



Appendix I Geotechnical Assessment

Prepared by Torlesse

Report Layout

Report Sheet No. 1 of 4—Overview, Findings & Recommendations

Report Sheet No. 2 of 4—Public Data Search

Report Sheet No. 3 of 4—Ground Model and Geotechnical Hazard Assessment

Report Sheet No. 4 of 4—Liquefaction Assessment

Appendix A—Sketches

Appendix B—Topographic Survey and Proposed Site Levels

Appendix C—Investigation Records

Appendix D—Liquefaction Analysis

Introduction

Sussex Trust have engaged Torlesse Ltd (Torlesse) to provide a geotechnical assessment of 160 Mazengarb Road, as supporting documentation for resource and building consent.

This report presents the findings based on the scope of service set out in the email agreement dated 9 July 2024. Our scope of work comprises the following:

- Complete an intrusive geotechnical investigation comprising of Test Pits to a target depth of 3.0 metres below ground level with associated Scala penetrometer testing.
- Complete 2 days CPT Testing across the site to refusal.
- Complete a geotechnical assessment report including liquefaction assessment and recommendations to assist in the developed and detailed design stages.

Previous Reports

Torlesse undertook a previous pre-purchase assessment of the site, which is referenced below. However, all relevant information has been updated with site specific data collected as part of the intrusive investigation and is presented within this report.

- Torlesse, 'Geotechnical Desktop Study—Pre-purchase Assessment', dated 15 May 2024.

Received Information

We have received the following information:

- Cuttriss, 'Scheme Plan—Existing and Proposed Contours', no date.
- Design Group Stapleton Elliott, 'Masterplan—160 Mazengrab Road, Paraparaumu—RC02', dated 20 June 2024.

Proposed Development

The proposed development consists of the following key aspects:

- Increasing site levels by up to 2.0m to create a near level building platform between 5.8m RL and 6.5m RL.
- A total of 41 individual units are proposed consisting of 1 and 2 storey structures.
- The units are a mix of 1, 2 and 3 bedroom units.
- The units are proposed to be timber framed with the use of light weight construction material.
- The development also includes a driveway and associated parking.

A copy of the proposed layout is included in Appendix B, while Sketch 2 in Appendix A shows the testing locations overlaid on the proposed development.

The existing topographic survey and proposed contours are also included in Appendix B.

Findings

The following is a summary of the key findings from the data search, investigation and geotechnical assessment:

- The site is underlain by beach sands to at least 15m bgl.
- The sands consistently increase density with depth and are at low risk of static settlement.
- Fill was locally identified in TP02 up to 0.9m bgl. Fill was not encountered in the other test locations and is considered to be localised.
- Groundwater was identified at an approximate RL of 2.5m.
- The site is at low risk of all identified geotechnical hazards with the exception of liquefaction which presents a moderate risk.

Recommendations

Element	Recommendations	Comments
Site subsoil Class	Site Class D	
Recommended Foundation Type	Shallow foundations	Low bearing pressure waffle slab or stiff concrete raft type foundation, founded at a depth of 0.3m below cleared ground level or on imported fill certified to NZS4431 as per the proposed plans.
Ultimate Bearing Capacity	200kPa	The natural ground is suitable for founding, following proof roll, inspection and approval by a Torlesse geotechnical engineer. The fill identified in TP02 will require inspection and proof rolling during the earthworks stage to confirm suitability. So localised re-working of material may be required.
Strength Reduction Factor	0.5	As per MBIE/NZGS Module 4 (2021) and B1/VM4.
Settlement	<25mm	Adopting either of the foundation options above will result in static and differential settlements being less than 25mm over a 6m length under SLS load combinations as per B1/VM4.
Earthworks	Earthworks Specification Required	In general the site will be raised to achieve proposed site levels. Either re-use of site won material or imported fill (either quarry fill such as GAP65, or Sand fill) is considered appropriate. Due to the underlying sand nature of the site earthworks can be carried out in winter months typically with the use of cohesionless (granular) fill material. Fill works should be inline with NZS4404:2010 and NZS4431:2022.
Cut and Fill batters	A maximum slope angle of 1V:3H is recommended for all cut and fill batters within the sand material up to a maximum height of 4m.	It is recommended any slope greater than 1V:3H are retained unless a site specific slope stability assessment is completed. Temporary cut or fill slopes can be at angles of 1V:1H within the sand material.
Further Investigations	None required	
Construction Monitoring	Yes, refer to earthworks specification	The earthworks specification will provide detailed hold/inspection points for the development of the site. This will include but not be limited to: <ul style="list-style-type: none">• Site clearance• Subgrade inspections• Fill placement and testing

- The site does not meet NZS 3604 conditions due to some low DCP blow counts and presence of liquefaction at the site.
- The proposed 3.3m to 4.0m crust at the site will reduce the impact of liquefaction during a ULS seismic event.

Discussion

The site is generally level lying and underlain by sand. The proposed 3.3m+ crust at the site will significantly mitigate the risk of liquefaction induced ejecta at the surface and also the impact of settlement on the proposed structures.

Geotechnically the site is well suited to residential development, and the identified liquefaction risk can be mitigated through the proposed earthworks and foundation design.

Recommendations are presented in the table below.

Conclusion

Statement of Suitability

In my professional opinion, not to be construed as a guarantee, I (Nick Clendon, PEngGeol 1015552) consider the site is suitable for subdivision as long as the recommendations presented here are adhered to and specific engineering design is undertaken.

Client:

Sussex Trust

Project Name:

Geotechnical Assessment Report

Site Location:

160 Mazengarb Road

Sheet Title:

Overview, Findings and Recommendations

Project/Report No:

T0399/02

Sheet No:

1 of 4

Author:

L Heaton/N Clendon

Initials:

LH/NC

Reviewed By:

N Schumacher

Initials:

NS

Rev.	Date:	Description	Initials
A	17/07/2024	RC and BC	NC
B	24/07/2024	RC and BC	NC

Notes:

Applicability Statement:

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Rev.	Date:	Description	Initials
A	17/07/2024	RC and BC	NC
B	24/07/2024	RC and BC	NC

Notes:

Summary of Site Observations

Element	Description
Date of Visit	4 and 8 July 2024
Vegetation and topography	The property is vegetated with several large trees and grass. The north area of the property has a higher elevation than the south area (up to 2m difference in places), with generally undulating topography.
Site structures (buildings, walls, etc)	There is currently an existing dwelling and garage located on the property. In terms of foundations, the garage has a concrete slab while the dwelling is on piles.
Underground and overhead services	All services are underground on this property.
Soil/ rock exposures	No soil or rock exposures were observed on the property,
Water/ Drainage	No drainage features were observed.

Summary of Public Data

Source	Source Description	Data Description	Notes
GNS	NZ Geological Webmap (1:50,000)	Holocene windblown deposits	Inactive dunes.
	NZ Active Fault Database	Ohariu Fault ~ 3.5km southeast Gibbs Fault—4.7km southeast	Dextral, RI II >2,000 to <= 3,500 years, slip rate moderate. Dextral, RI III >3,500 to <= 5,000 years, slip rate low.
GWRC	Mapped Hazard	Combined Hazard Ground Shaking Liquefaction Slope	Moderate to high Moderate High Low
KCDC	Flood Hazards	Ponding on site GWRC Flood Hazard Webmap notes a 1%AEP.	Stream corridor shown 120m south-east of the property.
	Historical Aerial Imagery	1940s—One building existing on site 1991—Two buildings added to property.	No major changes to site between 1991 and 2021.
Retrolens	Historical Aerial Images	1942—Single building present on the property. 1964—Small structure added to north end of site. 1966—Northern structure no longer present. 1991—Building added to south end of property, near the existing driveway	
NZGD	Nearby Investigation Records	18 CPTs and 5 hand auger logs have been completed within 300m of the site.	Logs generally indicated sands with gradually increasing soil strength.

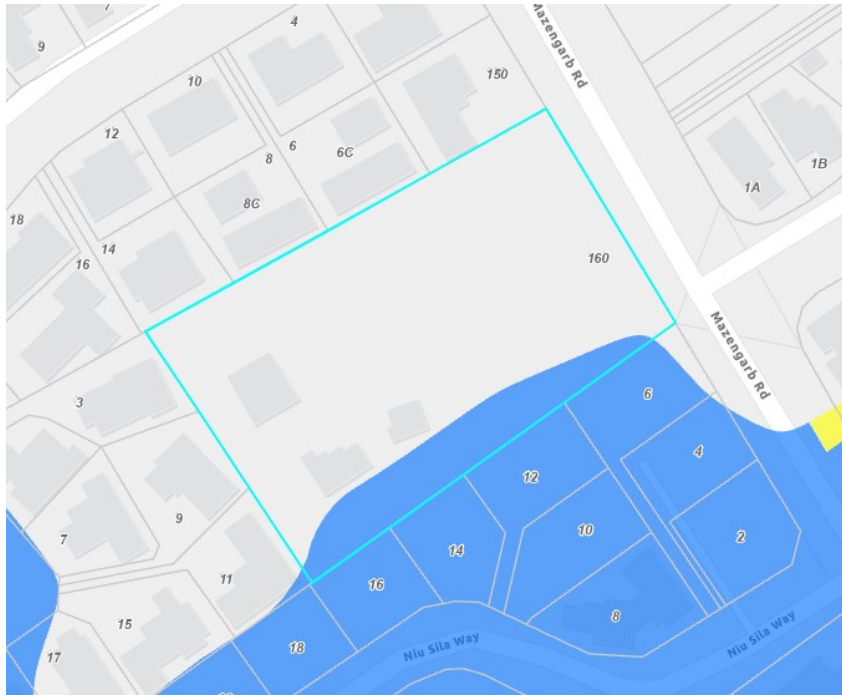


Figure 1: KCDC flood hazard map—Ponding



Figure 2: NZGD test locations

Kaikoura PGAs

Strong motion stations throughout the Wellington region recorded ground motions during the 2016 Kaikoura earthquake which was a 7.8 M_w event. A record for the Paraparaumu Primary School is shown adjacent.

Site	PAPS
Location	Paraparaumu Primary School
Distance from site	~2.6km south
PGA (g)	0.092
Subsoil Class	D

Ground Investigation

A geotechnical investigation was completed between the 4 and 8 July 2024 and consisted of 6 No. Test Pits to a maximum depth of 3.2m below existing ground level and 10 CPTs to a maximum depth of 15m where refusal was encountered.

- CPT05 was repeated due to early refusal with the second test achieving 12m.
- A DCP was undertaken at each pit location to refusal.
- The test locations are shown on Sketch 1 in Appendix A.
- A full copy of the Test Pit and CPT logs are included in Appendix C.

Based off the above data and our existing knowledge of sites in the area we have developed a ground model which is presented in the adjacent table.

Site Geotechnical Hazards

Torlesse has undertaken a qualitative assessment of the site geotechnical hazards. For simplicity, we have adopted a three-tiered system (low/moderate/high) to characterise the significance of the risk specific to the proposed development. The risk allocation may differ for any subsequent or additional developments at the site.

Typically risks with a low rating are no longer further assessed, while those with moderate or high are assessed in more detail.

Ground Motion Parameters

The ground motion parameters for geotechnical analysis are estimated using the MBIE and NZGS Earthquake Geotechnical Engineering Practice Module 1. Two design cases have been considered, all with an assumed 50-year design life. The design peak ground accelerations (PGA) are outlined in the table below.

Design Case	Importance Level	Return Period	M _w	PGA (g)
SLS1	2	25 years	6.5	0.13
ULS	2	500 years	7.7	0.68



Figure 3: Photo near CPT02, looking South

Ground Model and Material Properties

Unit	Description	Strength	Depth to top of layer (mbegl)	γ (kN/m ³)	φ' (°)	c' (kPa)
Beach Deposits	Fine to medium grained sand	Loose to medium dense	0.0	17	30	0
Beach Deposits	Fine to coarse grained sand	Medium dense	0.3–1.1	18	32	0
Beach Deposits	Fine to coarse grained sand	Dense	1.5–2.5	20	36	0
Beach Deposits	Sand	Very dense	3.1–4.8	22	40	0
Beach Deposits	Sand	Dense	6–6.5	20	36	0
Beach Deposits	Sand	Very dense	12–14	20	40	0
Groundwater	Groundwater is estimated to be at 2m RL, approximately 2.5 to 4m below existing ground level (mbegl) based on observations and CPT data.					
Notes	γ bulk unit weight; φ' effective friction angle; c' effective cohesion. Topsoil not shown in ground model.					

Geotechnical Hazards

Geohazard	Risk category	Notes
Weak or variable soils	Low	The soils were consistent across the property, typically granular in nature and increasing in strength with depth.
Shallow groundwater	Low	Water was encountered at 2.6m bgl in TP05 and some seepage was observed at around 3.0m in other test locations.
Slope instability	Low	The site is flat and is not located near any slopes.
Liquefaction	Moderate	Refer to sheet 4 for a detailed liquefaction assessment.
Lateral spreading	Low	The nearest free face is approximately 50m away, where a pond is present on a neighbouring property. However it is of limited extent and considered to be a low risk. The nearest stream is over 300m away.
Fault rupture	Low	The nearest fault is 3.5km away. The nearest major fault as per NZS1170.5 is the Wellington Fault which is >20km away.



Figure 4: Photo near TP05, looking North



Figure 5: Photo near TP04, looking Southeast

Client:
Sussex Trust

Project Name:
Geotechnical Assessment Report

Site Location:
160 Mazengarb Road

Sheet Title:
Ground Model and Geotechnical Hazard Assessment

Project/Report No:
T0399/02

Sheet No:
3 of 4

Author:
L Heaton/N Clendon

Initials:
LH/NC

Reviewed By:
N Schumacher

Initials:
NS

Rev.	Date:	Description	Initials
A	17/07/2024	RC and BC	NC
B	24/07/2024	RC and BC	NC

Notes:

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APPENDIX A: SKETCHES



Legend

- ▲ CPT
- Test Pit
- Property Boundary

Client:
Sussex Trust

Project Name:
Geotechnical Assessment Report

Site Location:
160 Mazengarb Road, Paraparaumu

Sketch Title:
Test Location Plan

Project/Report No:
T0399/02

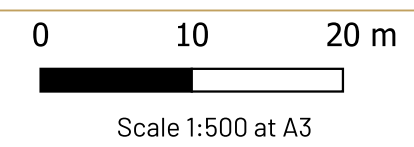
Sketch ID:
1 of 2

Author: L Heaton	Initials: LH
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Checked By: N Clendon	Initials: NC
--------------------------	-----------------

Rev.	Date	Description	Initials
A	17/07/24	Final	LH

Notes:



Data Courtesy:
LINZ, OPENMAPS



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Legend

- ▲ CPT
- Test Pit
- Property Boundary

Client:
Sussex Trust

Project Name:
Geotechnical Assessment Report

Site Location:
160 Mazengarb Road, Paraparaumu

Sketch Title:
Proposed Development Plan

Project/Report No:
T0399/02

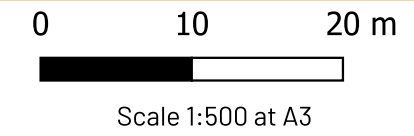
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2 of 2

Author:	Initials:
L Heaton	LH

Checked By:	Initials:
N Clendon	NC

Rev.	Date	Description	Initials
A	17/07/24	Final	LH

Notes:



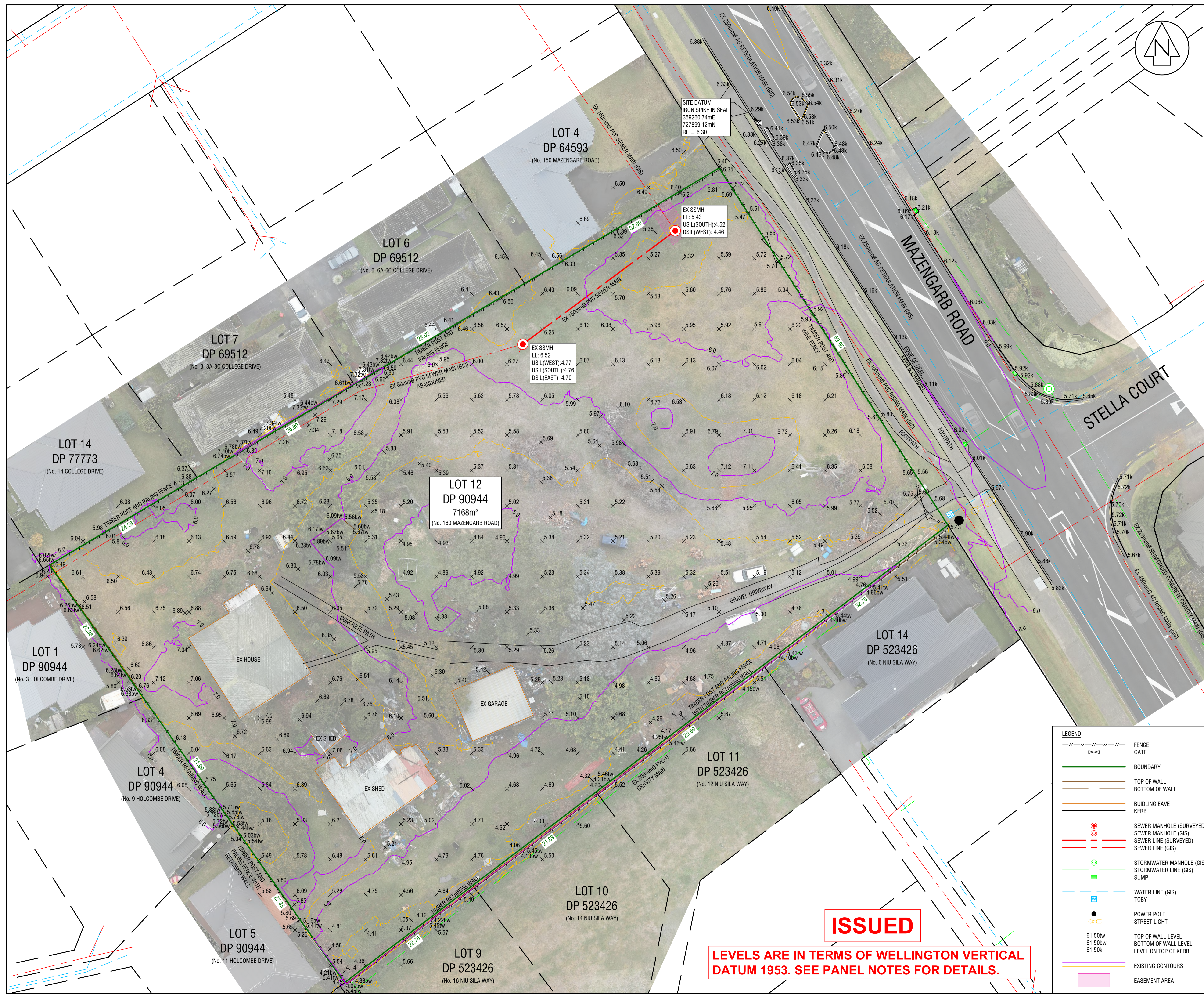
Data Courtesy:
LINZ, OPENMAPS



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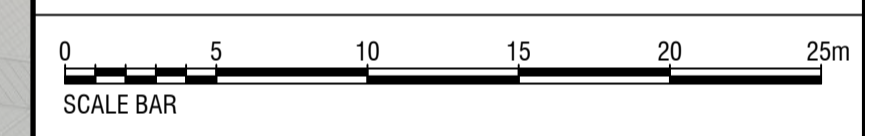


APPENDIX B: TOPOGRAPHICAL SURVEY AND PROPOSED SITE LEVELS



REVISION DETAILS	NAME	DATE

- NOTES:**
- THIS PLAN DEFINES THE TOPOGRAPHICAL NATURE & FEATURES OF THE SITE & SHOULD NOT TO BE RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE CONSENT OF CUTTRISS CONSULTANTS LIMITED
 - COORDINATES ARE IN TERMS OF NEW ZEALAND GEODETIC DATUM 2000, WANGANUI CIRCUIT
 - LEVELS ARE IN TERMS OF MEAN SEA LEVEL WELLINGTON VERTICAL DATUM 1953. ORIGIN OF LEVELS: SP 1 DP 7773 (DC8A) RL: 5.414. SOURCED FROM LINZ ELLIPSOIDAL HEIGHT CONVERSION, DECEMBER 2021
 - A DENOTES EXISTING EASEMENT AREAS. NOT ALL INTERESTS ON THE RECORD OF TITLE MAY BE SHOWN ON THIS PLAN, AND SHOULD BE INVESTIGATED FURTHER
 - SERVICES HAVE BEEN LOCATED ON SITE WHERE POSSIBLE, OTHERWISE SHOWN FROM RELEVANT SERVICE AUTHORITIES RECORDS, AND SHOULD BE VERIFIED ON SITE
 - CONTOUR INTERVALS: 0.5m
 - SURVEYED BY: RHIANNO EVANS & STEPH ROBERTS, 13 OF MAY 2024
 - INSTRUMENT USED: TRIMBLE GPS RTK R10 VRS & TRIMBLE S7 & DJI M300 RTK
 - GROUND LEVELS SHOWN ON THIS PLAN ARE EXISTING GROUND LEVELS AT THE TIME OF SURVEY. LEVELS FOR DETERMINATION OF CRITICAL RECESION PLANES OR DESIGN ELEMENTS MUST BE CONFIRMED PRIOR TO ANY APPLICATION FOR BUILDING CONSENT AND/OR CONSTRUCTION
 - BOUNDARY INFORMATION HAS BEEN DETERMINED BY SURVEY CALCULATION METHODS AND HAS NOT BEEN VERIFIED ON SITE
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PROJECT
**TOPOGRAPHICAL SURVEY
 LOT 12 DP 90944
 160 MAZENGARB ROAD,
 PARAPARAUMU**

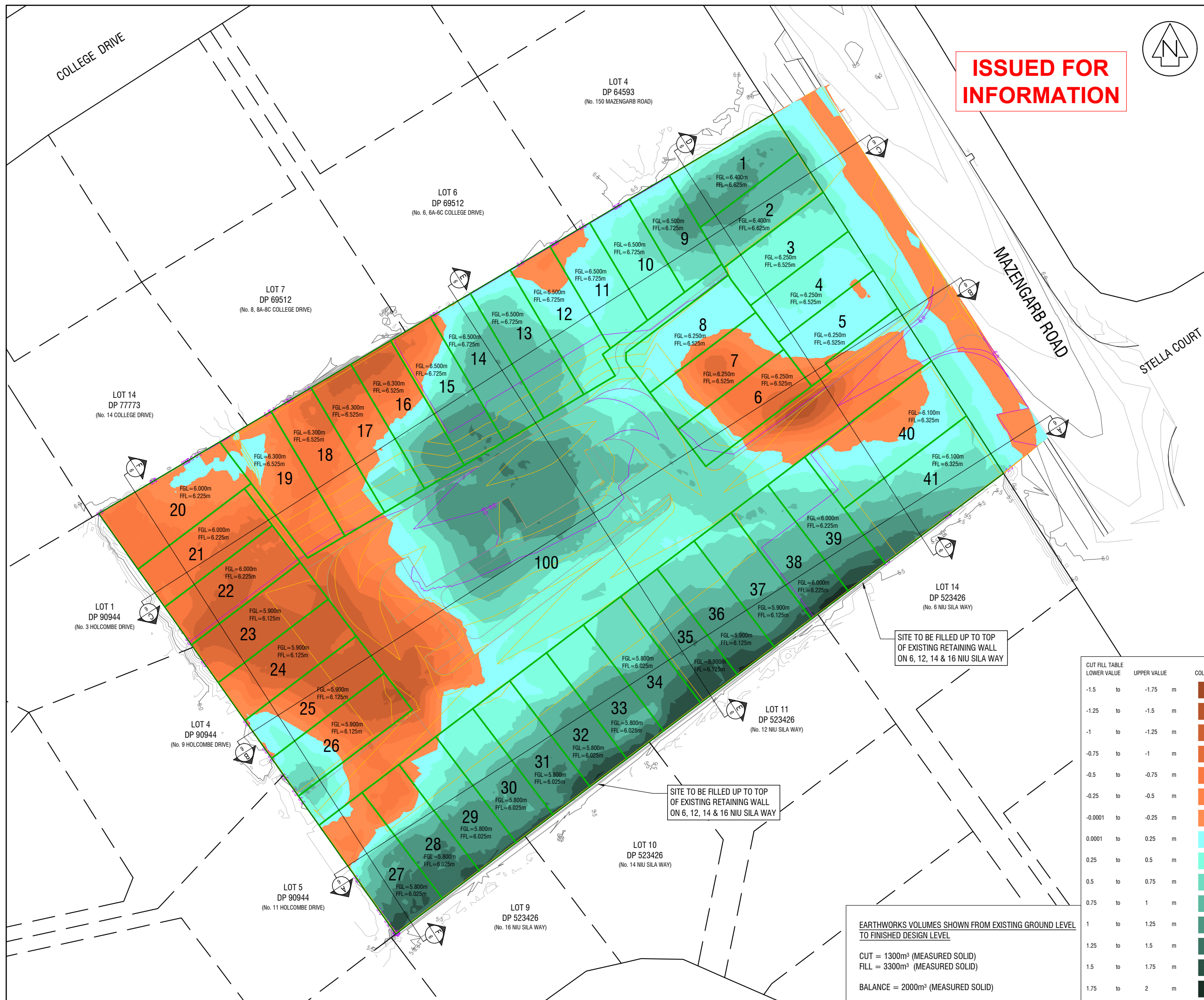
TOPOGRAPHICAL PLAN

SCALE A1 - 1:250	REDUCED SCALE A3 - (1:500)
DRAWING NUMBER 23333 TPO	
SHEET 1 OF 1 SHEETS	
FIELDWORK DESIGNED DRAWN CHECKED	NAME RME CJB NKT
DATE 05/24 05/24 05/24	DATE 05/24 05/24 05/24
REVISION -	

LEGEND

	FENCE GATE
	BOUNDARY
	TOP OF WALL
	BOTTOM OF WALL
	BUILDING EAVE
	KERB
	SEWER MANHOLE (SURVEYED)
	SEWER MANHOLE (GIS)
	SEWER LINE (SURVEYED)
	SEWER LINE (GIS)
	STORMWATER MANHOLE (GIS)
	STORMWATER LINE (GIS)
	SUMP
	WATER LINE (GIS)
	TOBY
	POWER POLE
	STREET LIGHT
	61.50bw TOP OF WALL LEVEL
	61.50k BOTTOM OF WALL LEVEL
	61.50k LEVEL ON TOP OF KERB
	EXISTING CONTOURS
	EASEMENT AREA

ISSUED
LEVELS ARE IN TERMS OF WELLINGTON VERTICAL DATUM 1953. SEE PANEL NOTES FOR DETAILS.



ISSUED FOR INFORMATION



REVISION DETAILS	NAME	DATE

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- THIS PLAN IS TO BE USED FOR RESOURCE CONSENT PURPOSES ONLY & IS NOT TO BE RELIED UPON FOR ANY OTHER PURPOSE WITHOUT THE CONSENT OF CUTTRISS CONSULTANTS LIMITED.
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 - LEVELS ARE IN TERMS OF MEAN SEA LEVEL WELLINGTON VERTICAL DATUM 1953. ORIGIN OF LEVELS: SP 1 DP 7773 (DC8A) RL: 5.414. SOURCED FROM LINZ ELLIPSOIDAL HEIGHT CONVERSION, DECEMBER 2021
 - NOT ALL INTERESTS ON THE RECORD OF TITLE MAY BE SHOWN ON THIS PLAN, AND SHOULD BE INVESTIGATED FURTHER
 - SERVICES HAVE BEEN LOCATED ON SITE WHERE POSSIBLE, OTHERWISE SHOWN FROM KDCD RECORDS, AND SHOULD BE VERIFIED ON SITE
 - THE SERVICES SHOWN ON THIS PLAN ARE CONCEPTUAL ONLY, AND THE LOCATION AND DEPTHS MAY CHANGE DURING THE DETAILED DESIGN PROCESS
 - CONTOUR INTERVAL: 0.2m
 - SURVEYED BY: R EVANS & S ROBERTS, 13 MAY 2024
 - INSTRUMENT USED: TRIMBLE GPS RTK R10 VRS & TRIMBLE S7 & DJI M300 RTK
 - BOUNDARY LEVELS FOR DETERMINATION OF CRITICAL RECESSION PLANES MUST BE CONFIRMED PRIOR TO ANY APPLICATION FOR BUILDING CONSENT.
 - BOUNDARY INFORMATION HAS BEEN DETERMINED BY SURVEY CALCULATION METHODS AND HAS NOT BEEN VERIFIED ON SITE
 - ALL ELECTRONIC CAD DATA MUST BE READ IN CONJUNCTION WITH THESE NOTES.

LEGEND

	BOUNDARY - EXISTING
	BOUNDARY - NEW
	CONTOURS - EXISTING
	CONTOURS - PROPOSED

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PROJECT
**PROPOSED SUBDIVISION
 LOT 12 DP 90944
 160 MAZENGARB ROAD,
 PARAPARAUMU**

**SCHEME PLAN -
 EARTHWORKS LAYOUT**

SCALE A1 - 1:250		REDUCED SCALE A3 - 1:500	
FIELDWORK	RE	05/24	23333 SCH
DESIGNED	JTR	07/24	
DRAWN	JAQ	07/24	
CHECKED	JTR	07/24	
SHEET 3 OF 17 SHEETS		REVISION	

CUT FILL TABLE

LOWER VALUE	UPPER VALUE	COLOUR
-1.5	to -1.75	
-1.25	to -1.5	
-1	to -1.25	
-0.75	to -1	
-0.5	to -0.75	
-0.25	to -0.5	
-0.0001	to -0.25	
0.0001	to 0.25	
0.25	to 0.5	
0.5	to 0.75	
0.75	to 1	
1	to 1.25	
1.25	to 1.5	
1.5	to 1.75	
1.75	to 2	

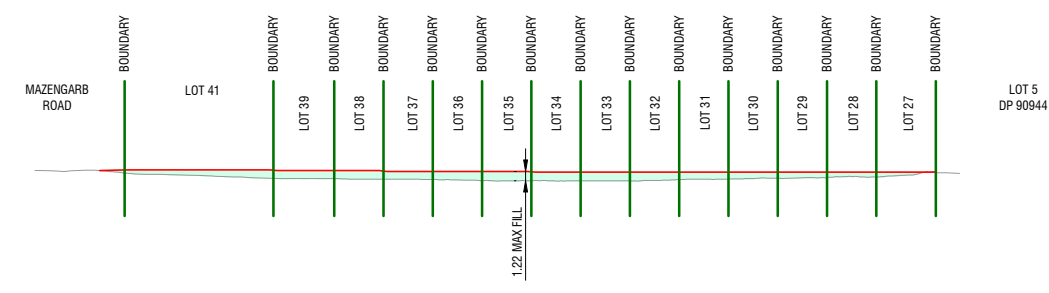
SITE TO BE FILLED UP TO TOP OF EXISTING RETAINING WALL ON 6, 12, 14 & 16 NIU SILA WAY

SITE TO BE FILLED UP TO TOP OF EXISTING RETAINING WALL ON 6, 12, 14 & 16 NIU SILA WAY

EARTHWORKS VOLUMES SHOWN FROM EXISTING GROUND LEVEL TO FINISHED DESIGN LEVEL

CUT = 1300m³ (MEASURED SOLID)
 FILL = 3300m³ (MEASURED SOLID)
 BALANCE = 2000m³ (MEASURED SOLID)

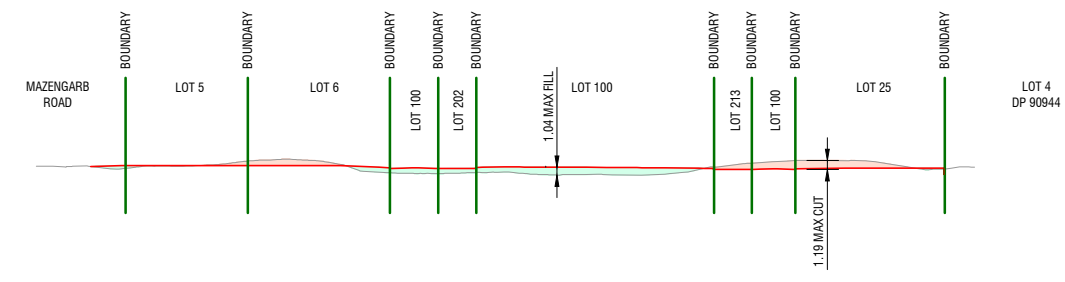
ISSUED FOR INFORMATION



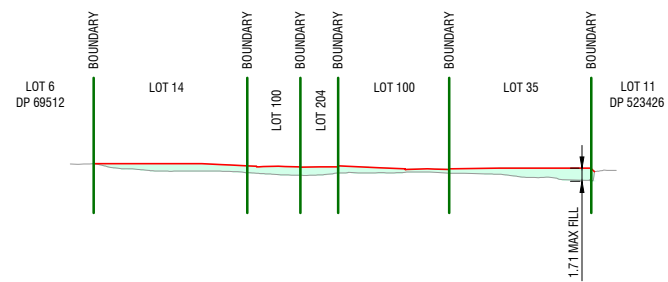
SECTION A-A



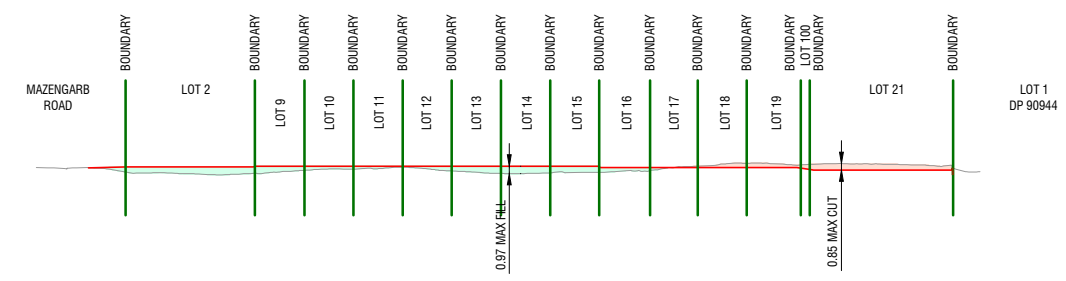
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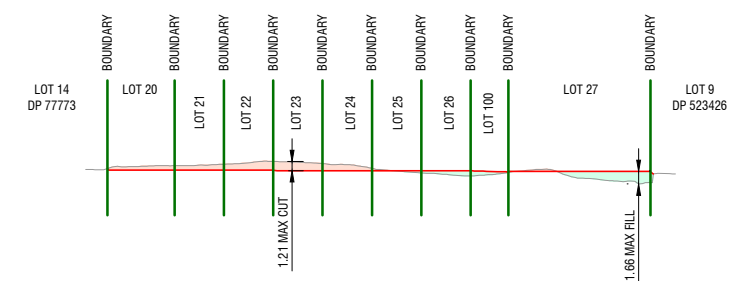
SECTION B-B



SECTION E-E



SECTION C-C



SECTION F-F

REVISION DETAILS	NAME	DATE

- NOTES:
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 - LEVELS ARE IN TERMS OF MEAN SEA LEVEL WELLINGTON VERTICAL DATUM 1953. ORIGIN OF LEVELS: SP 1 DP 77773 (DC8A) RL: 5.414, SOURCED FROM LINZ ELLIPSOIDAL HEIGHT CONVERSION, DECEMBER 2021
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 - CONTOUR INTERVAL: 0.2m
 - SURVEYED BY: R EVANS & S ROBERTS, 13 MAY 2024
 - INSTRUMENT USED: TRIMBLE GPS RTK R10 VRS & TRIMBLE S7 & DJI M300 RTK
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PROJECT
**PROPOSED SUBDIVISION
 LOT 12 DP 90944
 160 MAZENGARB ROAD,
 PARAPARAUMU**

**SCHEME PLAN -
 EARTHWORKS CROSS
 SECTIONS**

SCALE A1 - 1:500		REDUCED SCALE A3 - 1:1000	
FIELDWORK	RE	DATE	05/24
DESIGNED	JTR	DATE	07/24
DRAWN	JAQ	DATE	07/24
CHECKED	JTR	DATE	07/24
DRAWING NUMBER 23333 SCH		SHEET 4 OF 17 SHEETS	
REVISION		-	

UNITS	
Unit A (1Bed) or Unit B (2Bed) or Unit D (1Bed Acc)	20
Unit C (3Bed)	3
Unit E or E2 (2Bed)	13
Unit B2 (2Bed)	5
TOTAL	41

CARPARKS	
UNIT ADJACENT CARPARK	28
SITE CARPARK	13 (ALLOCATED)
ACCESSIBLE / GUEST	1

SITE INFORMATION

Address: 160 Mazengarb Road, Paraparaumu
 Legal Description: LOT 12 DP 90944
 District Plan Zone: General Residential Zone
 Site Area: 7168.6m²

COMPLIANCE INFORMATION

Building Coverage: 2506.9m² (35%)

RC02 REV.

MASTERPLAN

THAMES PACIFIC

160 Mazengarb Road, Paraparaumu,
 WELLINGTON, 5032

CONCEPT

Contractors shall verify all dimensions on site before commencing work. Do not scale from the drawings. If in doubt ask. Copyright of this drawing is vested in Designgroup Stapleton Elliott.

PROJECT No. **PROJECT NUMBER**

PLOT DATE. **20/06/2024 3:10:29 pm**

NO.	DESCRIPTION	DATE
-----	-------------	------

Site Information

Rainfall Intensity: 60 mm/h
 Climate Zone: 3
 Corrosion Zone: Zone C
 Legal Description: Lot 12 DP 90944
 Wind Zone: Very High
 NZBC E2 Compliance: Compliance with NZBC E2 is by means of NZBC E2 AS1. Refer Risk Matrix provided.



A3 Print Scale 1 : 1
 A1 Print Scale 1 : 0.5

Wellington	+64 4 920 0032	wn@dgse.co.nz
Palmerston North	+64 6 357 4534	pn@dgse.co.nz
Tauranga	+64 7 925 6238	tr@dgse.co.nz
Napier	+64 6 835 6173	np@dgse.co.nz
Auckland	+64 9 976 8288	ak@dgse.co.nz



MASTERPLAN
 SCALE @ A3 - 1 : 500 | SCALE @ A1 - DOUBLE SCALE

APPENDIX C: INVESTIGATION RECORDS

Test Pit & DCP Log No: TP01

Client: **Sussex Trust**
 Job No.: **T0399**
 Job Name: **160 Mazengarb Road, Paraparaumu**

Logged by: **LH** Co-ordinates **WGS 84** Contractor: **CPT Elite** Elevation: **6.5 m** Page No:
 Entered by: **LH** Plunge (Degrees): **90** Start Date: **2024-07-08** Northing: **-40.89057** **1 of 1**
 Reviewed by: **NC** Trend (Degrees): **0** End Date: **2024-07-08** Easting: **175.00469**

Depth Scale	Lithologic Description	Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP	Comments / Additional Notes
0	Ground Surface						
0	TOPSOIL						
	Fine to coarse SAND Light brown, loose, moist.						
	Fine to medium SAND With trace silt. Dark brown, loose to medium dense, moist. Silt is non-plastic.						
	Fine SAND Light brown, medium dense, moist.						
	Fine to medium SAND Grey, medium dense, moist.						
2	From 2.2m bgl - Medium dense to dense.						
	From 2.5m bgl - Dense.						
3	Test Hole Terminated at 3 m - Target depth.						
4							
5							

Test Location Information:

Equipment: **Excavator**
 Size (m): **0.8 x 2.7m**
 Water Level (m):
 Water Level (Elv):

Test Location Notes:

Coordinates obtained from mobile phone GPS.
Elevation estimated from Cuttriss Consultants Topographic Survey.
Groundwater was not encountered.



TP01 Pit



TP01 Stockpile

Test Pit & DCP Log No: TP02

Client: **Sussex Trust**
 Job No.: **T0399**
 Job Name: **160 Mazengarb Road, Paraparaumu**

Logged by: **LH** Co-ordinates **WGS 84** Contractor: **CPT Elite** Elevation: **6 m** Page No:
 Entered by: **LH** Plunge (Degrees): **90** Start Date: **2024-07-08** Northing: **-40.89052** **1 of 1**
 Reviewed by: **NC** Trend (Degrees): **0** End Date: **2024-07-08** Easting: **175.00427**

Depth Scale	Lithologic Description	Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP	Comments / Additional Notes
						0 5 10 15 20	
Ground Surface							
0	TOPSOIL						
	Fine to medium SAND With trace gravel. Dark brown, loose, dry to moist. Gravels are fine to medium, sub-round. (FILL?).						
	Fine to medium SAND With trace rootlets. Brown, loose, dry to moist.						
	Fine SAND Light brown, medium dense, dry to moist.						
	Fine to coarse SAND Grey brown, medium dense to dense, moist. From 2.1m bgl - Dense.						
	Test Hole Terminated at 3.1 m - Target depth.						
5							

Test Location Information:

Equipment: **Excavator**
 Size (m): **0.8 x 2.7m**
 Water Level (m):
 Water Level (Elv):

Test Location Notes:

Coordinates obtained from mobile phone GPS.
Elevation estimated from Cuttriss Consultants Topographic Survey.
Groundwater was not encountered.



TP02 Pit



TP02 Stockpile

Test Pit & DCP Log No: TP03

Client: **Sussex Trust**
 Job No.: **T0399**
 Job Name: **160 Mazengarb Road, Paraparaumu**

Logged by: **LH** Co-ordinates **WGS 84** Contractor: **CPT Elite** Elevation: **5 m** Page No:
 Entered by: **LH** Plunge (Degrees): **90** Start Date: **2024-07-08** Northing: **-40.89075** **1 of 1**
 Reviewed by: **NC** Trend (Degrees): **0** End Date: **2024-07-08** Easting: **175.00415**

Depth Scale	Lithologic Description	Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP	Comments / Additional Notes
0	Ground Surface						
0	TOPSOIL						
0	Fine SAND With minor tree roots. Brown, loose to medium dense, dry.						
0	Fine to coarse SAND With trace rootlets. Light brown, medium dense, dry to moist.						
1	From 1.2m bgl - Medium dense to dense.						
2	From 1.8m bgl - Dense.						
2	From 2.0m bgl - Moist.						
3	Fine to coarse SAND Grey, dense, moist to wet.						
3	Test Hole Terminated at 3.2 m - Target depth and pit wall collapse.						
4							
5							

Test Location Information:

Equipment: **Excavator**
 Size (m): **0.8 x 2.7m**
 Water Level (m):
 Water Level (Elv):

Test Location Notes:

Coordinates obtained from mobile phone GPS.
Elevation estimated from Cuttriss Consultants Topographic Survey.
Groundwater was not encountered.



TP03 Pit



TP03 Stockpile

Test Pit & DCP Log No: TP04

Client: **Sussex Trust**
 Job No.: **T0399**
 Job Name: **160 Mazengarb Road, Paraparaumu**

Logged by: **LH** Co-ordinates **WGS 84** Contractor: **CPT Elite** Elevation: **6.5 m** Page No:
 Entered by: **LH** Plunge (Degrees): **90** Start Date: **2024-07-08** Northing: **-40.89083** **1 of 1**
 Reviewed by: **NC** Trend (Degrees): **0** End Date: **2024-07-08** Easting: **175.00359**

Depth Scale	Lithologic Description	Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP	Comments / Additional Notes
0	Ground Surface						
0	TOPSOIL						
	Fine to medium SAND Light brown, loose to medium dense, moist.						
	Fine to coarse SAND Light brown, loose, moist.						
1	From 1.1m bgl - Medium dense.						
2	From 2.0m bgl - Dense.						
3	Test Hole Terminated at 3 m - Target depth.						
4							
5							

Test Location Information:

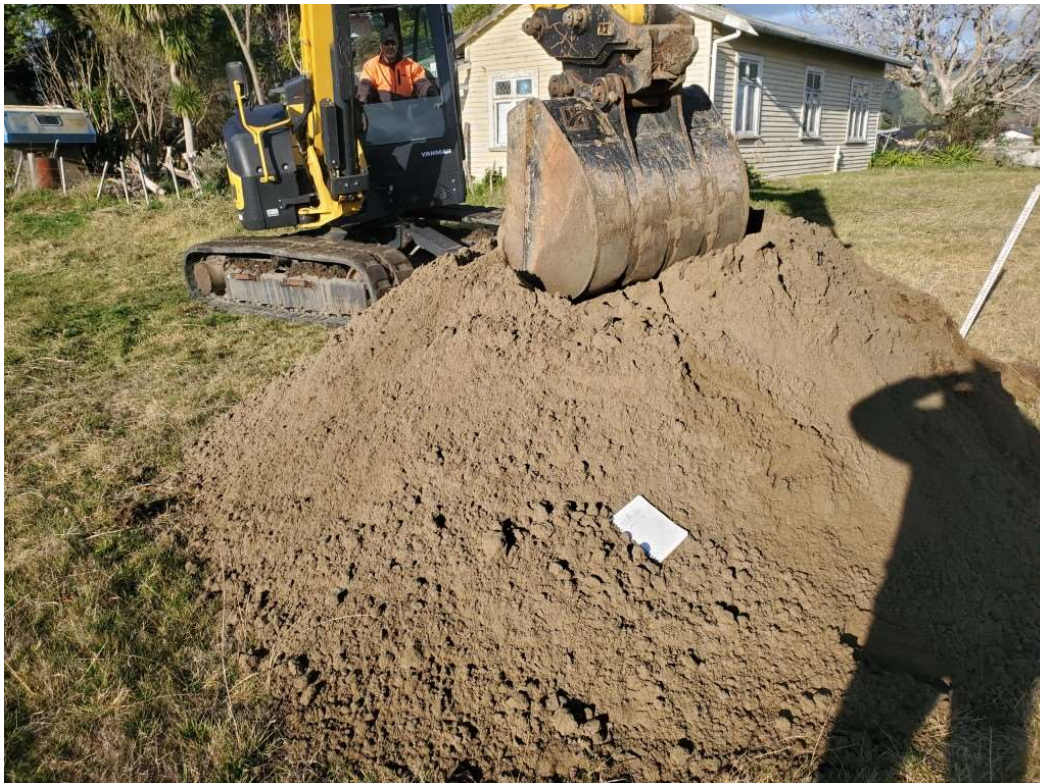
Equipment: **Excavator**
 Size (m): **0.8 x 2.7m**
 Water Level (m):
 Water Level (Elv):

Test Location Notes:

Coordinates obtained from mobile phone GPS.
Elevation estimated from Cuttriss Consultants Topographic Survey.
Groundwater was not encountered.



TP04 Pit



TP04 Stockpile

Test Pit & DCP Log No: TP05

Client: **Sussex Trust**
 Job No.: **T0399**
 Job Name: **160 Mazengarb Road, Paraparaumu**

Logged by: **LH** Co-ordinates **WGS 84** Contractor: **CPT Elite** Elevation: **4.5 m** Page No:
 Entered by: **LH** Plunge (Degrees): **90** Start Date: **2024-07-08** Northing: **-40.89123** **1 of 1**
 Reviewed by: **NC** Trend (Degrees): **0** End Date: **2024-07-08** Easting: **175.00398**

Depth Scale	Lithologic Description	Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP	Comments / Additional Notes
0	Ground Surface						
0	TOPSOIL						
	Fine to coarse SAND Light brown, loose, moist.						
	Sandy SILT With trace gravel and rootlets. Dark brown, stiff, moist. Non-plastic. Sand is fine to medium. Gravels are fine, sub-angular.						
	Fine to medium SAND Dark brown, medium dense, moist.						
1	Silty fine SAND Grey, moist. Silt has low plasticity.						
	Fine to coarse SAND Grey, medium dense, moist.						
	From 1.8m bgl - Strong organic smell.						
2	From 2.5m bgl - Saturated. Organics in base of pit (bark).						
3	Test Hole Terminated at 2.6 m - Refusal on organic material (possible log).						
08 Jul 2024							
3							
4							
5							

Test Location Information:

Equipment: **Excavator**
 Size (m): **0.8 x 2.7m**
 Water Level (m): **2.6 m**
 Water Level (Elv): **1.9 m**

Test Location Notes:

Coordinates obtained from mobile phone GPS.
 Elevation estimated from Cuttriss Consultants Topographic Survey.



TP05 Pit



TP05 Stockpile

Test Pit & DCP Log No: TP06

Client: **Sussex Trust**
 Job No.: **T0399**
 Job Name: **160 Mazengarb Road, Paraparaumu**

Logged by: **LH** Co-ordinates **WGS 84** Contractor: **CPT Elite** Elevation: **5 m** Page No:
 Entered by: **LH** Plunge (Degrees): **90** Start Date: **2024-07-08** Northing: **-40.89094** **1 of 1**
 Reviewed by: **NC** Trend (Degrees): **0** End Date: **2024-07-08** Easting: **175.0044**

Depth Scale	Lithologic Description	Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP	Comments / Additional Notes
0	Ground Surface						
0	Fine SAND With trace tree roots. Grey brown, loose to medium dense, dry.	[Symbol]					
	Fine SAND Light brown, medium dense to dense, dry.	[Symbol]					
1	From 1.1m bgl - Dense.	[Symbol]					
2	Fine to coarse SAND Grey, dense, moist.	[Symbol]					
3	From 3.0m bgl - Wet.	[Symbol]					
	Test Hole Terminated at 3.1 m - Target depth and pit wall collapse.						
4							
5							

Test Location Information:

Equipment: **Excavator**
 Size (m): **0.8 x 2.7m**
 Water Level (m):
 Water Level (Elv):

Test Location Notes:

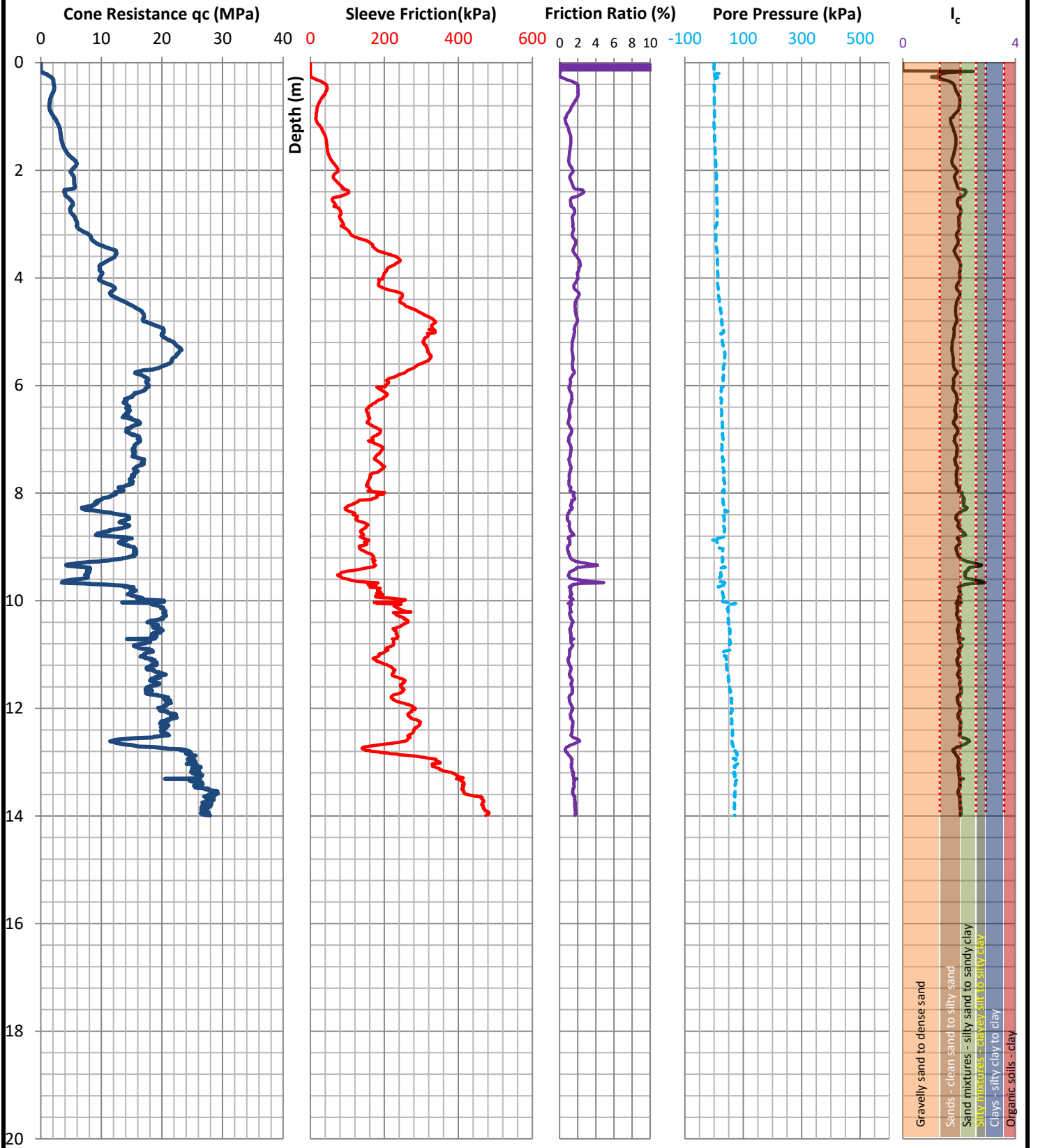
Coordinates obtained from mobile phone GPS.
 Elevation estimated from Cuttriss Consultants Topographic Survey.
 Groundwater was not encountered, however some seepage was observed in the base of the pit.



TP06 Pit



TP06 Stockpile



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

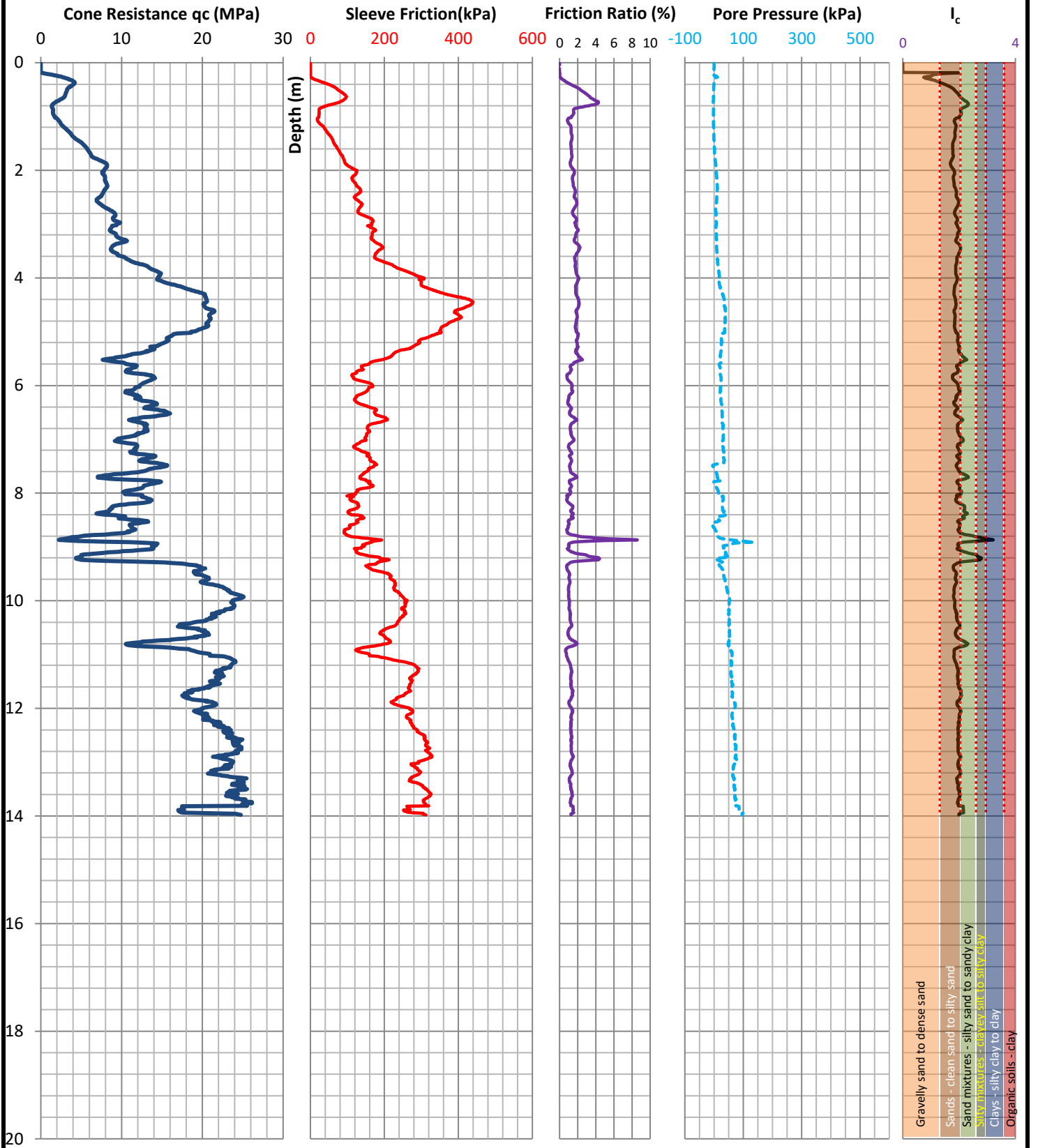
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m.
No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

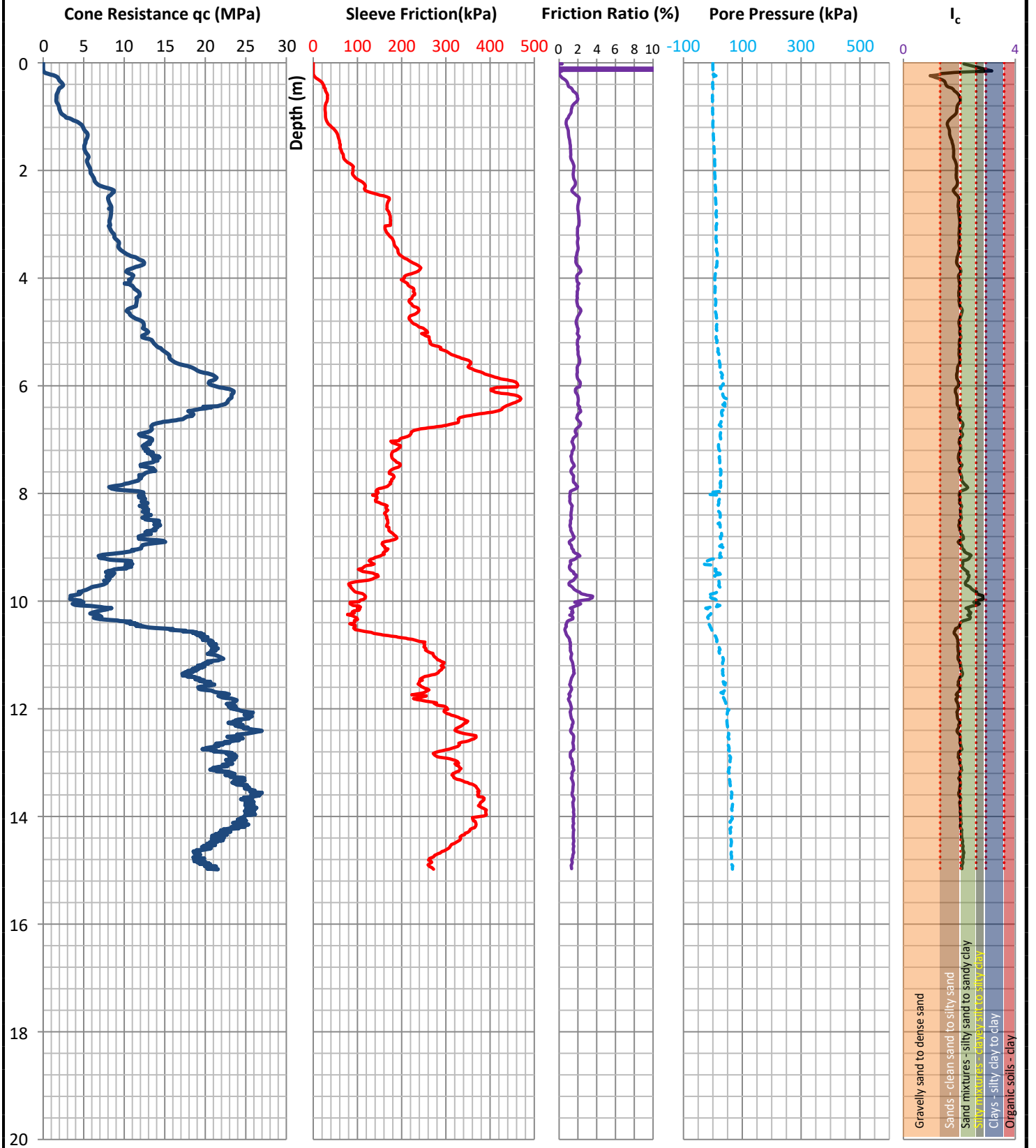
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m.
No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

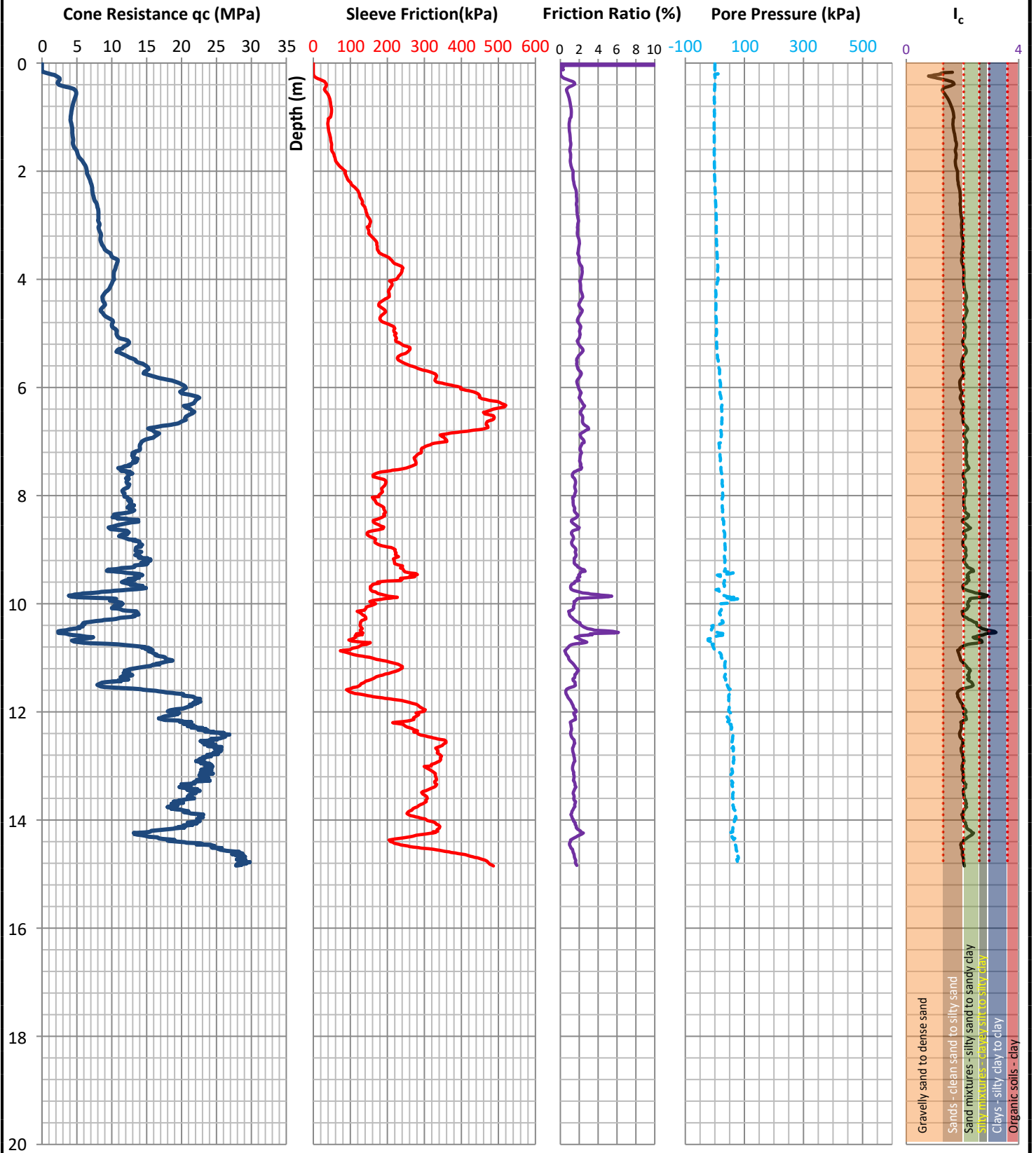
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

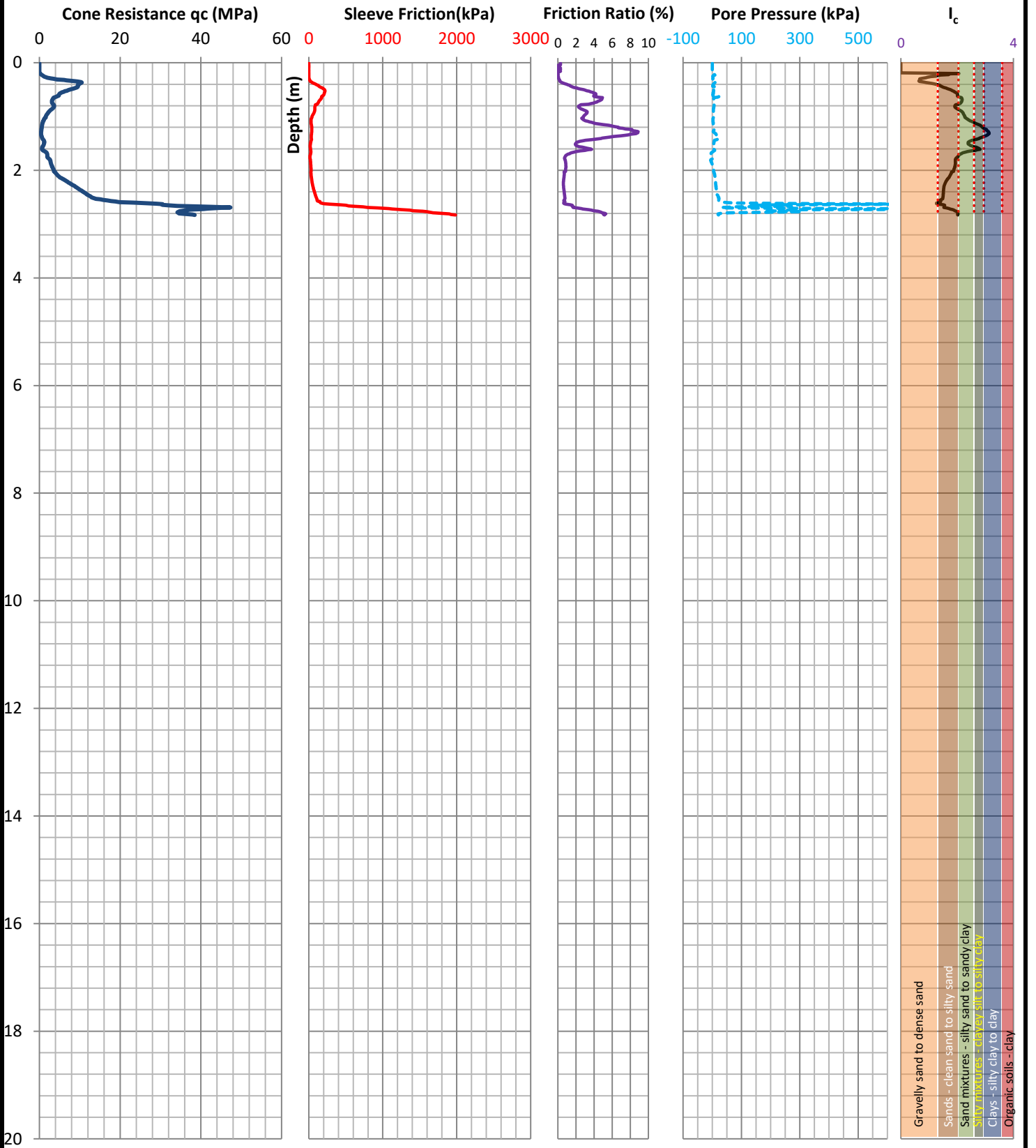
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Operator: ross

Remarks: Groundwater level:

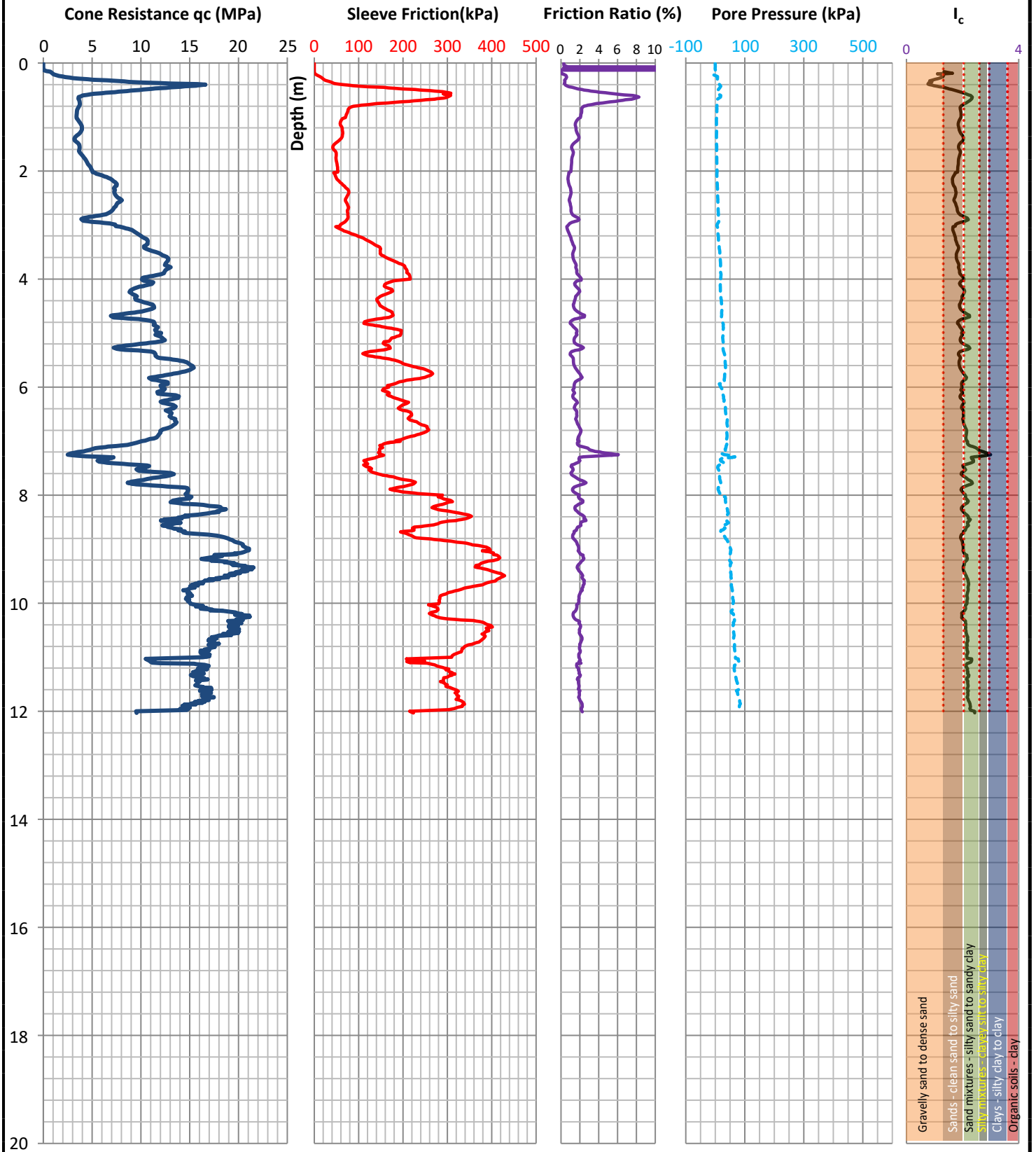
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m.
No GW observed

Tip refusal

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

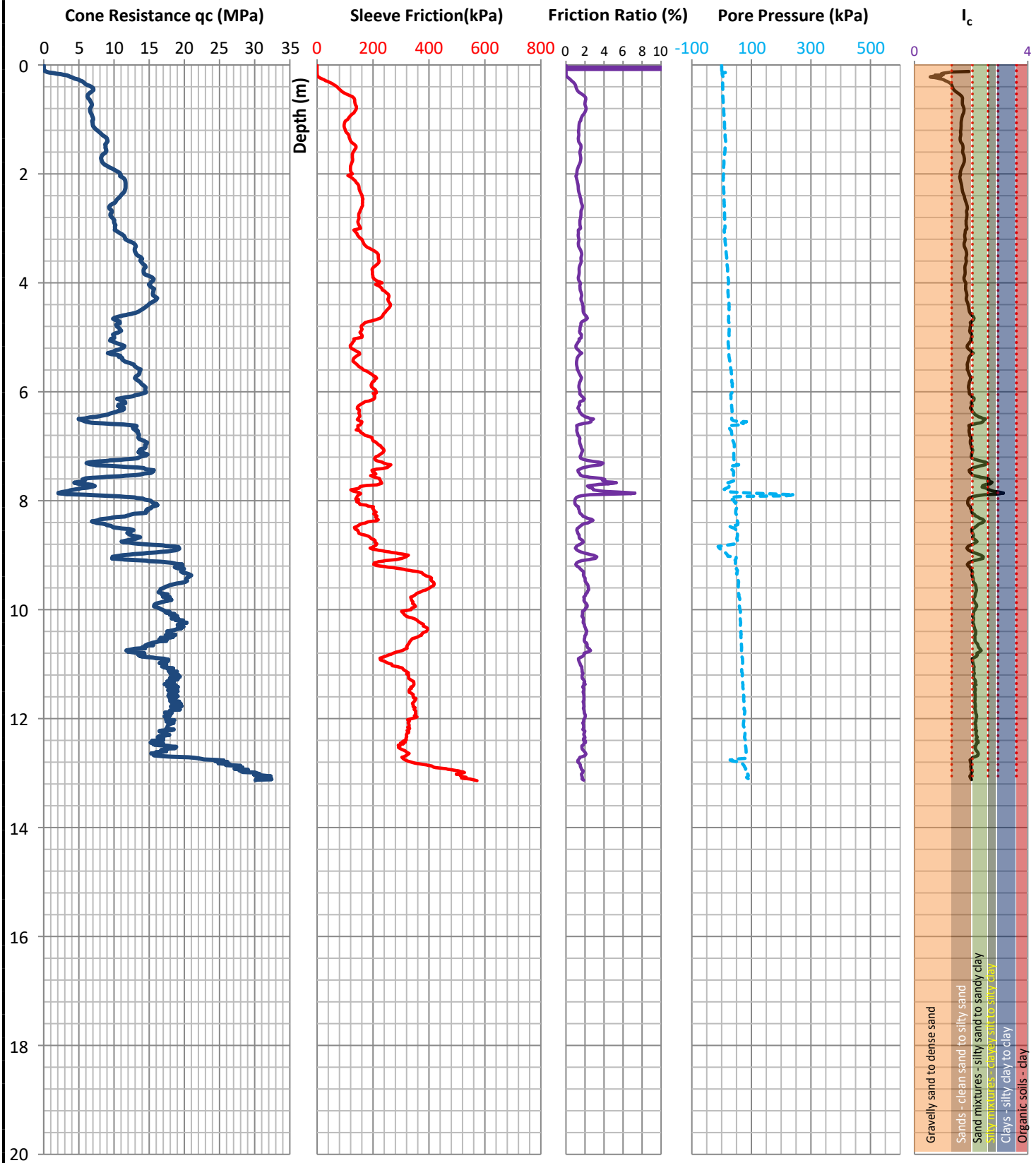
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

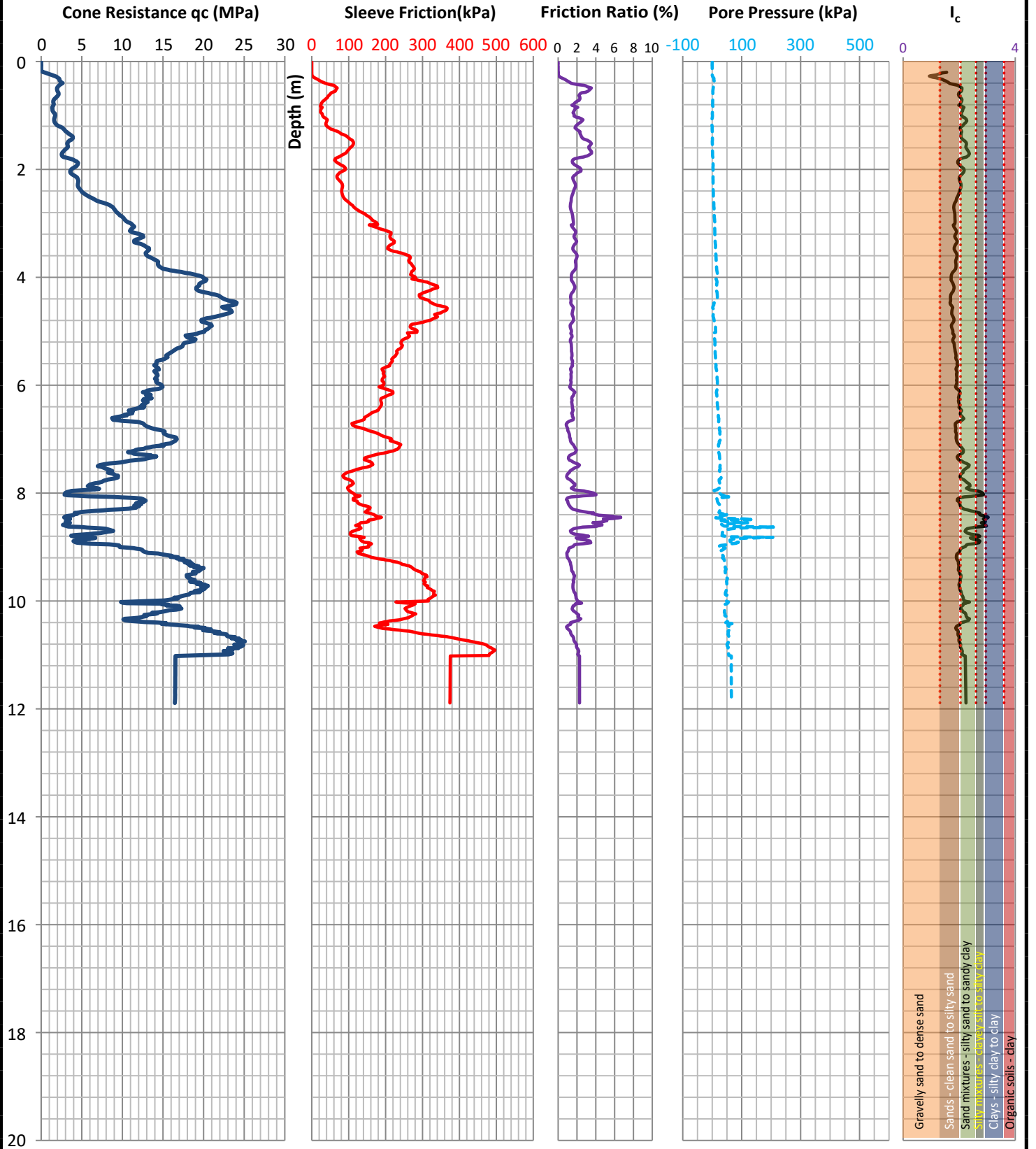
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

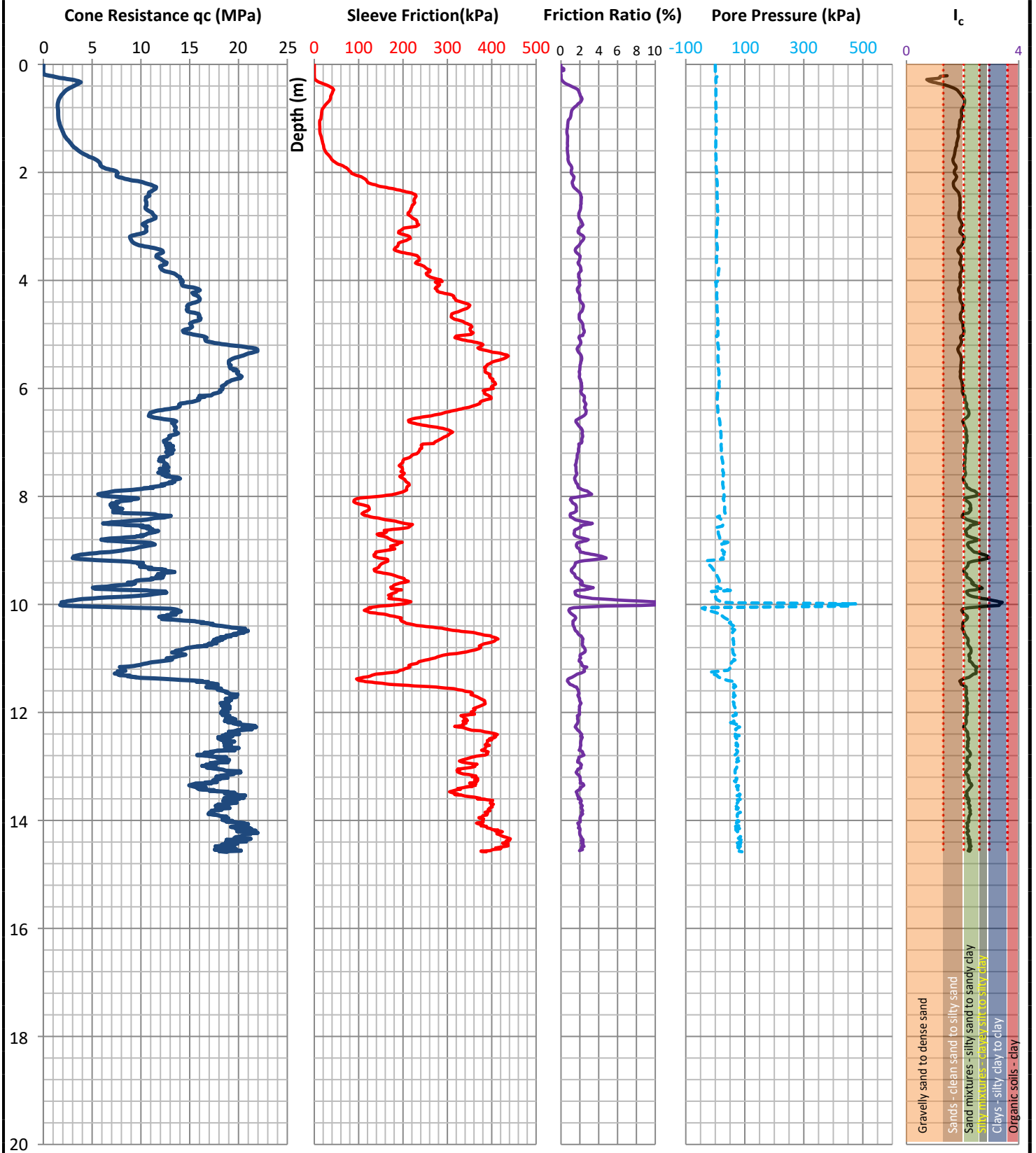
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Operator: ross

Remarks: Groundwater level:

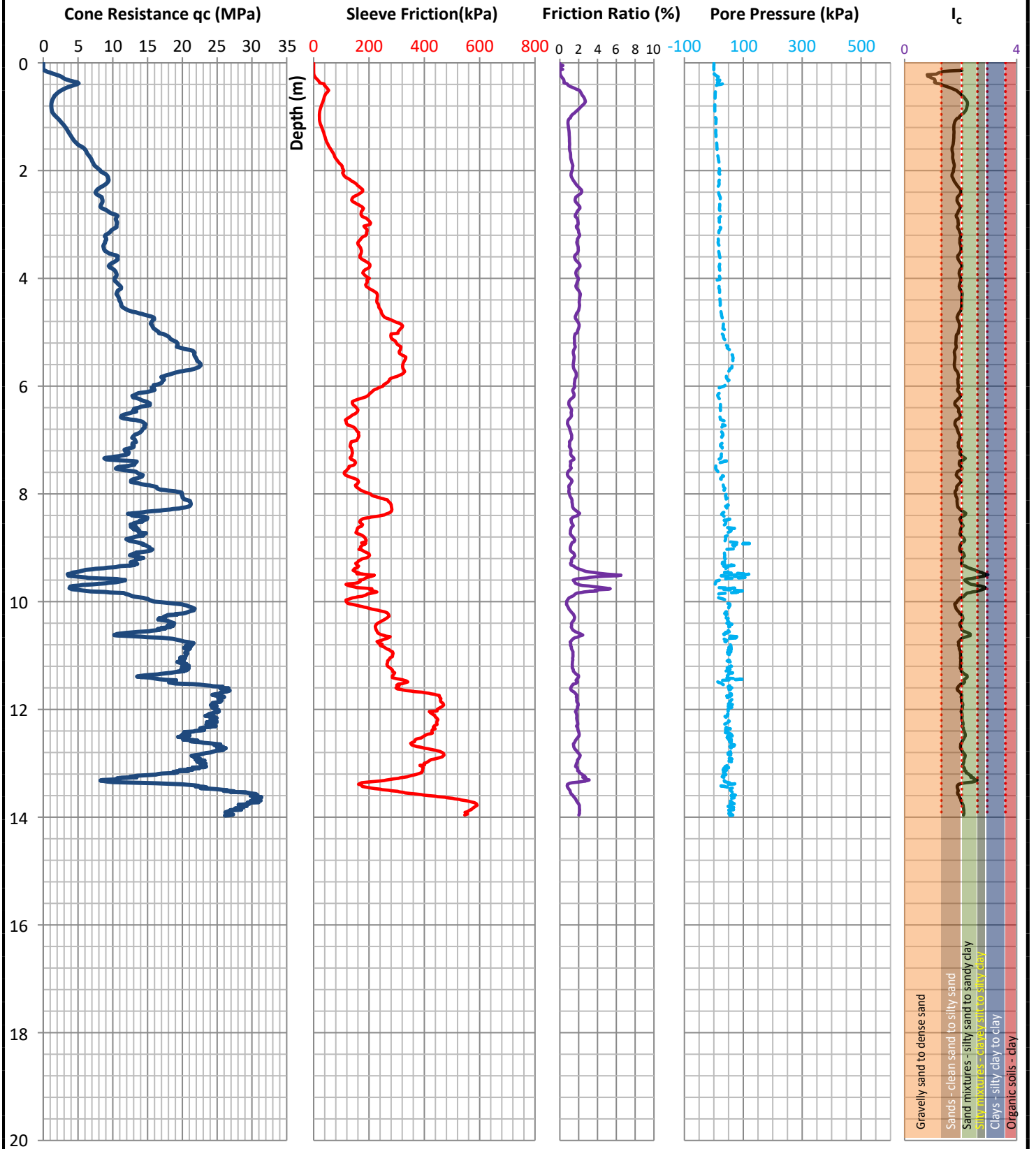
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

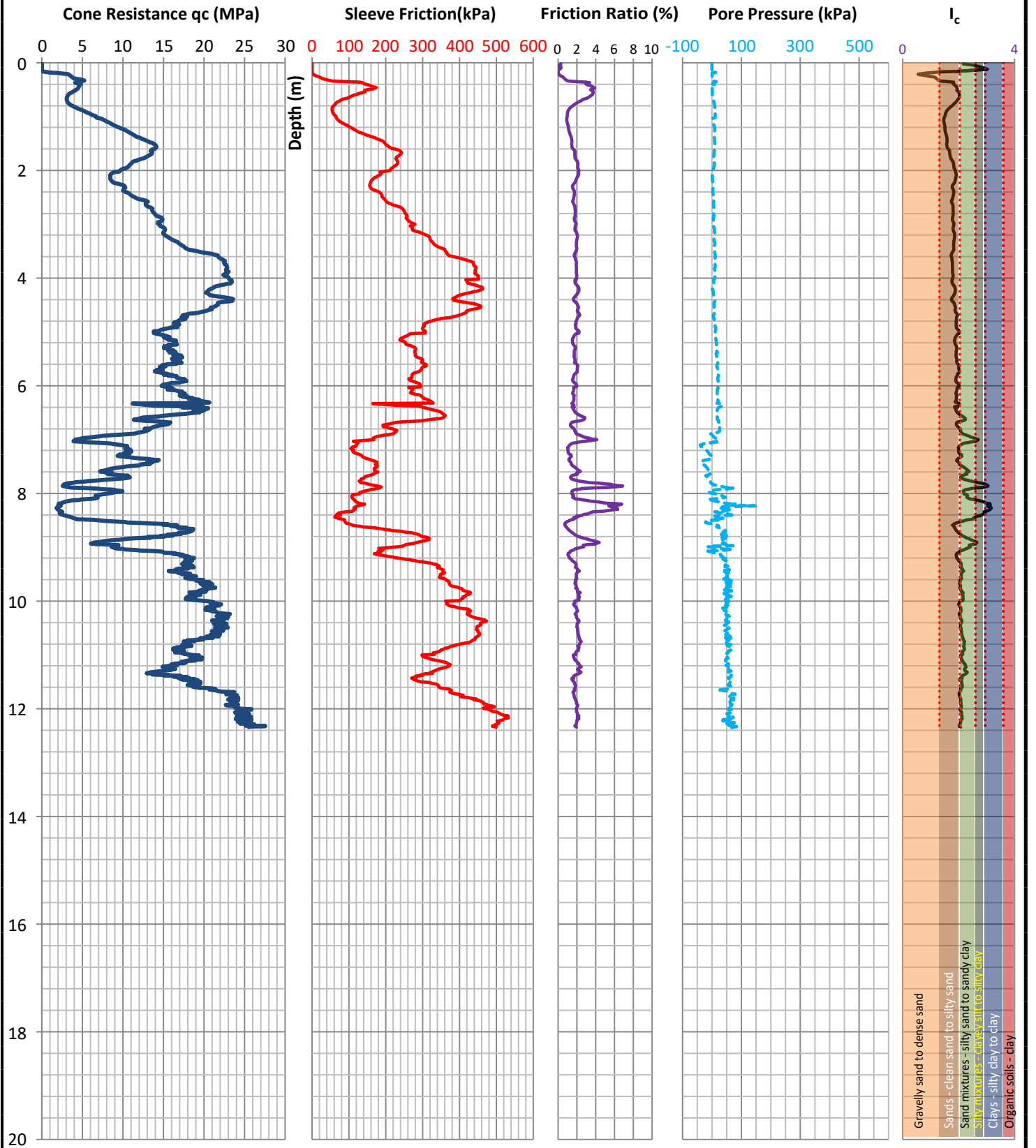
Termination reason:

Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone



Soil Behavior Type Index I_c

Operator: ross

Remarks: Groundwater level:

Termination reason:

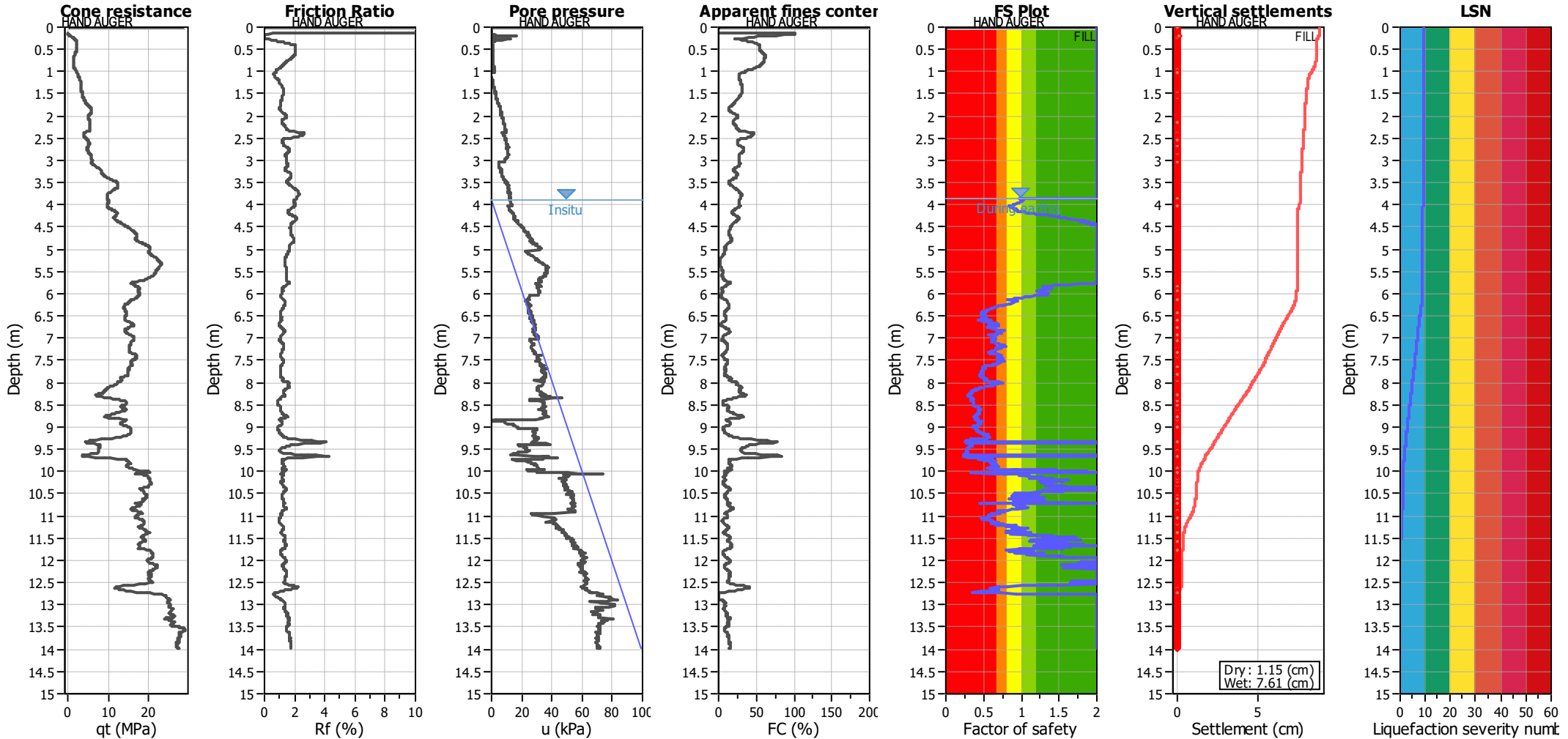
Probe code: 001045

Holes collapsed 3.5m to 4.5m. No GW observed

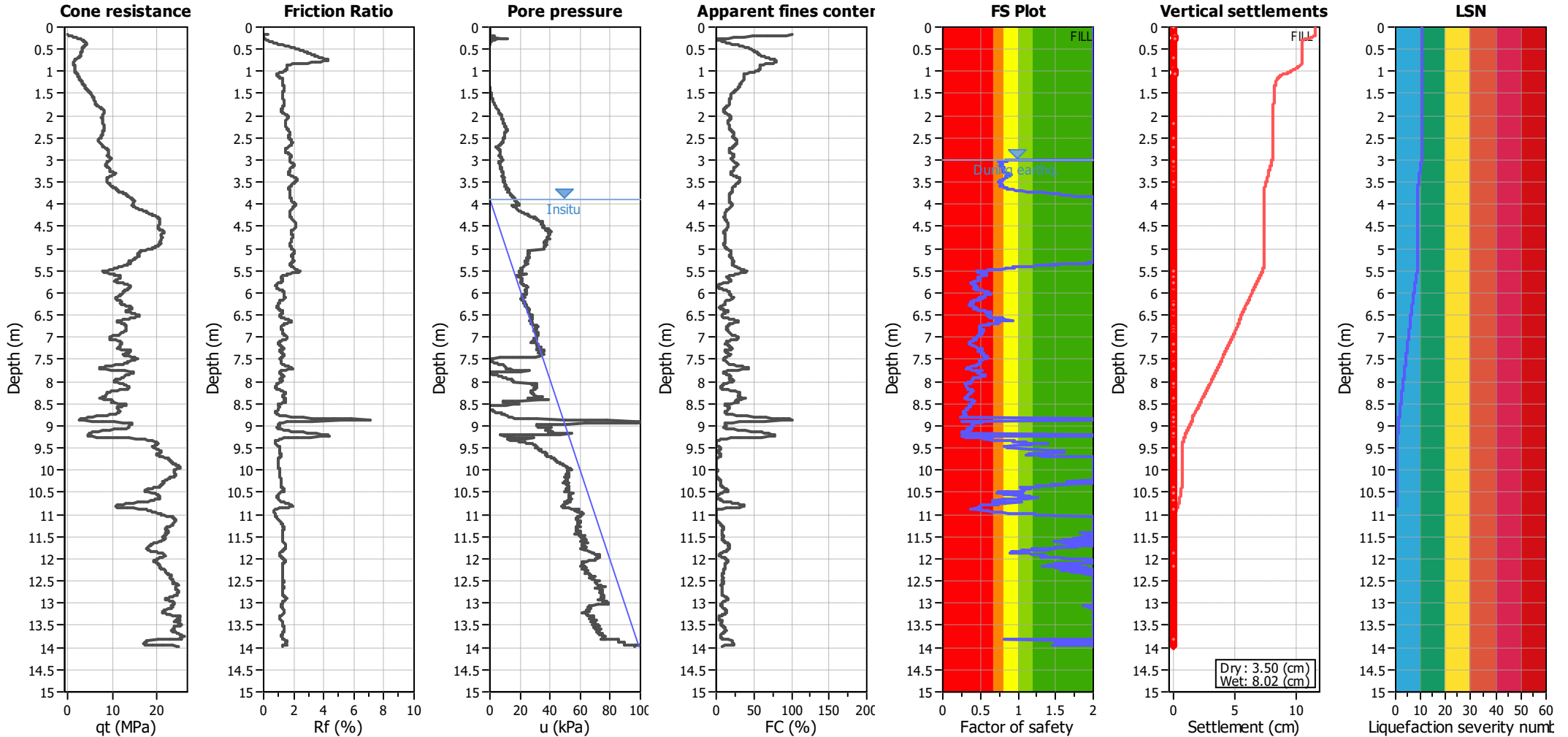
Hydraulic pressure 15t

Cone type: 15 sqr cm piezocone

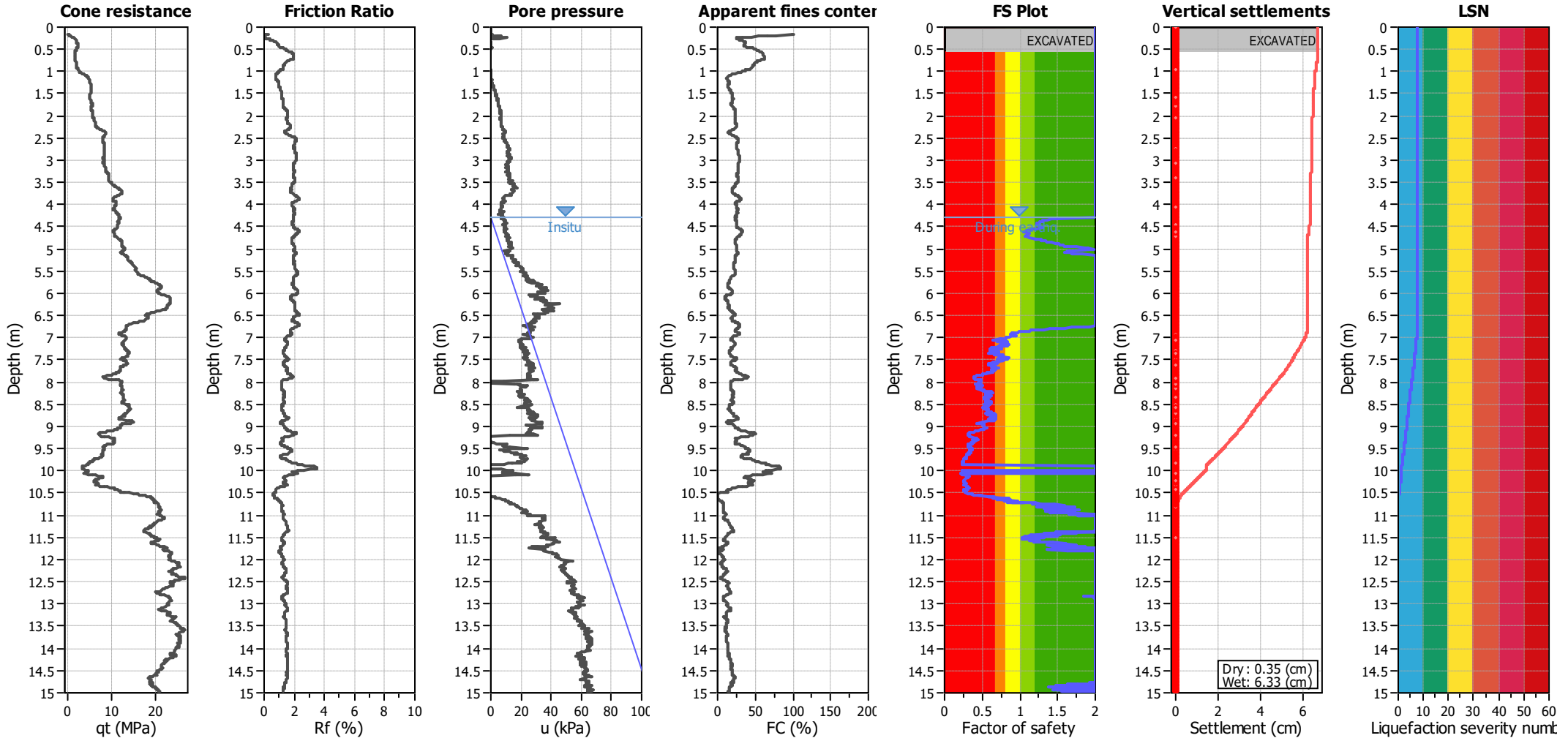
APPENDIX D: LIQUEFACTION ANALYSIS



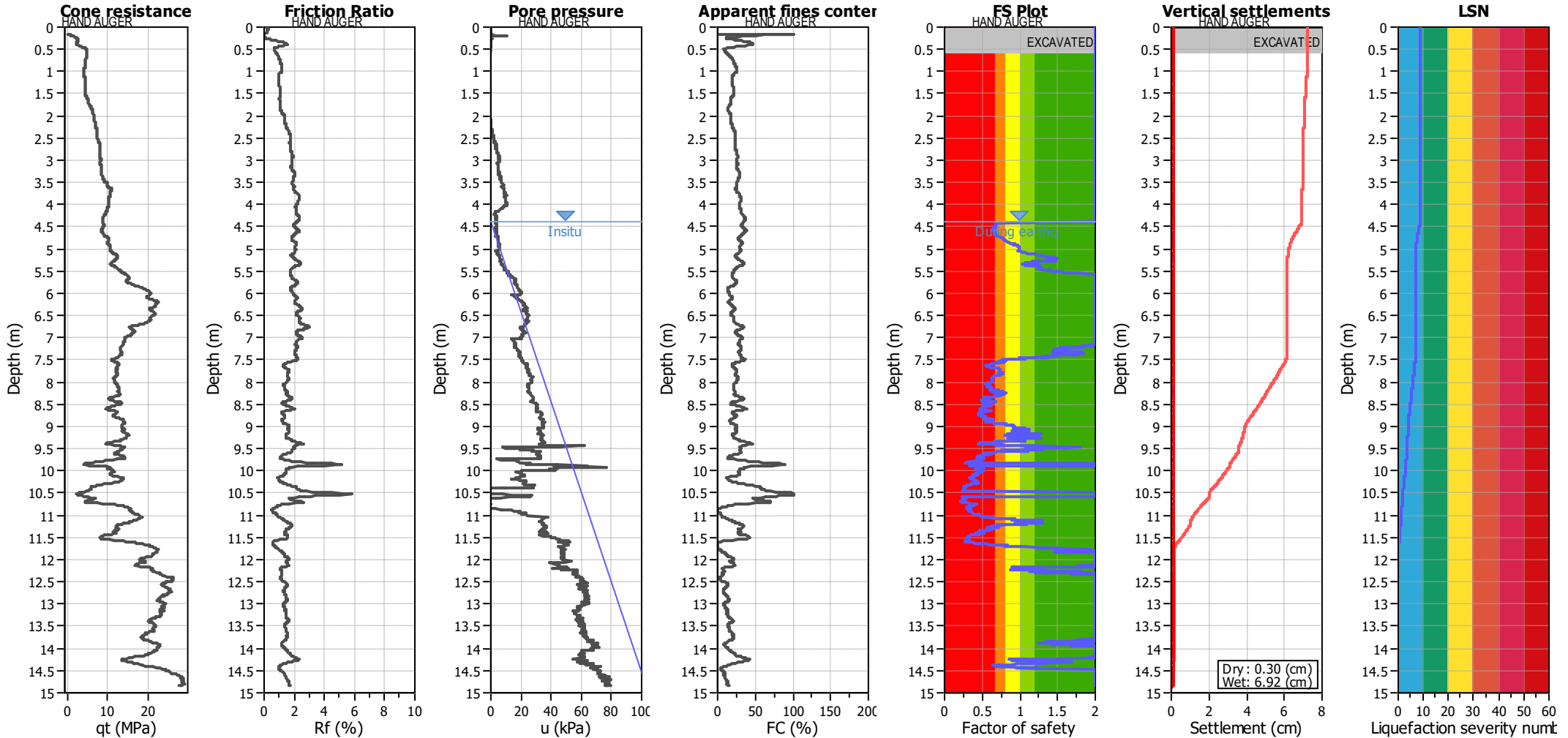
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.90 m	Use fill:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.90 m	Fill height:	0.05 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	No
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	No	N/A
						MSF method: Method based



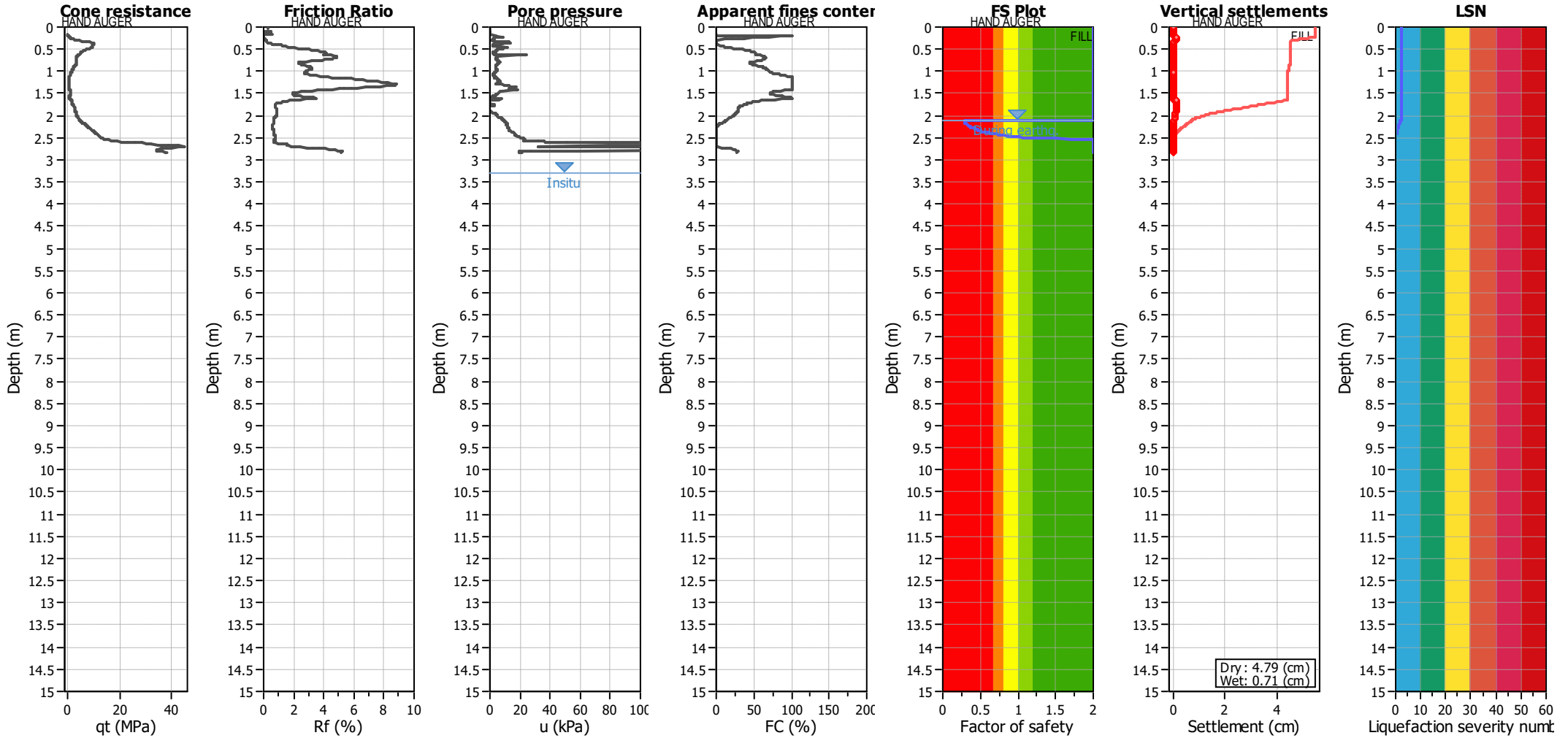
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.90 m	Use fill:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.90 m	Fill height:	0.90 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	No
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	No	N/A
						MSF method: Method based



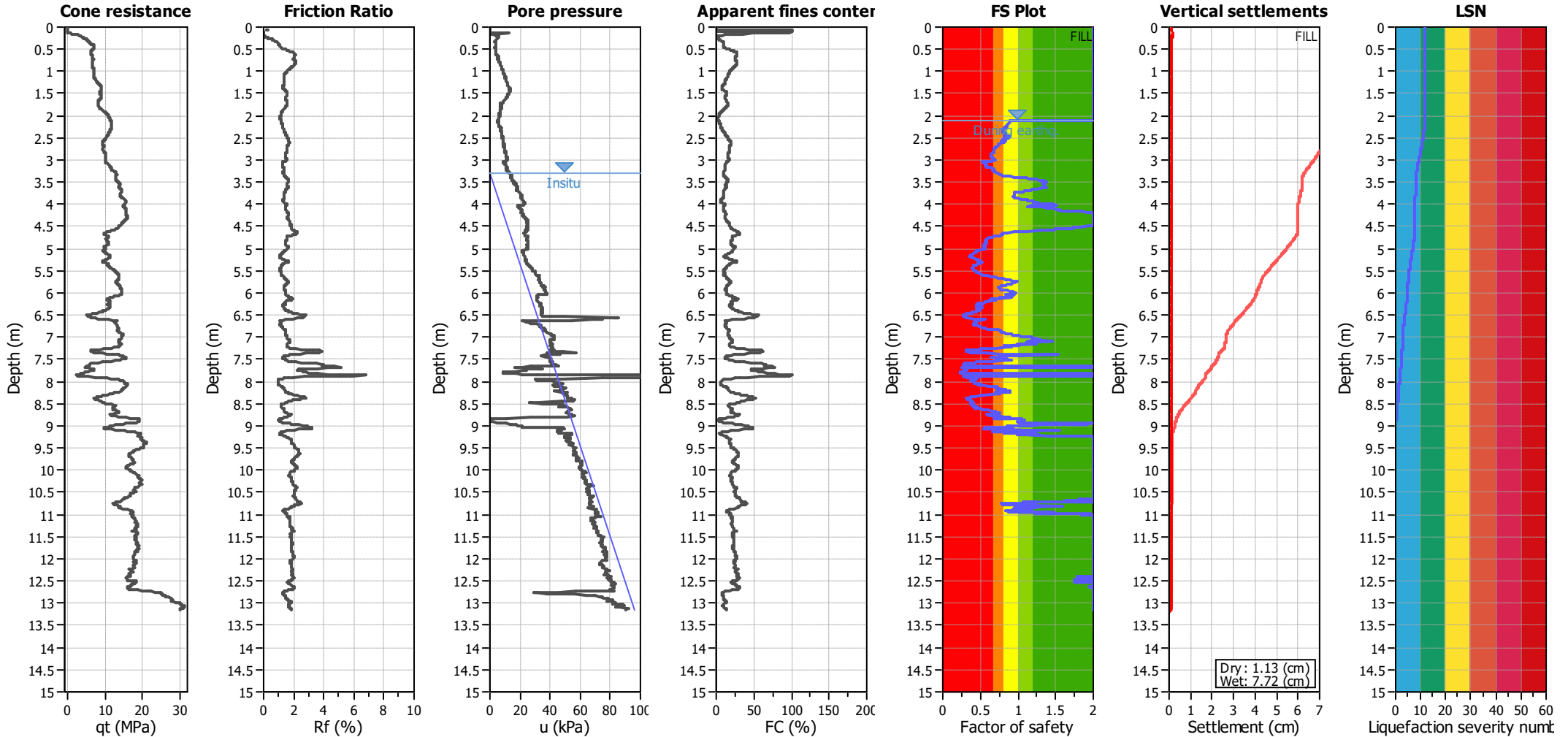
Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.30 m	Excavation:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.30 m	Excavation depth:	0.55 m	applied:	
Points to test:	Based on Ic value	Average results interval:	3	Footing load:	10.00 kPa	Limit depth applied:	No
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based



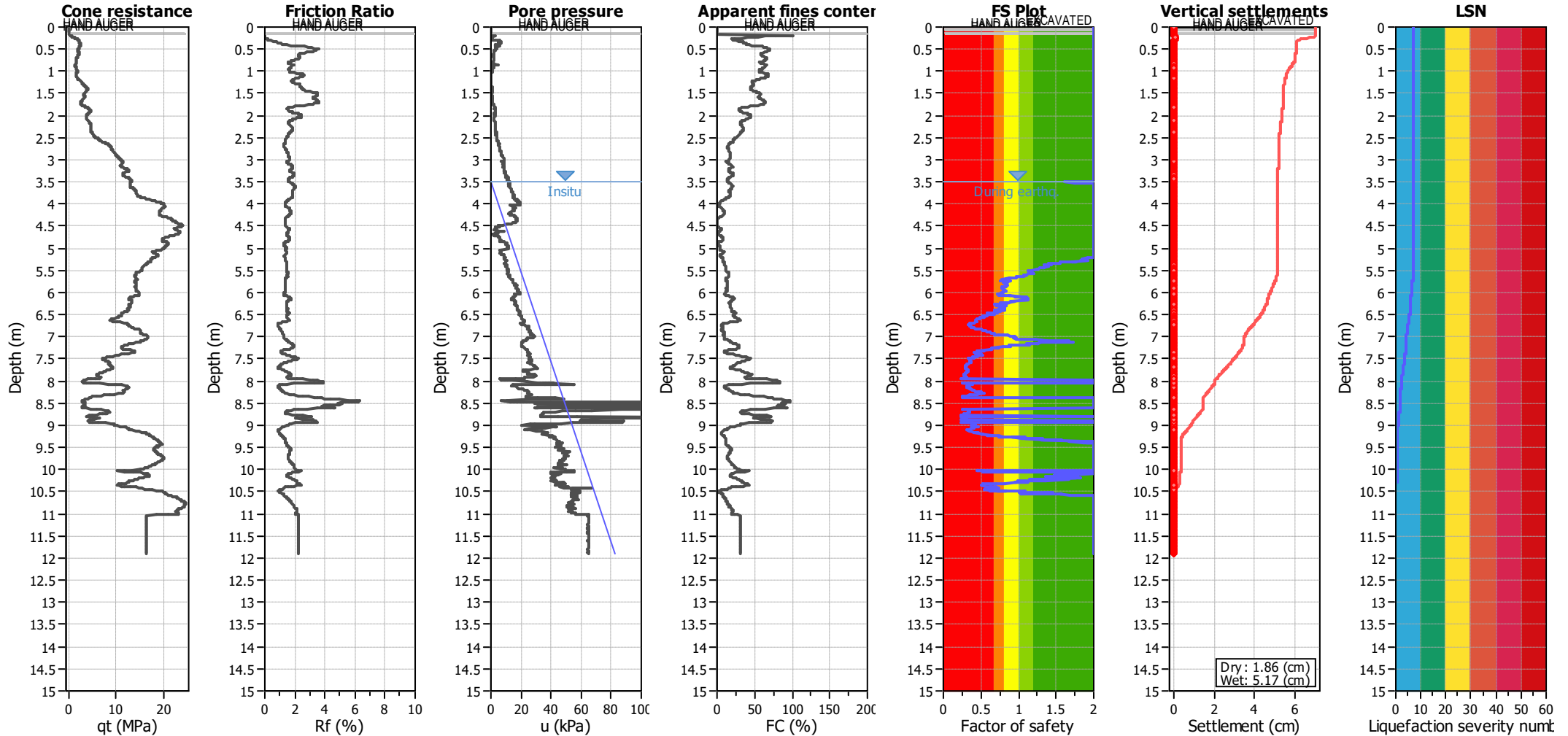
Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.40 m	Excavation:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.40 m	Excavation depth:	0.60 m	applied:	
Points to test:	Based on Ic value	Average results interval:	3	Footing load:	10.00 kPa	Limit depth applied:	No
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based



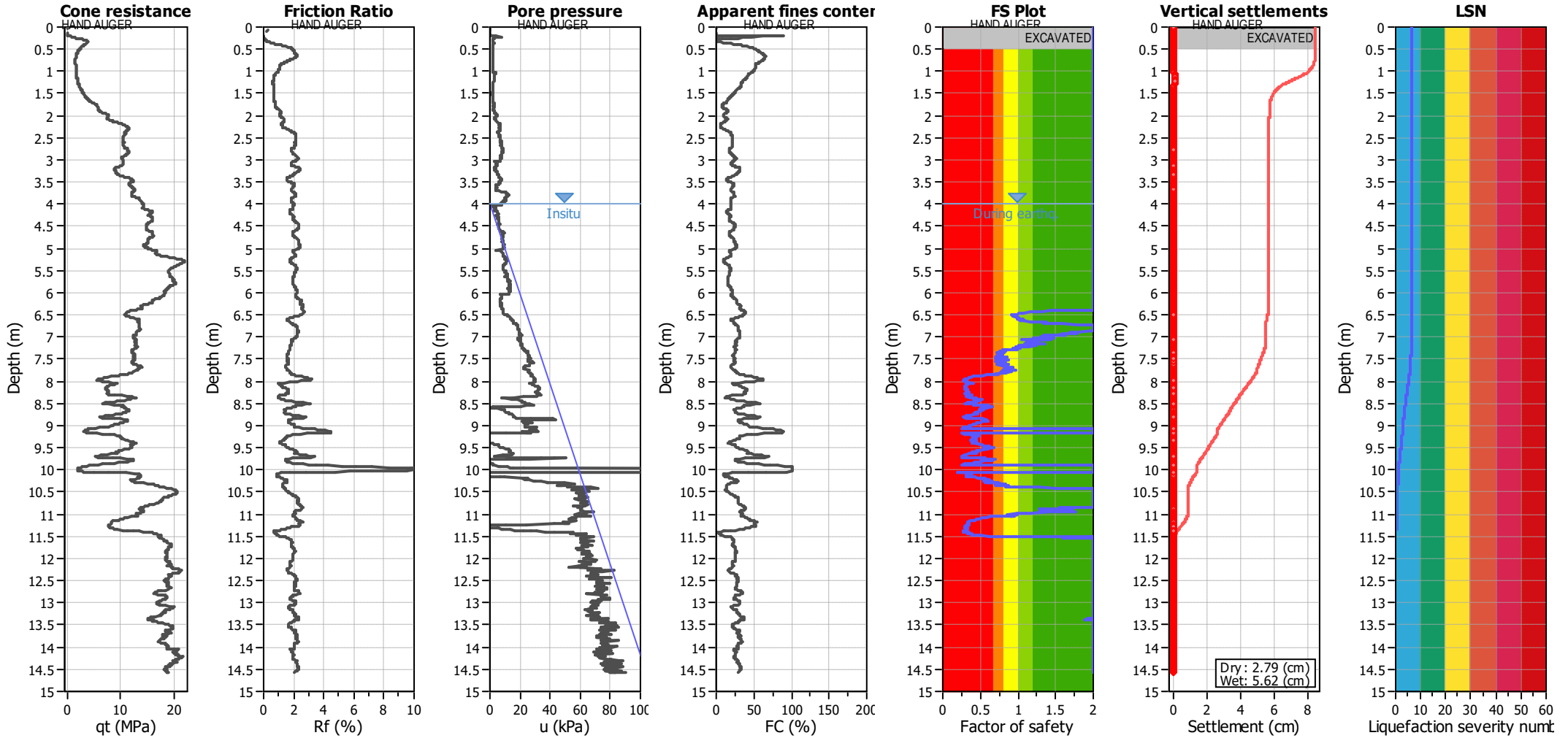
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.30 m	Fill height:	1.20 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	No
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_{σ} applied:	No	N/A
						MSF method: Method based



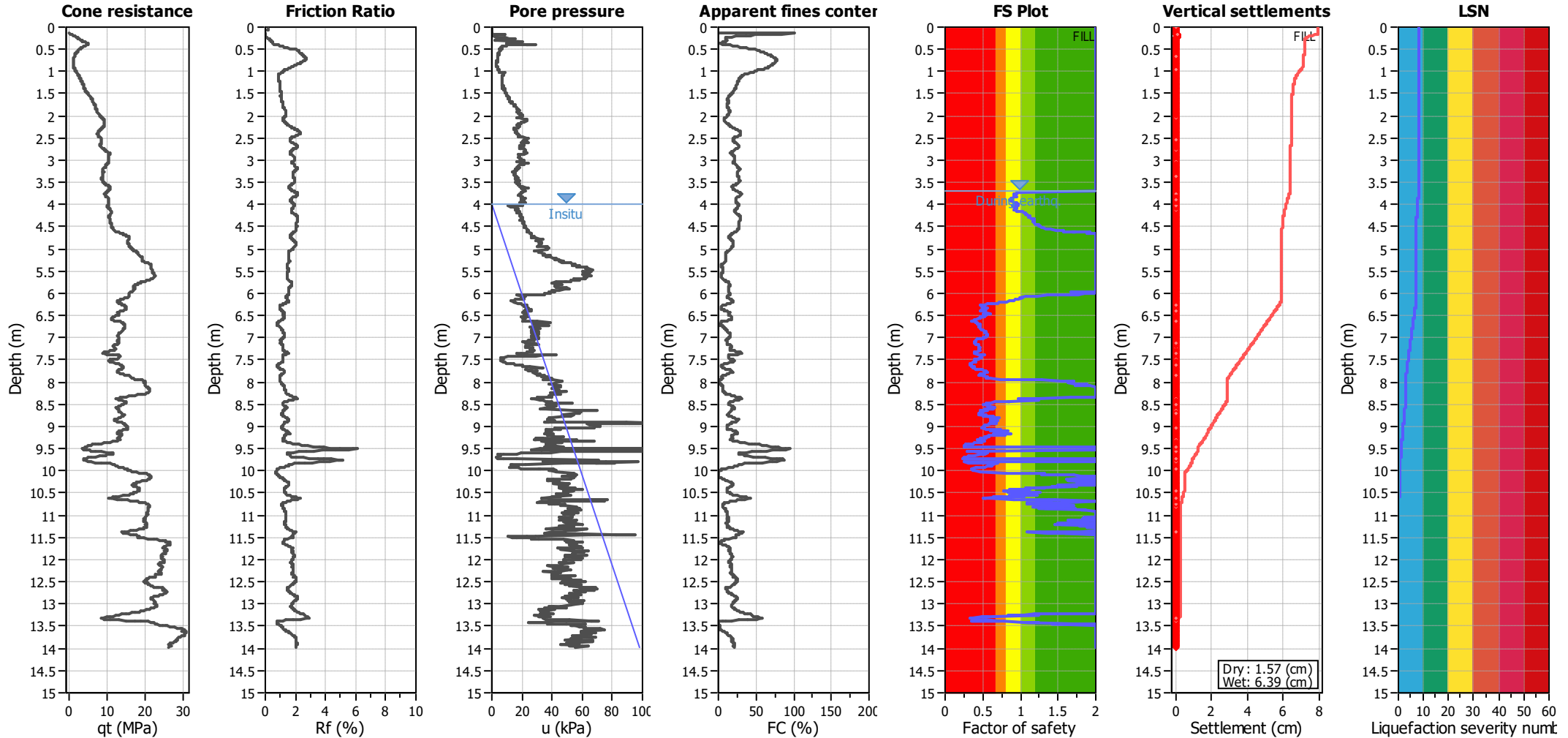
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.30 m	Fill height:	1.20 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	No
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_{σ} applied:	No	N/A
						MSF method: Method based



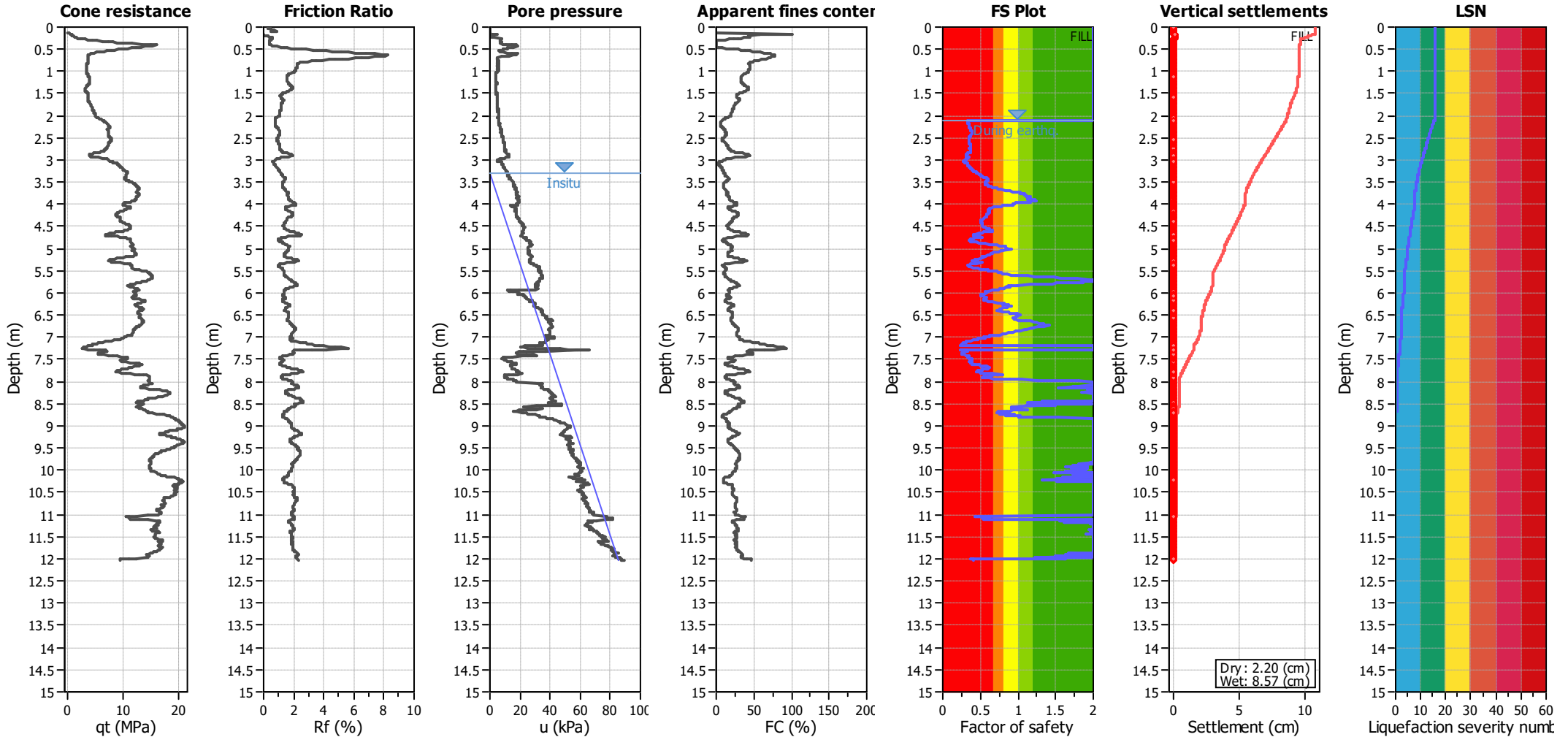
Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.50 m	Excavation:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 m	Excavation depth:	0.10 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Footing load:	10.00 kPa	Limit depth applied:
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:
						Method based



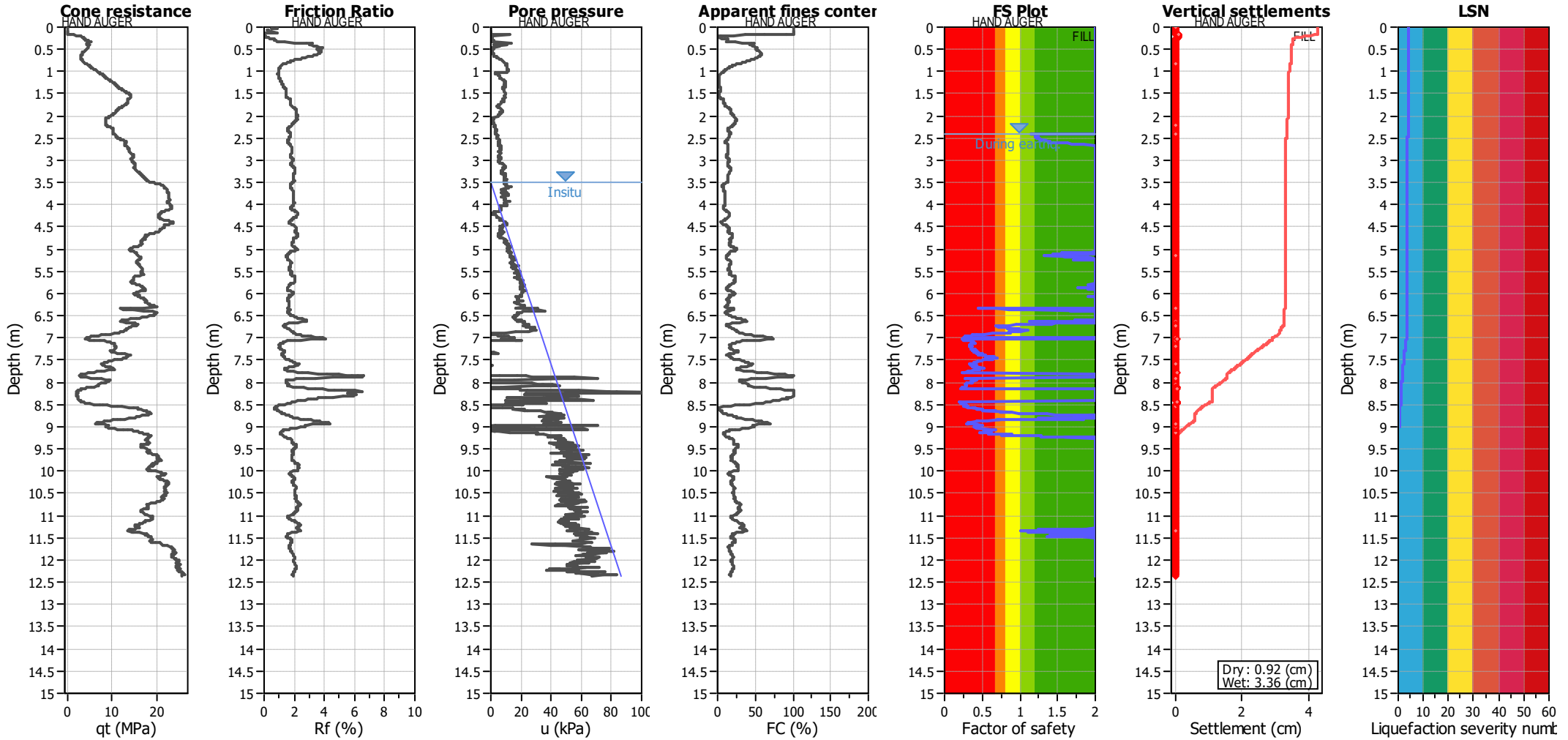
Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Excavation:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.00 m	Excavation depth:	0.50 m	applied:	
Points to test:	Based on Ic value	Average results interval:	3	Footing load:	10.00 kPa	Limit depth applied:	No
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based



Analysis method:	B&I (2014)	G.W.T. (in-situ):	4.00 m	Use fill:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	4.00 m	Fill height:	0.30 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:
Earthquake magnitude M _w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	No
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K _σ applied:	No	N/A
						MSF method: Method based



Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.30 m	Use fill:	Yes	Clay like behavior	
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.30 m	Fill height:	1.20 m	applied:	
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:	No
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	Limit depth:	N/A
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_{σ} applied:	No	MSF method:	Method based



Analysis method:	B&I (2014)	G.W.T. (in-situ):	3.50 m	Use fill:	Yes	Clay like behavior
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	3.50 m	Fill height:	1.10 m	applied:
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	19.00 kN/m ³	Limit depth applied:
Earthquake magnitude M_w :	7.70	Ic cut-off value:	2.60	Trans. detect. applied:	No	No
Peak ground acceleration:	0.68	Unit weight calculation:	Based on SBT	K_{σ} applied:	No	N/A
						MSF method: Method based