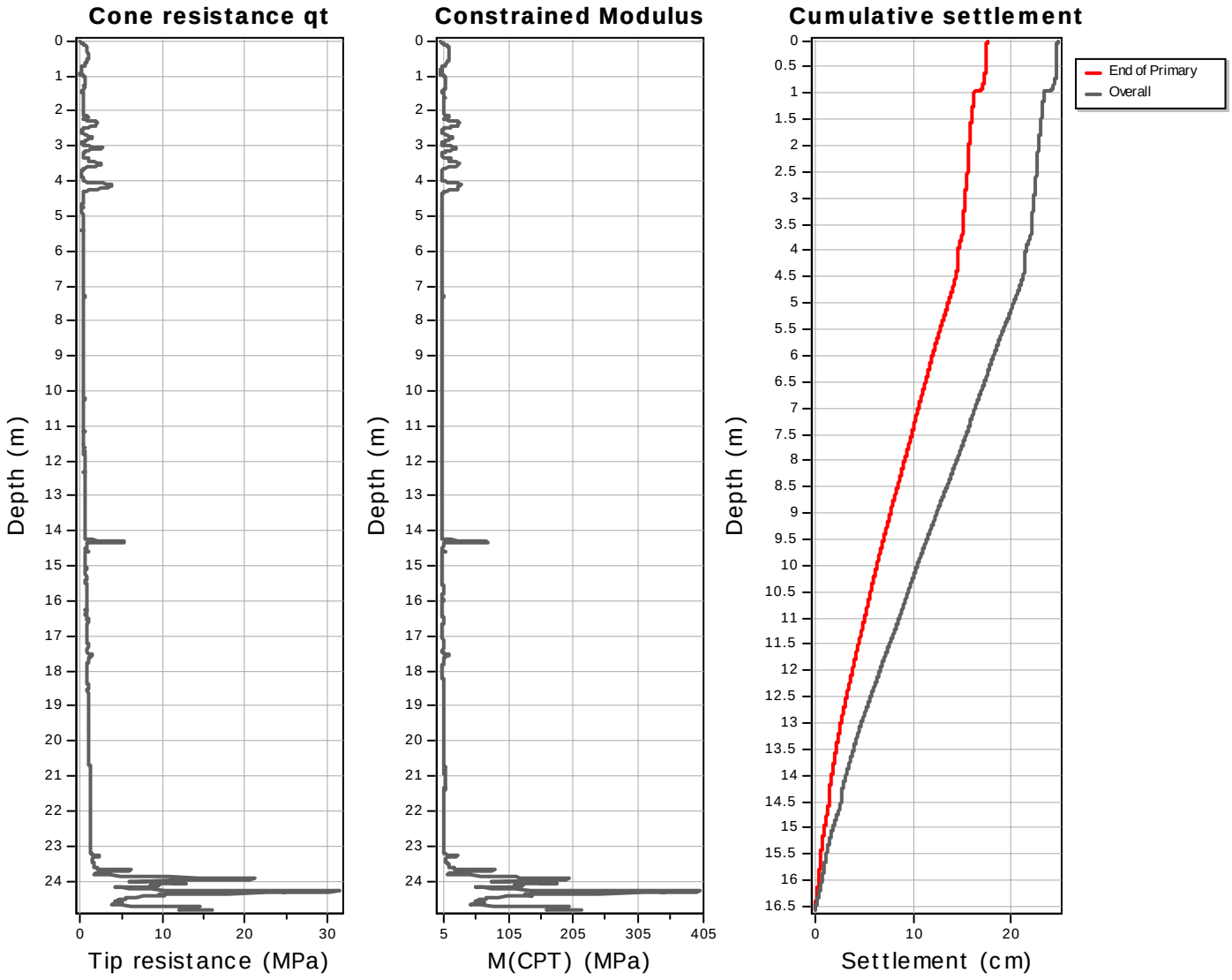
Appendix C
Settlement Assessment Results

VISION CONSULTING ENGINEERS
Level 1
62 Kerikeri Road, Kerikeri
www.vce.co.nz

CPT: CPT-01
Total depth: 24.83 m, Date: 7/07/2017
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project: 107 Yorke Street
Location: Haruru

Settlements calculation according to theory of elasticity*



Calculation properties

Footing type: Rectangular
Footing width: 30.00 (m)
L/B: 1.0
Footing pressure: 30.00 (kPa)
Embedment depth: 0.00 (m)
Footing is rigid: No
Remove excavation load: No
Apply 20% rule: Yes
Calculate secondary settlements: Yes
Time period for primary consolidation: 6 months
Time period for second. settlements: 606 months

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

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

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

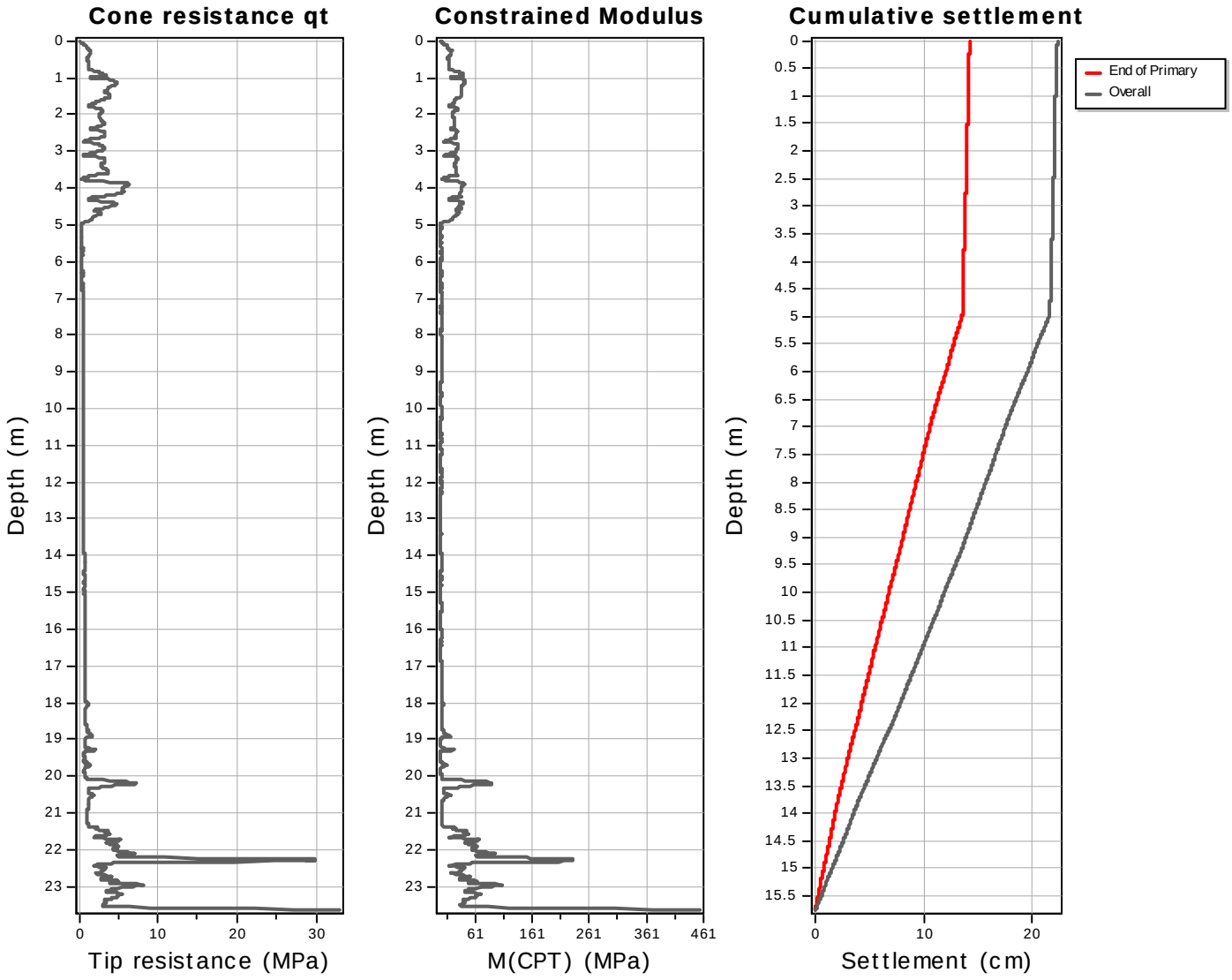
$$S = C_a \cdot \Delta z \cdot \log(t)$$

VISION CONSULTING ENGINEERS
Level 1
62 Kerikeri Road, Kerikeri
www.vce.co.nz

CPT: CPT-02
Total depth: 23.64 m, Date: 7/07/2017
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type: Uknown
Cone Operator: Uknown

Project: **107 Yorke Street**
Location: **Haruru**

Settlements calculation according to theory of elasticity*



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