## **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 & Geohazard 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, Paraparaumu 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 Rev B', dated July 2024.
- 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.
- 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.

Further geotechnical investigations are not required.

## **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.

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 below cleared ground level or on imported fill certified to NZS4431 as per the plans.		
Ultimate Bearing Capacity	200kPa	The natural ground is suitable for founding, following proof roll, inspection and appr geotechnical engineer. The fill identified in TPO2 will require inspection and proof ro earthworks stage to confirm suitability. So localised re-working of material may be		
<b>Reduction Factor</b>	0.5	As per MBIE/NZGS Module 4 (2021) and B1/VM4 for both shallow and deep foundatio		
Settlement	<25mm	Adopting either of the foundation options above will result in static and differential < 25mm over 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 sit imported fill (either quarry fill such as GAP65, or Sand fill) is considered appropriate underlying sand nature of the site earthworks can be carried out in winter months ty use of cohesionless (granular) fill material. Fill works should be inline with NZS4404 NZS4431:2022.		
Cut and Fill batters	Max 1V:3H up to 4m	A maximum slope angle of 1V:3H is recommended for all cut and fill batters within th to a maximum height of 4m. It is recommended any slope greater than 1V:3H are ret specific slope stability assessment is completed. Temporary cut or fill slopes can b within the sand material.		
Private Right of Way (ROW) Design	4 to 6%	The right of way for the development is proposed to be at approximately RL5.70m to centreline. The pavement will be located over areas of cut (up to 1.2m) and fill (up to subgrade levels (on site won sand fill, imported GAP65 fill or in situ sands), a design be used for pavement design.		
Proposed Utilities	Considerations required during maintenance, future upgrade or replacement, or removal of the utility services	<ul> <li>Utilities in trenches are proposed, in some locations, to act within a 45° influence zo projected invert of the utility. It is understood the utilities will be installed prior to the foundations for the proposed dwellings. During the detailed design phase our desig guided by WorkSafe Excavation Safety Good Practice Guidelines (2016).</li> <li>During the maintenance, future upgrade or replacement, or removal of the utility set of the dwelling foundations and NZS4431 fill can be achieved by:</li> <li>Installation of short driven timber piles along the foundation edges where they a influence zone; alternatively,</li> <li>During temporary works for the utilities, trench shields can be implemented to radverse impact of foundation performance adjacent to utility trenches.</li> <li>If short driven timber piles are utilised during detailed design, it is important Torless the design process to assess suitability of the piles and differential settlement across platform which may result.</li> </ul>		
Construction Monitoring	Yes, refer to earthworks specification	The earthworks specification will provide detailed hold/inspection points for the de site. This will include but not be limited to site clearance, subgrade inspections, fill		

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## **Applicability Statement:**

This report has been prepared on behalf of, and for the exclusive use of, the Client, and is subject to, and issued in accordance with, the provisions of the contract between Torlesse and the Client. Torlesse accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party. In preparing this report, Torlesse has relied upon information provided by or on behalf of our Client. Torlesse accept no responsibility for the reliability or accuracy of this information. This report is not to be reproduced either wholly or in part without Torlesse's prior written approval. Interpretation of the ground conditions presented have been based on geotechnical data from point locations, between which ground conditions may differ. The actual underlying ground conditions may differ from those presented in this report.



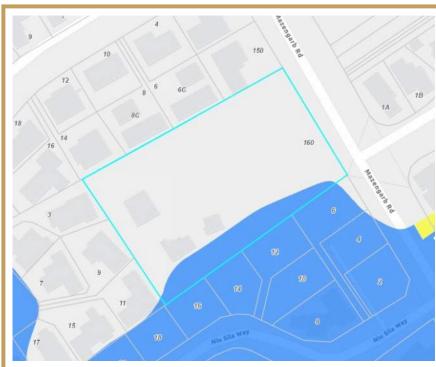


Figure 1: KCDC flood hazard map—Ponding



Figure 2: NZGD test locations

## 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 p higher elevation than the south area (up to 2m difference in places), with generally u topography.
Site structures (buildings, walls, etc)	There is currently an existing dwelling and garage located on the property. In terms 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
	NZ Geological Webmap (1:50,000)	Holocene windblown deposits	Inactive dunes.
GNS	NZ Active Fault Database	Ohariu Fault ~ 3.5km southeast	Dextral, RI II >2,000 to <= 3,500 ye moderate.
	Database	Gibbs Fault—4.7km southeast	Dextral, RI III >3,500 to <= 5,000 ye
		Combined Hazard	Moderate to high
GWRC	Mapped Hazard	Ground Shaking	Moderate
OWRC	Маррец пазаги	Liquefaction	High
		Slope	Low
	Flood Hazards	Ponding on site	Stream corridor shown 120m sout
KCDC		GWRC Flood Hazard Webmap notes a 1%AEP.	property.
	Historical Aerial	1940s—One building existing on site	
	Imagery	1991—Two buildings added to property.	
		1942—Single building present on the property.	
	Historical Aerial	1964—Small structure added to north end of site.	No major changes to site between
Retrolens	Images	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 wit increasing soil strength.

## Kaikoura PGAs

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

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

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## **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	Mw	PGA (g)	
SLS1	2	25 years	6.5	0.13	
ULS	2	500 years	7.7	0.68	

## **Ground Model and Material Properties**

Ground Hodel and Material Properties						
Unit	Description	Strength	Depth to top of layer (mbegl)	γ (kN/m³)	ቀ' (°)	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 observa- tions and CPT data.					
Notes	$\gamma$ bulk unit weight; $\phi'$ 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 in strength with depth.
Shallow groundwater	Low	Water was encountered at 2.6m bgl in TP05 and some seepage was observed at 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 r property. However it is of limited extent and considered to be a low risk. The ne over 300m away.
Fault rupture	Low	The nearest fault is 3.5km away. The nearest major fault as per NZS1170.5 is the which is >20km away.



Figure 3: Photo near CPT02, looking South





Figure 4: Photo near TP05, looking North

Figure 5: Photo near TP04, looking Southeast

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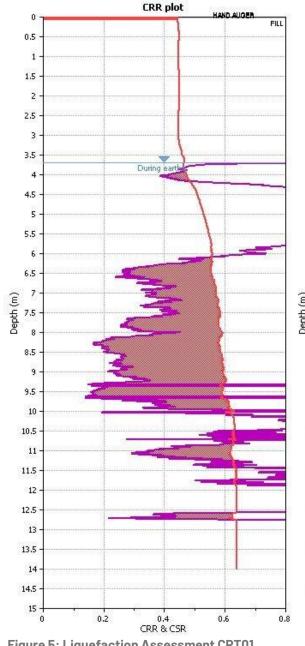
## **Ground Motion Parameters**

The ground motion parameters are detailed on sheet 3 above and have been utilised for the liquefaction assessment.

## **Liquefaction Assessment**

An assessment utilising the software CLiq (v.3.4.1.4) has been undertaken. A summary of the assessment is provided below. Descriptions of performance levels are taken from MBIE/ NZGS (Module 3, 2021, p. 24) guidance and presented in the adjacent table.

- The assessment is based on proposed site levels.
- A fines correction value (CFC) is set as 0%.
- A groundwater table at 2.5m RL has been used across the site and the CPTs adjusted based on the proposed fill levels. The values utilsied for depth to groundwater from the top of the fill can be seen in the summary table below.
- Note the ground levels at location CPT05 and CPT06 are proposed to be raised 1.2m during development. This will increase the crust thickness to approximately 3.3m.
- Under SLS seismic loading, no liquefaction is predicted. Note the Kaikoura 2016 earthquake event (0.09g/M<sub>w</sub> 7.8) generated similar levels of shaking as SLS loading and we are not aware of any reports of liquefaction in this area.
- Under ULS earthquake conditions, the majority of the liquefaction is occurring between 6 and 11m below proposed site levels. With more variable levels of liquefaction occurring between 4 and 6m below proposed site levels.
- Overall the liquefaction hazard is considered to be moderate due to the proposed crust thickness and the typically increasing density of the ground profile with depth.
- A summary of the results are presented below. A full copy of the assessment is included in Appendix D.



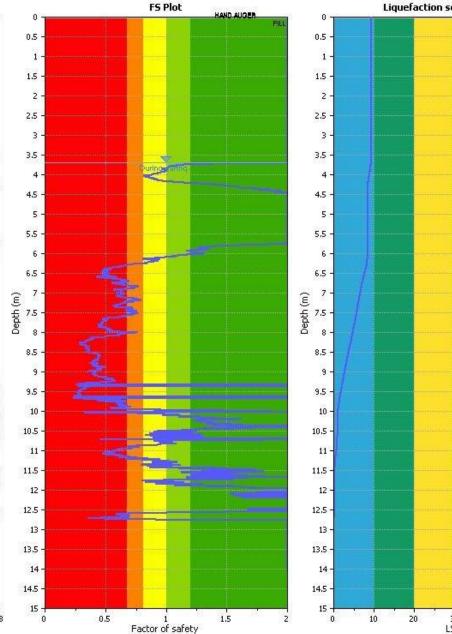


Figure 5: Liquefaction Assessment CPT01

	Current	Proposed Fill	Depth to	ULS loading condition				
Test ID	mRL	Thickness (m)	Groundwater (mbgl)	Free Field Settlement (mm)	LPI (ISH)	LSN	Performance level	
CPT01	6.2	0.05	3.90	90	3	9	Moderate/ High	
CPT02	5.5	0.90	3.90	120	7	10	High	
CPT03	6.8	-0.55	3.75	70	3	8	Moderate	
CPT04	6.9	-0.60	3.80	80	2	9	Moderate	
CPT05 part 2	4.6	1.20	3.30	110	11	15	High	
CPT06	4.7	1.20	3.30	90	6	12	Moderate	
CPT07	6.0	-0.10	3.40	80	4	7	Moderate	
CPT08	6.5	-0.50	3.5	85	3	7	High	
CPT09	6.2	0.30	4.0	80	5	8	Moderate	
CPT10	4.9	1.1	3.5	45	2	4	Mild	

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

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# **APPENDIX A: SKETCHES**



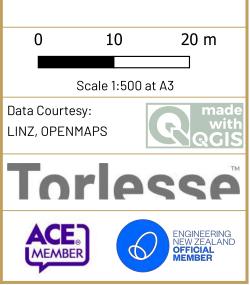
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Project Name: Geotechnical Assessment Report

Site Location: 160 Mazengarb Road, Paraparaumu

Sketch Title: Test Location Plan

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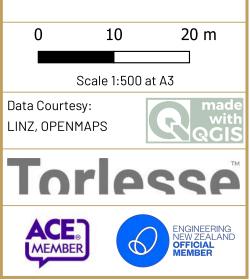


Project Name: Geotechnical Assessment Report

Site Location: 160 Mazengarb Road, Paraparaumu

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# Torlesse

# APPENDIX B: TOPOGRAPHICAL SURVEY AND PROPOSED SITE LEVELS



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

## **RC02** REV.

### MASTERPLAN

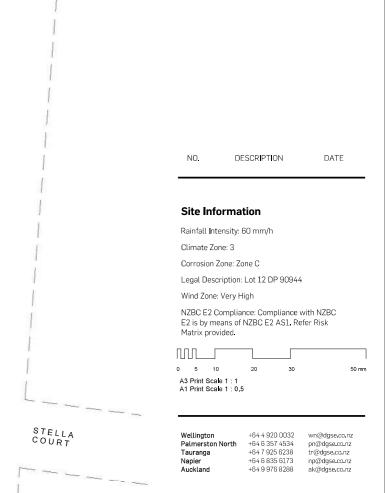
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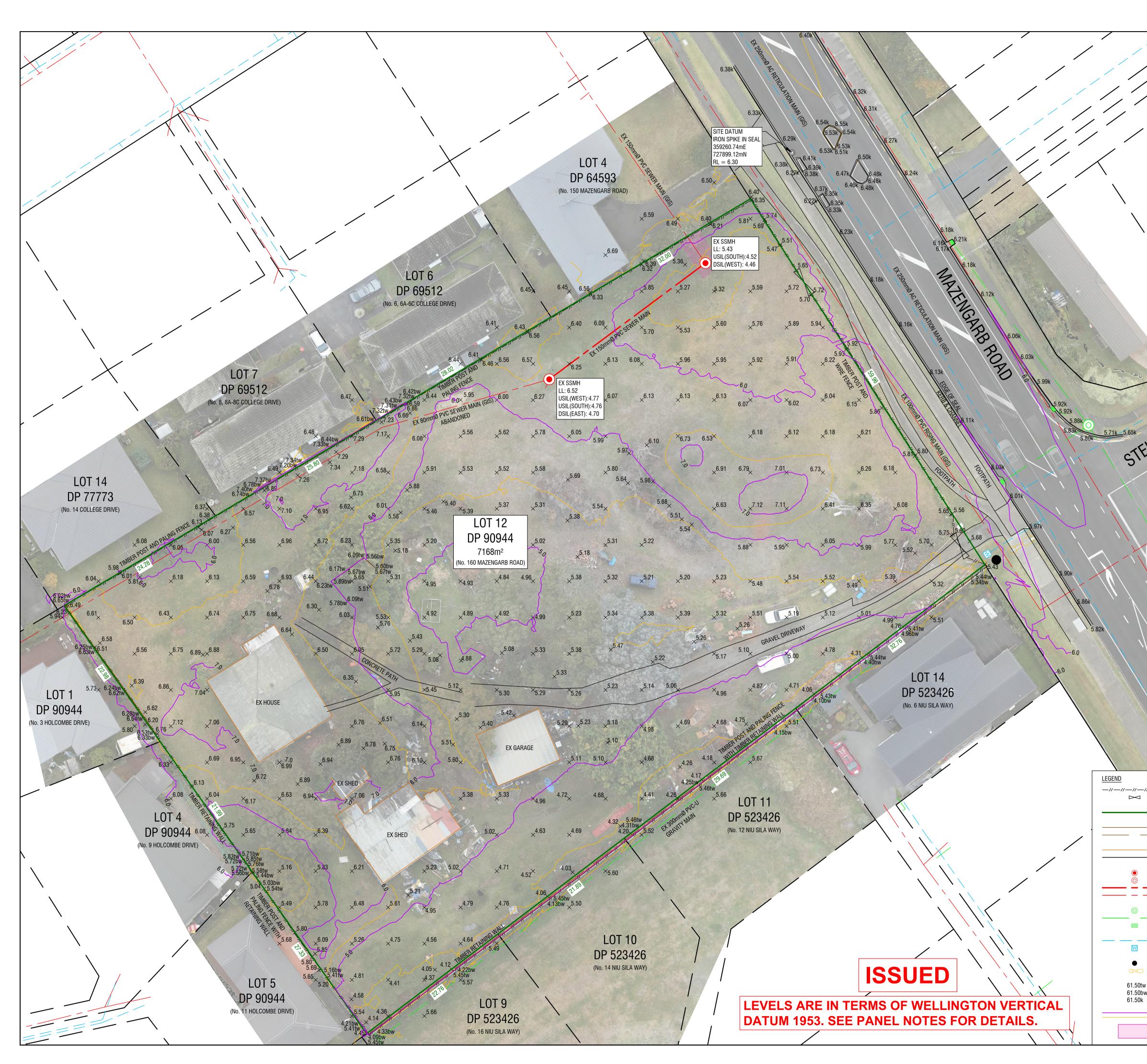
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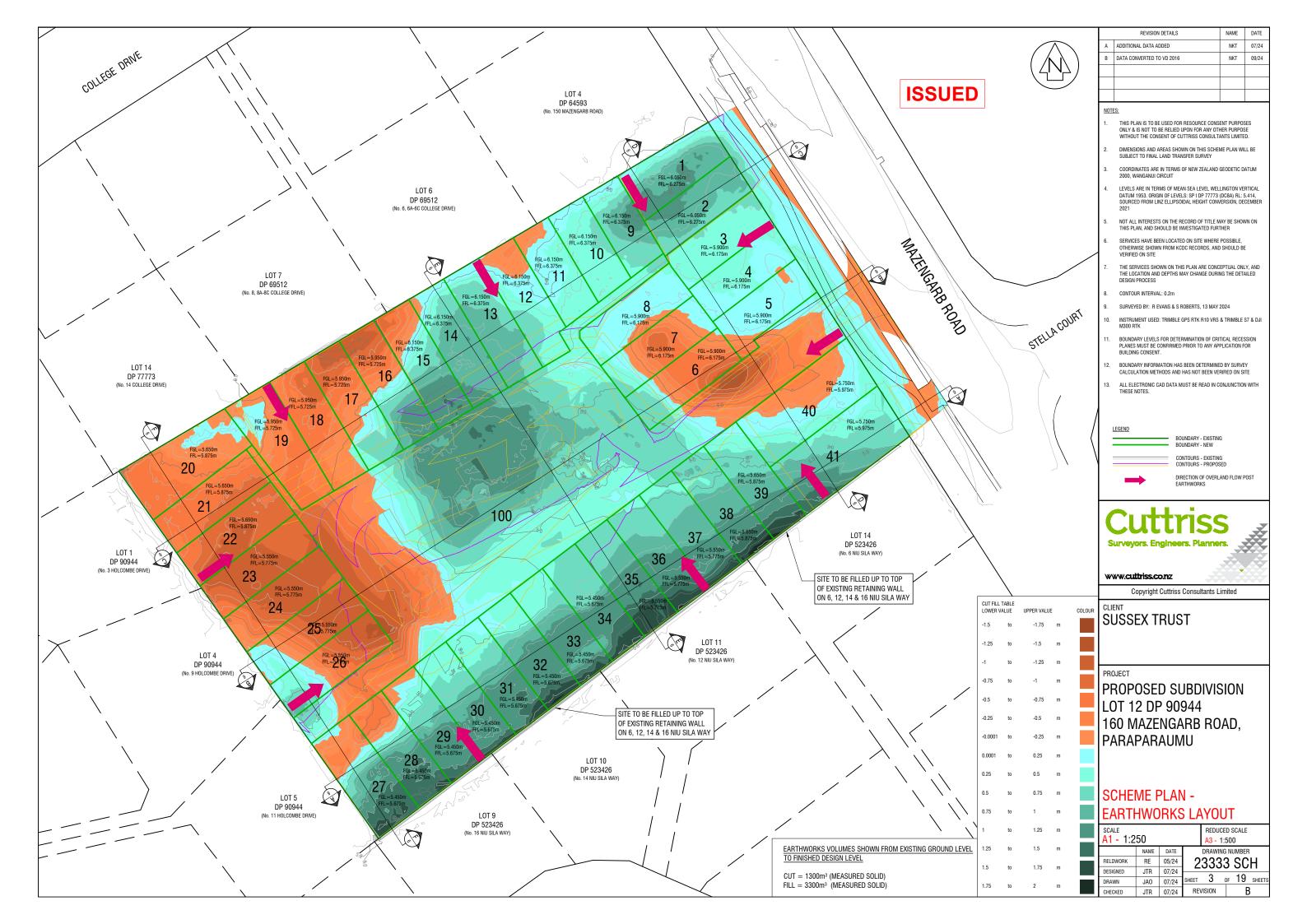
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	SCAL	E BAR					
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/	51	irvey	ors. En	gineer	s. Plar	iners.	
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ē\					Consultar	nts Limited	
	CLIE						
	SL	JSS	EX T	RUS	T		
						י ירויי	~\/
						SURVE	Y
				AUM		ROAD,	
))		ΠA	r An	AUIVI	U		
5)							
	-		<b></b>				
	TC	)P()	GRA	PHIC		PLAN	
	scal <mark>A1</mark>	. <sub>E</sub> - 1:2	50			educed scai <mark>3 -</mark> (1:500)	_E
	FIELD	NUBK	NAME RME	DATE 05/24			
				00/24	23	333 T	۲U

- HOWN ON THIS PLAN ARE EXISTING GROUND
- EEN LOCATED ON SITE WHERE POSSIBLE, VN FROM RELEVANT SERVICE AUTHORITIES IOULD BE VERIFIED ON SITE

NAME DATE

- ALS: 0.5m
- ANNON EVANS & STEPH ROBERTS, 13 OF MAY

sc. A1	ale - 1:2	50			redu <mark>A3 -</mark>			
		NAME	DATE		DRAWI	NG NI	JMBEI	R
FIEL	.DWORK	RME	05/24	2	333	3.3	TP	0
DES	GIGNED	-	-					0
DRA	WN	CJB	05/24	SHEET		OF		SHEETS
CHE	CKED	NKT	05/24	RE	-			



# **APPENDIX C: INVESTIGATION RECORDS**

Job	ent: No.: Name:	T039	ex Trust 9 Mazengarb Road, Parapar	aumu					TECHNICAL EN	
Ente	ged by: ered by: iewed by:		Co-ordinates WGS 8 Plunge (Degrees):90 Trend (Degrees): 0	Sta	art Date		Elite I-07-08 I-07-08		Elevation: <b>6.5 r</b> Northing: <b>-40.</b> 8 Easting: <b>175.</b>	89057
Depth Scale			Lithologic Description		Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP 0 5 10 15 20	Comments / Additional Notes
0	Ground Sur	face			<u>NU.</u>				• • • • •	
5					\!!/ : ··· :					
	Fine to co									
1	plastic.	ilt. Dark t	AND prown, loose to medium dense, moist. Silt	is non-						
	Fine SAN		m dense, moist.							
	Fine to me	edium S	AND		1					
	Grey, mediu	ım dense,	, moist.							
2	From 2.2m l	ogl - Mec	lium dense to dense.							
	From 2.5m l	ogl - Den	se.							
3	Test Hole T	erminate	d at 3 m - Target depth.		••.•					
t										
Equi Size Vat	ipment: e (m): er Level (	m):	ormation: Excavator 0.8 x 2.7m		EI	oordin evatio	n estim	tained ated fi	from mobile phone	GPS. Itants Topographic Survey
vat	er Level (	⊨IV):								





TP01 Pit



TP01 Stockpile

Torlesse Ltd Job Number: T0399/02 Date: 15 July 2024

	No.:	T039							orle	
Log Ente	ged by: ered by: iewed by:	LH LH	Mazengarb Road, Parapara Co-ordinates WGS 84 Plunge (Degrees):90 Trend (Degrees): 0	Co Sta	rt Date	or: CPT e: 2024 : 2024	-07-08	GEU	Elevation:6 m Northing: -40.89052 Easting: 175.00427	Page No:
Depth Scale			Lithologic Description		Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP Co	mments / Additional Notes
0	medium, su	- edium S. gravel. Dai b-round. (	rk brown, loose, dry to moist. Gravels are fir (FILL?).	le to						
1	Fine SAN Light browr Fine to co	nootlets. D a, medium arse SA	Brown, loose, dry to moist. dense, dry to moist.							
2	From 2.1m	bgl - Dens	se.							
3	Test Hole T	erminated	d at 3.1 m - Target depth.		· · · ·					
Equ Size Wat	t <u>Locatio</u> ipment: e (m): er Level ( er Level (	m):	o <u>rmation:</u> Excavator 0.8 x 2.7m		Co El	evatior	ites ob i estim	tained ated f	S: d from mobile phone GPS. from Cuttriss Consultants t encountered.	





## TP02 Pit

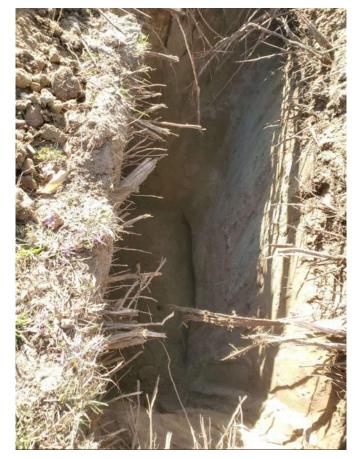


TP02 Stockpile

Torlesse Ltd Job Number: T0399/02 Date: 15 July 2024

Enfered by: LH Plunge (Degrees): 90 Start Date: 2024-07-08 Easting: 175.00415 10 Reviewed by: NC Trend (Degrees): 0 End Date: 2024-07-08 Easting: 175.00415 10 g g g g g g g g g g g g g g g g g g g		No.:	T039	ex Trust 9 Iazengarb Road, Paraparau	ımu							
Ground Statute       Image: Second Statute         TOPSOL       Tipe SAND         The SAND       Image: Second Statute         With index records. Light brown, medium dense, dry.       Image: Second Statute         Image: The SAND       Image: Second Statute         Image: Second Statute       Image: Second Statute         Image: Second Statue       Image: Second Statute	Enter	red by:	LH	Plunge (Degrees): <b>90</b>	Sta	rt Dat	e: <b>2024</b>	-07-08		Northing: -4	0.89075	Page No: 1 of 1
0         TorsSoll.         UU           Fine SAND         UIII framework         UIII framework           Vith trace notes. Light brown, loose to medium dense, dry.         Image: Construction of the second dense.         Image: Construction of the second dense.           1         From 1.2m bgl - Medium dense to dense.         Image: Construction of the second dense.         Image: Construction of the second dense.           2         From 1.8m bgl - Dense.         Image: Construction of the second dense.         Image: Construction of the second dense.           3         Test Hole Terminated at 3.2 m - Target depth and pit will collapse.         Image: Construction of the second dense.         Image: Construction of the second dense.           4         Second dense:         Image: Construction of the second dense.         Image: Construction of the second dense.         Image: Construction of the second dense.           3         Test Hole Terminated at 3.2 m - Target depth and pit will collapse.         Image: Construction of the second dense.         Image: Construction of the second dense.           4         Second dense collapse of the second dense collapse of the second dense collapse of the second dense.         Image: Construction of the second dense.           5         Execond dense collapse of the second dense of the second dense collapse of the second	Depth Scale			Lithologic Description		Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer		Comments	s / Additional Notes
Image: Second construction information:         Test Location Information:         Test Hole Terminated at 3.2 m - Target depth and pit wall collapse.         Image: Science information:         Equipment:       Excavator         Size (m):       0.8 x 2.7m						\$117.						
Vertices rootes boxen, locate to medium dense, dry.         Fine to coarse SAND         If from 1.2m bgl - Medium dense to dense.         From 1.2m bgl - Medium dense to dense.         From 1.2m bgl - Medium dense to dense.         From 2.2m bgl - Molat.         Fine to coarse SAND         Grey, dense, moist to wet.         Test Hole Terminated at 3.2 m - Target depth and pit wall collapse.         Test Hole Terminated at 3.2 m - Target depth and pit wall collapse.         Coordinates obtained from mobile phone GPS.         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       0.8 x 2.7m	° ⊦									♥		
Fire to coarse SAND         With trace rootets. Light brows, medium dense, dry to moist.         1         1         From 1.2m bgl - Medium dense to dense.         Prom 2.0m bgl - Moist.         Fire to coarse SAND         Grey, dense, molist to wet.         3         Test Hole Terminated at 3.2 m - Target depth and pit well collapse.         4         5         Copulpment:       Excavator         Size (m):       0.8 x 2.7m         Weat Level (m):				to Brown loose to modium darget day		••••				1		
With trace rootlets. Light brown, medium dense, dry to molst.         I         From 12m bgl - Medium dense to dense.         From 12m bgl - Medium dense to dense.         From 12m bgl - Medium dense to dense.         From 2.0m bgl - Moist.         Fine to coarse SAND Grey, dense, moist to wet.         Test Hole Terminated at 3.2 m - Target depth and pit wall collapse.         Test Location Information: Equipment:         Excavator Size (m):       0.8 x 2.7m         Size (m):       0.8 x 2.7m												
1       From 1.2m bgl - Medium dense to dense.         From 1.2m bgl - Medium dense to dense.       Image: Constraint of the second secon						••••				∳		
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       Image: State in the state										∳		
2       From 1.8m bgl - Dense.         From 2.0m bgl - Moist.         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         Nater Level (m):						:•:						
2       From 1.8m bgl - Dense.         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         Fest Location Information:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Vater Level (m):       Staned from Cutriss Consultants Topographic Su												
2       From 1.8m bgl - Dense.         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         Fest Location Information:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Vater Level (m):       Staned from Cutriss Consultants Topographic Su	1					:::						
2       From 1.8m bgl - Dense.         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         Fest Location Information:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Vater Level (m):		From 12m l	al - Med	ium dense to dense								
2       From 2.0m bgl - Moist.         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         Feest Location Information:         Fourprint:         Excavator         Size (m):       0.8 x 2.7m         Nater Level (m):	ľ	1101111.21111	i vieu	ium dense to dense.								
2       From 2.0m bgl - Moist.         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         Feest Location Information:         Fourprint:         Excavator         Size (m):       0.8 x 2.7m         Nater Level (m):												
2       From 2.0m bgl - Moist.         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:         Fquipment:       Excavator         Size (m):       0.8 x 2.7m         Nater Level (m):       Test Hole Tom Cuttriss Consultants Topographic Su Groundwater was not encountered.						••••						
2       From 2.0m bgl - Moist.         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:         Fquipment:       Excavator         Size (m):       0.8 x 2.7m         Nater Level (m):       Test Hole Tom Cuttriss Consultants Topographic Su Groundwater was not encountered.												
2       From 2.0m bgl - Moist.         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:         Fquipment:       Excavator         Size (m):       0.8 x 2.7m         Nater Level (m):       Test Hole Tom Cuttriss Consultants Topographic Su Groundwater was not encountered.												
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:         Grup:       0.8 x 2.7m         Nature Level (m):		From 1.8m I	ogl - Dens	Se.								
Grey, dense, moist to wet.	2	From 2.0m l	ogl - Mois	st.		···:						
Grey, dense, moist to wet.						$\cdots$						
Grey, dense, moist to wet.						••••						
Grey, dense, moist to wet.												
3       Image: Constraint of the second	Ī	Fine to co	arse SA	ND		•••						
4       Image: Constraint of the second		Grey, dense	moist to	wet.								
4       Image: Constraint of the second												
4       Image: Constraint of the second	2											
4 5 Test Location Information: Equipment: Excavator Size (m): 0.8 x 2.7m Water Level (m): Test Location Notes: Coordinates obtained from mobile phone GPS. Elevation estimated from Cuttriss Consultants Topographic Su Groundwater was not encountered.	5					••••						
4 5 Test Location Information: Equipment: Excavator Size (m): 0.8 x 2.7m Water Level (m): Test Location Notes: Coordinates obtained from mobile phone GPS. Elevation estimated from Cuttriss Consultants Topographic Su Groundwater was not encountered.	-	Test Hole T	erminater	hat 3.2 m - Target denth and nit wall collapse		•.••						
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.		restrible i	errinated	a 5.2 m - Target deptit and pit wan conapse								
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.	4											
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.												
Test Location Information:       Test Location Notes:         Equipment:       Excavator         Size (m):       0.8 x 2.7m         Water Level (m):       Groundwater was not encountered.	_											
Equipment:       Excavator       Coordinates obtained from mobile phone GPS.         Size (m):       0.8 x 2.7m       Elevation estimated from Cuttriss Consultants Topographic Su         Water Level (m):       Groundwater was not encountered.		t Locatio	on Info	ormation:		Te	est Lo	cation	Notes	<u>и и и и и</u> 3:		
Water Level (m):     Groundwater was not encountered.	Equip	pment:		Excavator		Co	oordina	ates ob	tained	l from mobile pho		
				0.8 x 2.7m							sultants Topo	graphic Survey
						G	roundv	vater w	as not	t encountered.		
Nater Level (Elv):	/vate	er Level (	EIV):									





TP03 Pit



TP03 Stockpile

Client: Job No.: Job Name:		Sussex Trust T0399 160 Mazengarb Road, Paraparaumu							<b>TORIES</b>					
Logged by: Entered by: Reviewed by					Contractor: CPT Elite Start Date: 2024-07-08 End Date: 2024-07-08			Elevation: <b>6.5</b> Northing: <b>-40</b>			0.89083	Page No: <b>1 of 1</b>		
Depth Scale		Lithologic Description			Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer	Mai 0 5	nual DCP	Comments / Additional Notes	s / Additional Notes		
	Ground Sur								•					
0	TOPSOIL Fine to me	edium S	AND medium dense, moist.		<u>\</u>   / ·									
	Fine to co Light brown													
1	From 1.1m l	ogl - Med	ium dense.											
2	From 2.0m l	ogl - Dens	se.											
3	Test Hole T	erminated	t at 3 m - Target depth.											
1														
Equi Size Nate	t <u>Locatio</u> pment: (m): er Level ( er Level (	— m):	rmation: Excavator 0.8 x 2.7m		EI	evatior	ates ob 1 estim	tained ated fi	from n			graphic Survey		





TP04 Pit



TP04 Stockpile

Те	st Pit & DCP Log No: TP05			1			ТМ
Clie	nt: Sussex Trust No.: T0399						<b>6666</b>
Job	Name: 160 Mazengarb Road, Paraparaun	nu			GEO	TECHNICAL	ENGINEERS
Ente	ged by:LHCo-ordinatesWGS 84ered by:LHPlunge (Degrees): 90rewed by:NCTrend (Degrees): 0	Start D	ate: <b>2</b>	CPT Elite		Elevation: <b>4</b> Northing: -/ Easting: <b>1</b>	40.89123
Depth Scale	Lithologic Description	Symbol	Camular	Samples Vane Shear Test (Su)	Pocket Penetrometer	Manual DCP 0 5 10 15 20	Comments / Additional Notes
_	Ground Surface					•	1
- 0	TOPSOIL	\И́/.					
E	Fine to coarse SAND	•••	•				
F	Light brown, loose, moist.	×``	 *X				
-	Sandy SILT With trace gravel and rootlets. Dark brown, stiff, moist. Non-plastic.	× >	(* 				
F	Sand is fine to medium. Gravels are fine, sub-angular.	×	•		1		
F	Fine to medium SAND		:		1		
	Dark brown, medium dense, moist.				1		
- '			•				
E	Silty fine SAND Grey, moist. Silt has low plasticity.						
F	Fine to coarse SAND						
-	Grey, medium dense, moist.		:				
Ē.			:				
F	From 1.8m bgl - Strong organic smell.		:				
-2							
F							
F			:				
Ĺ			•				
+	From 2.5m bgl - Saturated.		:				
- 7	Organics in base of pit (bark). Test Hole Terminated at 2.6 m - Refusal on organic material (possible	e + •	-				
1 2024	log).						
- 08 Jul							
-3							
-							
F							
24 -							
18:18							
024 0							
- 14							
Anr 4							-
auryn					1		
se / L'					1		
torles:					1		
/ bo							
J-L					1		
, mp; [					1		
	t Location Information:		 Test	Locatio	I Notes	<u>       </u> S:	<u> </u>
Equ	ipment: Excavator		Coord	dinates o	btained	from mobile pho	one GPS.
Size	(m): 0.8 x 2.7m		Eleva	ation esti	nated fi	rom Cuttriss Con	sultants Topographic Survey.
wat Wat	er Level (m): <b>2.6 m</b> er Level (Elv): <b>1.9 m</b>						
RSLog / Torlesse Test Pit & amp; DCP Log / torlesse / Lauryn / July 14, 2024 08:18 PM Torney Standing 15 1 2024 08:18 PM Son Standing 16 2024 08:18 PM	ging completed in general accordance with NZGS 2005 Guide	lines					





TP05 Pit



TP05 Stockpile

Torlesse Ltd Job Number: T0399/02 Date: 15 July 2024

Client: Sussex Trust Job No.: T0399 Job Name: 160 Mazengarb Road, Paraparaumu							<b>TOPICAL ENGINEERS</b>							
Ente	ged by: ered by: iewed by:	LH	Co-ordinates WGS 84 Plunge (Degrees): 90 Trend (Degrees): 0	Contractor: CPT Elite Start Date: 2024-07-08 End Date: 2024-07-08			0			-40.89094	Page No: <b>1 of 1</b>			
Depth Scale			Lithologic Description		Symbol	Samples	Vane Shear Test (Su)	Pocket Penetrometer		ual DCP 10 15		nents / Additional Notes		
2	Fine SAN Light brown From 1.1m Fine to cc Grey, dense From 3.0m	ID tree root D i, medium bgl - Den arse SA , moist.	ND											
Equ Size Vat	t <u>Locatio</u> ipment: (m): er Level ( er Level (	m):	o <u>rmation:</u> Excavator 0.8 x 2.7m		Co El G	oordina evatioi roundv	n estim vater w	tained ated fr as not	from m om Cut	triss C itered,		opographic Survey ne seepage was		

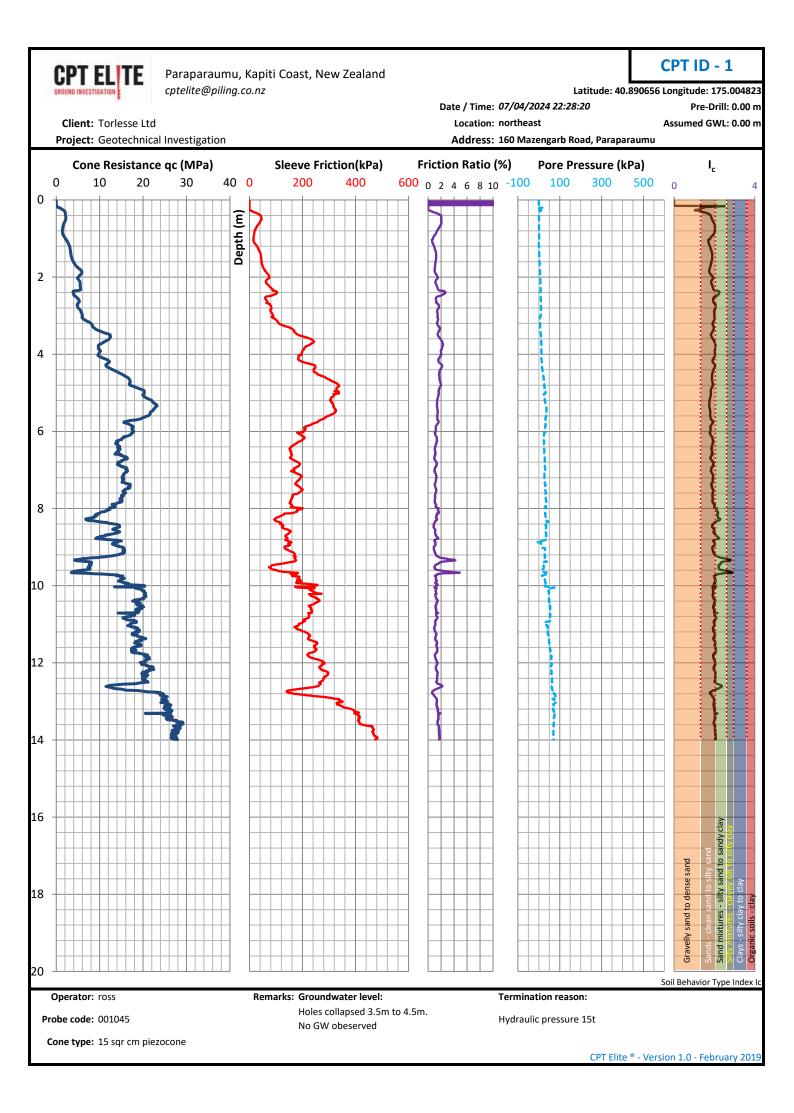


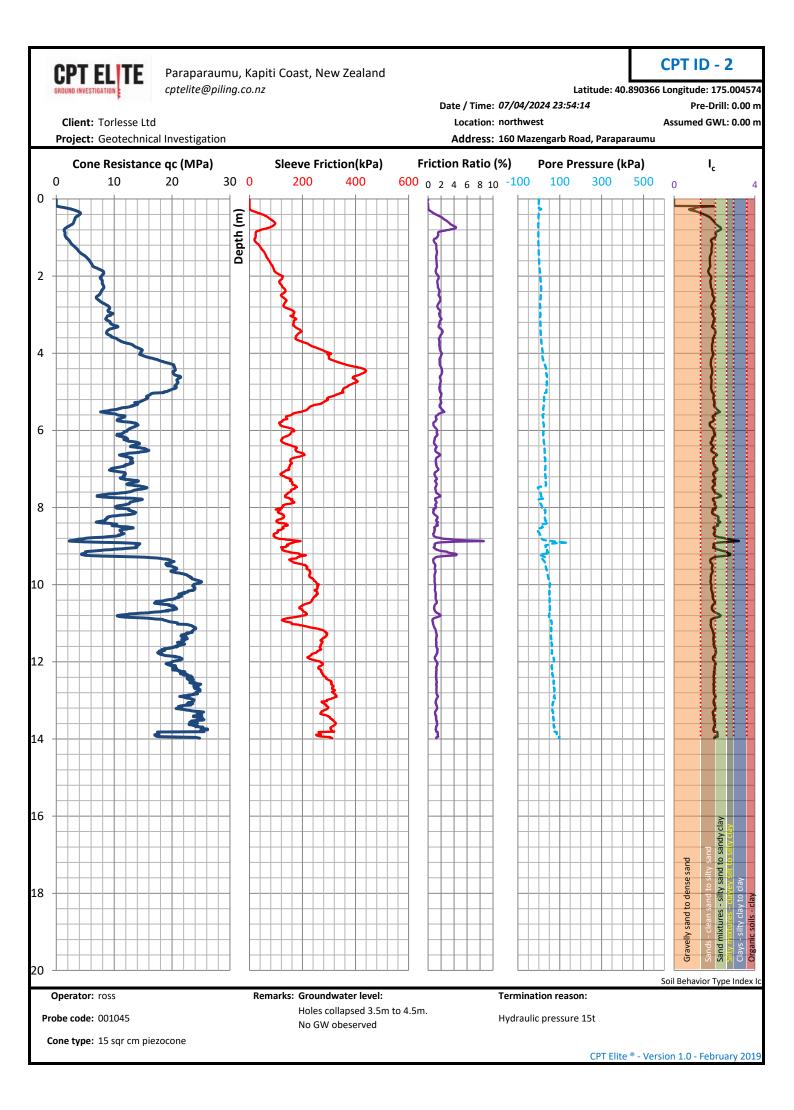


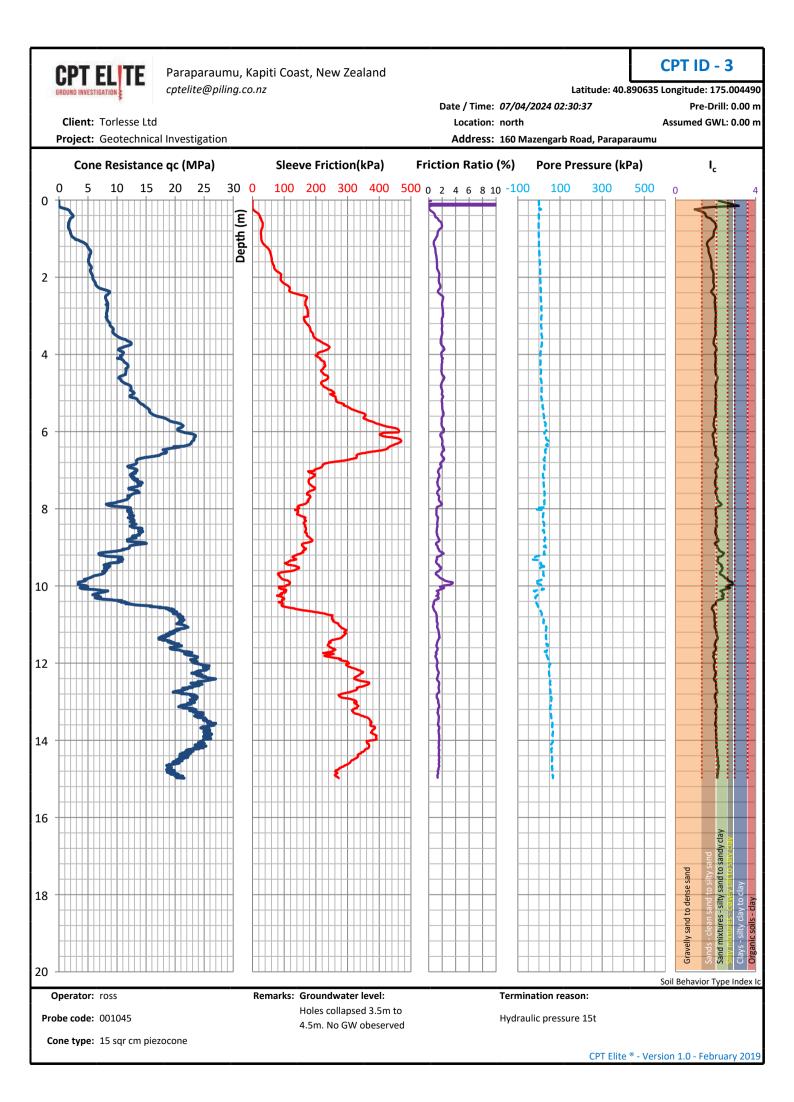
TP06 Pit

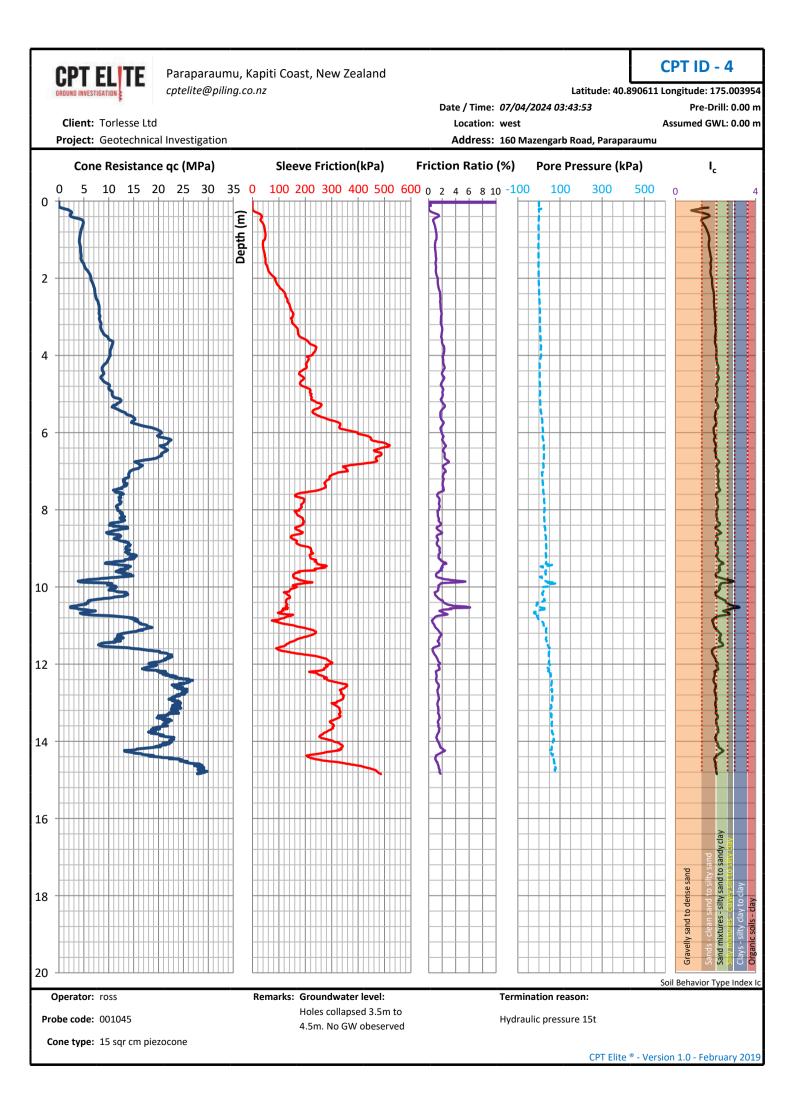


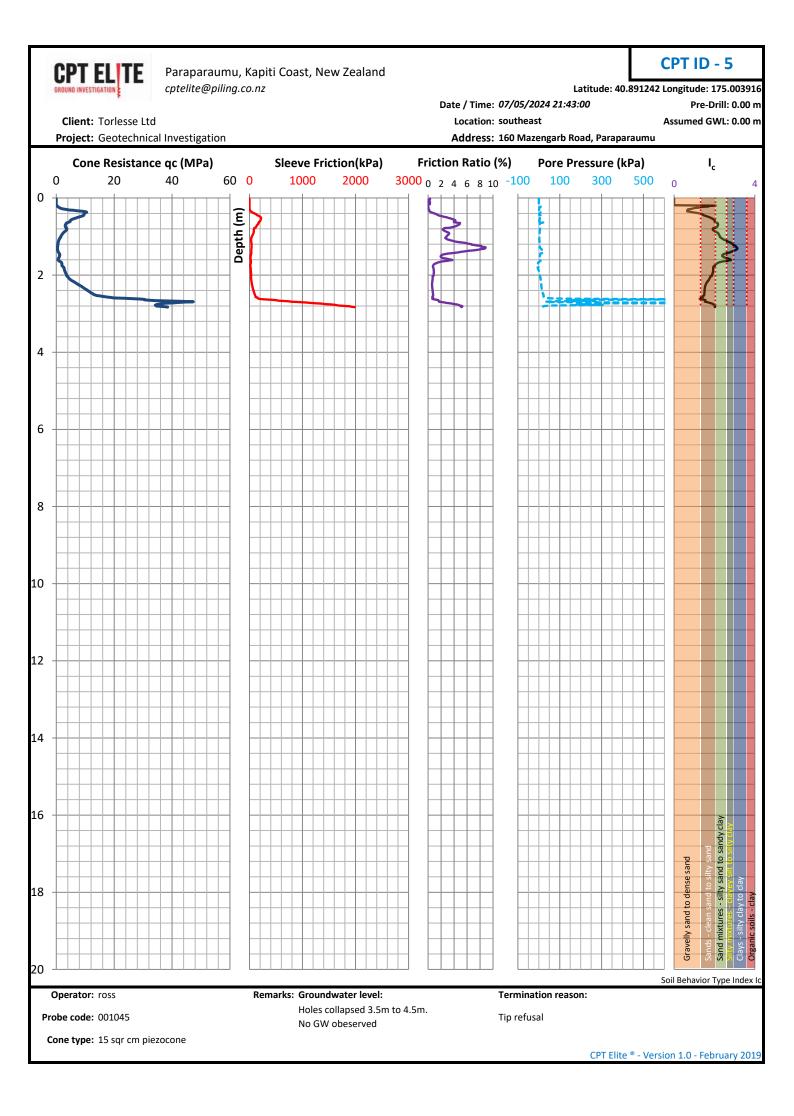
TP06 Stockpile

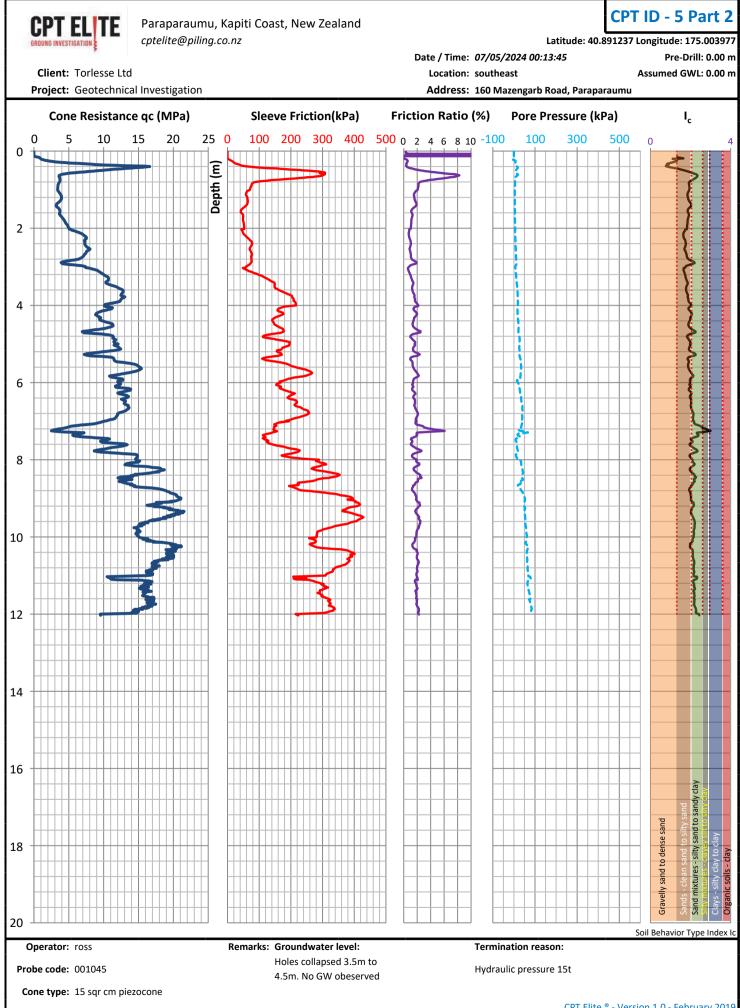


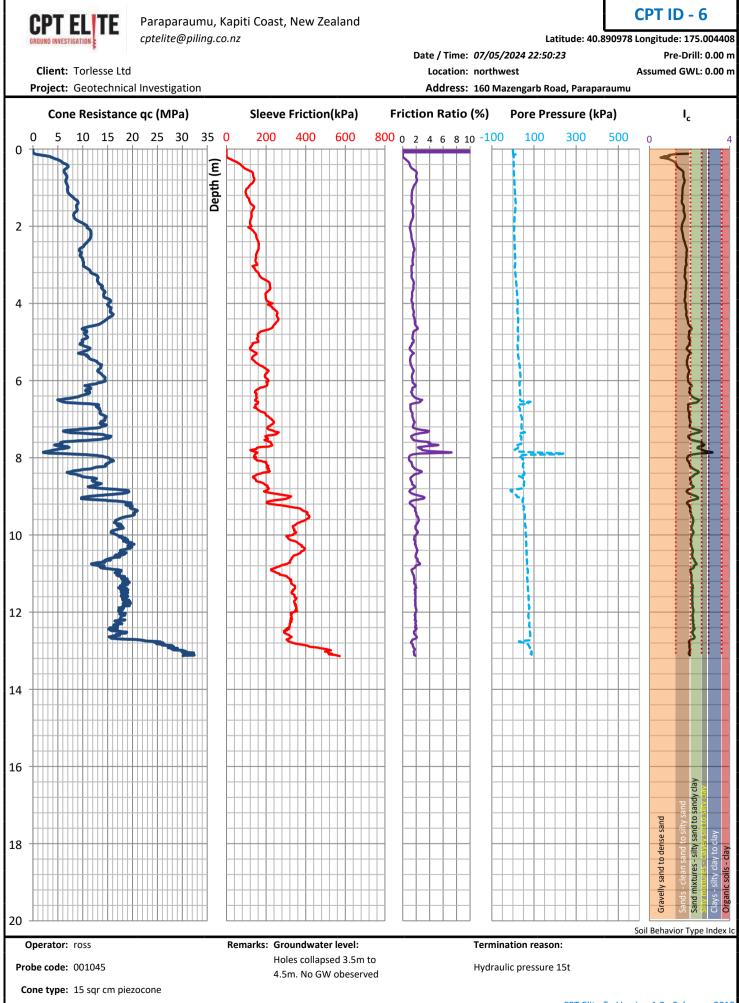


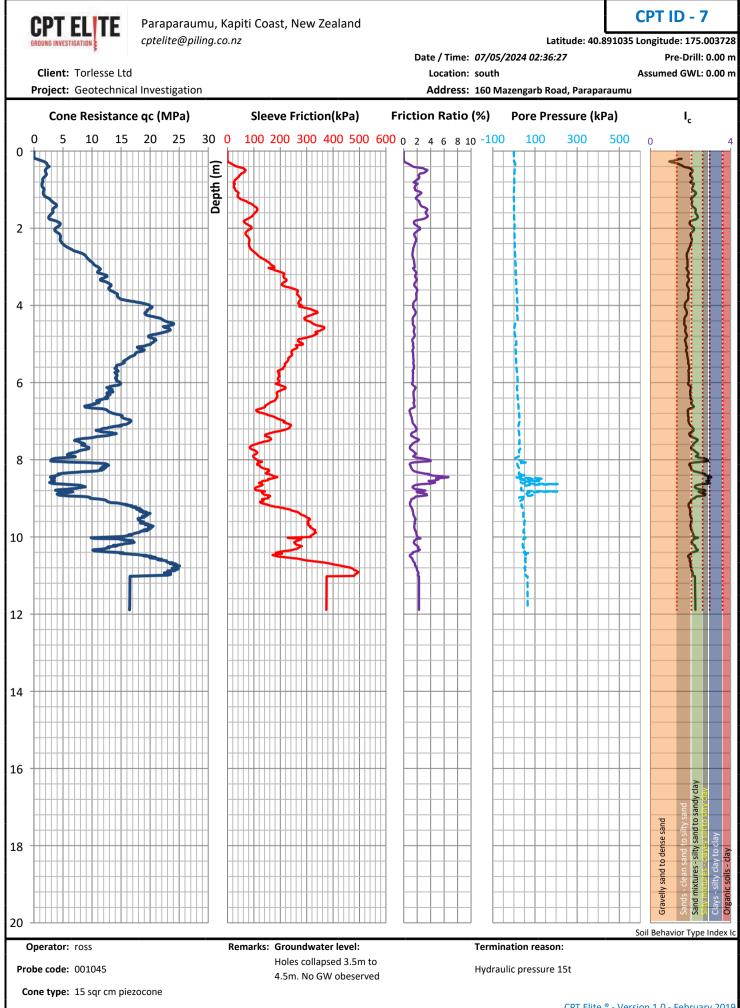


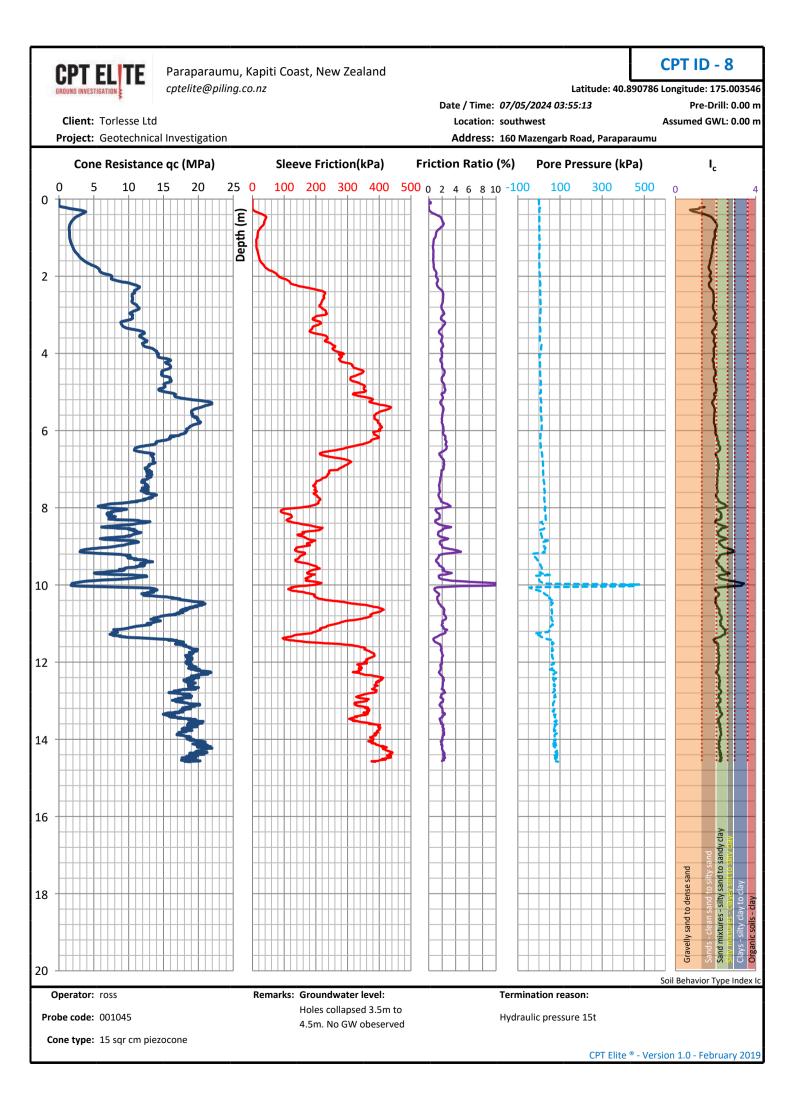


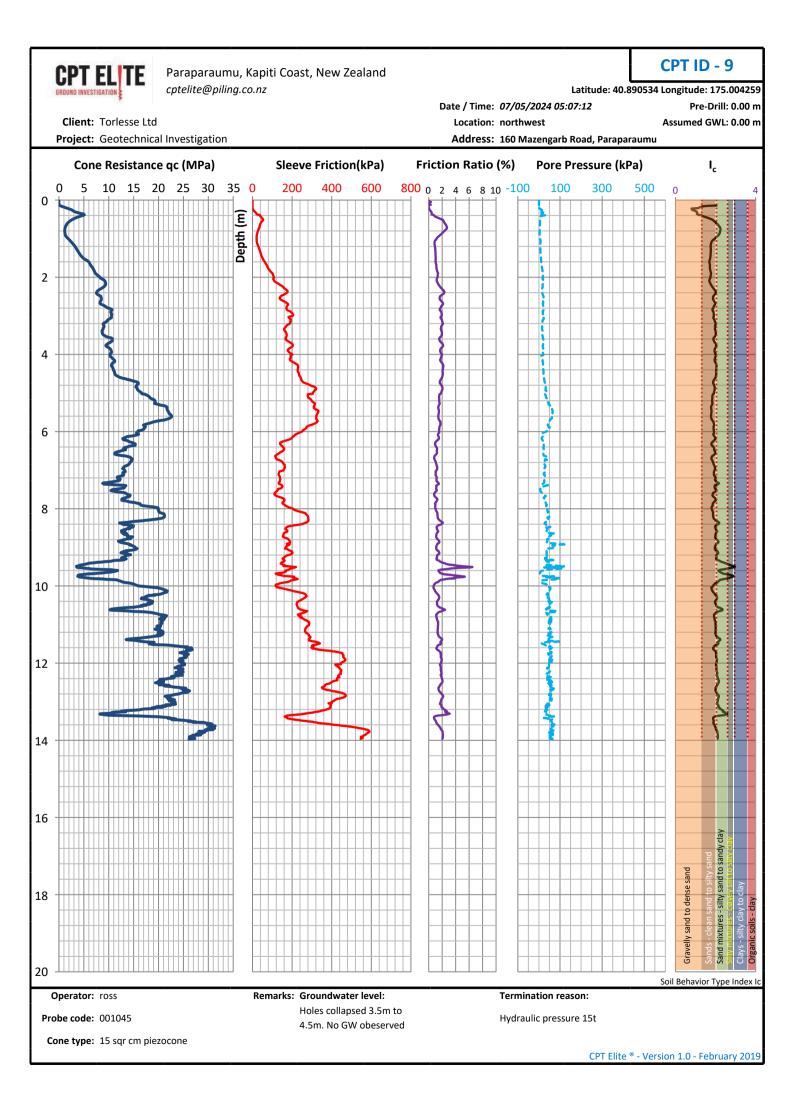


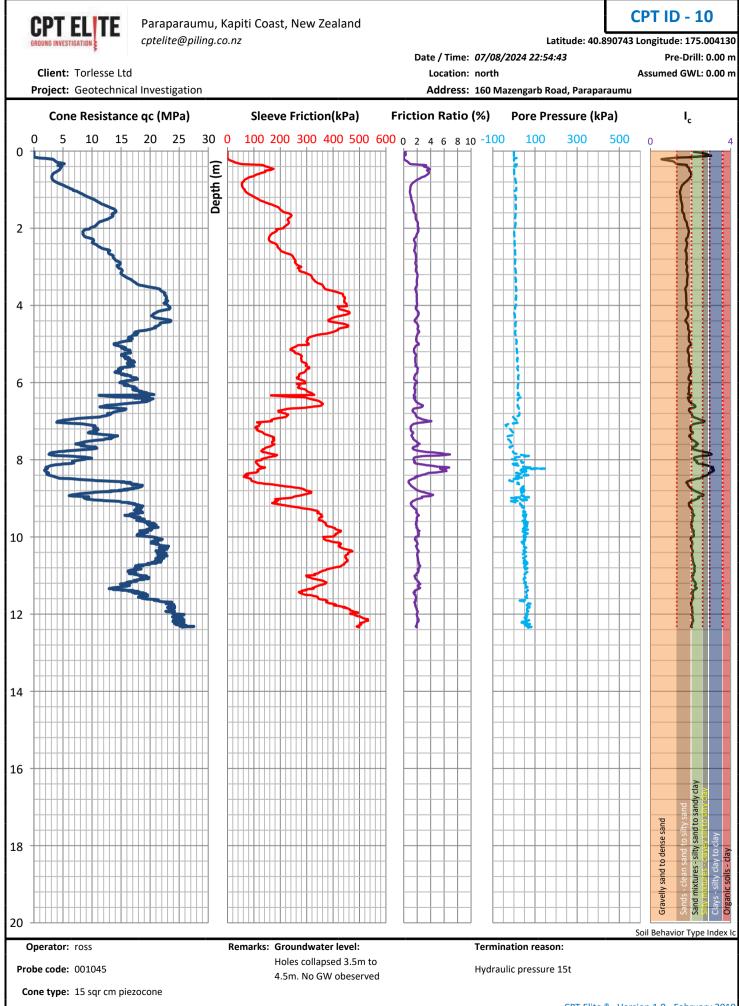












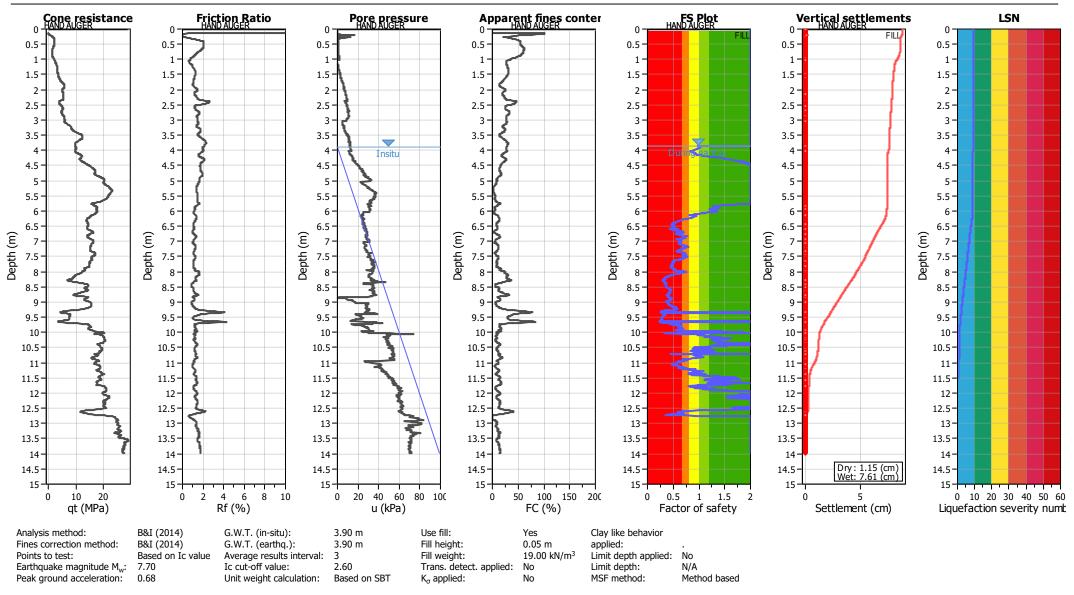
# **APPENDIX D: LIQUEFACTION ANALYSIS**

#### Project: Geotechnical Assessment Report

Location: 160 Mazengarb Road

#### CPT: CPT-01

Total depth: 13.99 m



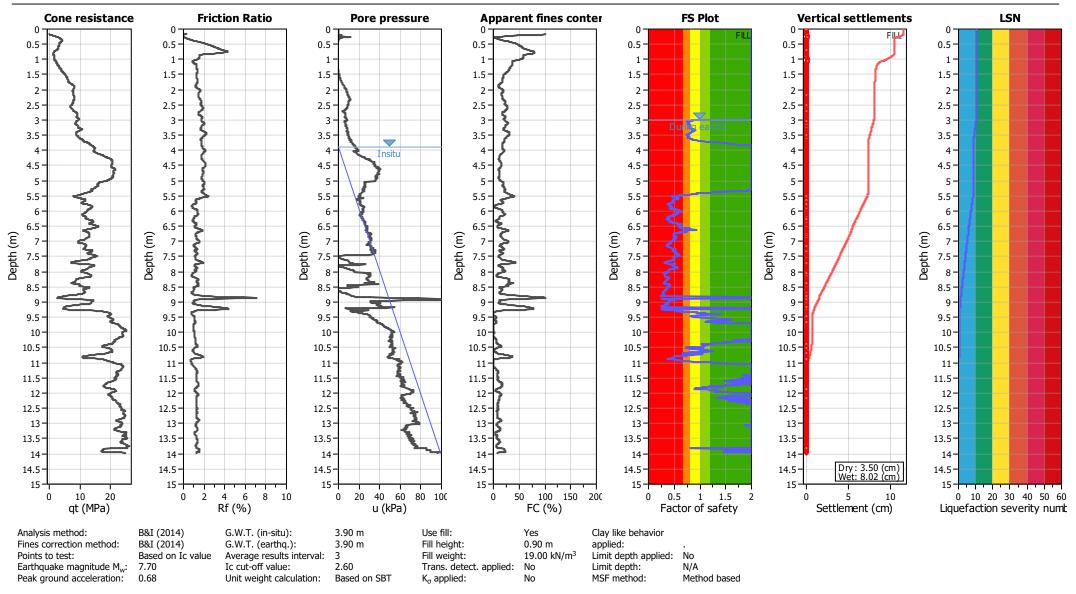
CLiq v.3.5.3.9 - CPTU data presentation & interpretation software - Report created on: 24/07/2024, 3:20:16 pm Project file: H:\Shared drives\TORLESSE\8. PROJECTS\T0399 - 160 Mazengarb Road\5. ANALYSIS & DESIGN\160 Mazengarb\_nc\_24-07-2024.clq

#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-02

Total depth: 13.98 m

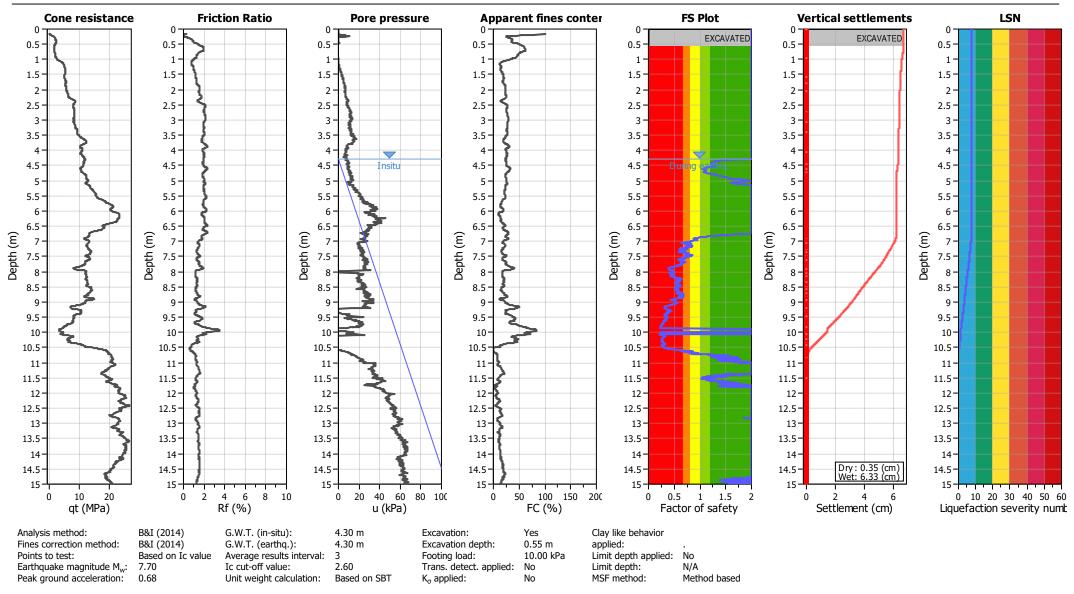


#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-03

Total depth: 14.98 m

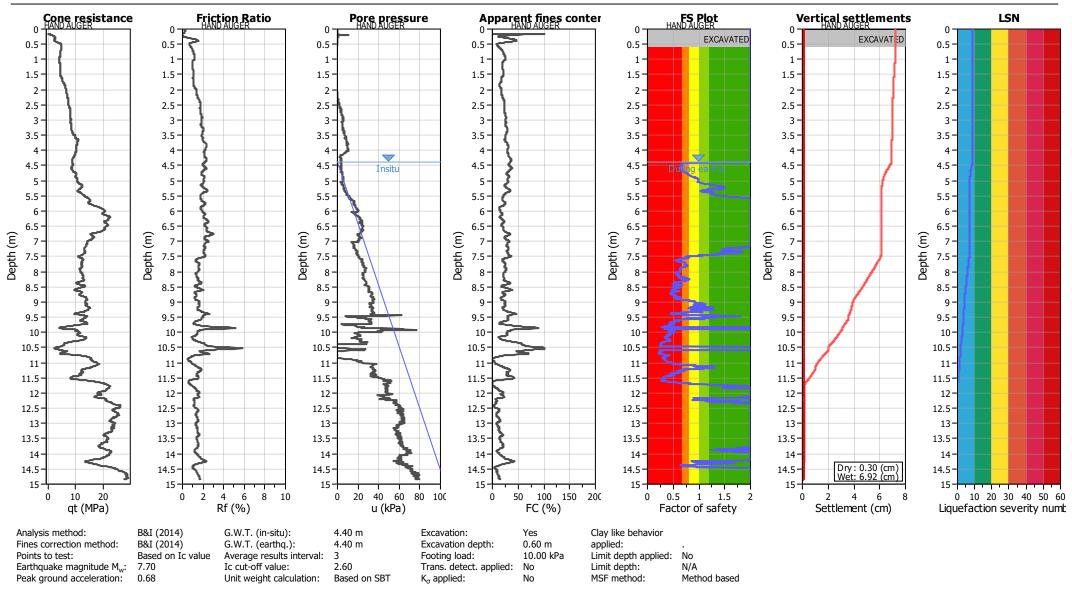


#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-04

Total depth: 14.85 m

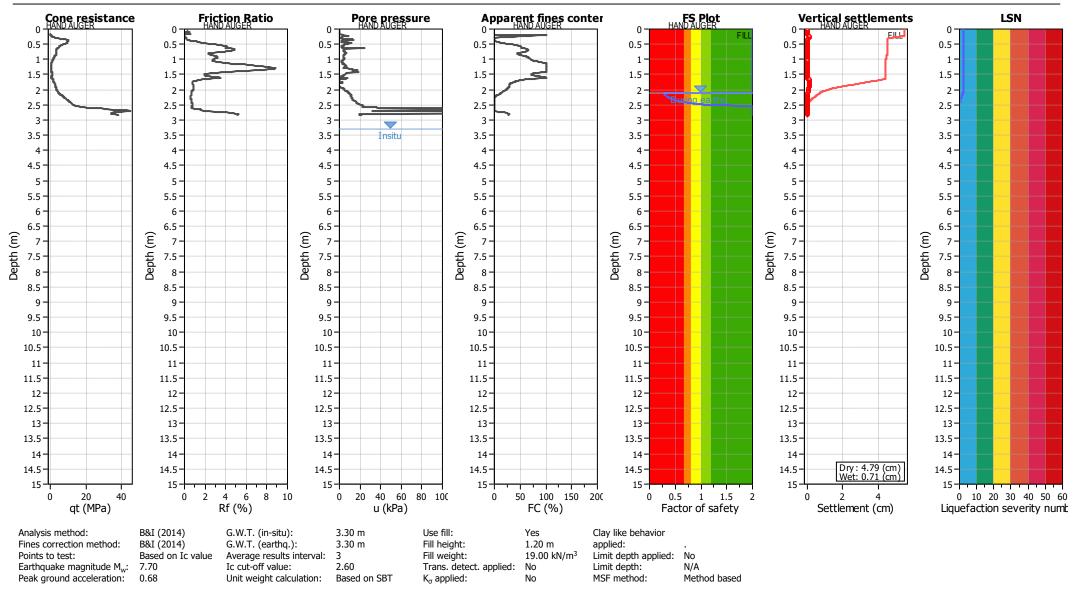


#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-05

Total depth: 2.83 m



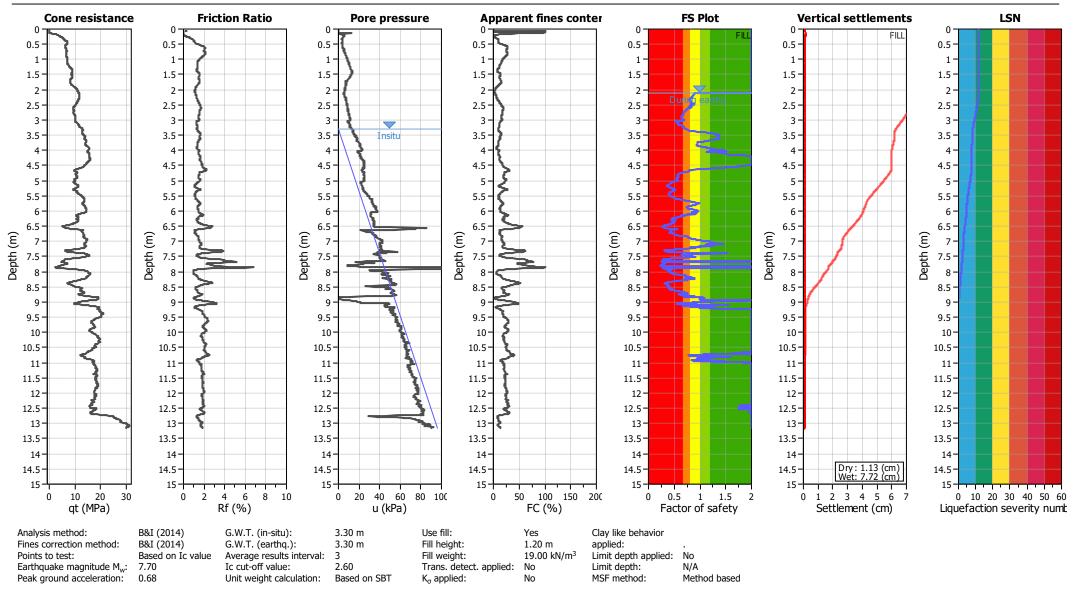
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#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-06

Total depth: 13.14 m

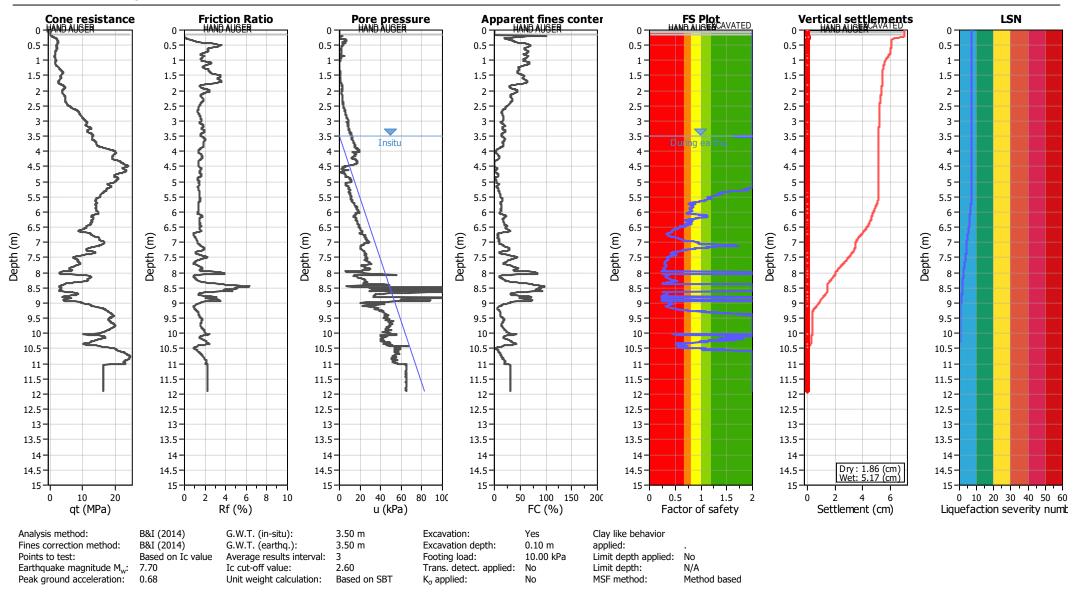


#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-07

Total depth: 11.91 m



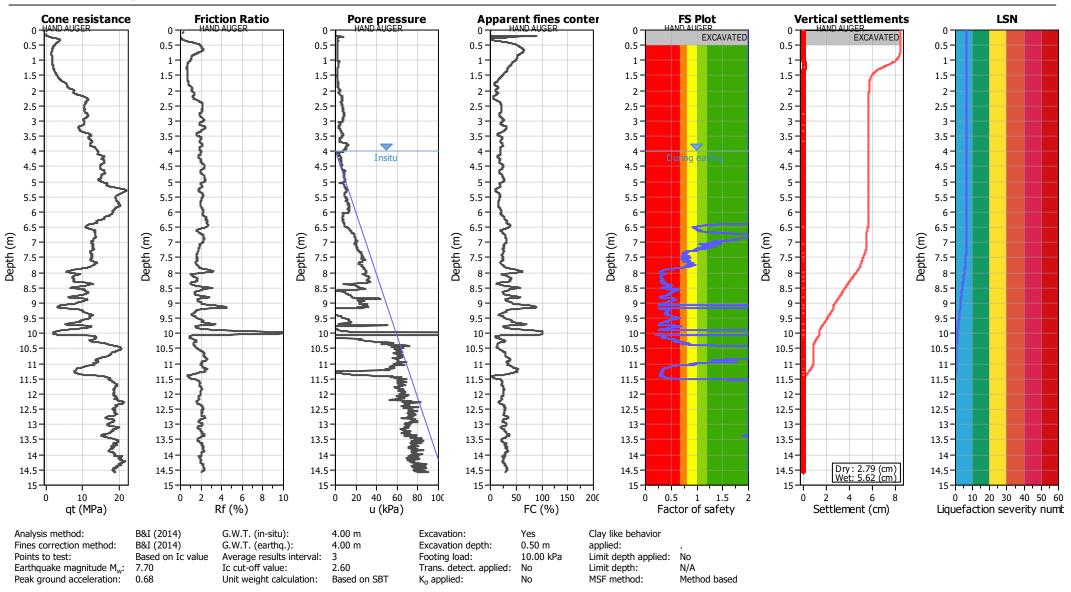
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#### Project: Geotechnical Assessment Report

Location: 160 Mazengarb Road

#### CPT: CPT-08

Total depth: 14.58 m



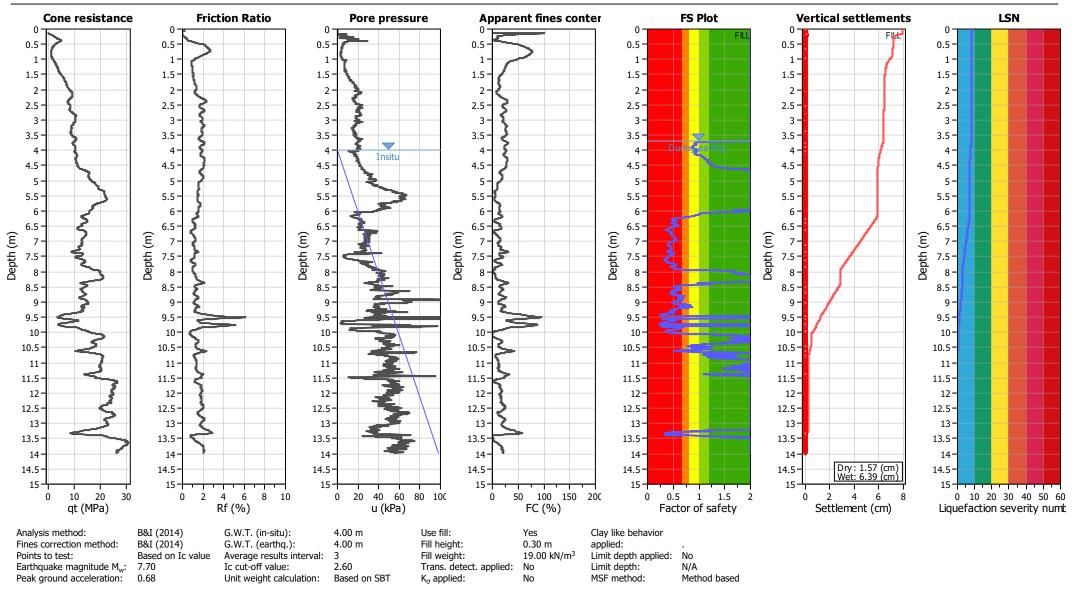
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#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

### CPT: CPT-09

Total depth: 13.97 m



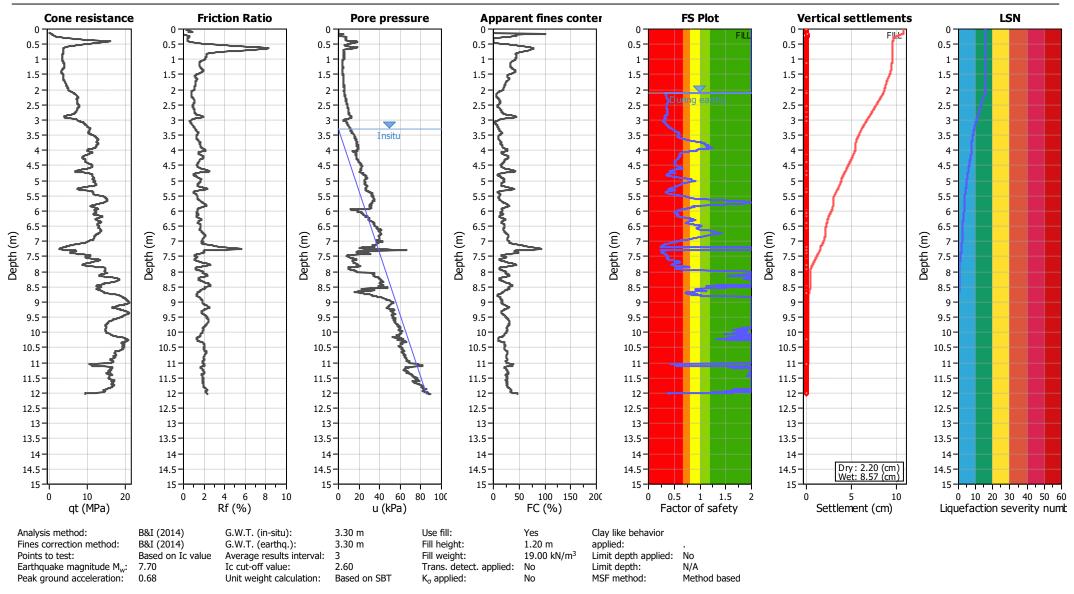
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#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-05A

Total depth: 12.03 m

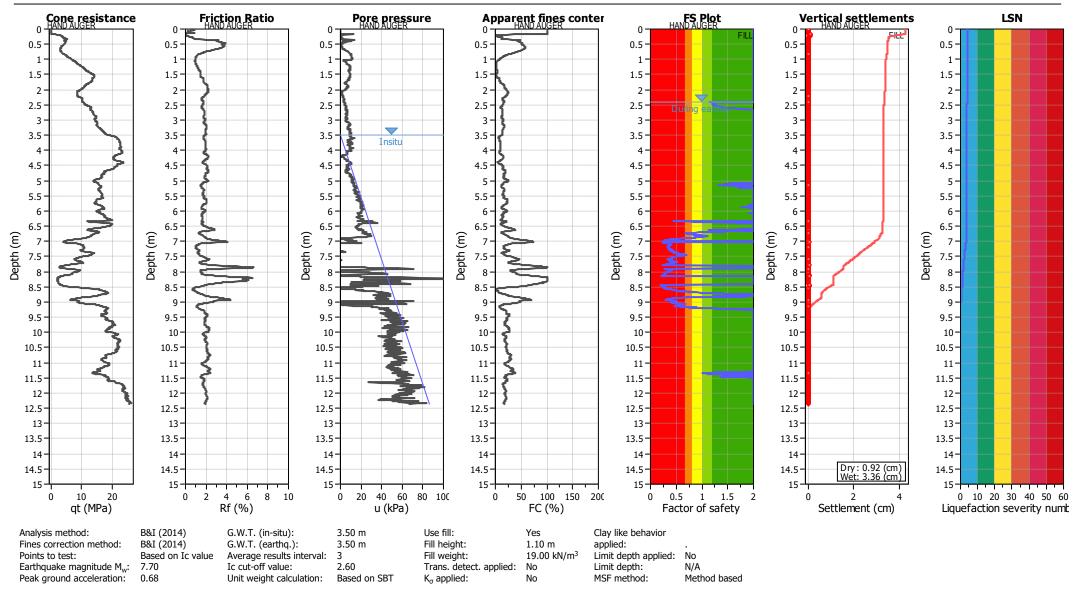


#### Project: Geotechnical Assessment Report

#### Location: 160 Mazengarb Road

#### CPT: CPT-10

Total depth: 12.35 m



CLiq v.3.5.3.9 - CPTU data presentation & interpretation software - Report created on: 24/07/2024, 3:20:21 pm Project file: H:\Shared drives\TORLESSE\8. PROJECTS\T0399 - 160 Mazengarb Road\5. ANALYSIS & DESIGN\160 Mazengarb\_nc\_24-07-2024.clq