GEOTECH
consulting ltd

275 HIGHSTED ROAD

SUBDIVISION

GEOTECHNICAL FINALISATION REPORT

Reference Number: 6096

Date: 29 July 2025

CONTENTS

OVERVIEW SUMMARY

Project Type:	Subdivision	
Nature of Project:	Residential subdivision	
Investigation undertaken:	24 CPTs to 5.6 – 14.8m depth, 13 hand augers (with scala penetrometer tests) to 1.9 - 2.8m depth.	
Subsoil Characteristics:	Generally, 0.4m of topsoil (but up to 0.55m in one location) and occasional shallow fill overlying a surface crust of silt. This very loose to loose silt layer (with occasional sand layers and in some areas peat inclusions between 100mm and 500mm thick) extends to 2m depth over much of the western two thirds of the site, deepening to 3m in the eastern end of the site. Below this are highly interbedded layers of very loose to medium dense sand, silty sand and silt, to between 13m (western end of site) and 14.3m depth (eastern end of site), where a very dense gravel layer is struck. In the central region of the site an intermediate dense to very dense gravel layer also exists, at 8m to 9m below ground level and 1.5m – 2m thick.	
Water table depth:	1.3m design depth.	
Calculated Settlements:	SLS (Upper 10m)	ULS (Upper 10m)
	40 – 90mm (60mm avg) (assessed based on crust as <50mm)	100 - 180mm (140mm avg)
Lateral Stretch:	Assessed as 10 – 50mm post liquefaction.	
Technical Category:	Subdivision assessed as TC2/TC3 hybrid -like behavior.	
Foundation options:	A geogrid layer and gravel fill layer has been constructed at subdivision construction stage, rendering the site TC2-like in seismic performance. In most cases shallow TC2-like foundations will be suitable, subject to site-specific investigations and specific engineering design. Where peat is encountered, specifically engineered foundations may be required to account for this (including the possibility of deep piles).	

GEOTECHNICAL DESIGN REPORT

275 Highsted Road Subdivision

1.0 INTRODUCTION

A geotechnical investigation was carried out at the site of a proposed subdivision at 275 Highsted Road, in Casebrook, Christchurch. The 3.2 hectare block of land is being subdivided into 48 residential lots, most of which are in the order of 500 – 600 square metres each, with the remaining (approximately 9) lots being 170 – 330 square metres in size.

The purpose of this site investigation was to determine subsoil conditions for the subdivision; to determine suitable foundation systems for the houses that will be constructed there; and to determine suitable design responses to the geotechnical hazards associated with the site.

This report summarises the results of the site investigation and the design implications that can be interpreted from those results.

2.0 THE SITE

The site, currently relatively flat semi-rural grounds for a modern house situated in the approximate centre of the site, fronts onto Highsted Road on its eastern boundary. The grounds are mainly grassed, with some established tress around the boundaries and in the south-eastern corner of the site. The property comprises a strip of land approximately 79 metres wide, running in an east-west direction over a length of 410 metres. An older, secondary dwelling is located in the south-eastern end of the site, and a small number of storage sheds are located on the southern boundary of the site towards the eastern end of the land.

To the south of the subdivision is a relatively newly-built residential subdivision, with new houses either under construction or recently completed. To the north and west is further semi-rural land.

3.0 DAMAGE OBSERVATIONS

Despite being subject to greater than 100-year return period design levels of shaking in the September 2010 and SLS levels of shaking in the February 2011 earthquake events, data from the New Zealand Geotechnical Database ('NZGD') shows no observations of liquefaction damage in the land on or immediately adjacent to the site in the February 2010 event (no observation data is available for the September 2010 event). Lidar data shows

moderate cumulative ground deformations (100 – 200mm) at the site from the events spanning from September 2010 to June 2011 (whereas a standard analysis shows in excess of 300mm would be expected). This indicates that standard liquefaction analysis methods are likely to be over-conservative for this site. Appendix 1 (figure SK2) shows the results of these damage observations.

Land some 400 metres to the south of the site is classified as MBIE Technical category 2 ("TC2"), as is some land 200 metres to the northeast; the Lidar cumulative ground deformations in both these areas are similar to those on this site. The Lidar cumulative ground deformations in the new subdivision to the immediate south are slightly more intense than those recorded for this property.

Appendix 1 contains summary information from the NZGD (drawing sheets 2 & 3).

4.0 THE SITE INVESTIGATION

4.1 Objectives

This site investigation data has been analysed to provide information about the composition, spatial relationships and geotechnical properties of the materials that underlie the site.

In particular the following information was sought:

- Definition of the quality and variability of the soils underlying the site.
- Water table depth.
- Liquefaction potential.
- Permissible likely foundation types.
- Site subsoil category.

4.2 Methodology

Twenty cone penetrometer tests ("CPT") were carried out at the site in January 2020. The CPTs range in depth from 7.9 – 14.8m below ground level (all refusing on dense gravels). A further four CPTs were carried out in June 2020, using a sensitive cone, in order to verify CPT results in the soft upper soils in those locations. These CPTs ranged in depth from 5.6m to 10.1m below ground level. The spatial density of deep testing meets or exceeds the MBIE requirements of 0.5 per lot.

This data has been supplemented by 13 hand augers (with scala penetrometer tests) to 1.9 - 2.8m depth. Additional testing was carried out during subdivision construction.

Further information regarding groundwater levels, ground deformations, levels of shaking, and observed ground damage during the Canterbury Earthquake Sequence was also retrieved from the New Zealand Geotechnical Database (NZGD).

Appendix 1 (drawing sheet 1) has a plan showing the locations of the investigations that were carried out at design stage. All data is available on the NZGD.

4.3 Subsurface Conditions

The geological map for Christchurch indicates that the site is underlain by predominantly sand and silt overbank deposits (Springston Formation), of Holocene age.

The interpreted CPT probes and hand augers show 0.4m of topsoil (but up to 0.55m in one location, HA8, and a small amount of fill to depths of up to 0.75m in locations HA2, HA5, HA7, HA12) overlying a surface layer of silt. This very loose to loose silt layer (with occasional sand layers) extends to 2m depth over much of the western two thirds of the site, deepening to 3m in the eastern end of the site. Within these silty materials are some inclusions or lenses of peat – often 100-200mm in thickness, but in some locations up to 500mm thick. Below this are highly interbedded layers of very loose to medium dense sand, silty sand and silt, to between 13m (western end of site) and 14.3m depth (eastern end of site), where a very dense gravel layer is struck. (This deep gravel layer extends to at least 18m depth, based on an Ecan well log on the site). In the central region of the site an intermediate dense to very dense gravel layer (1.5m – 2m thick) also exists, at 8m to 9m below ground level.

CPT traces and borelogs are included in Appendix 2.

4.4 Groundwater

Groundwater was observed during the hand auger investigations at 1.2 – 1.8m. The GNS Science Median Groundwater Surface Elevations from the Canterbury Geotechnical Database for this site indicate that the long-term median water table is 1.3m depth.

4.5 Environmental Issues

Environmental engineering is beyond the scope of our expertise. It is our understanding that this aspect of the site has been investigated by other parties.

4.6 Flood Levels

This aspect of the site has been investigated by other parties.

5.0 INTERPRETATION

The gathered data (as described in the previous section) has been analysed for dynamic and static conditions as follows:

5.1 Liquefaction Potential

The saturated silty and sandy materials below the water table have noticeable potential for liquefaction in a large earthquake. The CPT profiles have been analysed using the method of Boulanger & Idriss (2014) and Boulanger & DeJong (2018); and free field settlements assessed using the method of Zhang et al (2002). A 'fines correction' coefficient (C_{FC}) of 0 was adopted for this analysis. Additionally, given the good performance of the site in the Canterbury Earthquake Sequence as discussed in Section 3, a probability of liquefaction threshold, P_L, of 50% was adopted.

For the design input ground motion accelerations, we have adopted the PGAs (peak ground accelerations) recommended by MBIE, which is an SLS event (at M7.5) of 0.13g, a further SLS event (at M6) of 0.19g, and at ULS 0.35g (M7.5) for an IL2 (importance level 2) building. The SLS event at 0.19g/M6 was found (as is almost always the case) to be the dominant SLS event.

We calculate Ultimate Limit State ('U.L.S.') theoretical post liquefaction free-field ground settlements at the site averaging 145mm in the upper 10m of the soil profile. We have also calculated liquefaction potential and ground settlements from the smaller Serviceability Limit State ('S.L.S.') – this indicates ground settlements averaging 60mm in the upper 10m of the soil profile.

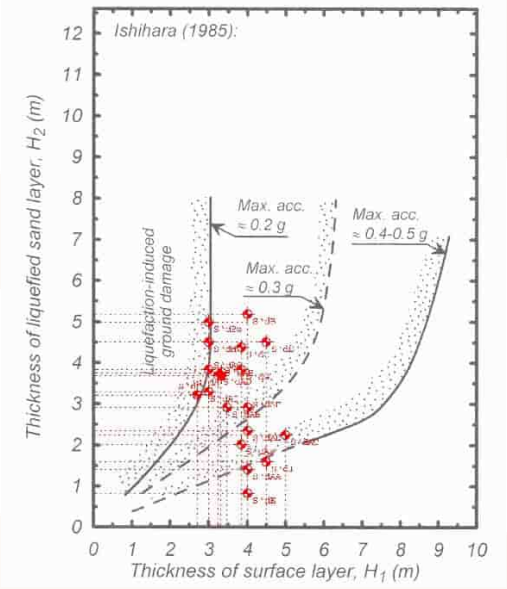


Figure 2 – Ishihara Crust Analysis at SLS

Following this, an assessment of the likelihood of ground damaging settlements at SLS was made using the method of Ishihara (1985) , based on the total thickness of liquefiable layers

versus the thickness of the overlying non-liquefiable crust (see Figure 2) All of the CPT locations were found to have SLS ground deformations supressed by the presence of the crust. Therefore, for foundation assessment purposes, these were assigned an effective SLS settlement of less than 50mm. (It is noted that the proposed development of the subdivision raises the ground levels from existing for flood level purposes, and therefore our assessment, based on the natural ground levels, is conservative – i.e. the raising the ground levels will further help to suppress the effects of liquefaction).

Additionally, we have assessed the 'Liquefaction Severity Number' (LSN) for each of the liquefaction cases. At ULS these average 32, whereas for SLS these average 12.

Table 1 – Assessed Index Liquefaction Induced Settlements (+/-50%) and LSN

CPT I.D.	500 years (ULS) 0.35g/M7.5		25 years (SLS) 0.13g / M7.5, 0.19g / M6		
	Ground Settlement (mm)	LSN	Ground Settlement (mm)	Assessed Settlement (Ishihara Crust) (mm)	LSN
CPT 001	155	33	80	<50mm	13
CPT 002	170	41	90	<50mm	17
CPT 003	175	40	80	<50mm	15
CPT 004	150	37	75	<50mm	14
CPT 005	155	37	35	<50mm	7
CPT 006a	180	46	65	<50mm	16
CPT 007	165	33	75	<50mm	13
CPT 008	145	37	70	<50mm	14
CPT 009	115	25	40	<50mm	8
CPT 010	120	27	45	<50mm	8
CPT 011	115	28	40	<50mm	8
CPT 012	125	27	65	<50mm	12
CPT 013a	145	36	42	<50mm	11
CPT 014a	180	44	59	<50mm	13
CPT 015	125	28	60	<50mm	11
CPT 016	120	23	50	<50mm	8
CPT 017	120	22	65	<50mm	11
CPT 018a	175	26	55	<50mm	9
CPT 019	100	18	55	<50mm	9
CPT 020	145	32	85	<50mm	16

The LSN values are a rough guide to the degree of ground surface damage that might be expected. The general descriptors are as follows in Table 2 (taken from the NZGS Module 3 document, 'Investigation, Assessment and Mitigation of Liquefaction Hazards'):

Table 2– General Performance levels for Liquefied Deposits

Effects	Characteristics and Consequences	Characteristic LSN
Insignificant	No significant excess pore water pressures (no liquefaction).	<10
Mild	Limited excess pore water pressures; negligible deformation of the ground, and small settlements.	5-15
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.	10 - 25
High	Liquefaction occurs in significant portion of the deposit (say 30 percent to 50 percent) resulting in transient lateral displacements, moderate differential movements, and settlement of the ground in the order of 100mm to 200mm.	15 - 35
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 200mm.	>30
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).	

The LSN values assessed at ULS levels of shaking indicate 'high' effects, For the SLS case the assessed effects are 'mild'.

Work by Bradley & Hughes (2012) indicates that in the M 7.1 September 2010 event, this site was subject to a median PGA of 0.20g, which scales to an equivalent 0.18g from a 'standard' M7.5 event (i.e. close to a 100 year ILS event) and is in excess of a 25 year 'SLS' event. If the 10-percentile ground motion is considered, this ground motion scales to an equivalent 0.12g from an M7.5 event, similar to an SLS event. Similarly, the February 2011 event (0.2g from M6.2) 10-percentile motion scales to an equivalent 0.09g from an M7.5 event.

5.2 Lateral Spread

Lateral spread is the post-liquefaction movement of either level liquefied ground towards a free edge or of sloping liquefied ground downhill. It often occurs along riverbanks and shorelines, and ground deformation is often expressed as extensional fissures. No instances of lateral spread were observed on the site as a result of the Canterbury Earthquake Sequence. However, a shallow drainage feature (approximately 1.5m deep) exists adjacent to the subdivision to the south of the site. The feature is within the non-liquefiable crust, but could be subject to some liquefaction-induced lateral movements.

We have carried out slope stability analyses using post-liquefaction soil strengths for the location in the subdivision which is closest to this drainage feature. It is normal practice to calculate factors of safety for liquefied soils using no seismic input, as shaking is normally well past peak or ceased once full liquefaction has been established. However, we have

examined both the case where there is no post – liquefaction shaking, and also post-liquefaction motions of approximately 50% of peak (pre-liquefaction) shaking. In all cases, to account for the peak ground acceleration being only an instantaneous load (i.e. non-continuous) the pseudo-static input has been taken as 67% of peak, as is normal practice. For the case of fully liquefied soils and no seismic input we estimate factors of safety (FOS) of 1.15. For post liquefaction shaking of 50% of pre-liquefaction ground motions, we estimate a FOS of 0.88.

To estimate likely ground deformations as a result of the liquefied soils we have used the method of Jibson (2007). This method compares calculated factors of safety for slopes against a calculated yield acceleration for the slope (ie where FOS = 1.0). Using this methodology, and accounting for uncertainty in the model by adding a standard deviation of the estimated displacement, we estimate less than 10mm movement at post liquefaction shaking of 50% of pre-liquefaction shaking, and 60 - 100mm of lateral movement at full ULS shaking post liquefaction (not a realistic design case), for failure surfaces terminating in this subdivision.

5.3 Static Bearing Capacities

Below the topsoil layer, scala penetrometer testing indicates an ultimate bearing capacity of 100 kPa (i.e. relatively low). The penetrometer testing carried out to date has been on a wide spacing (suitable for subdivision consent) and individual testing will be required at building consent stage for each lot, preferably tailored for the location of any proposed structure. Some minor over-excavation below the depth of the topsoil (which will need to be removed in all cases under building platforms) may be required on a case by case basis to remove excessively loose materials, and will also be required for the specifically engineered foundation types that will be require for houses in this subdivision (see section 6.2).

In some instances, peat soils may be encountered during lot-specific investigations, which will entail either removal and replacement (if shallow enough) or, potentially, some form of deep piling to transfer loads to below any significant peat layer.

5.4 RMA Natural Hazards

5.5.1 Erosion

There are no major waterways adjacent to this subdivision. If a swale is constructed, then flow quantities and velocities are likely to be small and not cause erosion issues.

5.5.2 Falling Debris

The site is flat and not adjacent to any sloping ground; therefore danger from falling debris is not an issue at this site.

5.5.3 Subsidence

The land was regarded as TC2/TC3 hybrid-like when first investigated, in regard to seismic performance (see section 6.1). Since that time, a reinforced gravel surface layer has been constructed to enhance the seismic performance of the site and allow TC2 foundations to be constructed (in terms of liquefaction). Boreholes and penetrometer testing has shown reasonably low static bearing capacities for foundations in some areas, as well as the possibility of encountering peat deposits. If suitable engineer-designed foundations are constructed however, then structures will meet the requirements of the building code.

5.5.4 Flooding

This aspect is discussed in section 4.6 of the report.

5.5.5 Instability

The site is flat lying and therefore slope instability is not an issue for the subdivision under static conditions.

6.0 RECOMMENDATIONS

Based on the information contained in section 3, and the data interpretations of section 5, we make the following recommendations for this site:

6.1 Technical Category

In considering the likely future land performance at this site we have considered the following aspects:

- Low levels of damage were observed after the September and February earthquakes.
- Recent research into the over-prediction of liquefaction deformations shows that soil profiles that consist of highly interbedded deposits, with few layers of clean sands, having liquefiable layers that are predominantly silty sands, and that lack vertical connectivity between liquefiable layers, will likely perform better than the standard analysis methods would predict (Cubrinovski et al, 2017). The soil profiles at this site are very much of this nature.

Therefore, based on the CPT-based assessment the land, and backed up by its performance in the Canterbury Earthquake Sequence, we advise that this subdivision in its pre-construction state could be characterised by performance that is TC2-like at SLS levels of shaking, and TC3-like at ULS levels of shaking. The construction of the subdivision has included the excavation of the existing ground, placement of a geogrid, and filling with compacted sandy gravel hardfill. Therefore, the entire site could be regarded as being TC2-like for the purposes of foundation performance. A concept sketch of this is included in Appendix 4.

6.2 Foundation Construction

As discussed in Section 6.1 above, the construction of the subdivision included the excavation of the existing ground, placement of a geogrid, and filling with compacted sandy gravel hardfill. Therefore, from a seismic liquefaction viewpoint, the site will be suitable for the construction of standard TC2-type foundations for residential housing. This is subject however to foundations being specifically designed for each lot, based on site-specific shallow investigations being carried out to check for the presence of peat or other unsuitable materials. In some instances, deep piles may be required.

6.3 Seismic Category

The consistency and depth of the alluvial formations underlying this site makes it a ‘Class D’ site in terms of the seismic design requirements of NZS1170.5:2004.

6.4 Pavement Design

Scala penetrometer testing carried out by others indicates that below the topsoil depth a CBR value of 3 could generally be adopted for pavement design.

7.0 SUMMARY & CONCLUSIONS

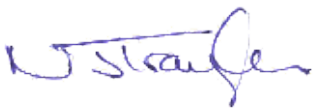
Ground conditions consist of 0.4m of topsoil (and a small amount of fill to depths of up to 0.75m in some locations) overlying a surface layer of silt. This very loose to loose silt layer (with occasional sand layers) extends to 2m depth over much of the western two thirds of the site, deepening to 3m in the eastern end of the site. Within these silty materials are some inclusions or lenses of peat – often 100-200mm in thickness, but in some locations up to 500mm thick. Below this are highly interbedded layers of very loose to medium dense sand, silty sand and silt, to between 13m and 14.3m depth, where a very dense gravel layer is struck. In the central region of the site an intermediate dense to very dense gravel layer (1.5m – 2m thick) also exists, at 8m to 9m below ground level.

Liquefaction assessments and site performance in the 2010-2011 Canterbury Earthquake Series indicate minor land deformations at SLS levels of shaking for the site, and moderate to significant deformations at ULS. The land was assessed as having hybrid TC2/3-like performance – however the subdivision construction included the excavation of the existing ground, placement of a geogrid, and filling with compacted sandy gravel hardfill. Therefore, from a seismic liquefaction viewpoint, the site will be suitable for the construction of standard TC2-type foundations for residential housing. This is subject however to foundations being specifically designed for each lot, based on site-specific shallow investigations being carried out to check for the presence of peat or other unsuitable materials below the depth of the ground improvement. In some instances, deep piles might be required.

It is our opinion that the land is suitable for the construction of a residential buildings provided a shallow investigation is carried out at building consent stage and engineered foundations are specifically designed for each section.

Yours faithfully,

Geotech Consulting Ltd per:



Nick Traylen BE(Civil) (Hons) FEngNZ CPEng MICE CEng

CPEng 119170

8.0 LIMITATIONS

This report has been prepared solely for the benefit of, and under specific instruction from the Aphrodite Ltd as our client with respect to the brief, for use for this specific project. The reliance by other parties on the information or opinions contained in the report shall be at such parties' sole risk.

Recommendations and opinions (not to be construed as guarantees) in this report are based on data from boreholes and probings, including data provided by others. The borelogs are an engineering interpretation of the subsurface conditions. The nature and continuity of subsoil conditions away from the test locations are inferred and it must be appreciated that actual conditions could vary from the assumed model.

Environmental engineering is not within our area of expertise and therefore others will need to be consulted on such matters as contaminated ground issues.

During excavation and construction, the site should be examined by an Engineer or Engineering Geologist competent to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. It is possible that the nature of the exposed subsoils may require further investigation, and the modification of any design work that may have been based on this report.

It is important that Geotech Consulting Ltd is contacted if there is any variation in subsoil conditions from those described, as well as any variation in the property damage discussed in this report, as it may affect opinions expressed and any design parameters recommended in this report.

Regulatory and insurance issues may arise from some of the recommendations in this report; the client should seek independent advice on these aspects. This opinion is not intended to be advice that is covered by the Financial Advisers Act 2010.

9.0 REFERENCES

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Appendix 1

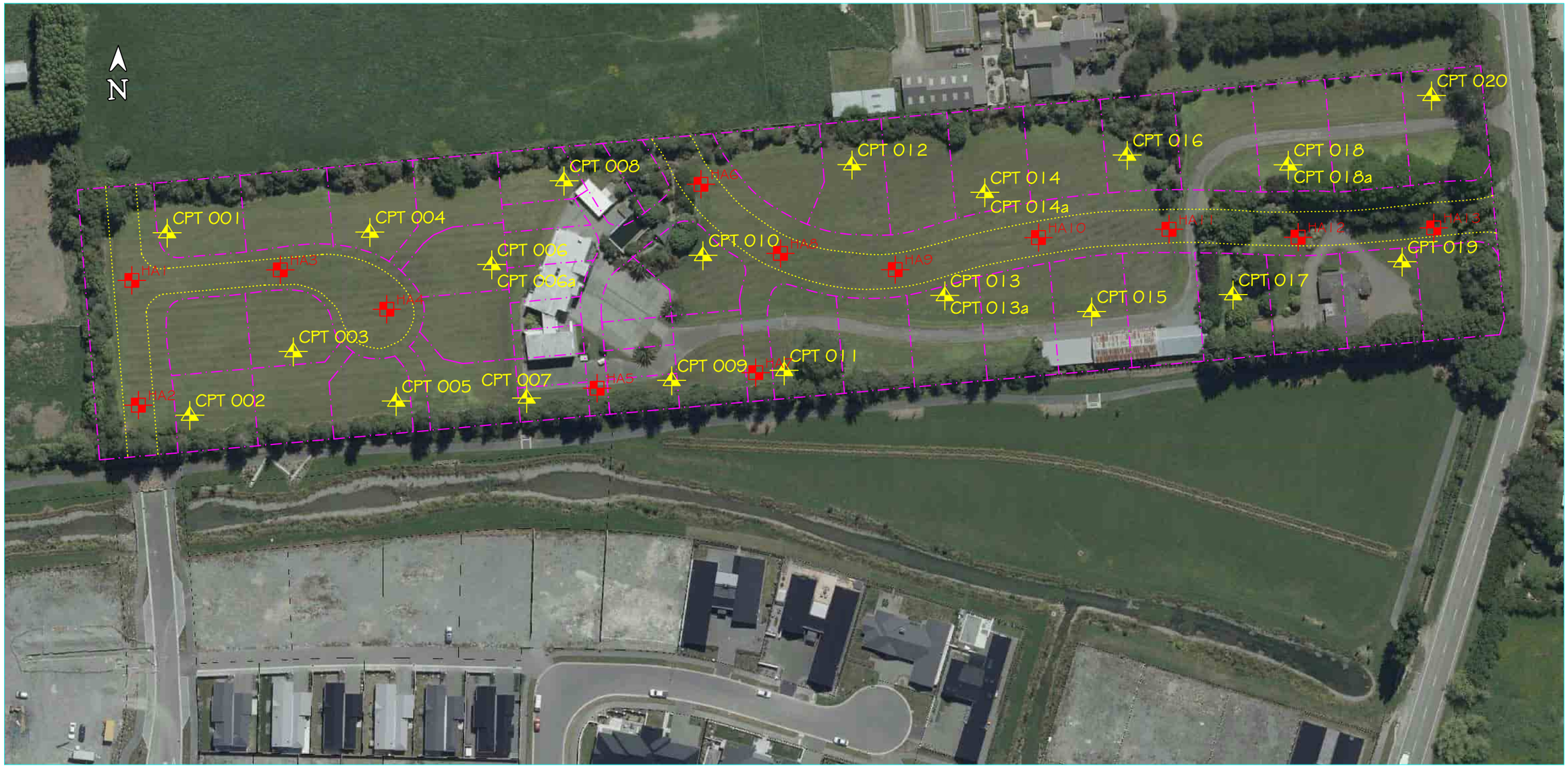
Site Plan & Land Damage Records

HA1 Hand Auger Borehole

CPT 001 Cone Penetrometer Test

Lot Boundary

Road Location



GEOTECH consulting ltd

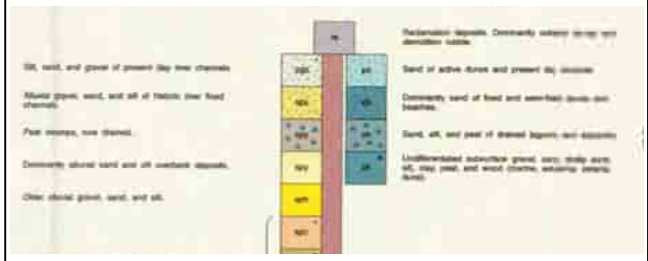
PROJECT:
275 HIGHSTED ROAD
CASEBROOK
CHRISTCHURCH

DRAWING:
SITE PLAN
SITE INVESTIGATION LOCATIONS

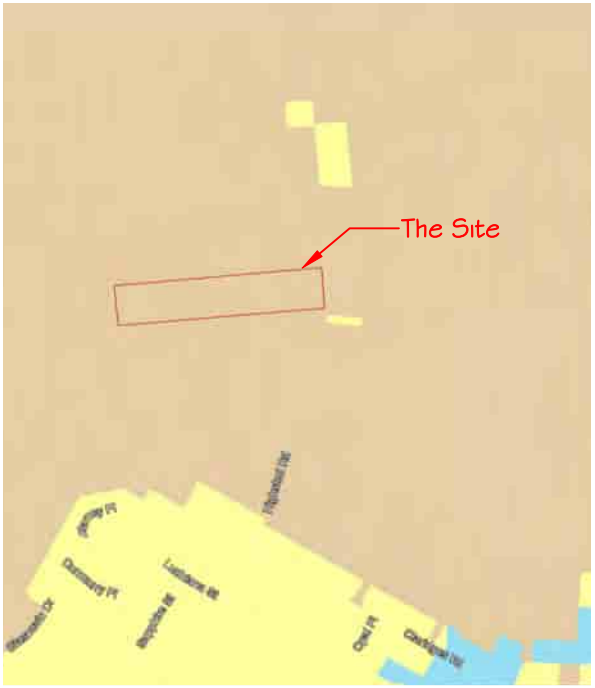
ISSUE	DATE	AMENDMENT DETAILS	CHKD
A			

SCALES:			
1:1200 @ A3	DESIGNED	NJT	09/20
	DRAWN	NJT	09/20
	CHECKED		

PROJECT No.	SHEET No.	ISSUE
6096	1	A



Geological Map 1:30,000

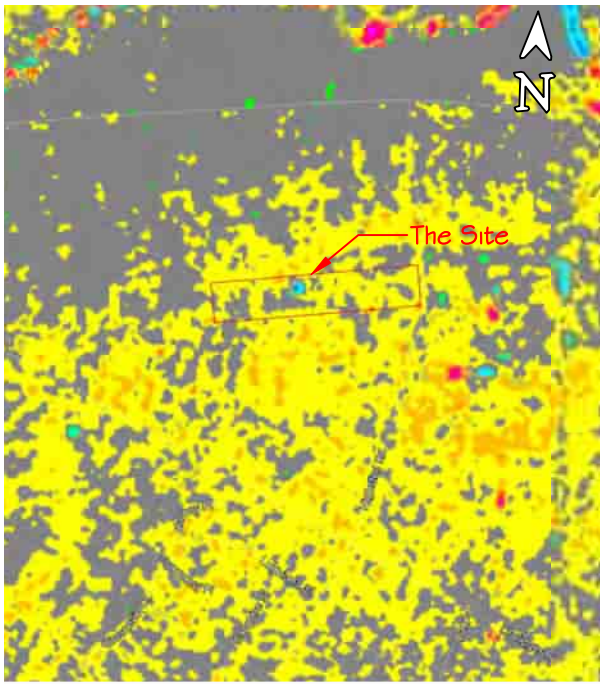


Technical Category 1
Technical Category 2
Technical Category 3
N/A - Urban Nonresidential
N/A - Rural & Unmapped
N/A - Port Hills & Banks Peninsula

CERA Residential Red Zone

Red Zone

MBIE Technical Categories 1:15,000



+ Upifted

1.0 to 1.5 m
0.5 to 1.0 m
0.4 to 0.5 m
0.3 to 0.4 m
0.2 to 0.3 m
0.1 to 0.2 m
-0.1 to 0.1 m
-0.2 to -0.1 m
-0.3 to -0.2 m
-0.4 to -0.3 m
-0.5 to -0.4 m
-1.0 to -0.5 m
-1.5 to -1.0 m

- Subsided

1:15,000

Lidar Settlements Sept 2010 - June 2011

GEOTECH consulting ltd

PROJECT:
275 Highsted Road
Christchurch

DRAWING:
Various Land Damage Observations

ISSUE	DATE	AMMENDMENT DETAILS	CHKD

SCALES: various @ A4 approx

DESIGNED	NJT	02/20
DRAWN	NJT	02/20
CHECKED		

PROJECT No.	SHEET No.	ISSUE
6096	SK2	A

Moderate-Severe Observed Liquefaction

Minor Observed Liquefaction

No Observed Liquefaction

1:20,000

Liquefaction from Aerial Photos Feb 2011

No observed ground cracking or ejected liquefied material

Minor ground cracking but no observed ejected liquefied material

No lateral spreading but minor to moderate quantities of ejected materi

No lateral spreading but large quantities of ejected material

Moderate to major lateral spreading; ejected material often observed

Severe lateral spreading; ejected material often observed

No observations (uncoloured)

1: 6,000

Property Damage Observations Feb 2011

GEOTECH consulting ltd

PROJECT:
275 Highsted Road
Christchurch

DRAWING:
Various Land Damage Observations

ISSUE	DATE	AMMENDMENT DETAILS	CHKD

SCALES: various @ A4 approx

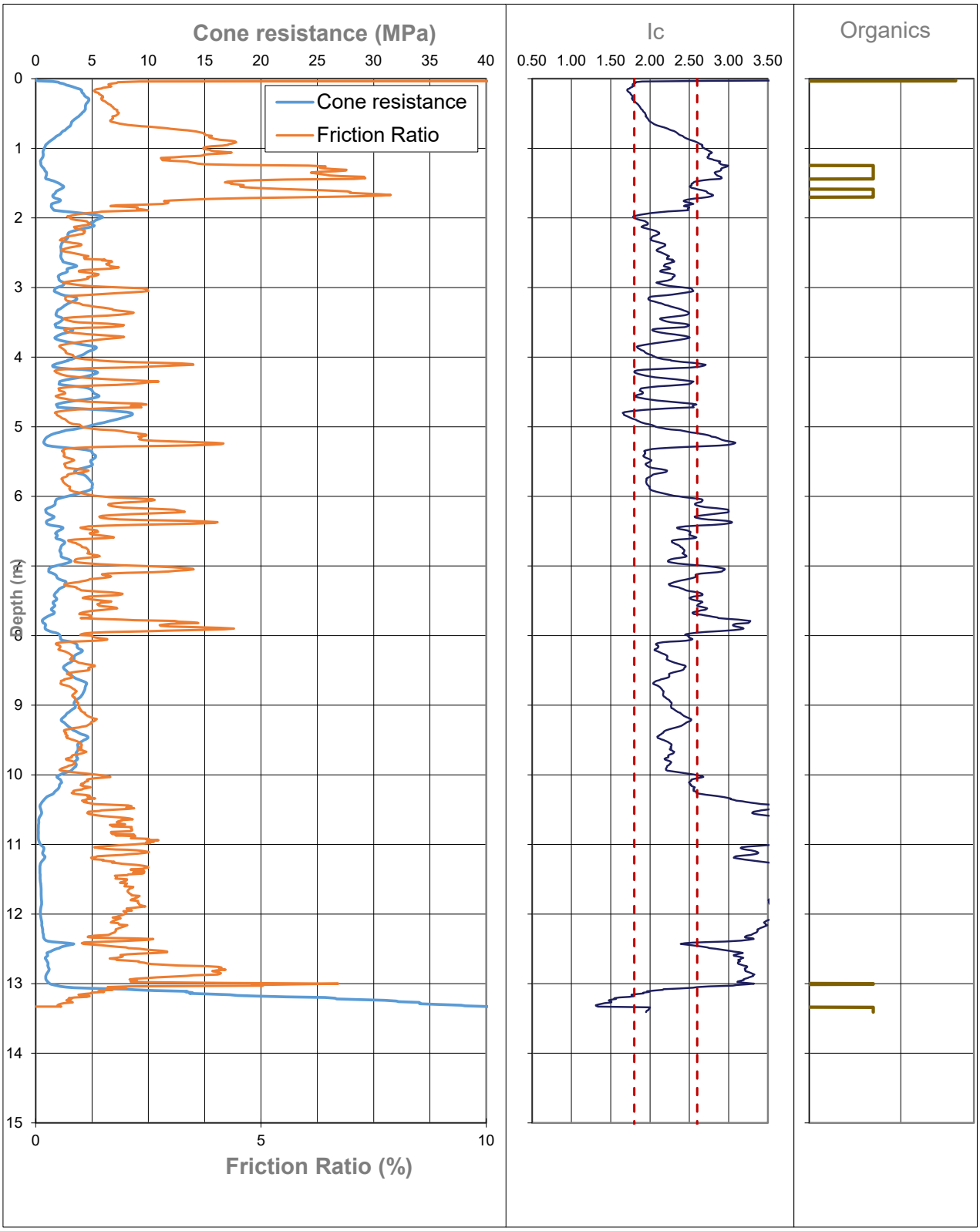
DESIGNED	NJT	02/20
DRAWN	NJT	02/20
CHECKED		

PROJECT No.	SHEET No.	ISSUE
6096	SK3	A

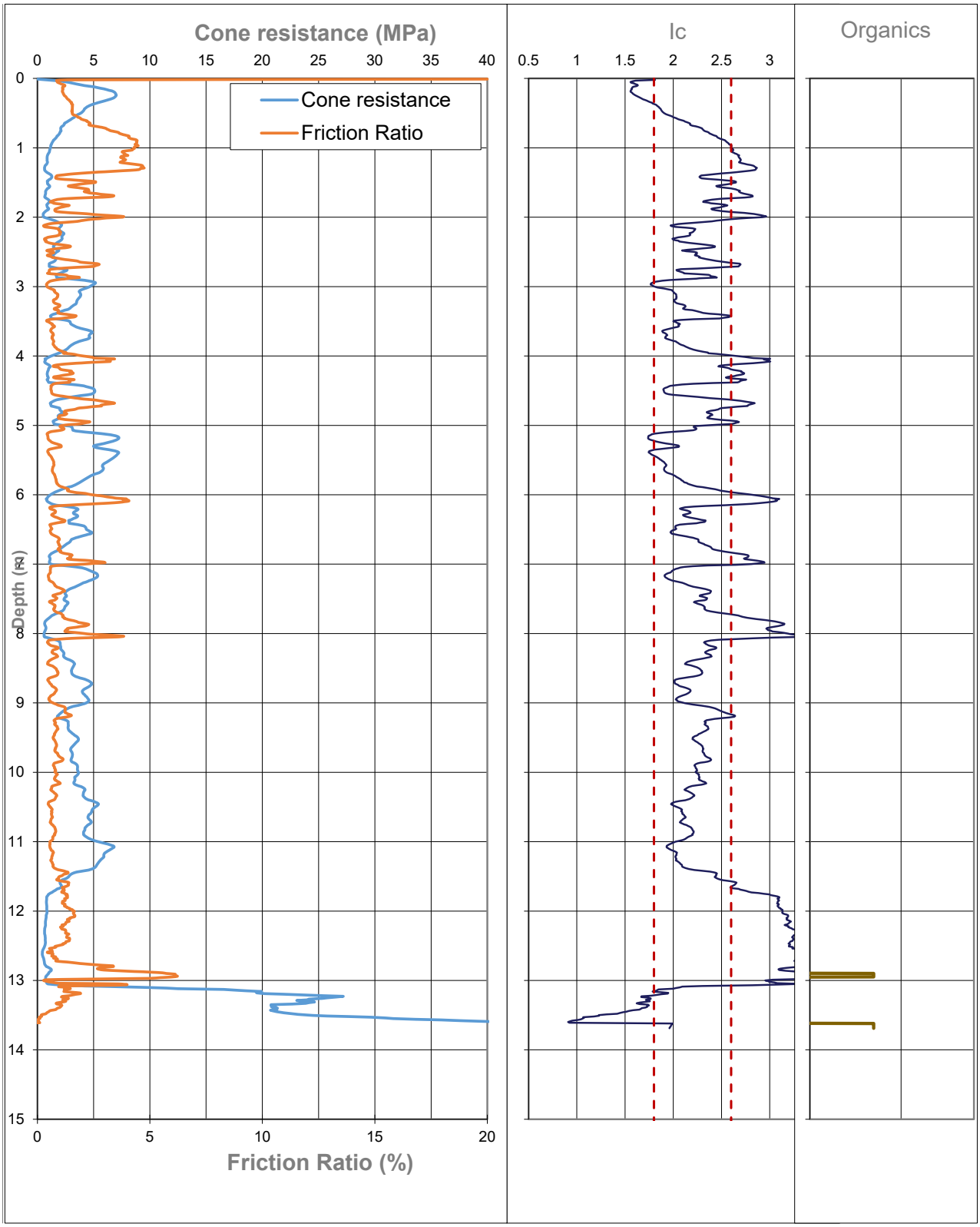
Appendix 2

CPT Profiles & Borelogs

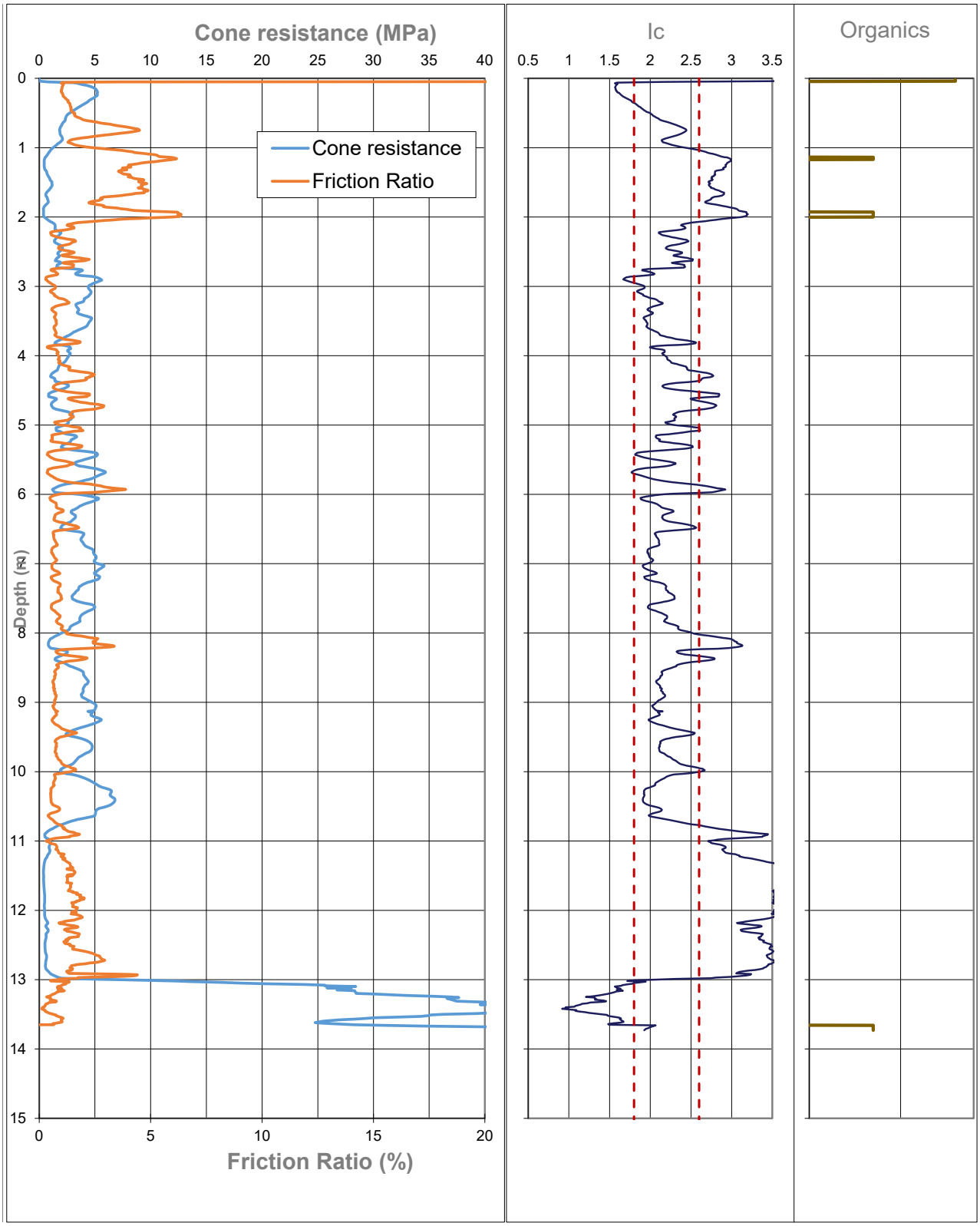
GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 001**
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 002**
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 003**
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
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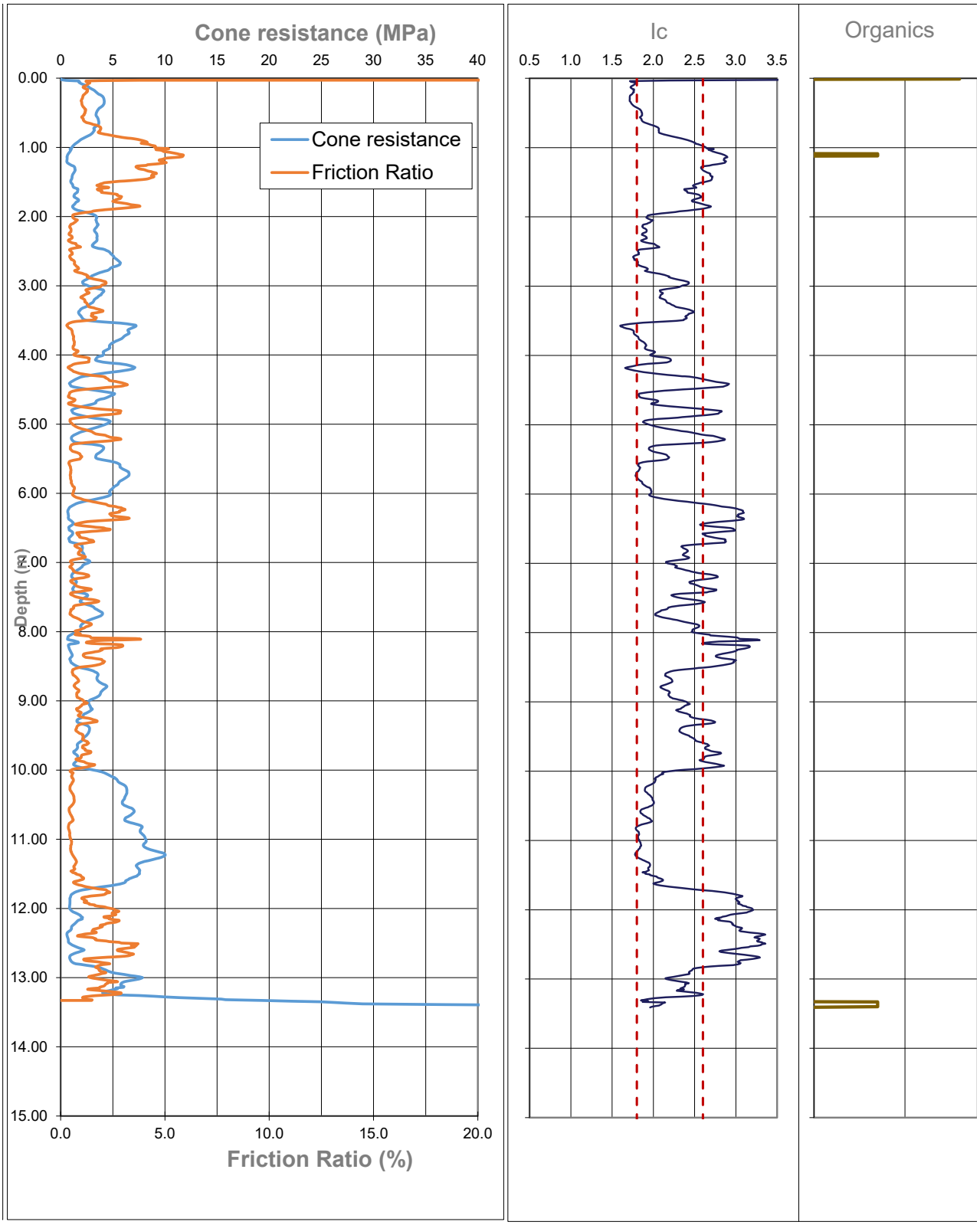
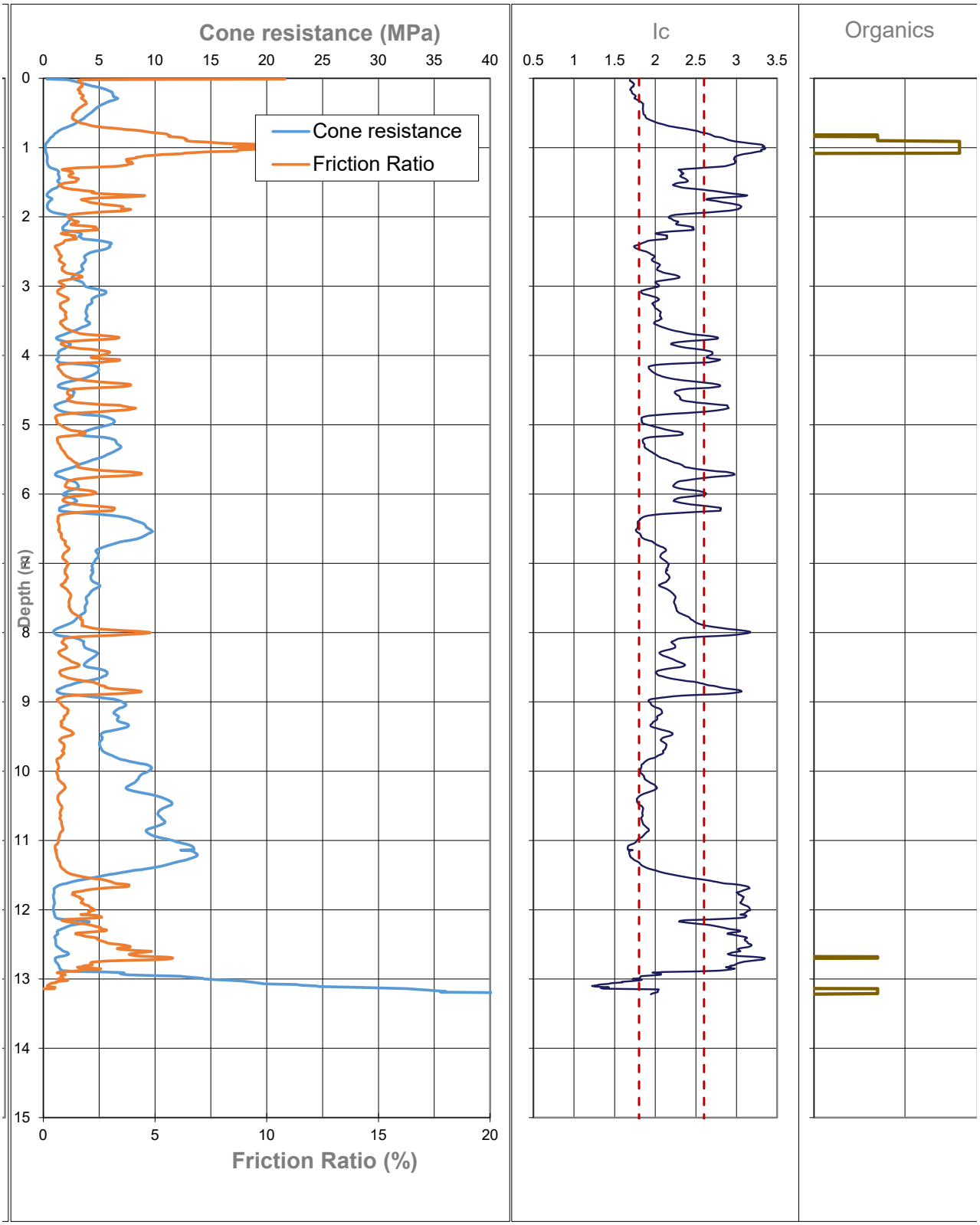
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 005**
	Client:	Aphrodite Ltd	Job No:	6096



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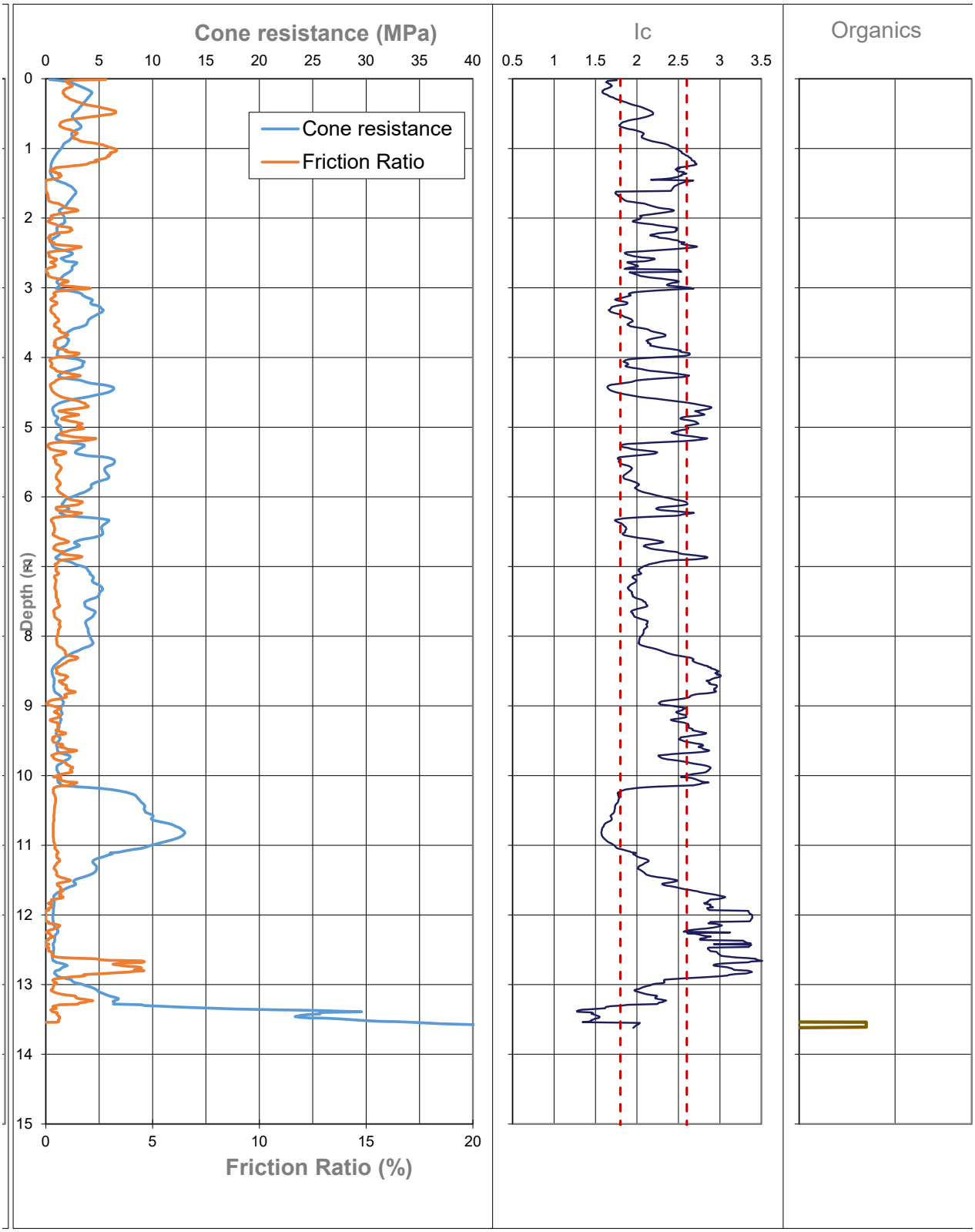
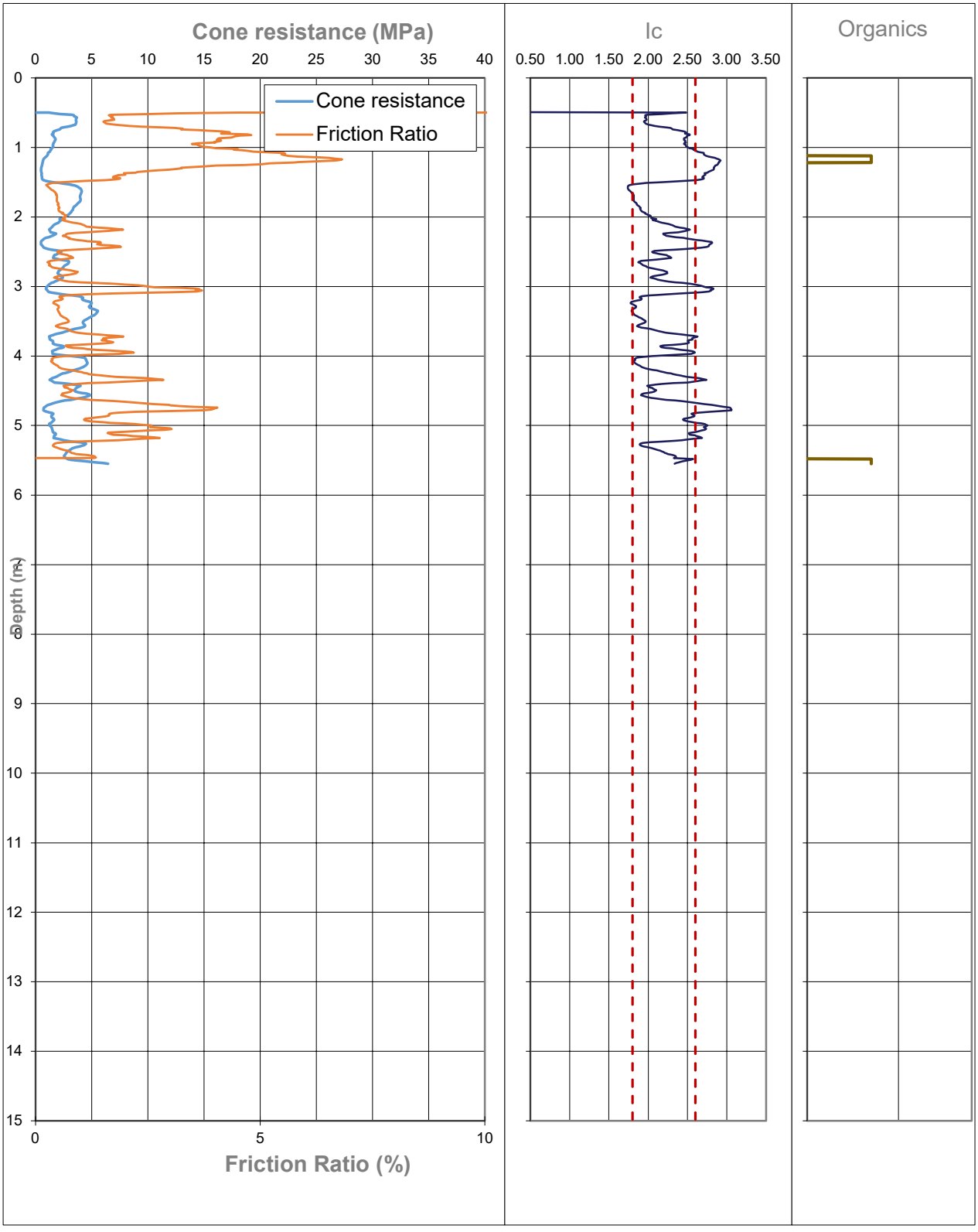
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 006a**
	Client:	Aphrodite Ltd	Job No:	6096



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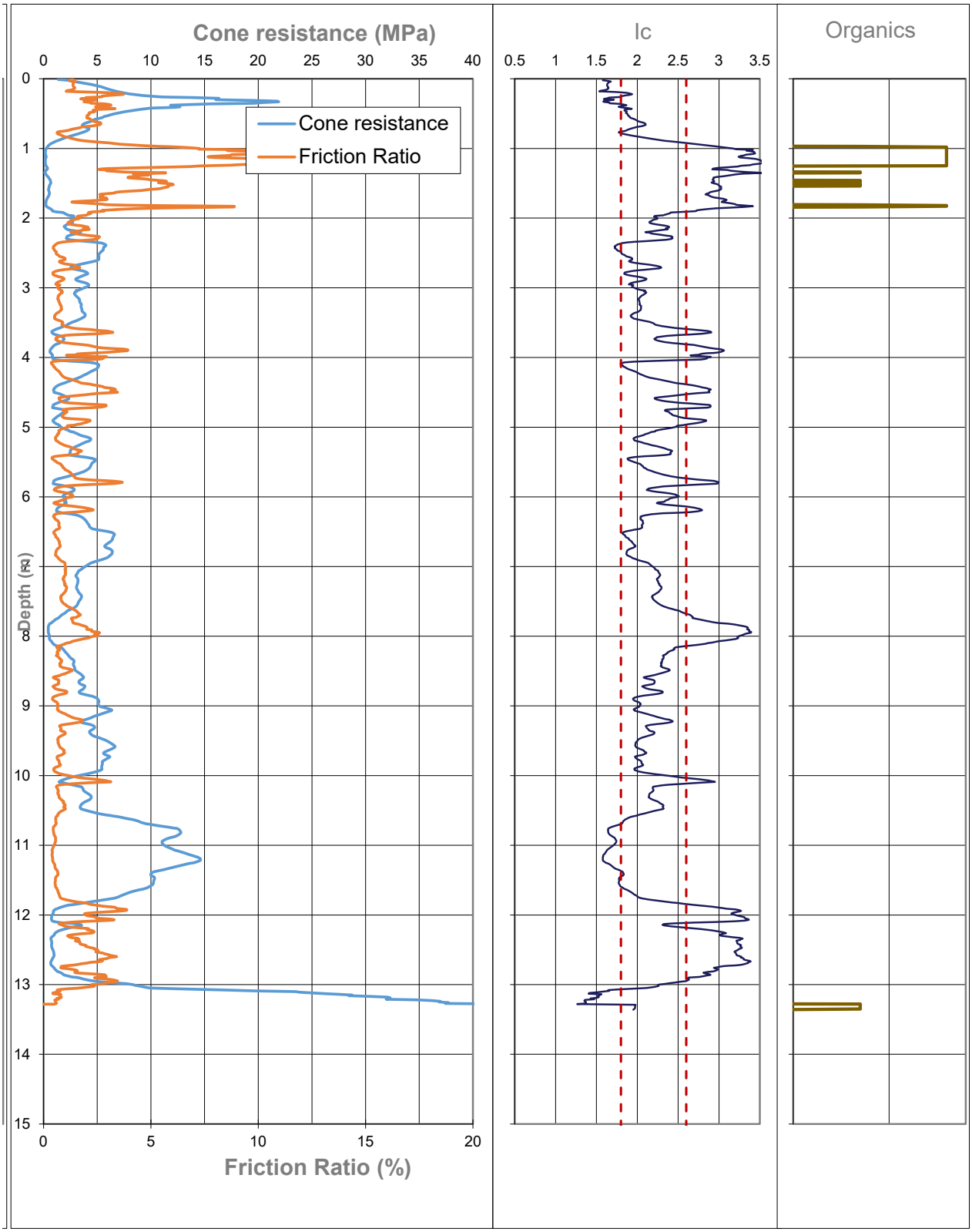
	Client:	Aphrodite Ltd	Job No:	6096



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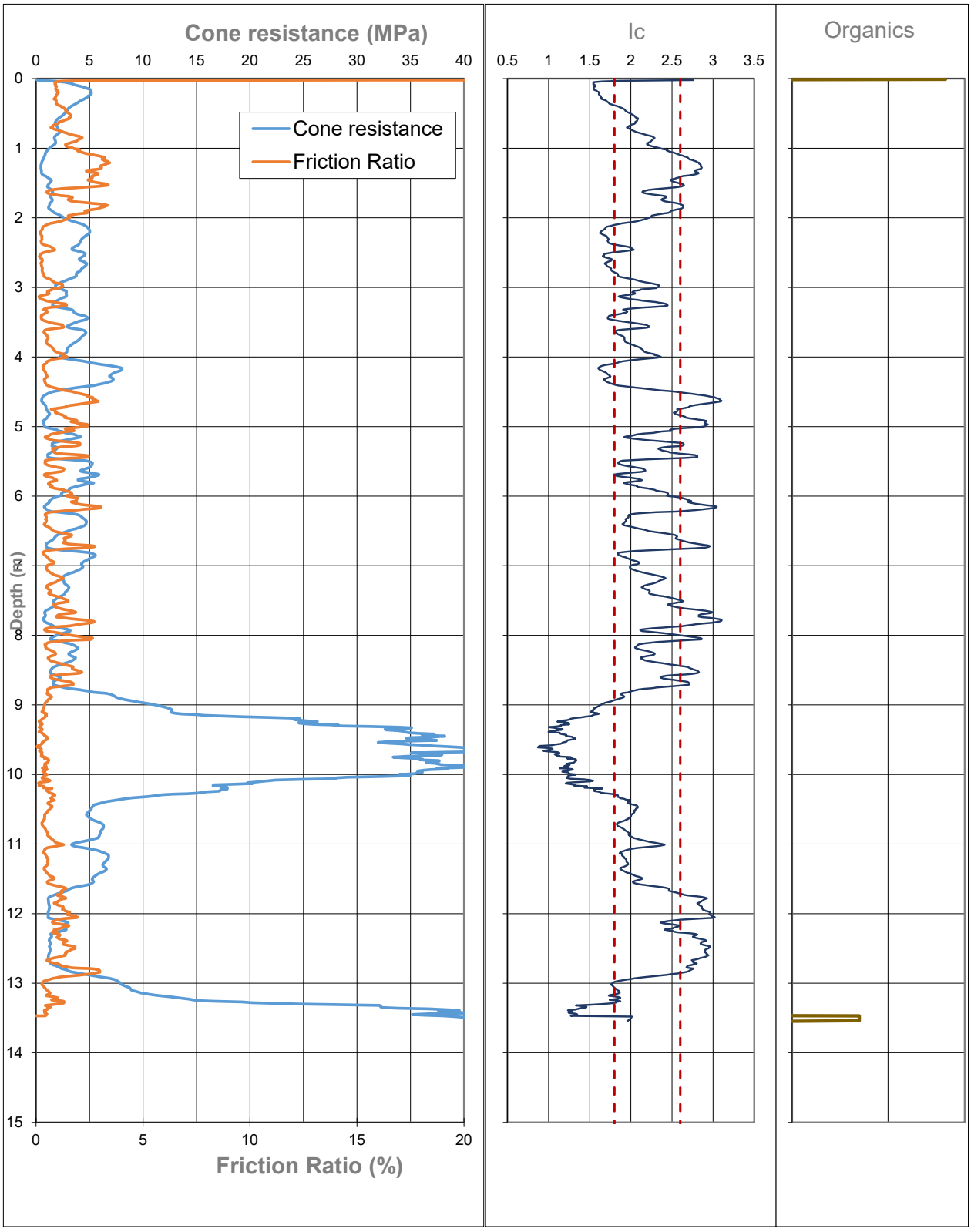
	Project:	275 Highsted Road	Hole No:	**CPT 008**
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
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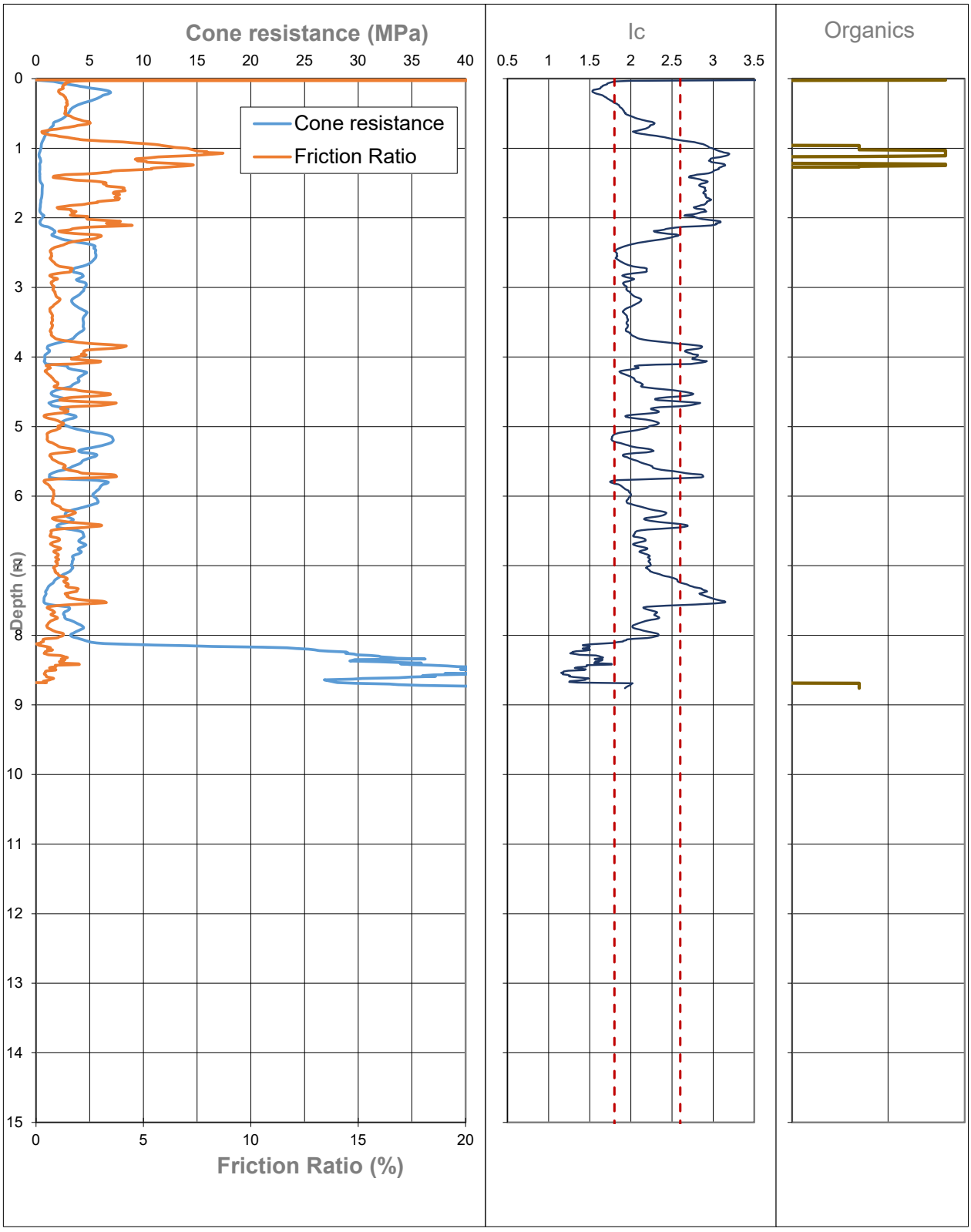
	Project:	275 Highsted Road	Hole No:	**CPT 009**
	Client:	Aphrodite Ltd	Job No:	6096



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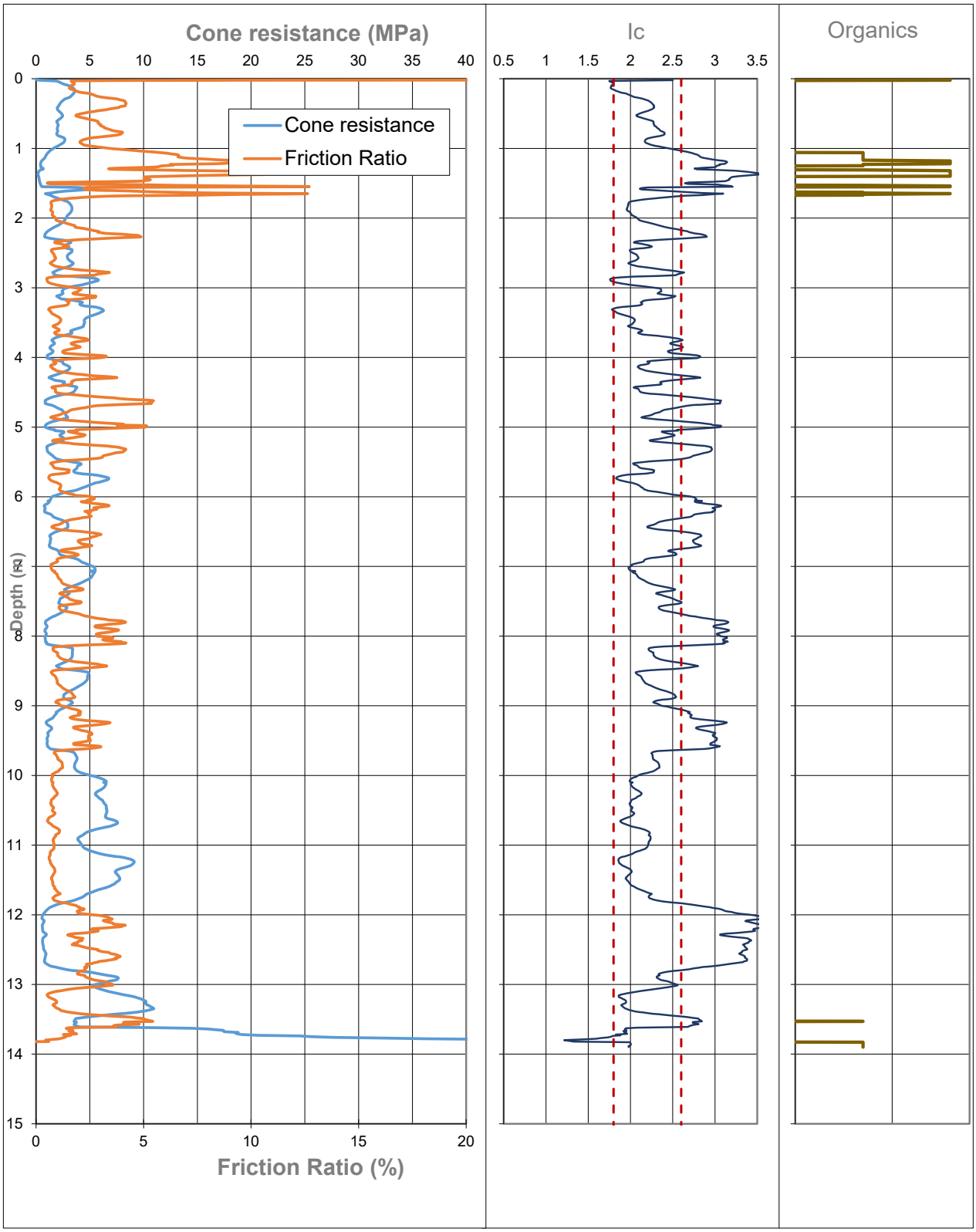
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
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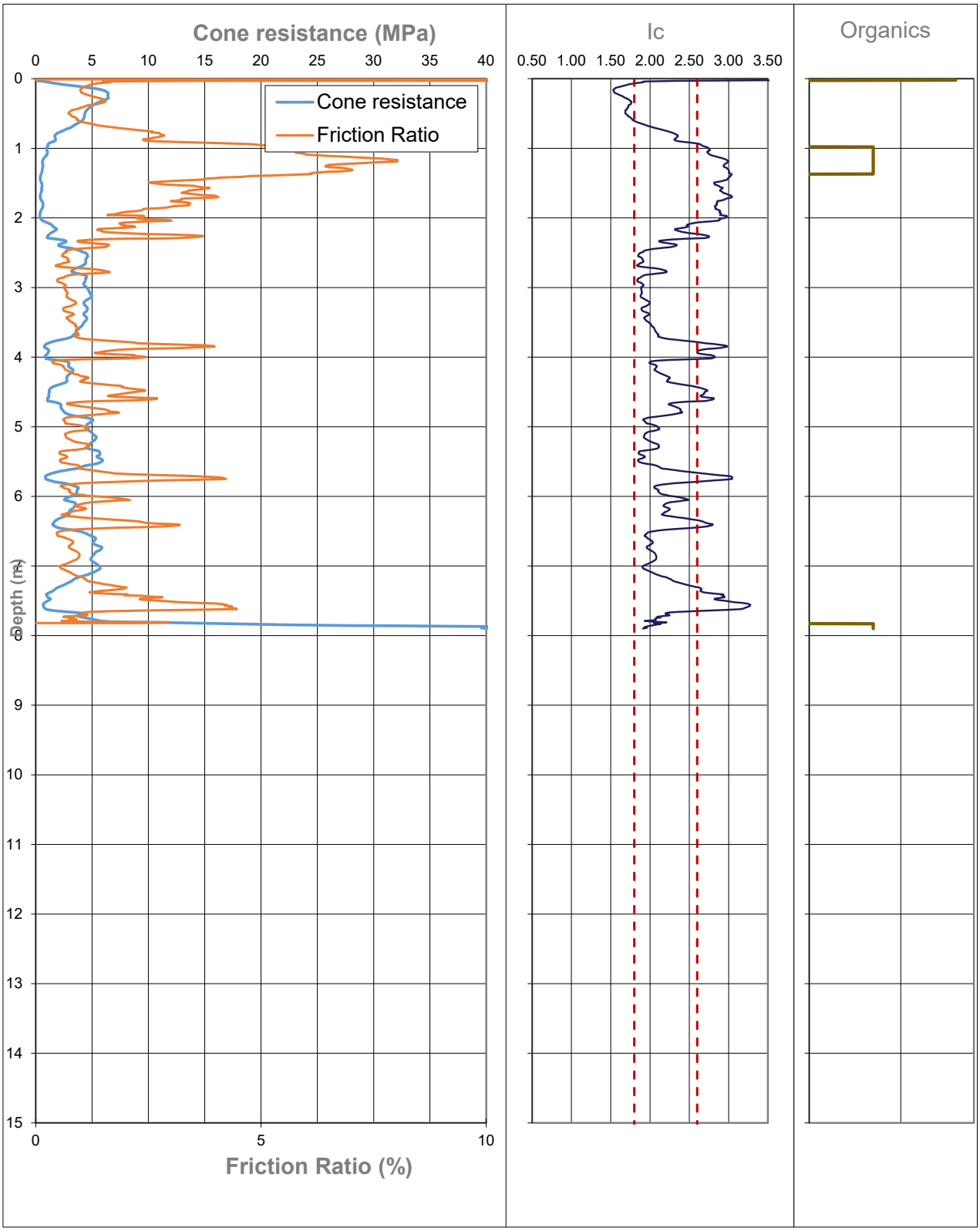
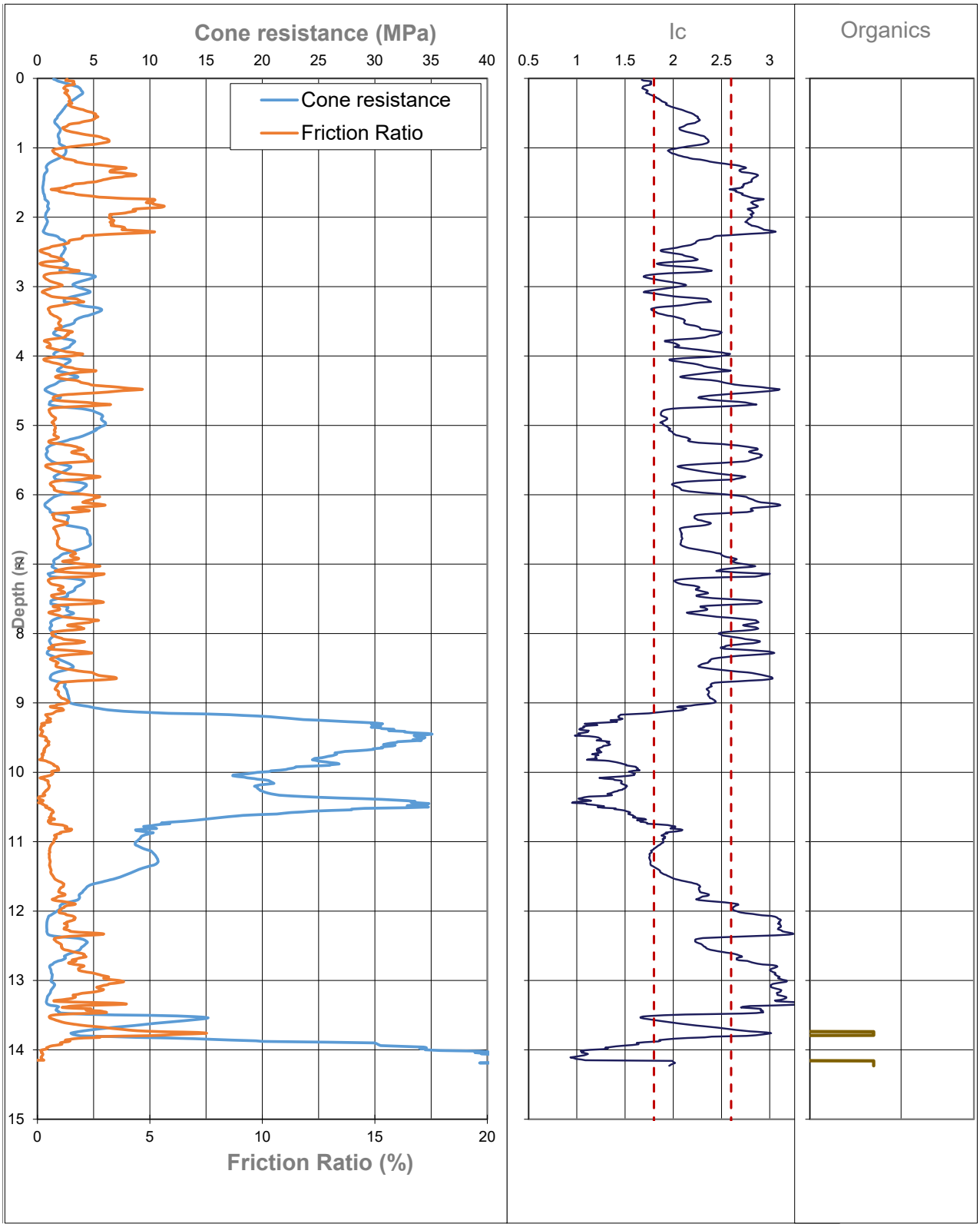
	Project:	275 Highsted Road	Hole No:	**CPT 011**
	Client:	Aphrodite Ltd	Job No:	6096



CPT Data Plots

GEOTECH CONSULTING LTD

Project:	275 Highsted Road	Hole No:	**CPT 012**
Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
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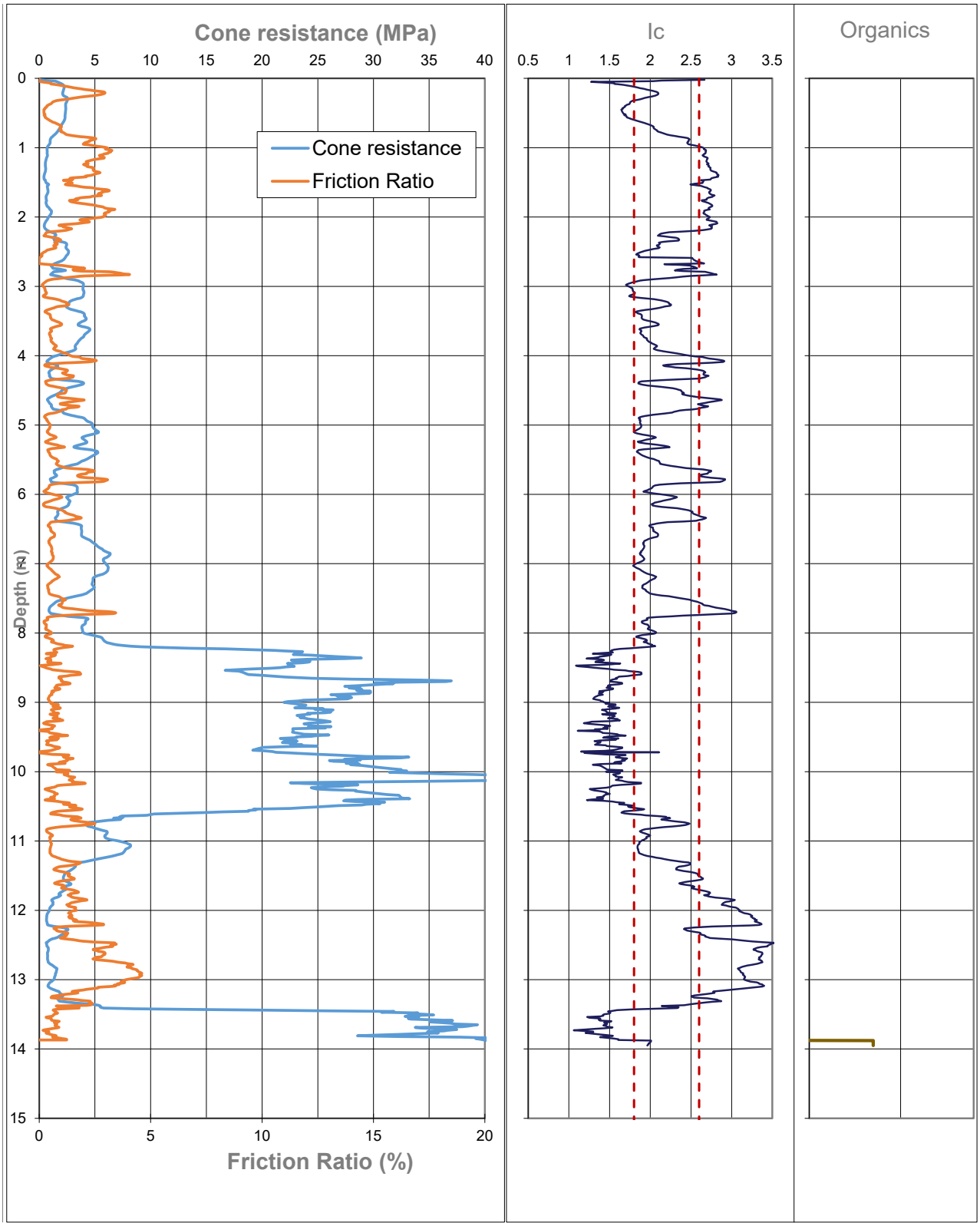
	Project:	275 Highsted Road	Hole No:	**CPT 013**
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
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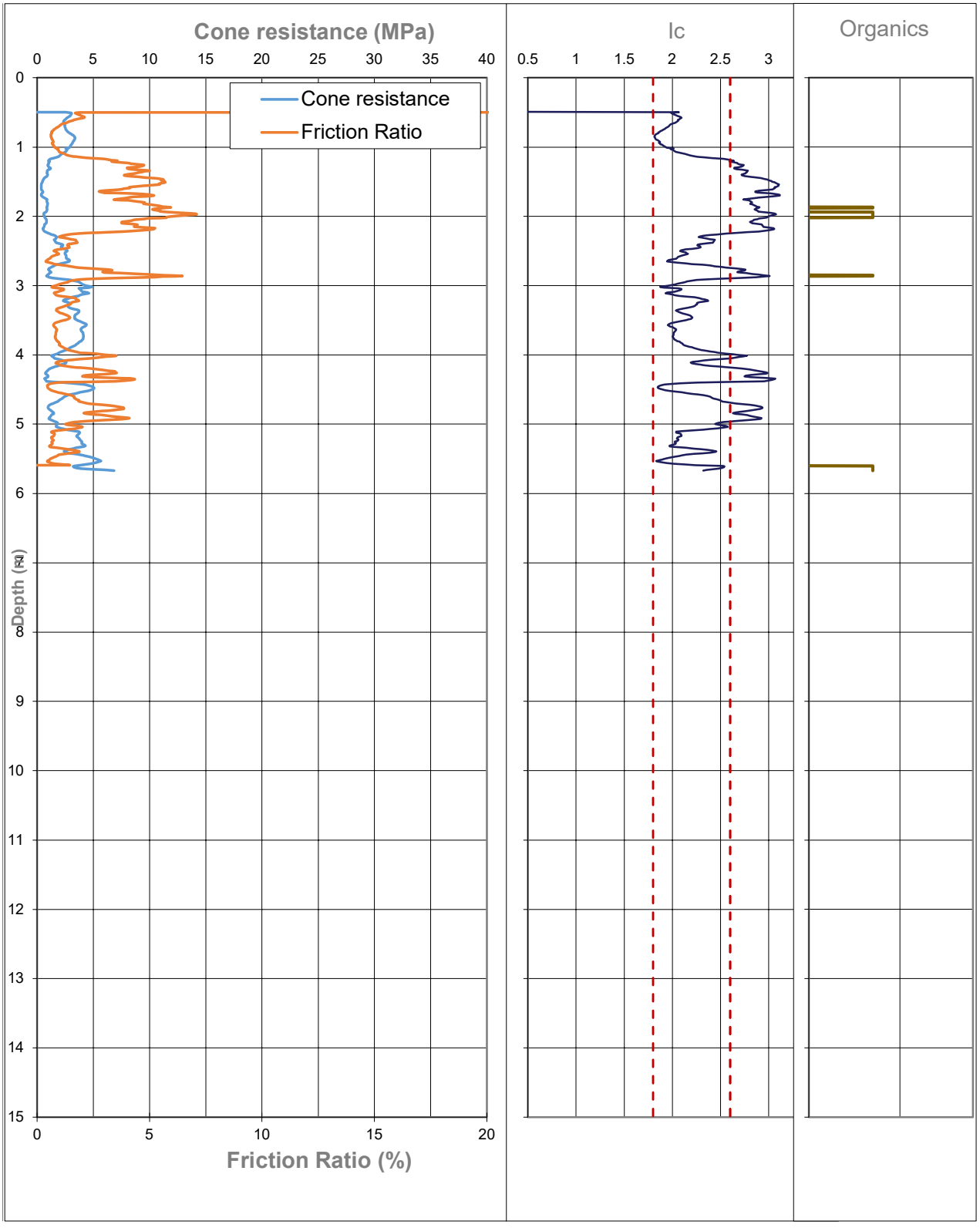
	Project:	275 Highsted Road	Hole No:	**CPT 0013a**
	Client:	Aphrodite Ltd	Job No:	6096



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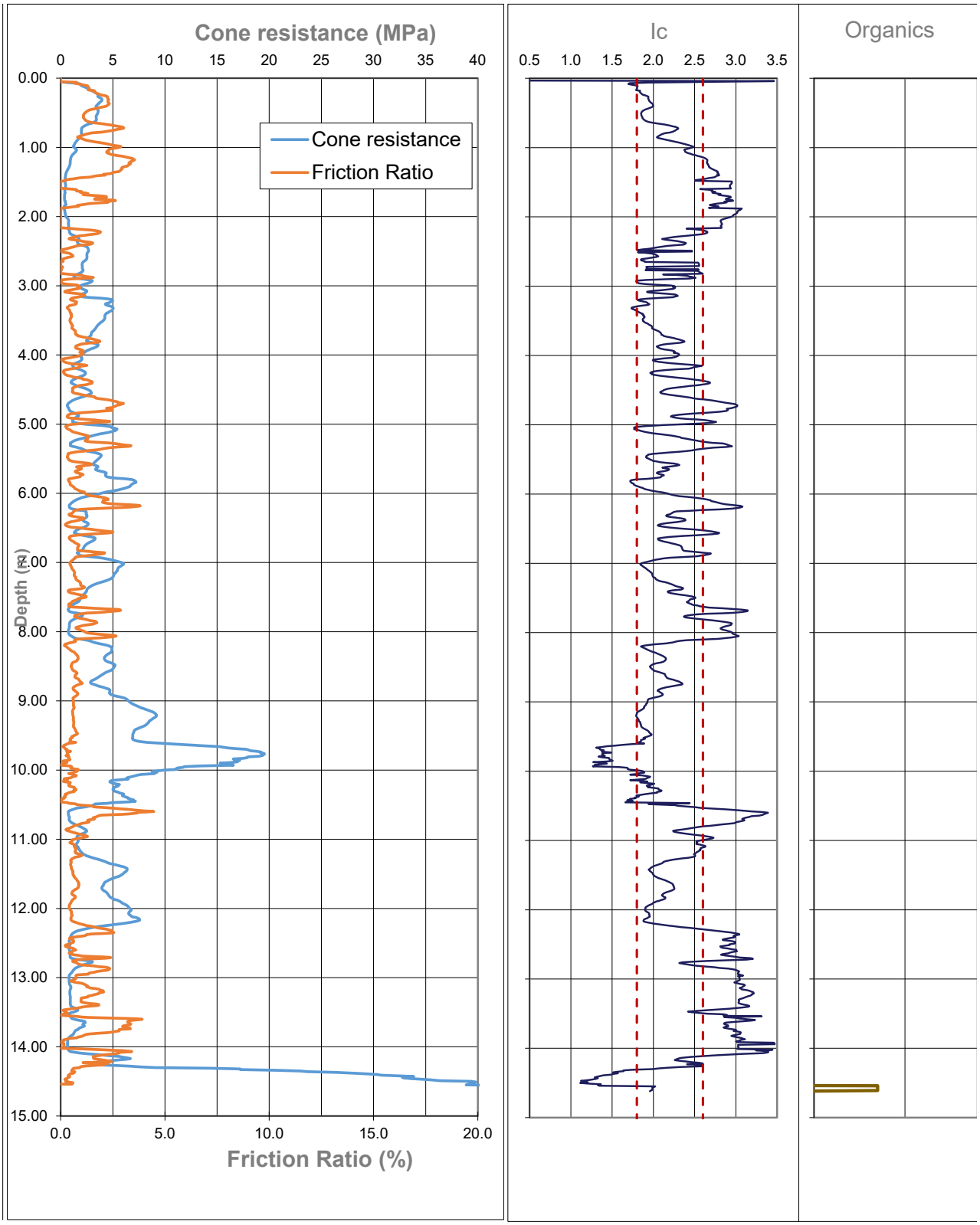
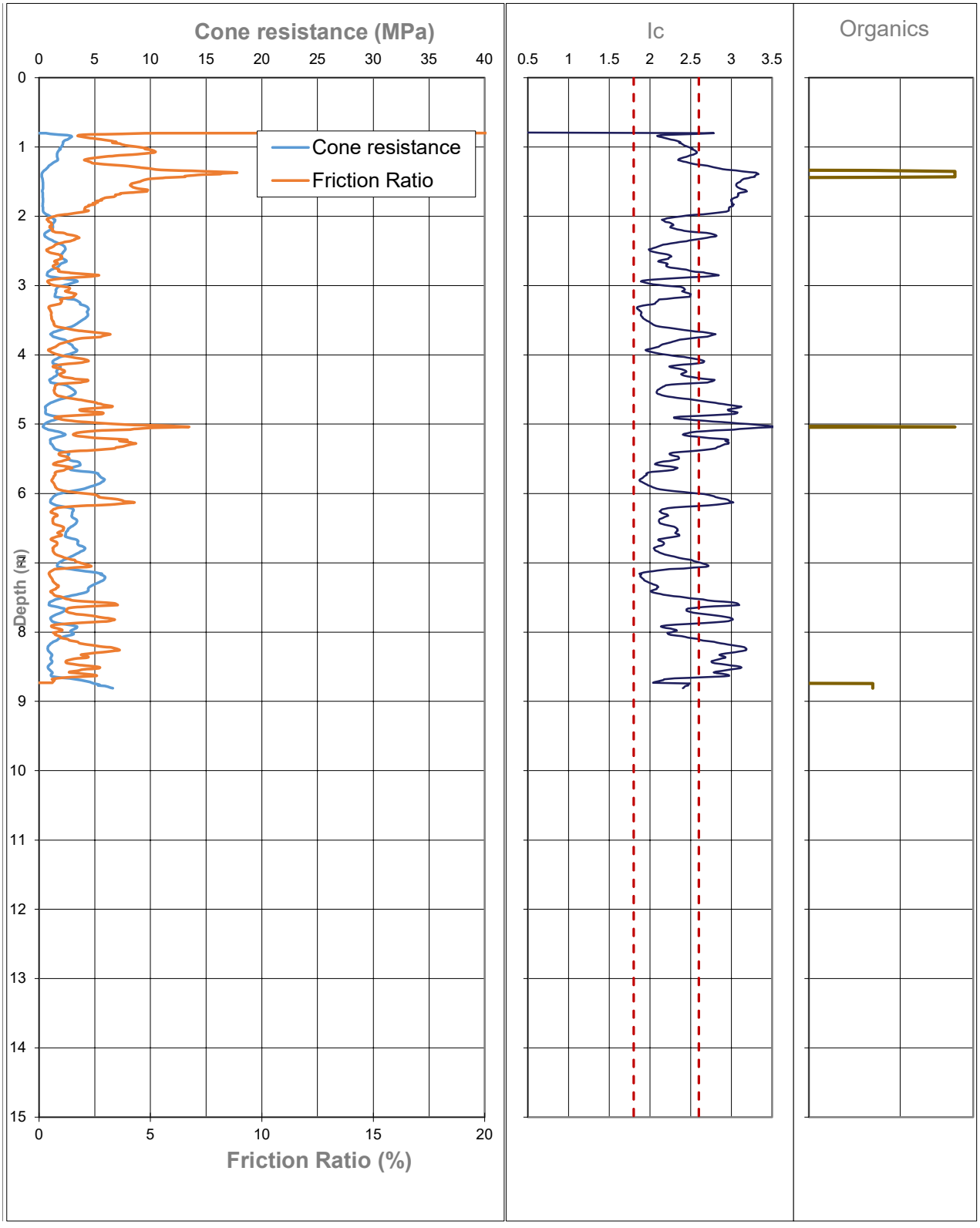
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 014a**
	Client:	Aphrodite Ltd	Job No:	6096



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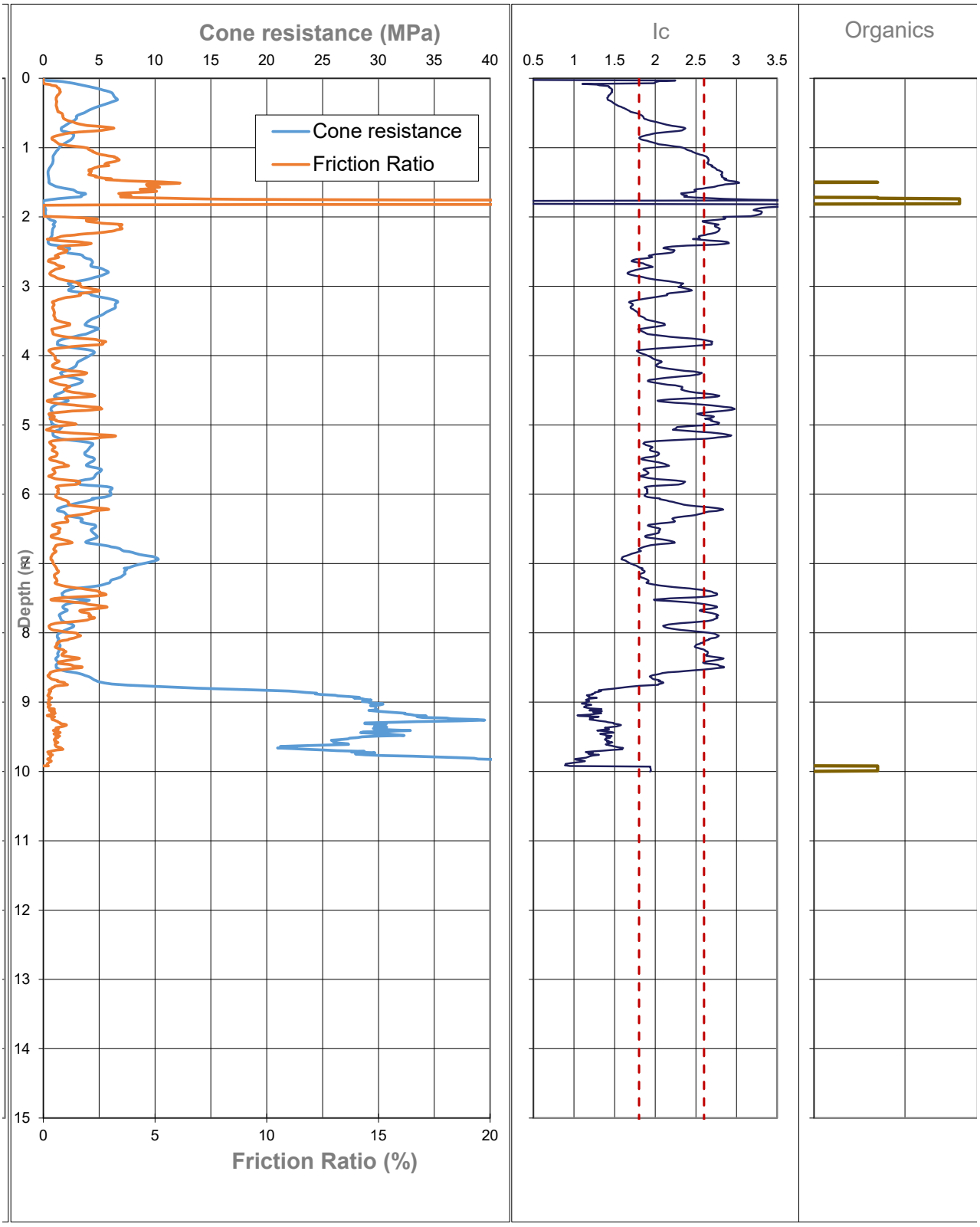
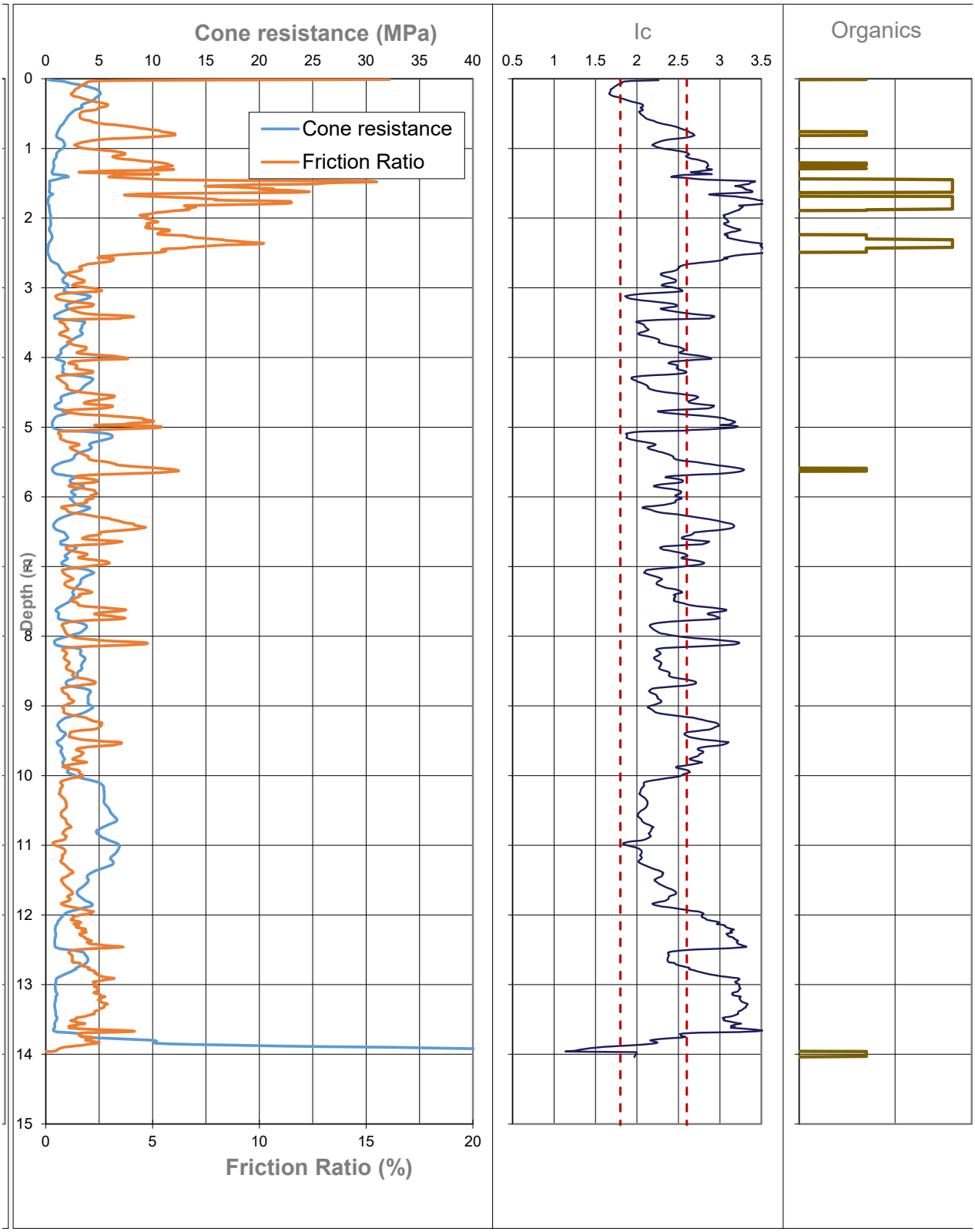
	Project:	275 Highsted Road	Hole No:	**CPT 015**
	Client:	Aphrodite Ltd	Job No:	6096



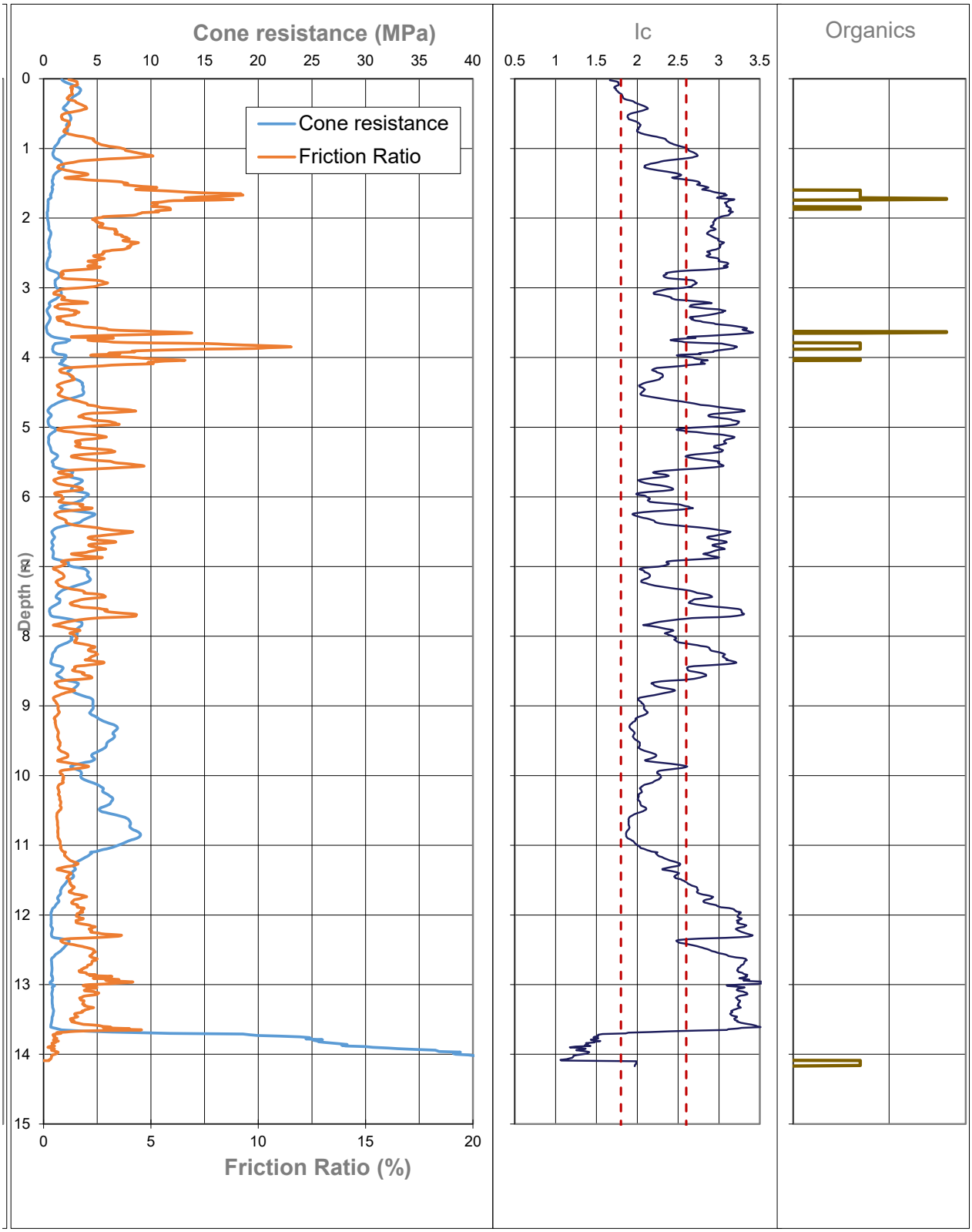
CPT Data Plots

GEOTECH CONSULTING LTD

Project:	275 Highsted Road	Hole No:	**CPT 016**
Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 017**
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
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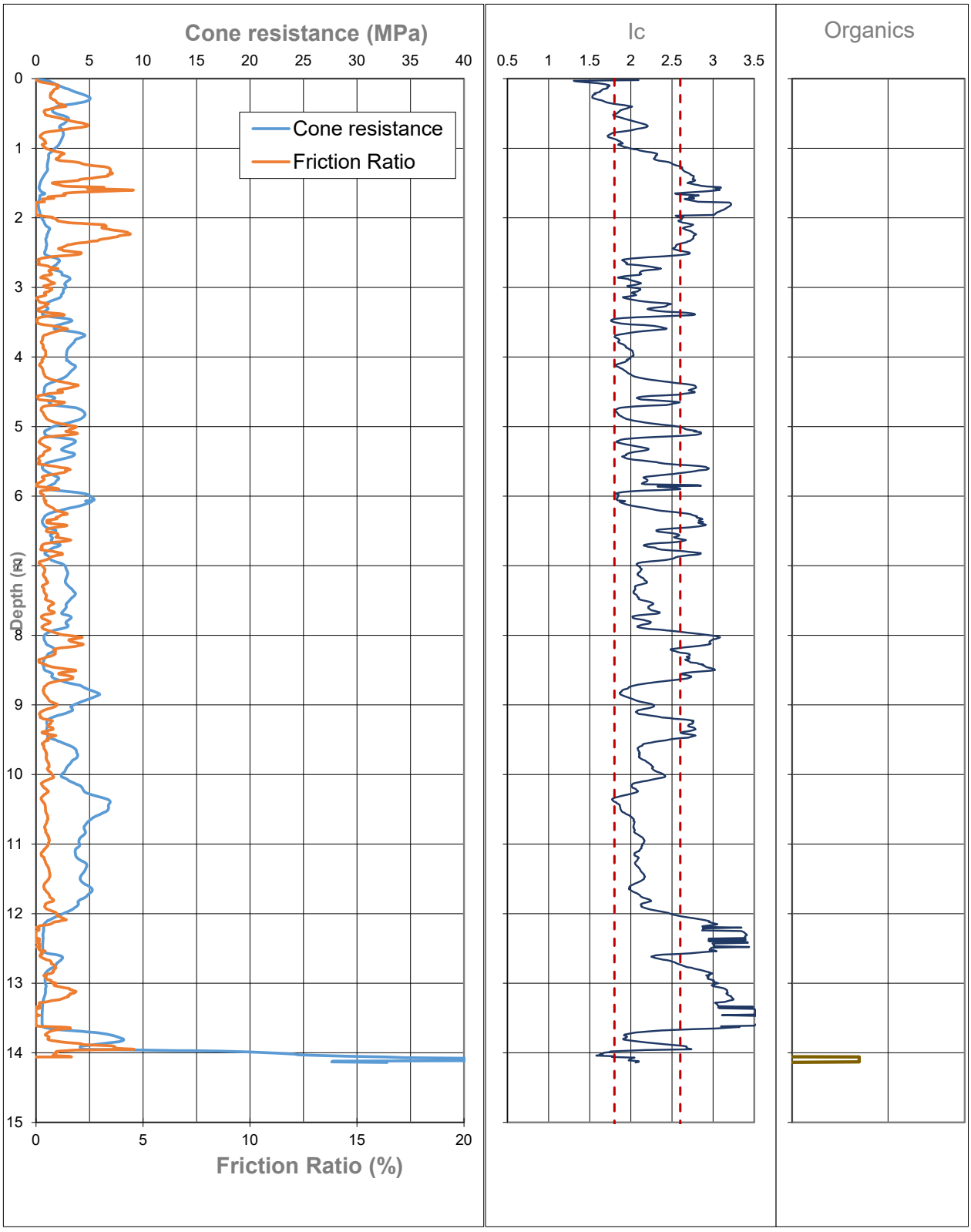
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
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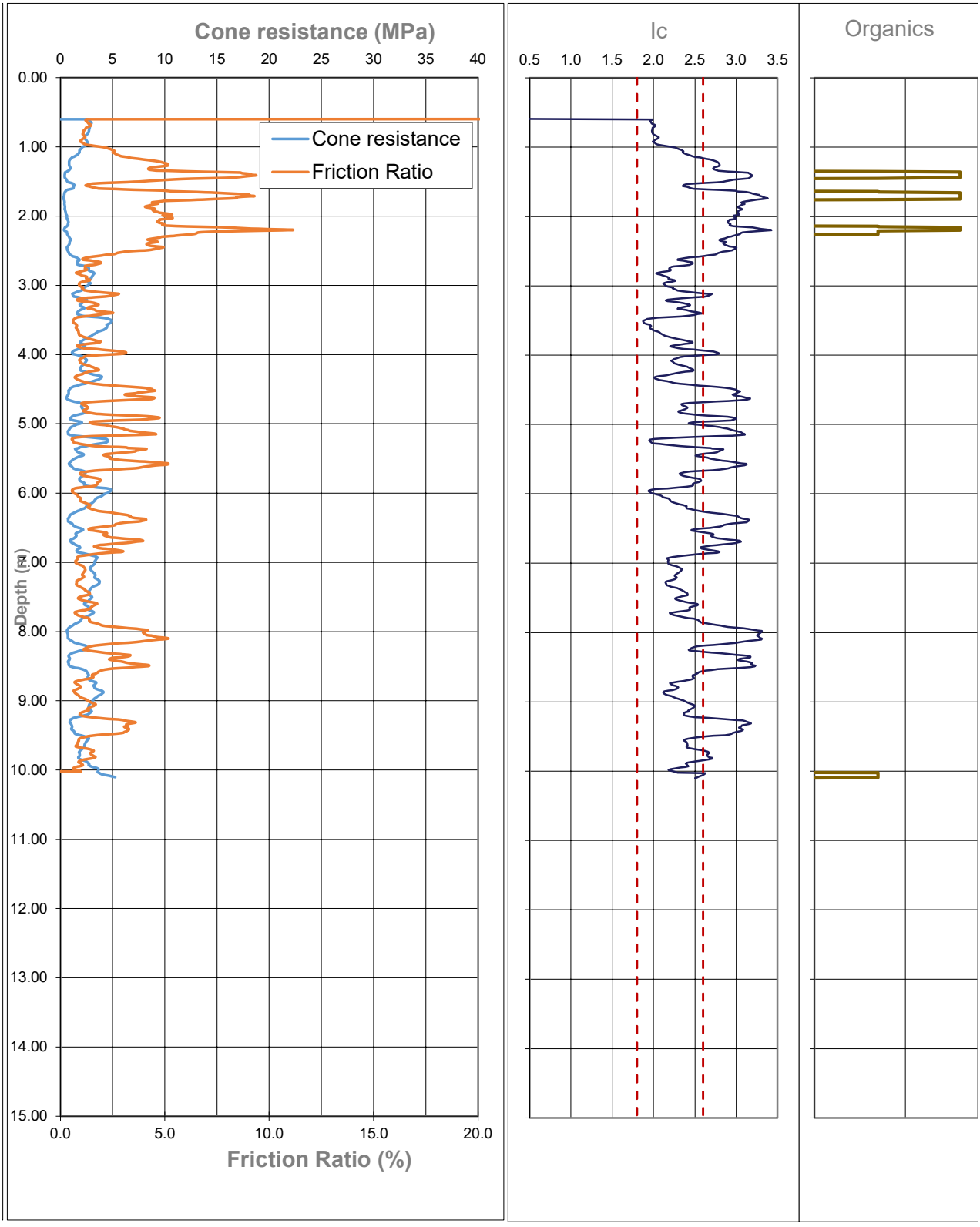
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
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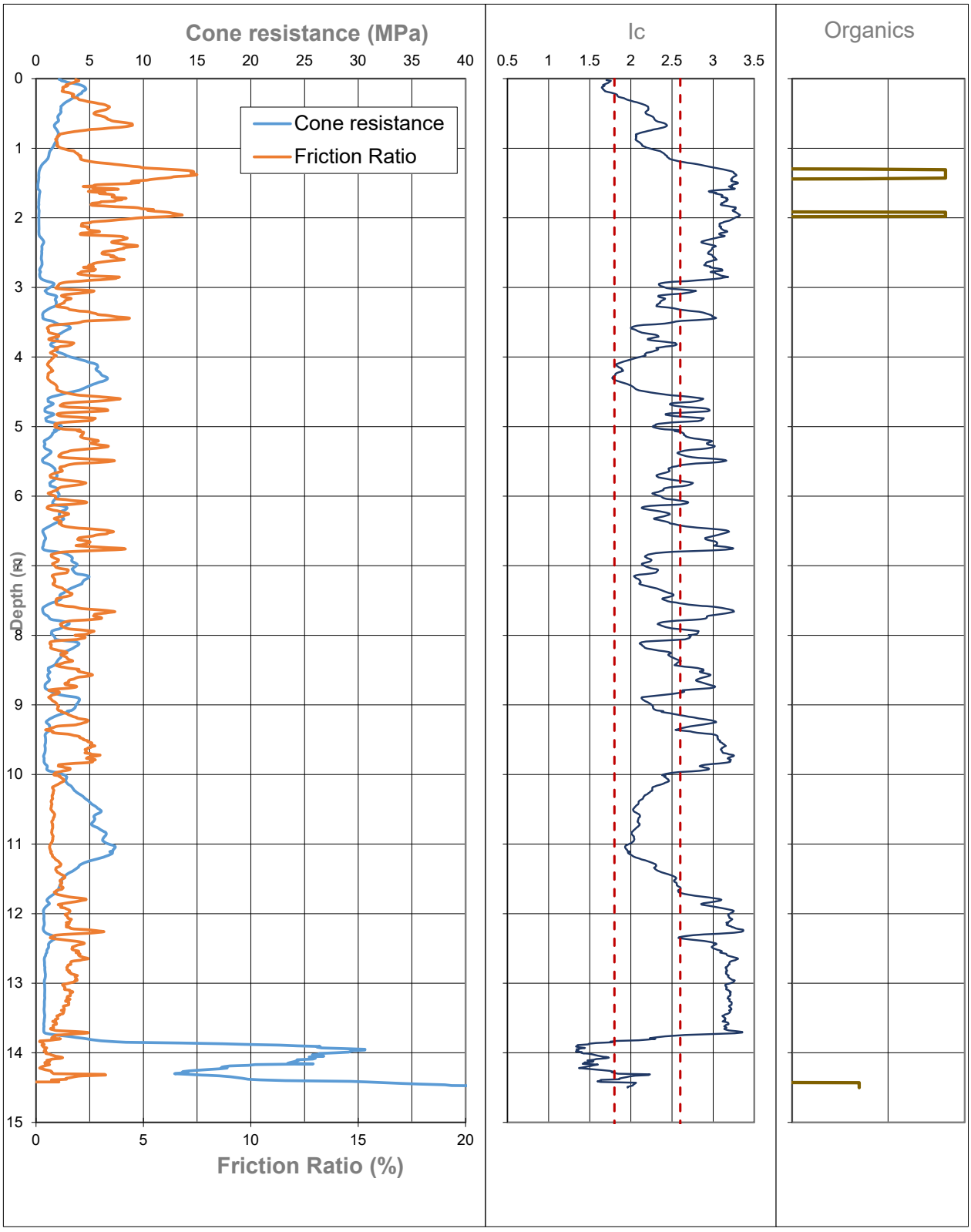
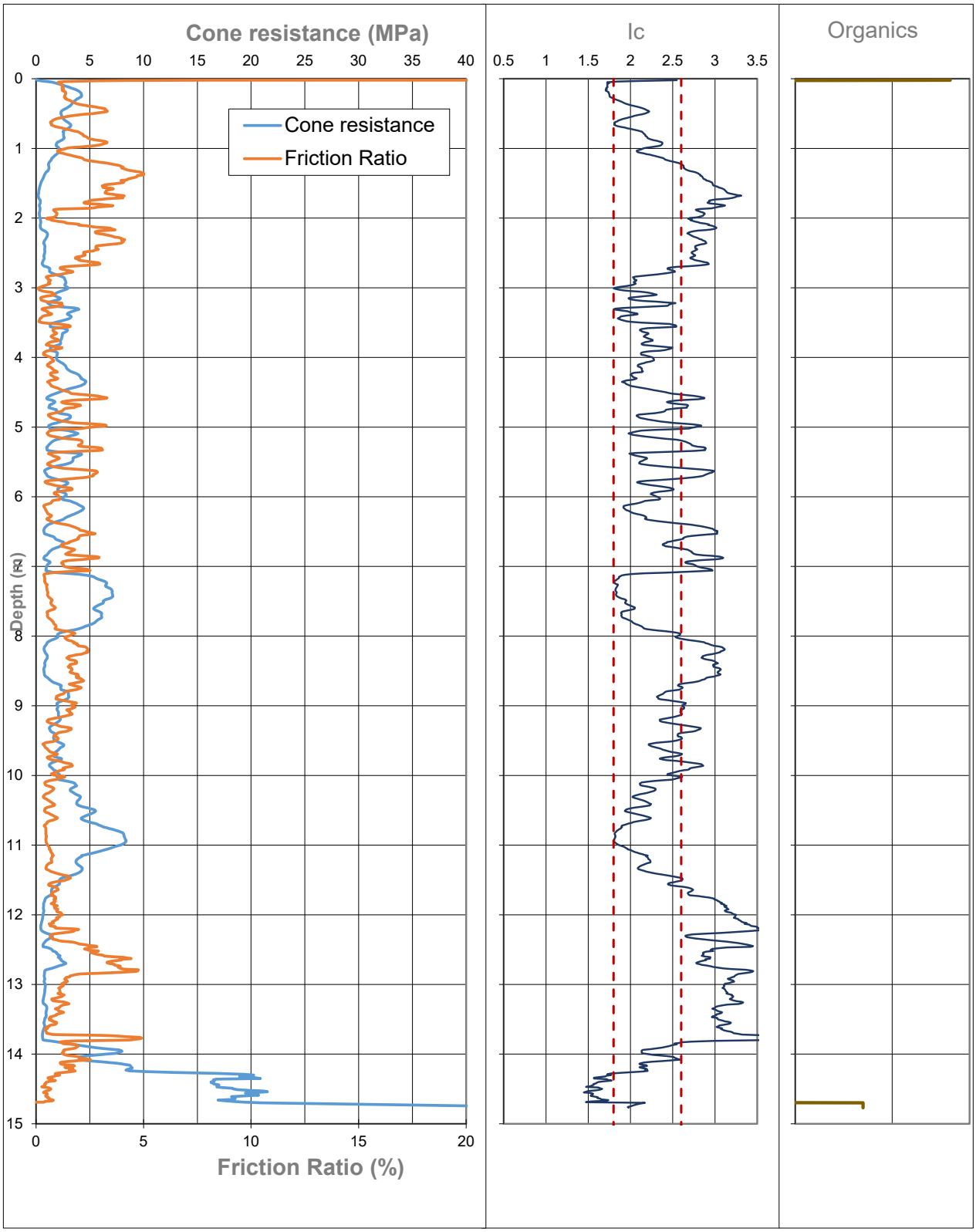
	Client:	Aphrodite Ltd	Job No:	6096



GEOTECH	CPT Data Plots			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 020**
	Client:	Aphrodite Ltd	Job No:	6096



LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 16/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 1

Sheet 1 of 1

Soil Description

SILT, trace sand, organics; darkish brown. Firm; moist; sand, fine. [TOPSOIL]

(0.0 - 0.35m)

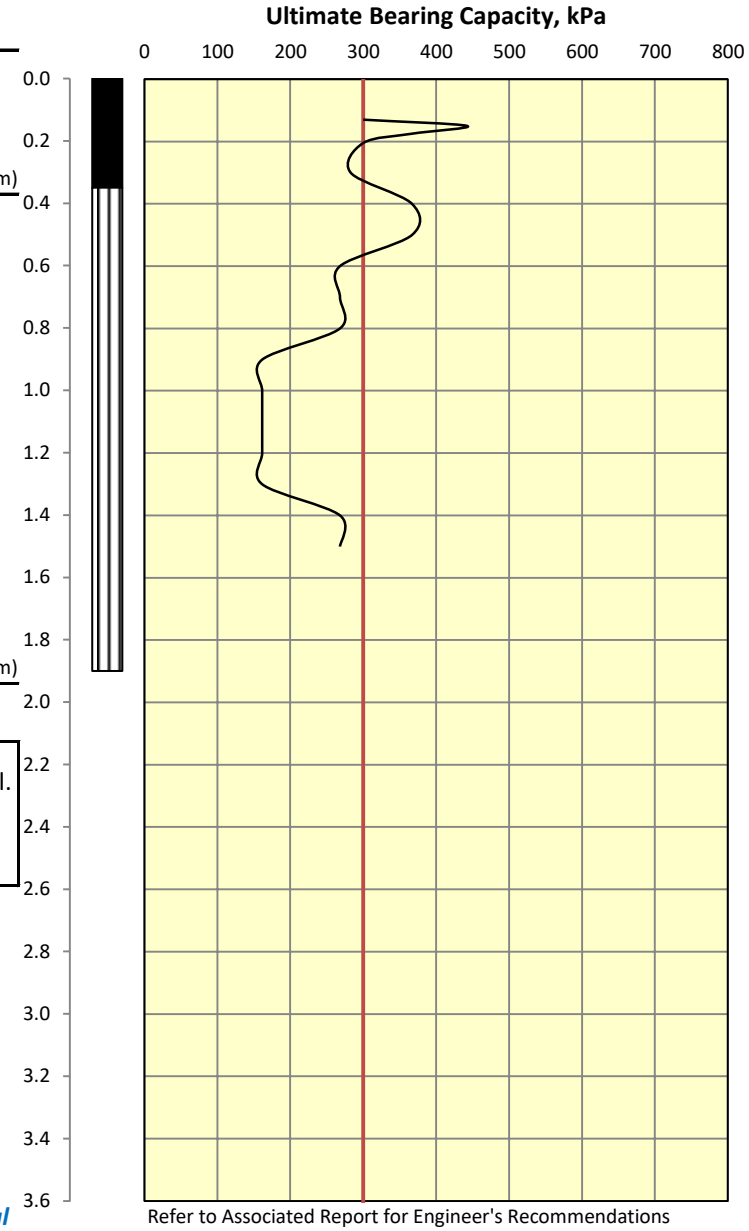
SILT, trace sand; grey, mottled orange. Firm; moist; sand, fine; non-plastic. [ALLUVIUM]
(From 0.55 - 0.7m: Some sand, fine)
(At 0.7m: Sand ends)
(From 0.8m: Soft; low plasticity)

(From 1.4m: Firm; non-plastic)

(From 1.55m: Some sand, fine; soft; wet; low plasticity)
(From 1.7m: Minor sand, fine; trace peat, fibrous, ~1%; bluish grey, mottling ends)

(0.35 - 1.9m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 1.9m bgl.
* NZTM2000 Coordinates:
  1567245m E
  5186829m N



WT depth approx. 1.20m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 16/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 2

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; darkish brown. Firm; moist; sand, fine. [TOPSOIL/POSSIBLE FILL]
(0.0 - 0.4m)

Fine SAND, trace silt; brownish grey, some mottled orange. Loose to very loose; moist. [POSSIBLE FILL]
(0.4 - 0.7m)

SILT; grey, mottled orange. Soft; moist; low plasticity. [ALLUVIUM]

(From 1.2m: Some sand, fine; wet)
(0.7 - 1.3m)

Fine to medium SAND, minor silt; grey, some mottled orange. Loose; saturated.
(1.3 - 1.7m)

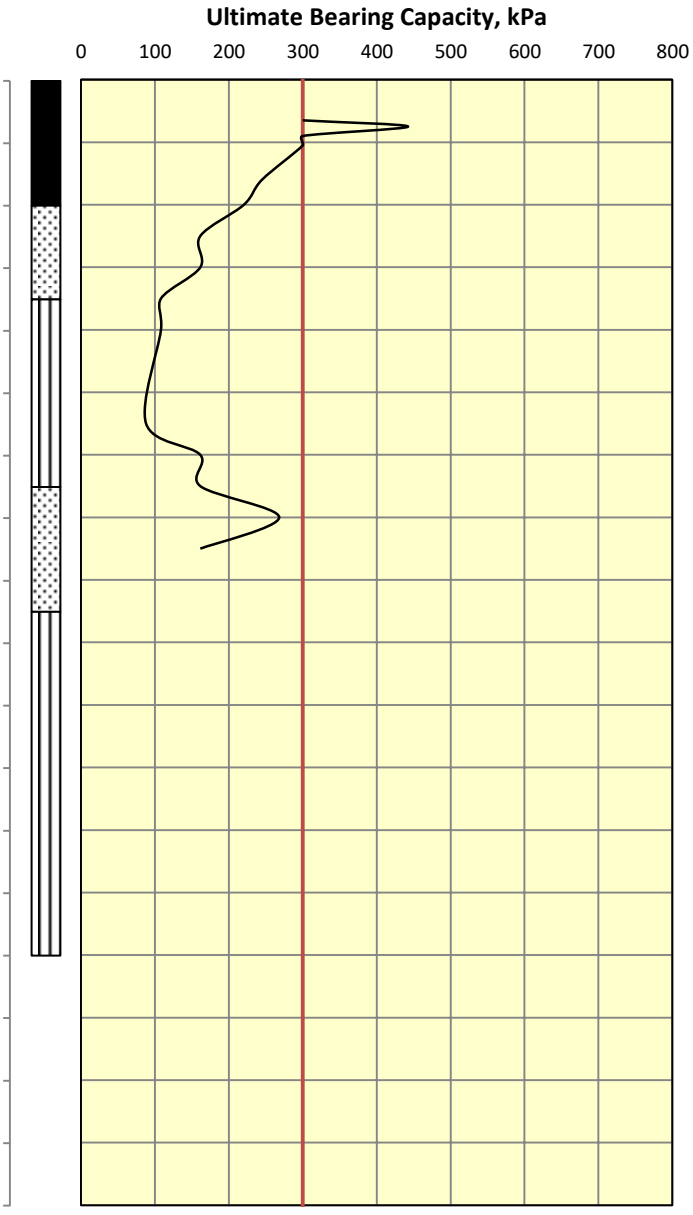
SILT, trace peat; bluish grey. Soft; saturated; peat, fibrous, ~1%; low plasticity.

(From 2.2m: Trace sand, fine)

(From 2.5m: Sand ends; moderate plasticity)
(From 2.6 - 2.7m: Minor peat, fibrous, ~10%)
(1.7 - 2.8m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 2.8m bgl.
* NZTM2000 Coordinates:
  1567249m E
  5186790m N

WT depth approx. 1.15m bgl



Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 16/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 3

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; darkish brown. Firm; moist; sand, fine. [TOPSOIL]

(0.0 - 0.4m)

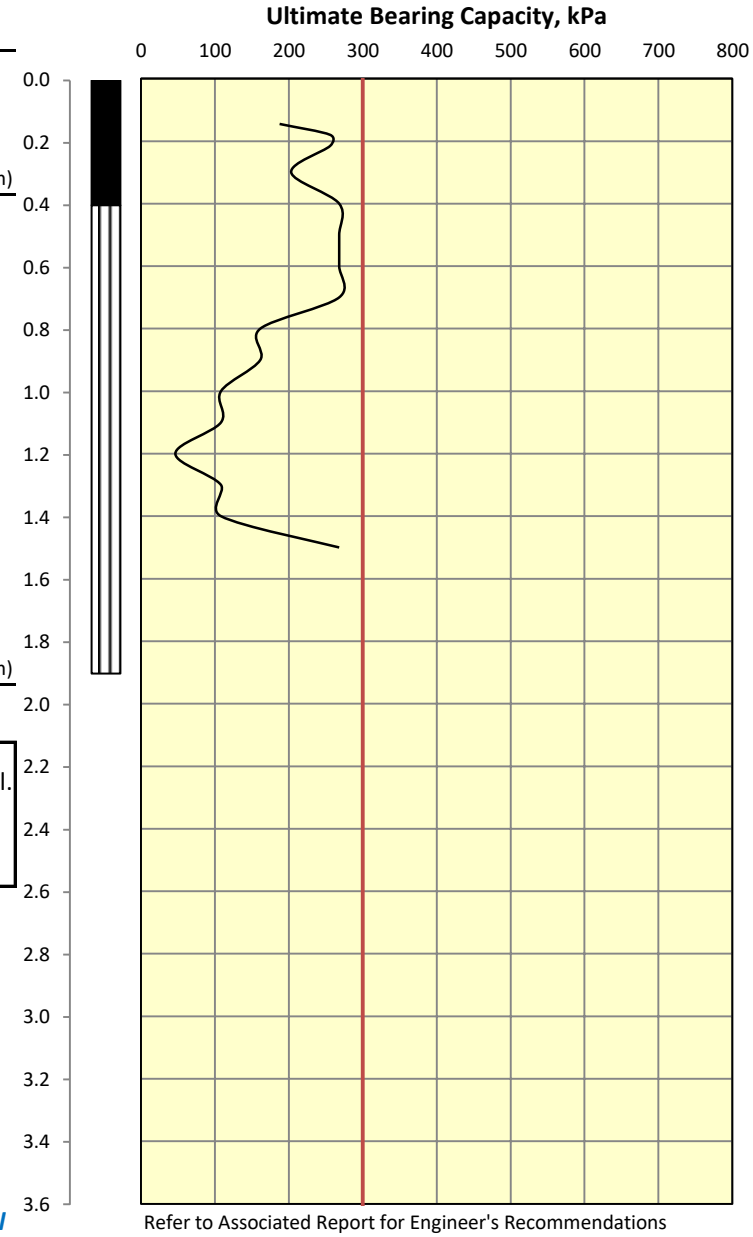
SILT, some sand, grey, mottled orange. Firm; moist; sand, fine; non-plastic. [ALLUVIUM]
(From 0.6 - 0.75m: Trace sand, fine)

(From 1.1m: Soft; low plasticity)

(From 1.4m: Minor sand, fine; wet)
(From 1.55m: Trace peat, fibrous, ~1%; bluish grey)

(0.4 - 1.9m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 1.9m bgl.
* NZTM2000 Coordinates:
  1567285m E
  5186832m N



WT depth approx. 1.50m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 16/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 4

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; darkish brown. Firm; moist; sand, fine. [TOPSOIL]

(0.0 - 0.4m)

Fine SAND, some silt; grey, mottled orange. Medium dense to loose; moist. [ALLUVIUM]

(0.4 - 0.65m)

SILT; grey, some mottled orange. Soft; moist; non-plastic.

(From 1.15m: Lightly iron-stained; low plasticity)

(From 1.3m: Minor sand, fine; wet; iron-staining ends)

(From 1.5m: Trace sand, fine; trace peat, fibrous, ~1%; bluish grey, mottling ends)

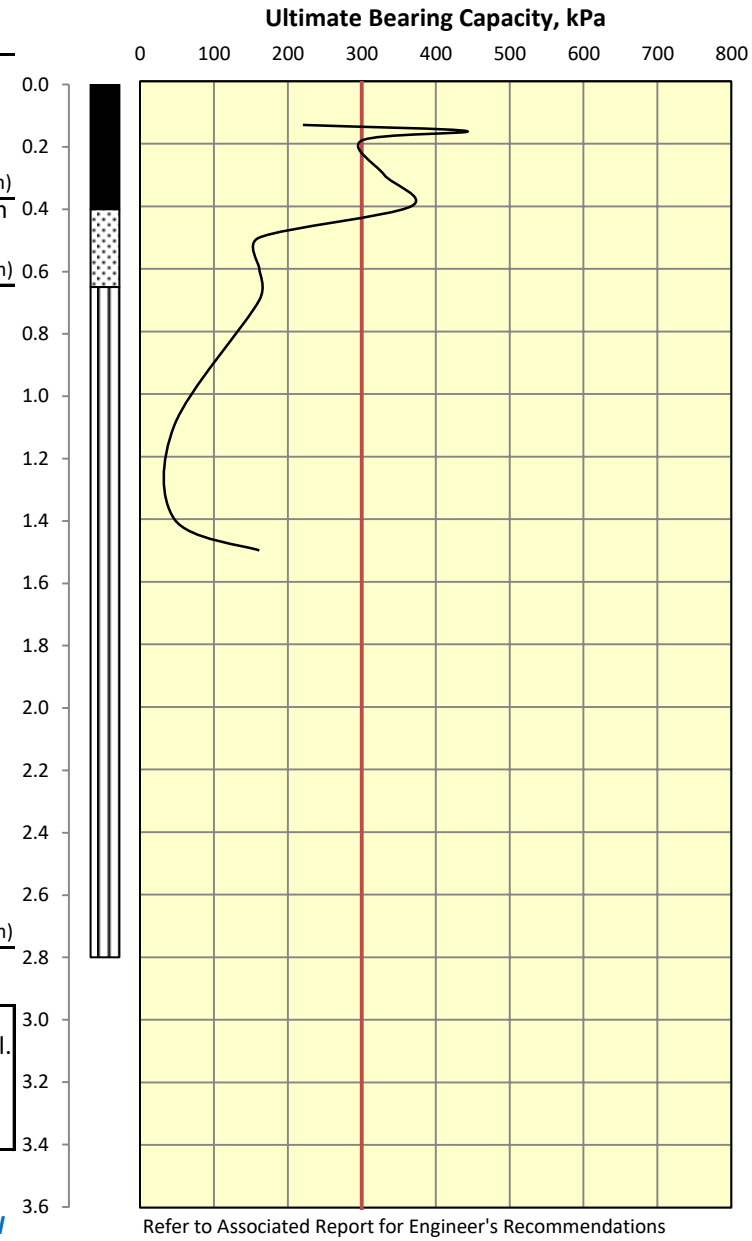
(From 1.8m: Saturated)

(From 2.1m: Grey; soft to very soft; moderate plasticity)

(From 2.5 - 2.7m: Some sand, fine)

(0.65 - 2.8m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 2.8m bgl.
* NZTM2000 Coordinates:
  1567325m E
  5186819m N



WT depth approx. 1.15m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 16/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 5

Sheet 1 of 1

Soil Description

SILT, some sand, trace organics; brownish grey. Firm; dry; sand, fine. [TOPSOIL/POSSIBLE FILL]

(0.0 - 0.4m)

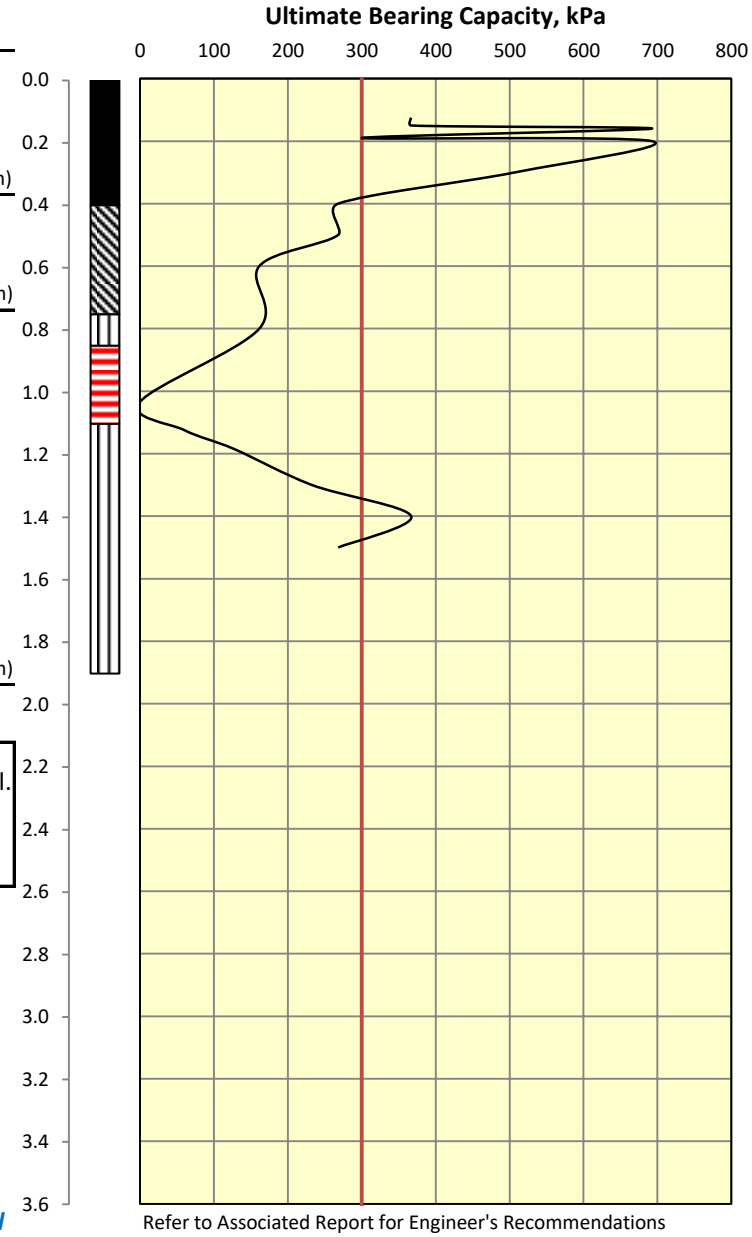
Silty fine SAND; brownish grey, mottled orange. Loose; moist. [POSSIBLE FILL]

(0.4 - 0.75m)

SILT; grey, some mottled orange. Soft to very soft; moist; moderate plasticity. [ALLUVIUM]
(From 0.85 - 1.1m: Some peat, amorphous, ~20%, odorous; dark brown)
(From 1.1m: Trace peat, fibrous, ~5%; bluish grey, mottling ends; soft; wet)

(0.75 - 1.9m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 1.9m bgl.
* NZTM2000 Coordinates:
  1567381m E
  5186797m N



WT depth approx. 1.75m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 19/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 6

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; darkish brown. Soft; moist; sand, fine. [TOPSOIL]

(0.0 - 0.4m)

Fine SAND, some silt; grey, mottled orange. Very loose; moist. [ALLUVIUM]

(0.4 - 0.7m)

SILT; grey, mottled orange. Soft; moist; non-plastic.

(From 1.35m: Grey, trace mottled orange; wet; low plasticity)
(From 1.5m: Trace peat, fibrous & amorphous, ~5%; darkish grey, mottling ends)
(From 1.6m: Trace sand, fine; bluish grey)
(From 1.8m: Peat, ~1%)

(From 1.95m: Sand ends; moderate plasticity)
(From 2.1m: Some sand, fine; saturated; low plasticity)

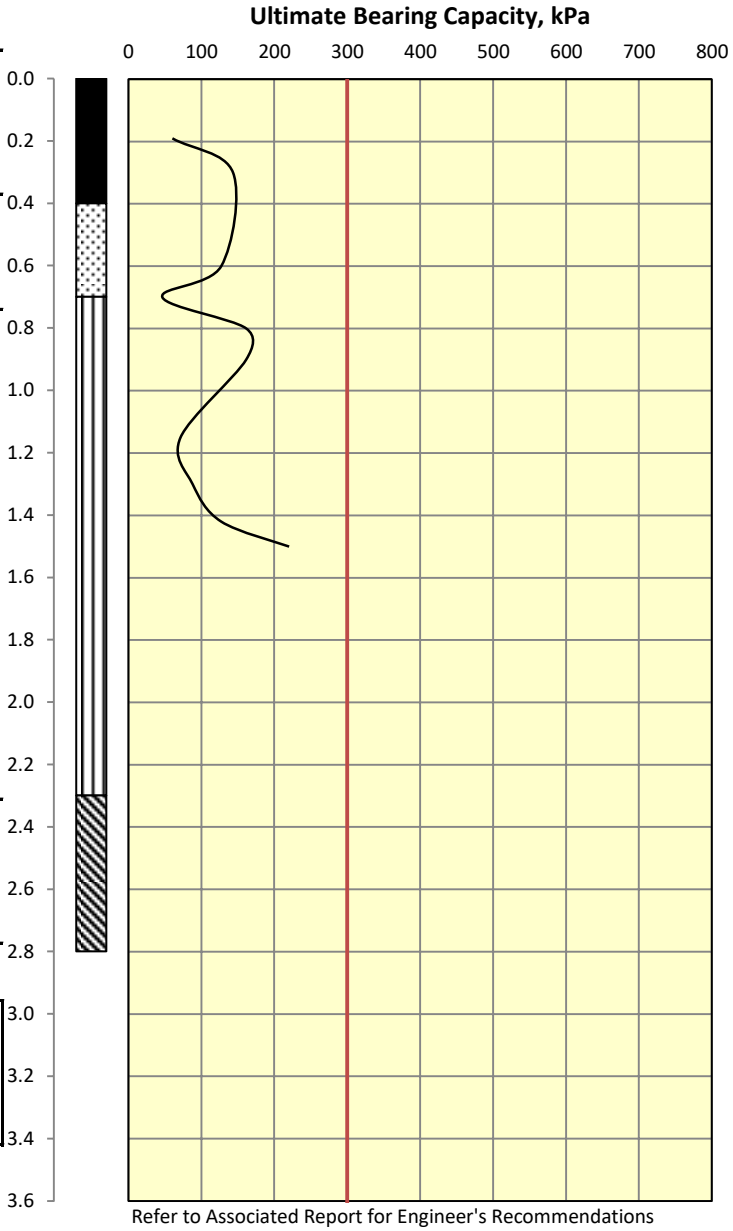
(0.7 - 2.3m)

Silty fine SAND; grey. Loosely packed; saturated.

(From 2.6m: Trace peat, fibrous, ~1%)

(2.3 - 2.8m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 2.8m bgl.
* NZTM2000 Coordinates:
  1567409m E
  5186862m N



WT depth approx. 1.15m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 19/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 7

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; darkish brown. Soft; moist; sand, fine. [TOPSOIL]

(0.0 - 0.4m)

Mixed SILTS, some sand; brown grey to darkish brown, some mottled orange. Firm; moist; sand, fine; non-plastic. [FILL]
(From 0.55m: Greyish dark brown; soft; some iron-staining; slight organic odour) (0.4 - 0.7m)

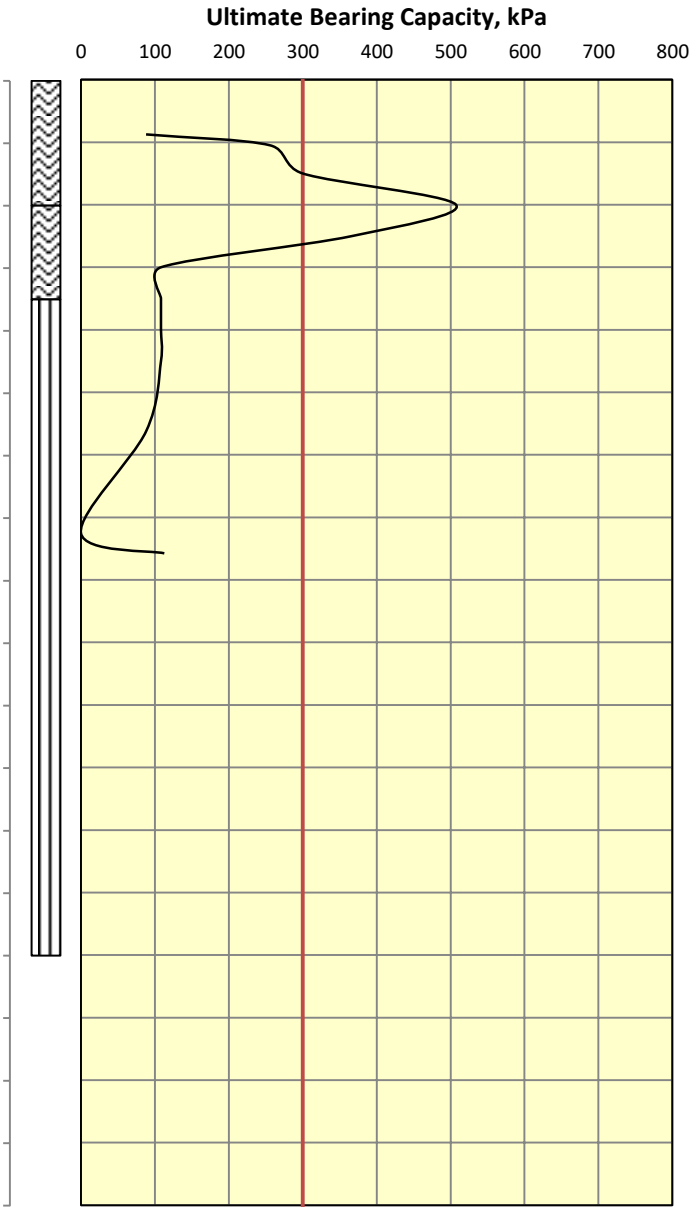
SILT, some sand; grey, mottled orange. Soft; moist; sand, fine; non-plastic. [ALLUVIUM]
(From 1.0m: Trace sand, fine; brownish grey, mottled orange; low plasticity)
(From 1.2m: Sand ends; minor peat, fibrous & amorphous, ~10%; dark brownish grey; very soft; wet; high plasticity)
(From 1.4m: Grey; soft; moderate plasticity)
(From 1.5m: Trace peat, fibrous & amorphous, ~5%; bluish grey)

(From 2.1m: Trace sand, fine; saturated)

(From 2.4m: Peat, ~1%; minor sand, fine; low plasticity)

(0.7 - 2.8m)

* Scala/DCP completed at 1.52m bgl.
* Hand auger completed at target depth of 2.8m bgl.
* NZTM2000 Coordinates:
  1567427m E
  5186802m N



WT depth approx. 1.10m bgl

Refer to Associated Report for Engineer's Recommendations

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Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 19/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 8

Sheet 1 of 1

Soil Description

SILT, some sand, trace organics; darkish brown. Soft; moist; sand, fine. [TOPSOIL]
(From 0.2 - 0.3m: Firm)

(0.0 - 0.55m)

SILT; grey, mottled orange. Soft; moist; non-plastic. [ALLUVIUM] (0.55 - 0.75m)

Fine sandy SILT; brownish grey, mottled orange. Soft; wet; low plasticity.

(0.75 - 1.0m)

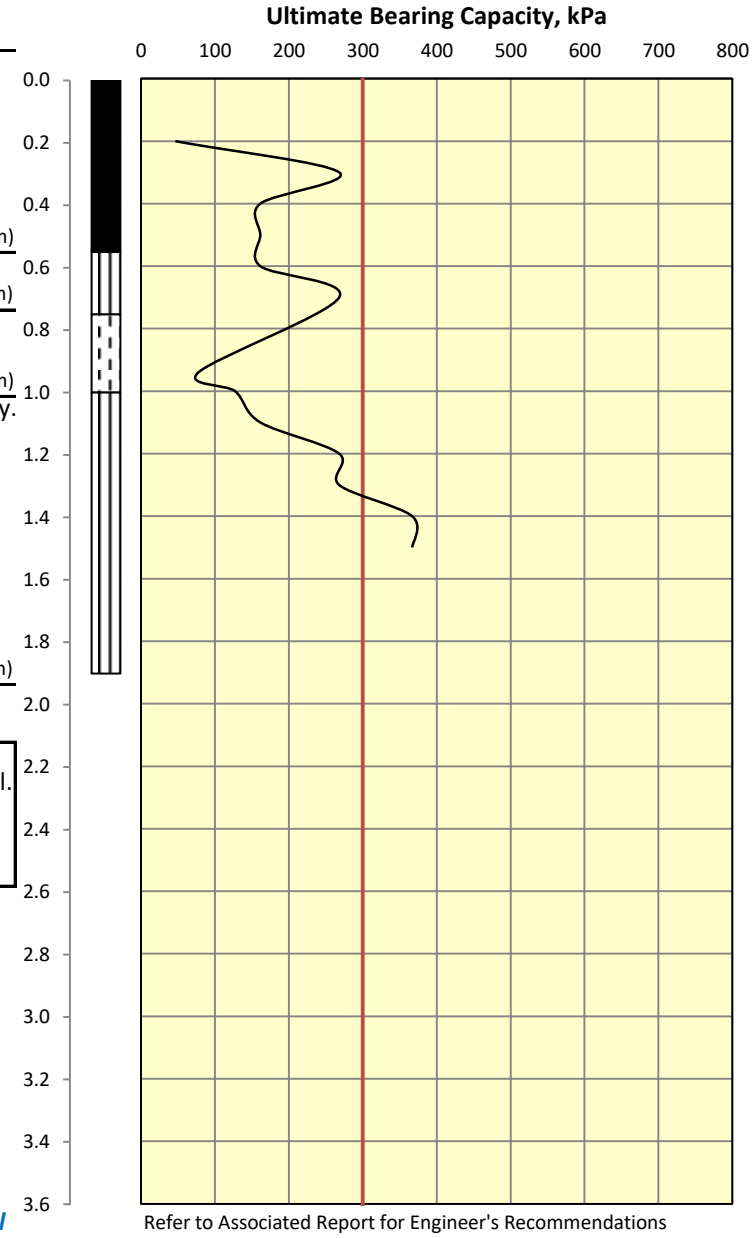
SILT; grey, mottled orange. Soft; moist; low plasticity.

(From 1.25m: Trace peat, amorphous, ~1%; wet)

(From 1.55m: Peat, fibrous & amorphous; bluish grey; firm; moderate plasticity)

(1.0 - 1.9m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 1.9m bgl.
* NZTM2000 Coordinates:
  1567436m E
  5186838m N



WT depth approx. 1.25m bgl

Refer to Associated Report for Engineer's Recommendations

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Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 19/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 9

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; dark brown. Soft; moist; sand, fine. [TOPSOIL]

(0.0 - 0.4m)

Fine SAND, trace silt; brownish grey, mottled orange. Very loose; moist. [ALLUVIUM]
(From 0.6m: Some silt)

(0.4 - 0.8m)

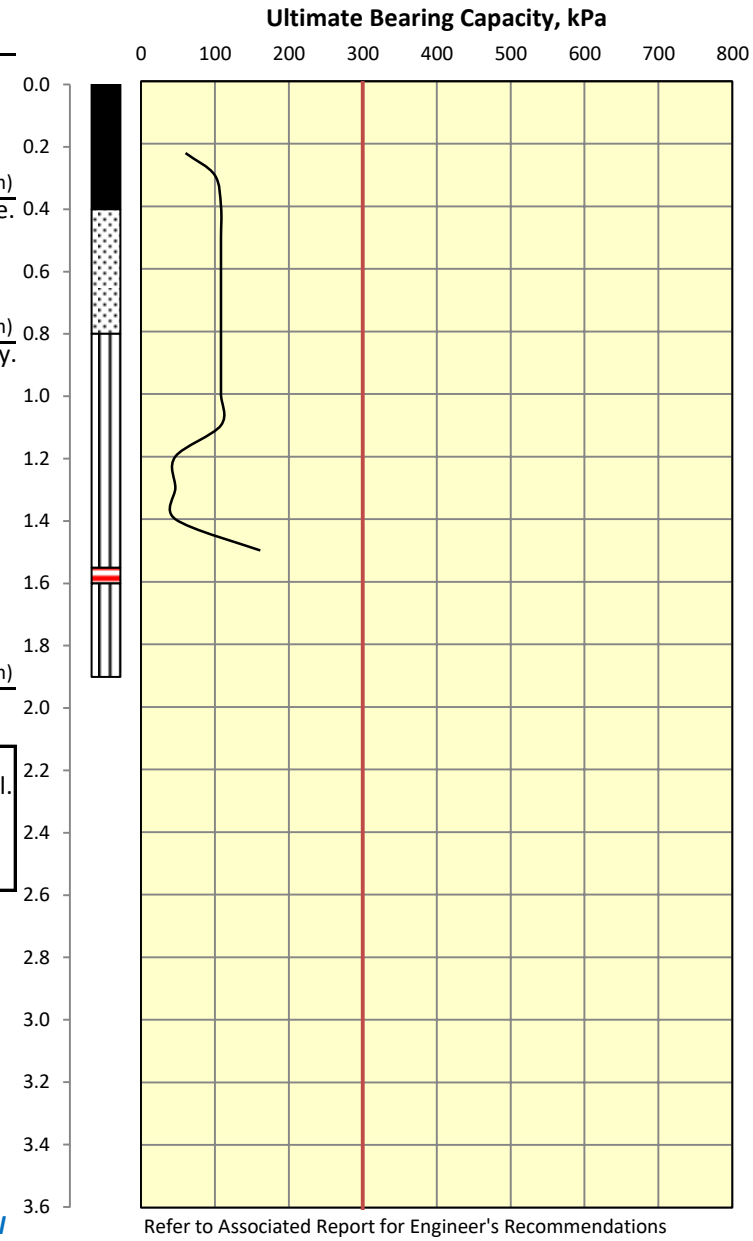
SILT; grey, mottled orange. Soft; moist; low plasticity.

(From 1.3m: Trace peat, amorphous, ~1%; grey, trace mottled orange)

(From 1.5m: Peat, fibrous & amorphous, ~5%; dark brownish grey; moderate plasticity)
(From 1.55 - 1.6m: Some peat, fibrous, ~20%)
(From 1.6m: Bluish grey)

(0.8 - 1.9m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 1.9m bgl.
* NZTM2000 Coordinates:
  1567470m E
  5186834m N



WT depth approx. 1.20m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 19/12/2019

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 10

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; dark brown. Soft; moist; sand, fine. [TOPSOIL]
(0.0 - 0.3m)

SILT, minor sand; grey, mottled orange. Firm; moist; sand, fine; non-plastic. [ALLUVIUM]
(From 0.5m: Some sand, fine; soft)

(At 0.7m: Sand ends)

(From 0.85m: Minor sand, fine; wet)

(From 1.2m: Sand ends; low plasticity)

(From 1.4m: Minor peat, fibrous & amorphous, ~10%; greyish dark brown)

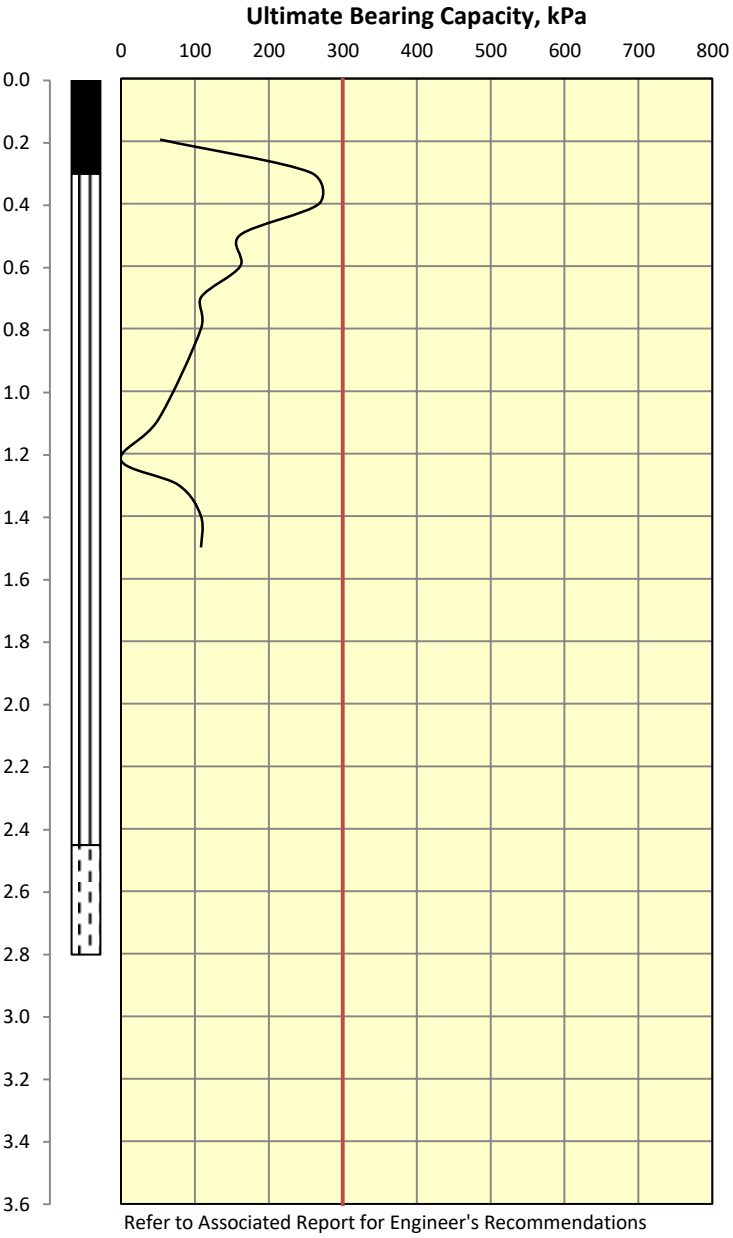
(From 1.65m: Trace peat, ~1%; bluish grey; moderate plasticity)

(From 2.1m: Firm; moist; low plasticity)

(From 2.25m: Some sand, fine; wet)
(0.3 - 2.45m)

Fine sandy SILT, trace peat; bluish grey. Soft; saturated; peat, fibrous, ~1%.
(2.45 - 2.8m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 2.8m bgl.
* NZTM2000 Coordinates:
  1567510m E
  5186843m N



WT depth approx. 1.60m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 14/01/2020

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 11

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics, gravel; dark brown. Firm; moist; sand, fine; gravel, medium. [TOPSOIL] (0.0 - 0.4m)

Fine sandy SILT; grey, mottled orange. Firm; moist. [ALLUVIUM] (0.4 - 0.6m)

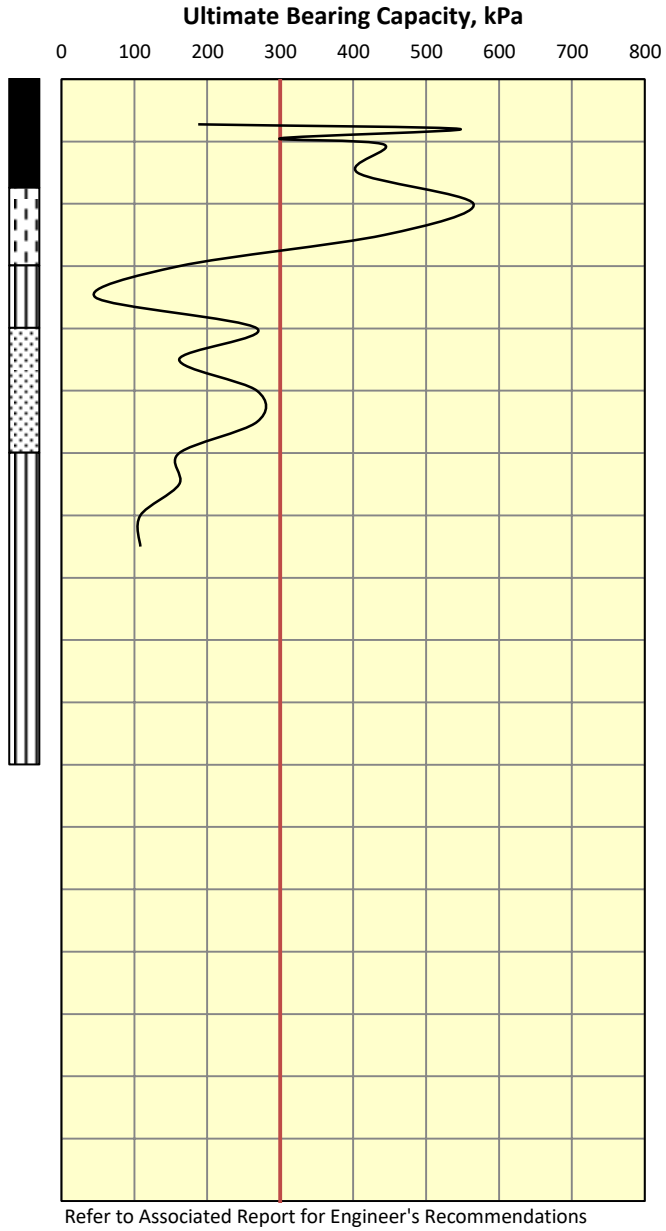
SILT; grey, some mottled orange. Soft; moist; non-plastic. (0.6 - 0.8m)

Fine SAND, trace silt; grey, mottled orange. Loose; wet; lightly iron-stained.
(From 1.05m: Minor silt) (0.8 - 1.2m)

SILT, minor sand; grey, mottled orange. Soft; wet; sand, fine; low plasticity.
(From 1.4m: Sand ends; minor peat, amorphous, ~10%; dark brownish grey)

(From 1.7m: Peat, fibrous & amorphous; greyish dark brown)
(From 1.9m: Trace peat, fibrous & amorphous, ~1%; bluish grey)
(From 2.1m: Peat ends; firm) (1.2 - 2.2m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 2.2m bgl.
* NZTM2000 Coordinates:
  1567547m E
  5186847m N



WT not struck

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 14/01/2020

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 12

Sheet 1 of 1

Soil Description

SILT, some sand, trace organics, charcoal; brownish grey. Firm; dry; sand, fine. [TOPSOIL/POSSIBLE FILL]
(0.0 - 0.45m)

SILT, minor sand, trace organics; greyish dark brown. Soft; moist; sand, fine; non-plastic. [POSSIBLE FILL]
(0.45 - 0.7m)

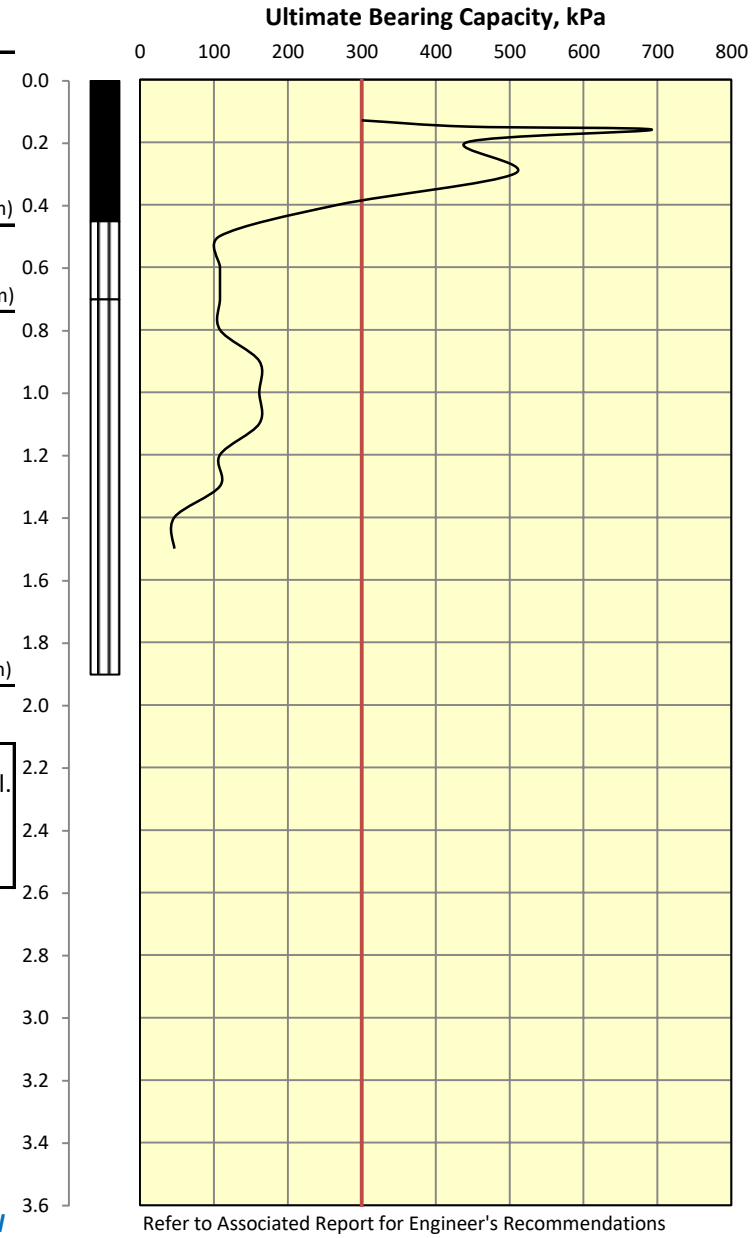
SILT, trace sand; grey, mottled orange. Soft; moist; sand, fine; non-plastic. [ALLUVIUM]

(From 1.2m: Minor sand, fine; wet)

(From 1.45m: Sand ends; low plasticity)

(From 1.7m: Trace peat, amorphous, ~5%; darkish grey)
(0.7 - 1.9m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 1.9m bgl.
* NZTM2000 Coordinates:
  1567585m E
  5186843m N



WT depth approx. 1.80m bgl

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

LEWIS & BARROW LTD
Consulting Civil and Structural Engineers:

File: 23593
Date: 14/01/2020

HAND AUGER AND SCALA/DYNAMIC CONE PENETROMETER (DCP) RESULTS

HA 13

Sheet 1 of 1

Soil Description

SILT, minor sand, trace organics; darkish brown. Firm; moist; sand, fine. [TOPSOIL]
(0.0 - 0.4m)

SILT, minor sand; grey, mottled orange. Firm; moist; sand, fine; non-plastic. [ALLUVIUM]
(From 0.5m: Soft)
(From 0.7m: Sand ends)
(0.4 - 0.95m)

Silty fine SAND; grey, mottled orange. Very loose; wet.
(0.95 - 1.2m)

SILT; grey, mottled orange. Soft; wet; low plasticity.

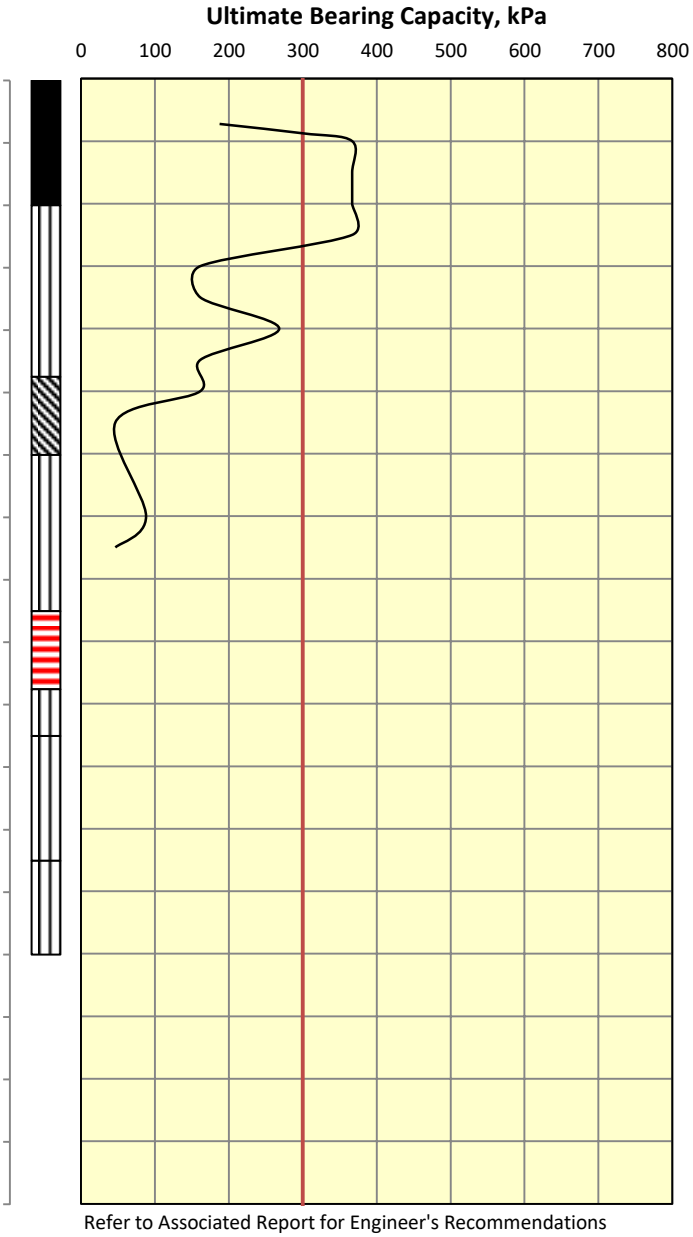
(From 1.55m: Minor peat, fibrous & amorphous, ~10%; dark brownish grey; saturated; high plasticity)
(From 1.7m: Some peat, ~20%; greyish dark brown)
(1.2 - 1.95m)

Clayey SILT, trace peat; bluish grey. Soft to very soft; saturated; peat, amorphous, ~5%; high plasticity.
(1.95 - 2.1m)

SILT, trace peat; bluish grey. Firm; wet; peat, amorphous, ~1%; low plasticity.
(2.1 - 2.5m)

Clayey SILT, trace peat; bluish grey. Soft; wet; peat, fibrous, ~5%; high plasticity.
(2.5 - 2.8m)

* Scala/DCP completed at 1.5m bgl.
* Hand auger completed at target depth of 2.8m bgl.
* NZTM2000 Coordinates:
  1567628m E
  5186846m N



WT not struck

Refer to Associated Report for Engineer's Recommendations

The information on this page should only be interpreted by a Chartered Professional Engineer experienced in Geotechnical Engineering

Site Address: **275 Highsted Road, Casebrook, Christchurch**

Client: **Aphrodite Ltd**

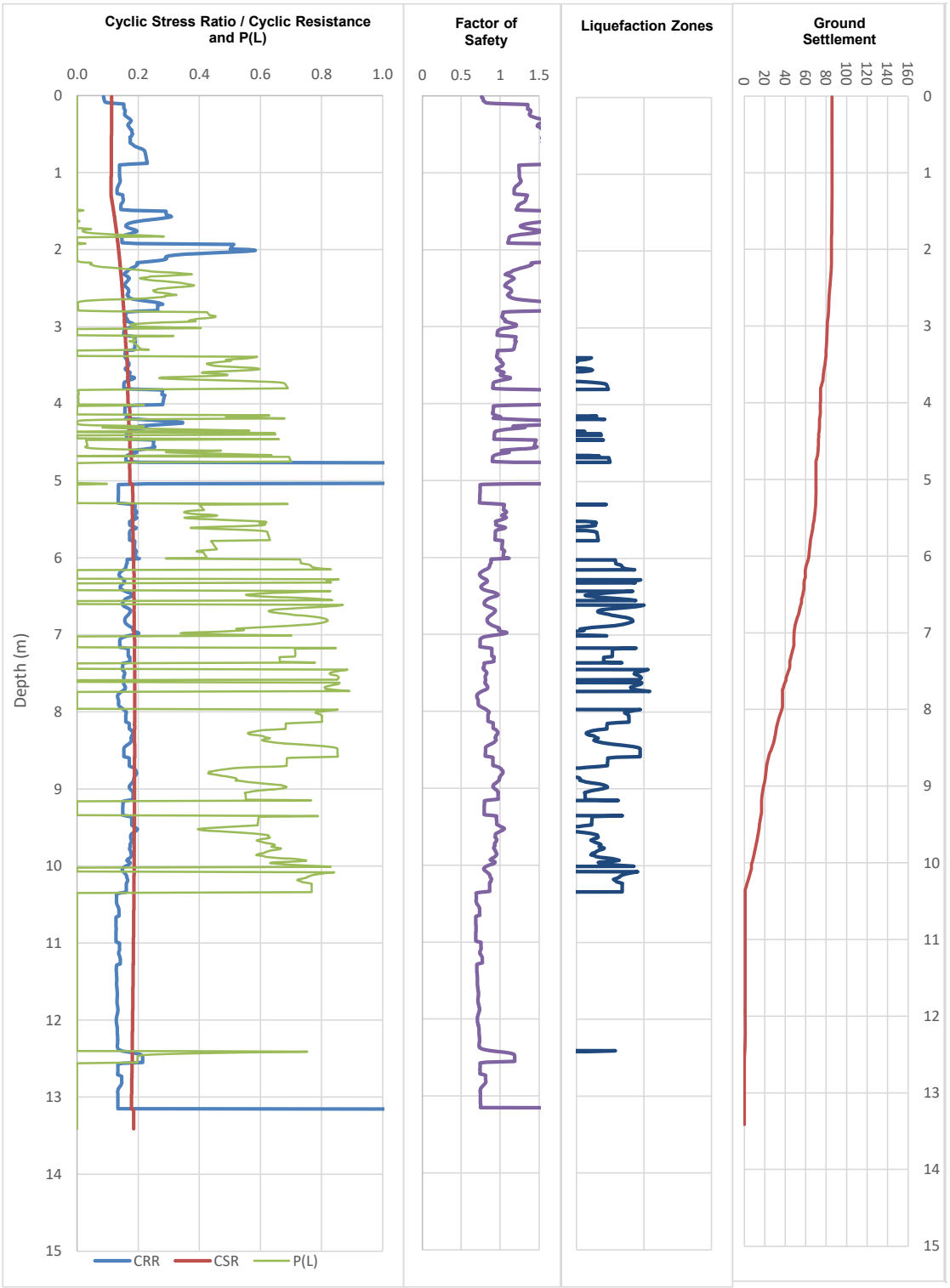
Technical Category: **N/A - Urban Non-Residential**
Reason for Test: **Confirmation of Geology**

Plotted by: **NL**
Field Worker: **NL**

Appendix 3

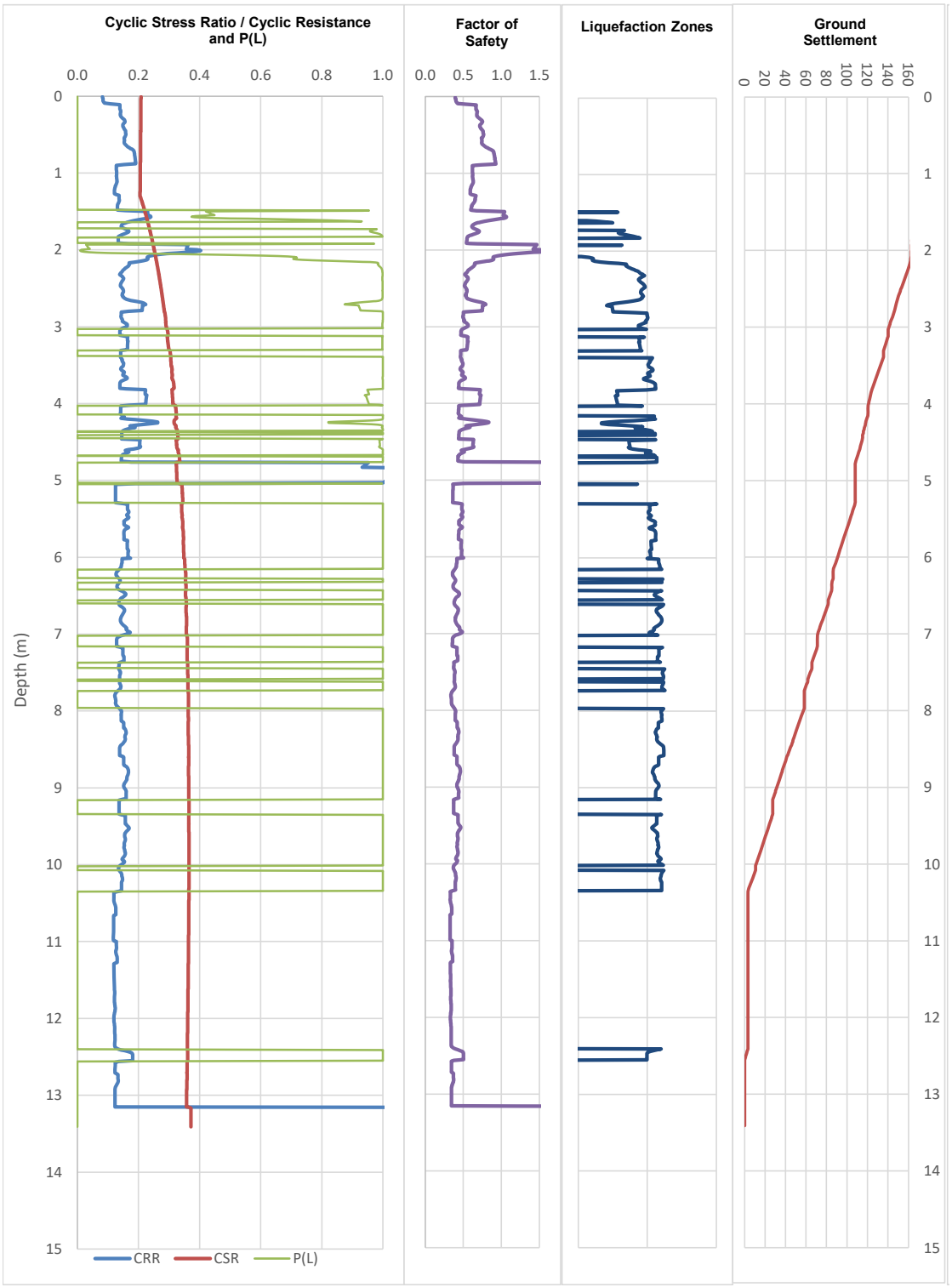
Liquefaction Profiles

GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 001**
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002)	**25 years**
a(g) = 0.19	M 6

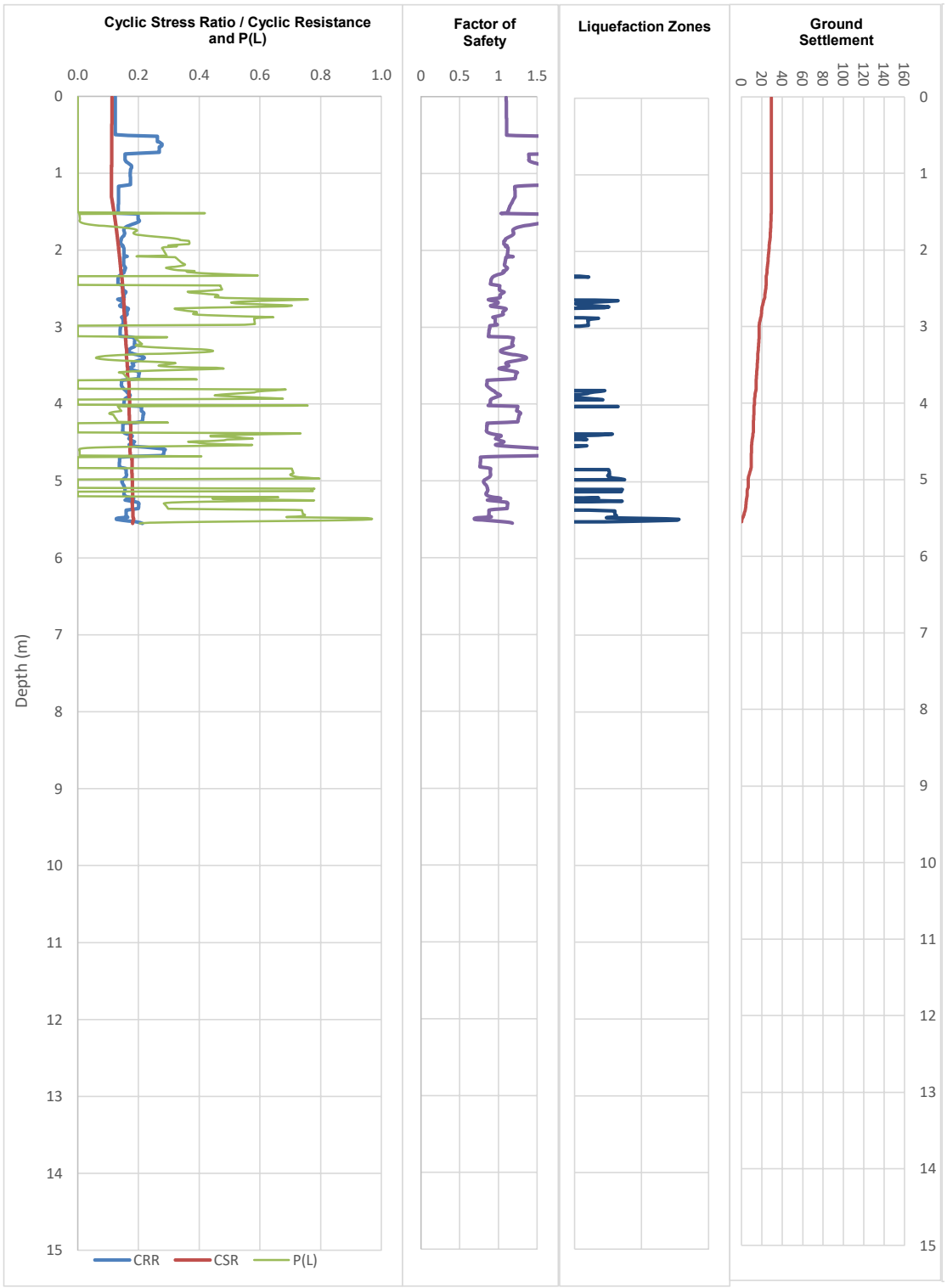
GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 001**
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002) **500 yrs**

a(g) = 0.35 M 7.5

GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 006c**
	Client:	Aphrodite Ltd	Job No:	6096



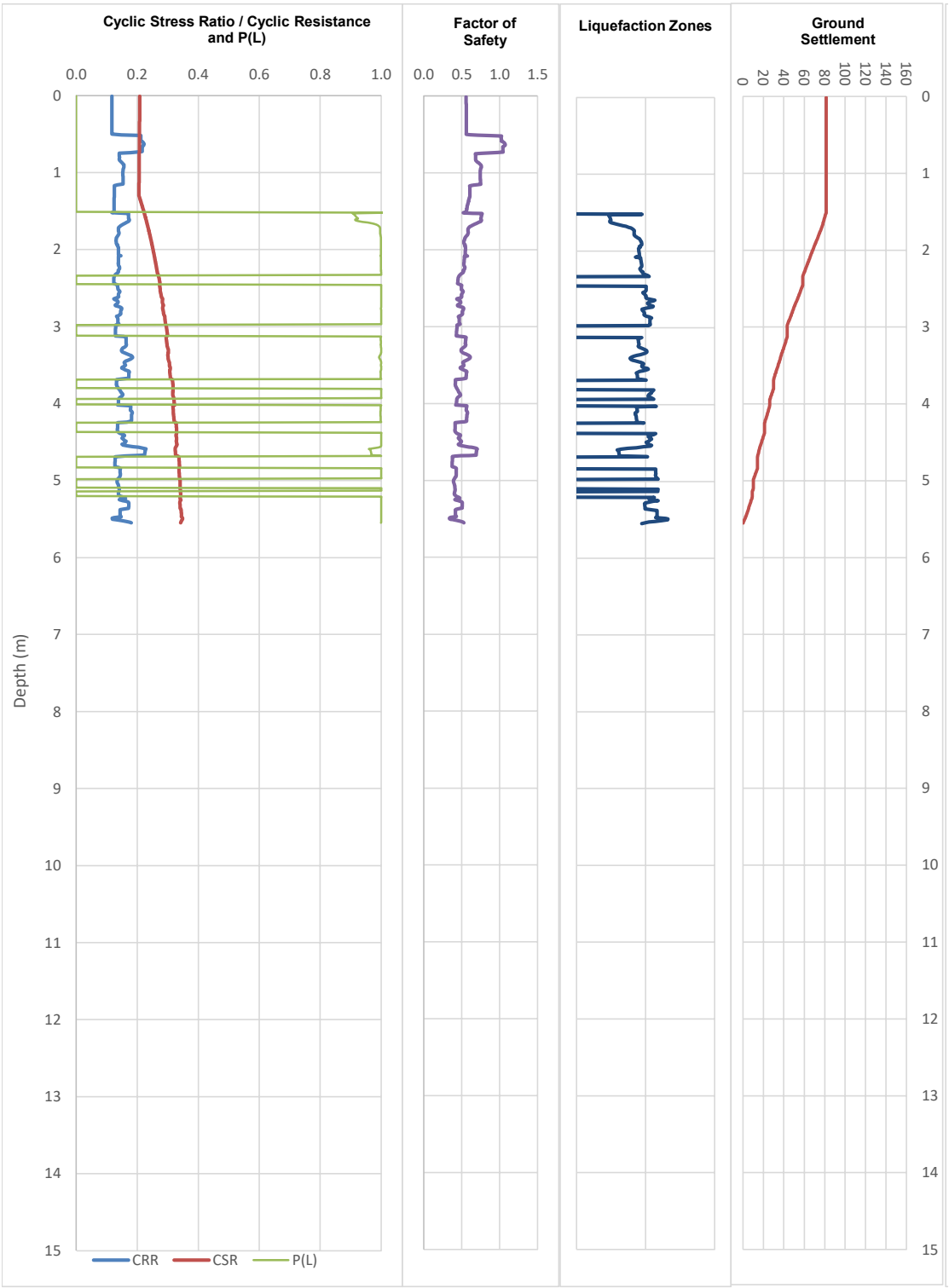
Based on Idriss & Boulanger (2014) and Zhang (2002) **25 years**

a(g) = 0.19 M 6

Liquefaction Potential Analysis

GEOTECH CONSULTING LTD

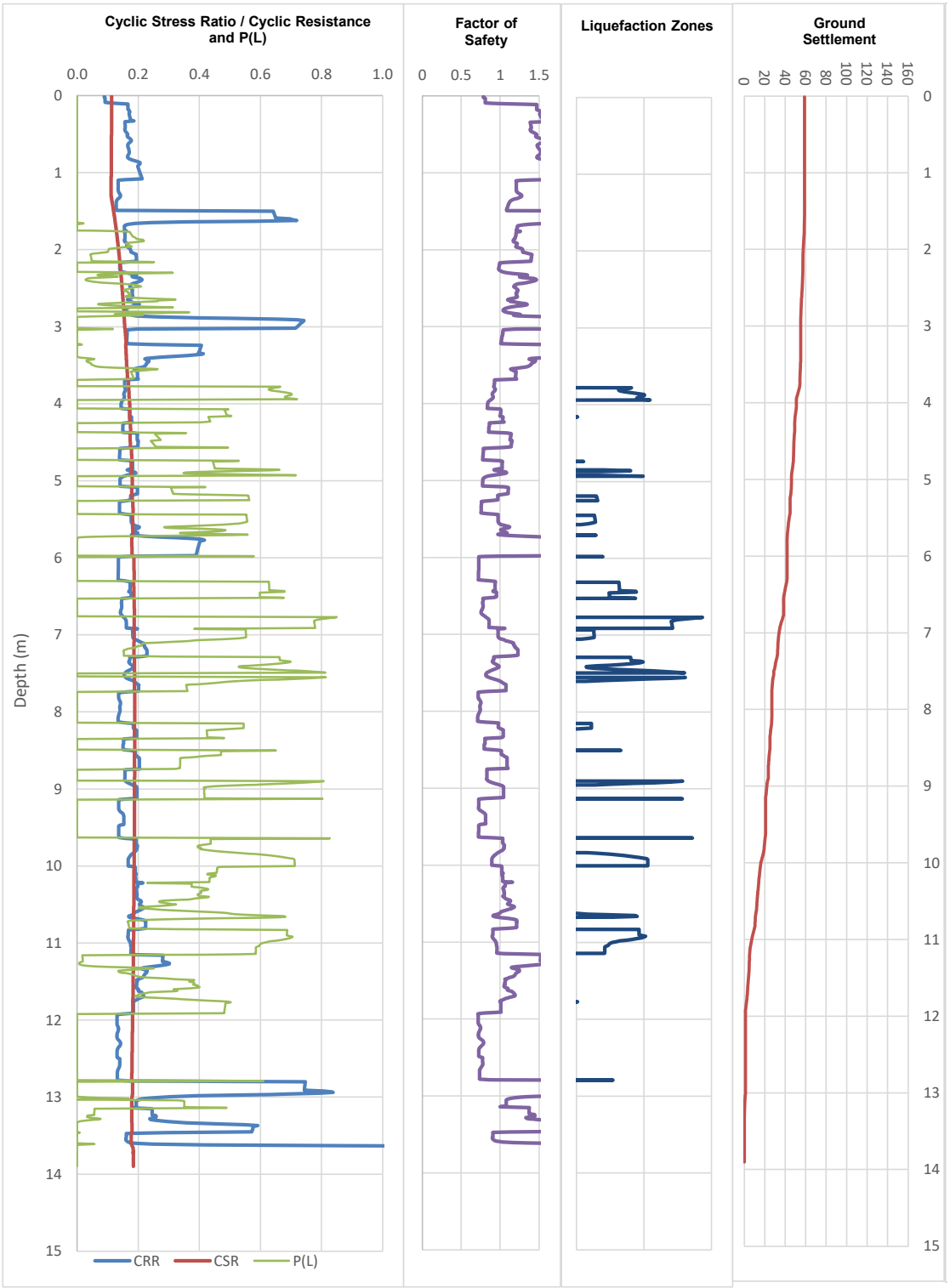
Project:	275 Highsted Road	Hole No:	**CPT 006c**
Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002) **500 yrs**

a(g) = 0.35 M 7.5

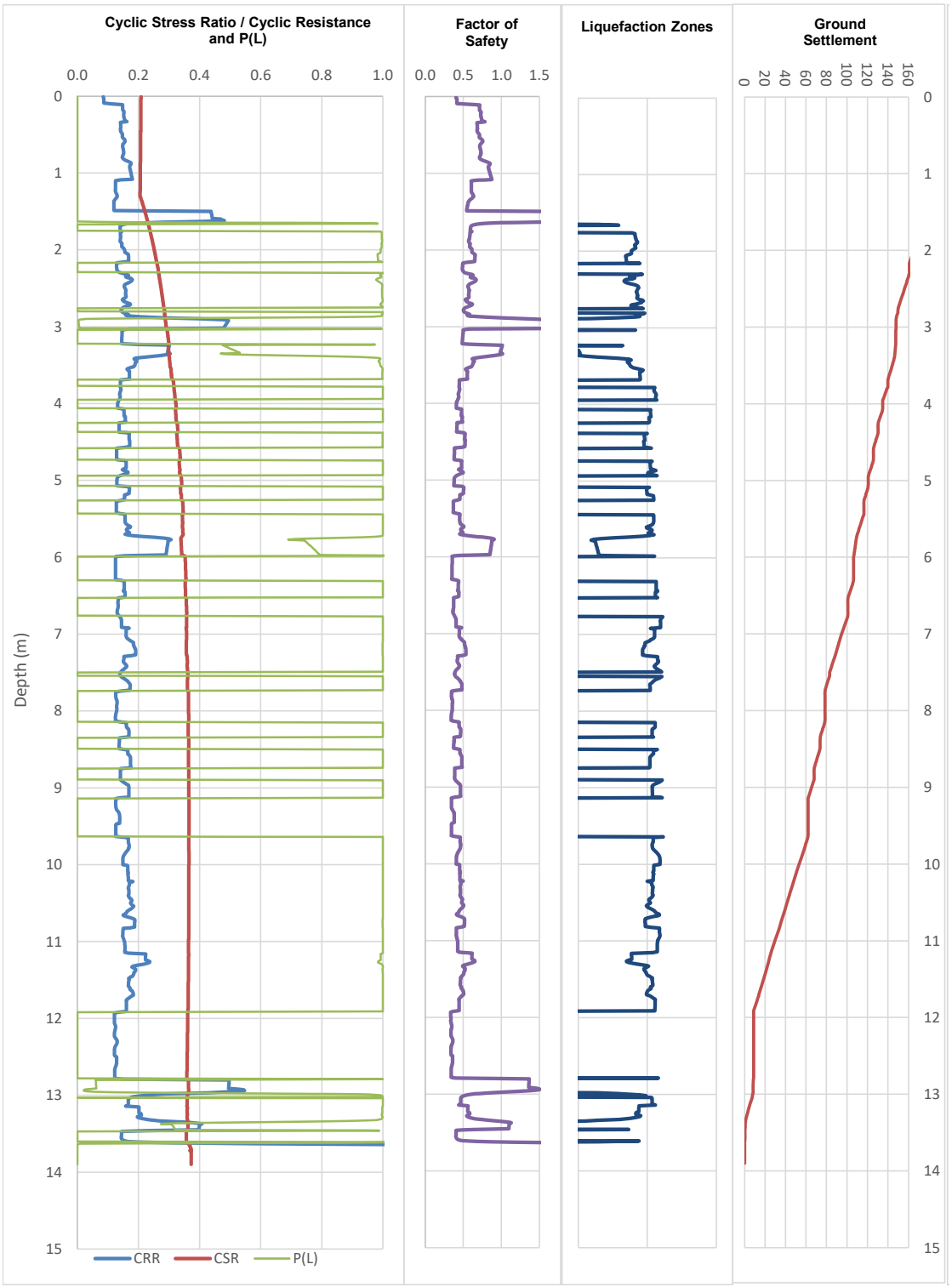
GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 010**
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002) **25 years**

a(g) = 0.19 M 6

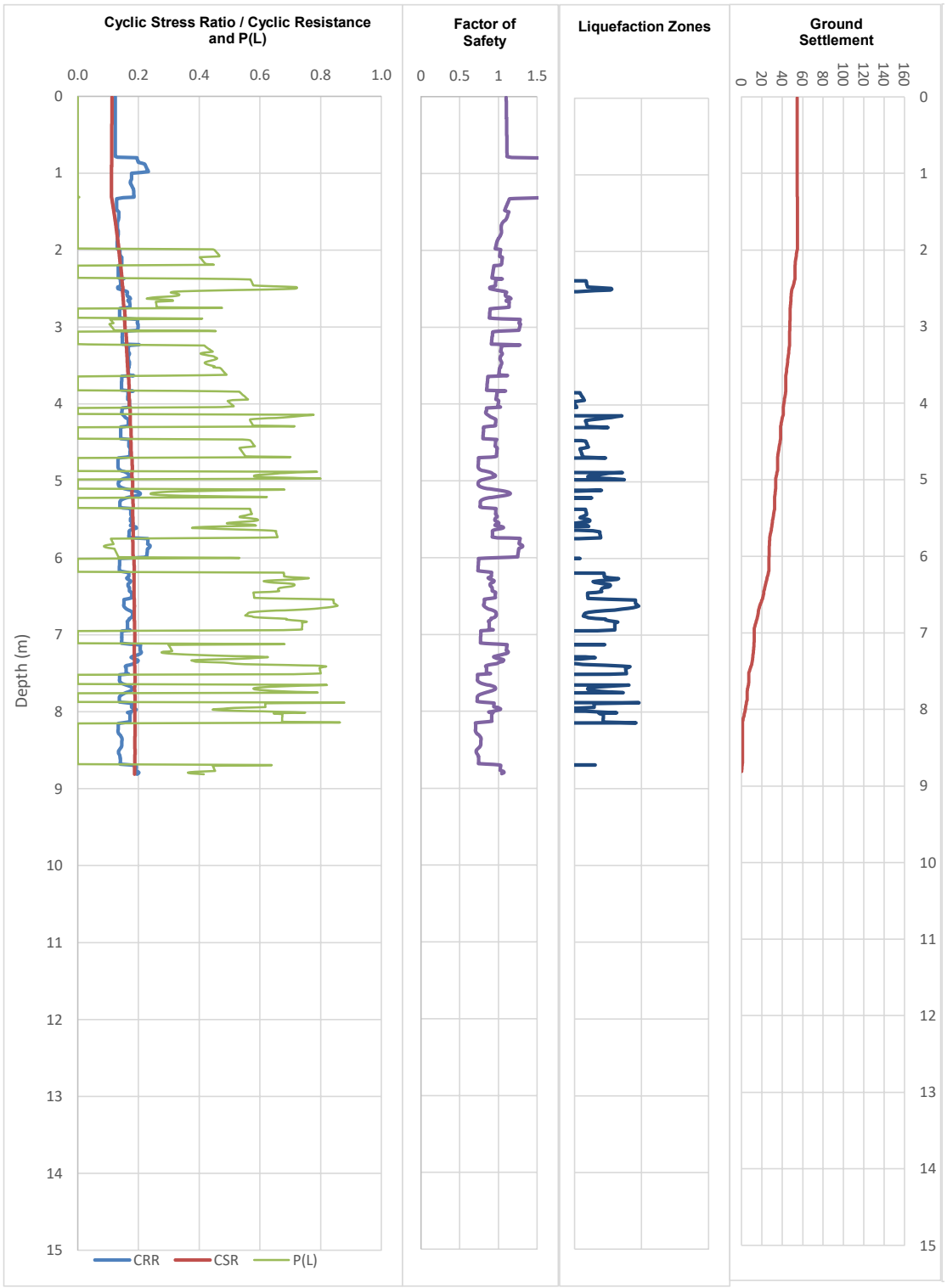
GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 010**
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002) **500 yrs**

a(g) = 0.35 M 7.5

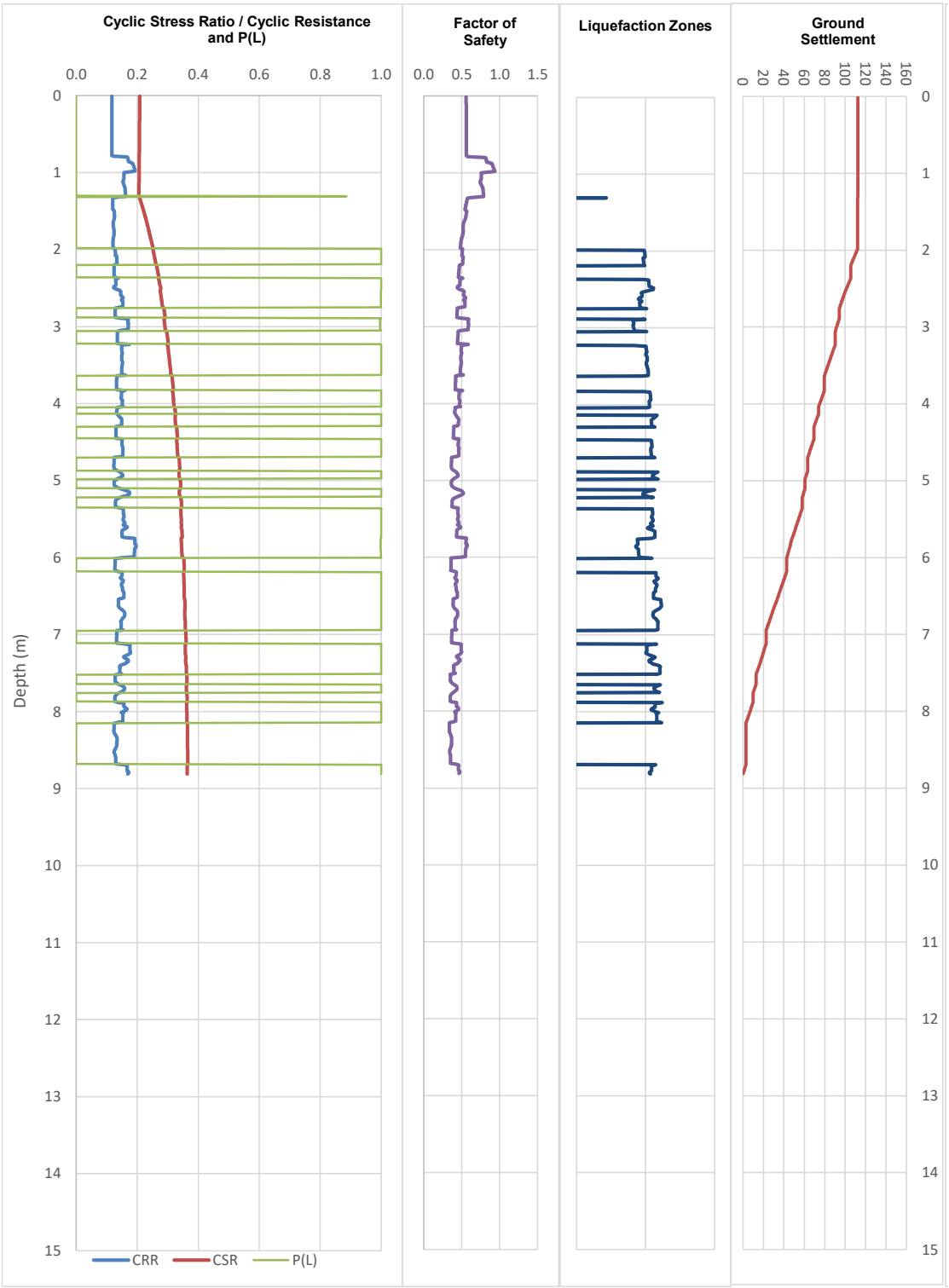
GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	CPT 014c
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002) **25 years**

a(g) = 0.19 M 6

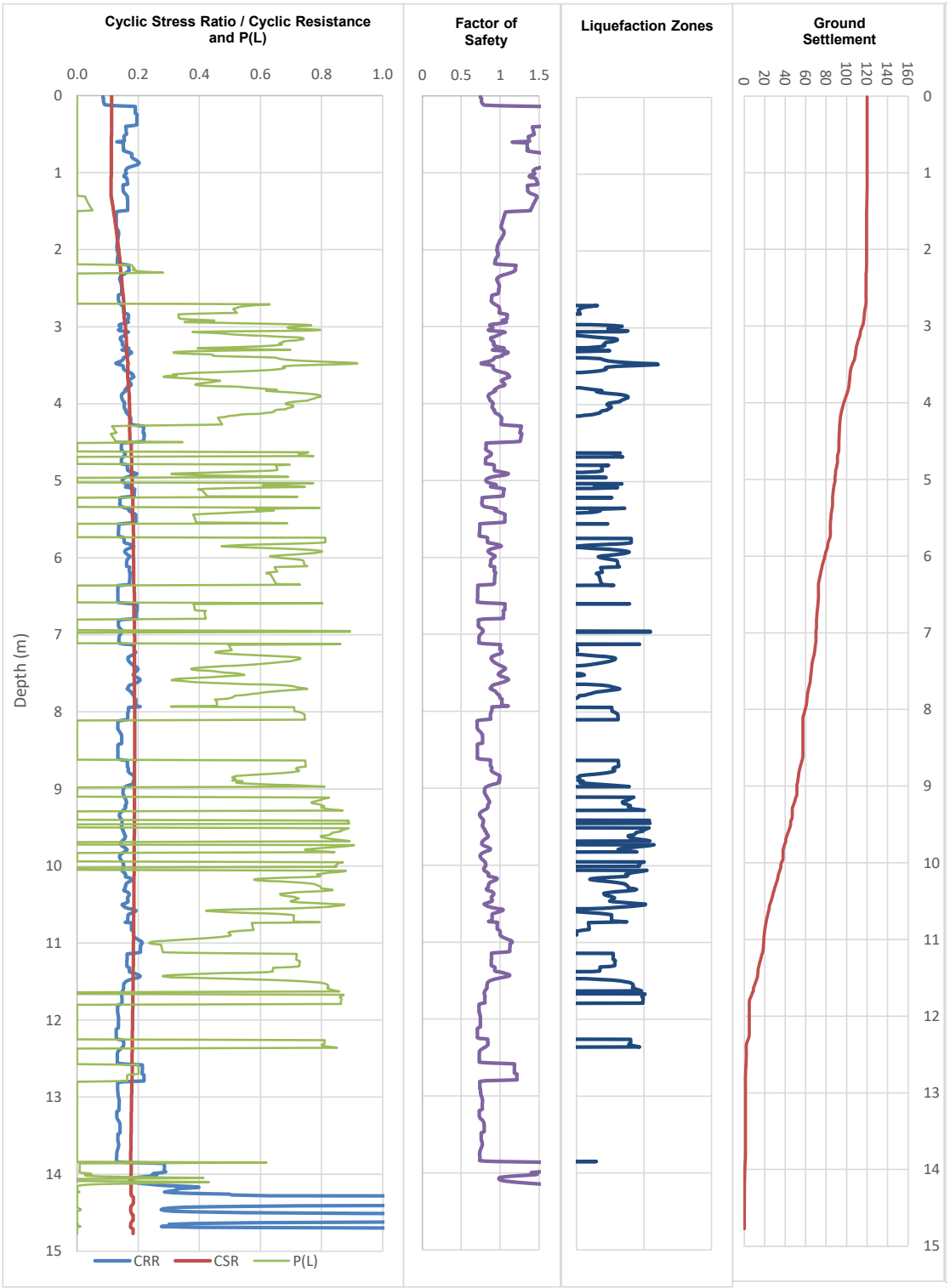
GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 014c**
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002) **500 yrs**

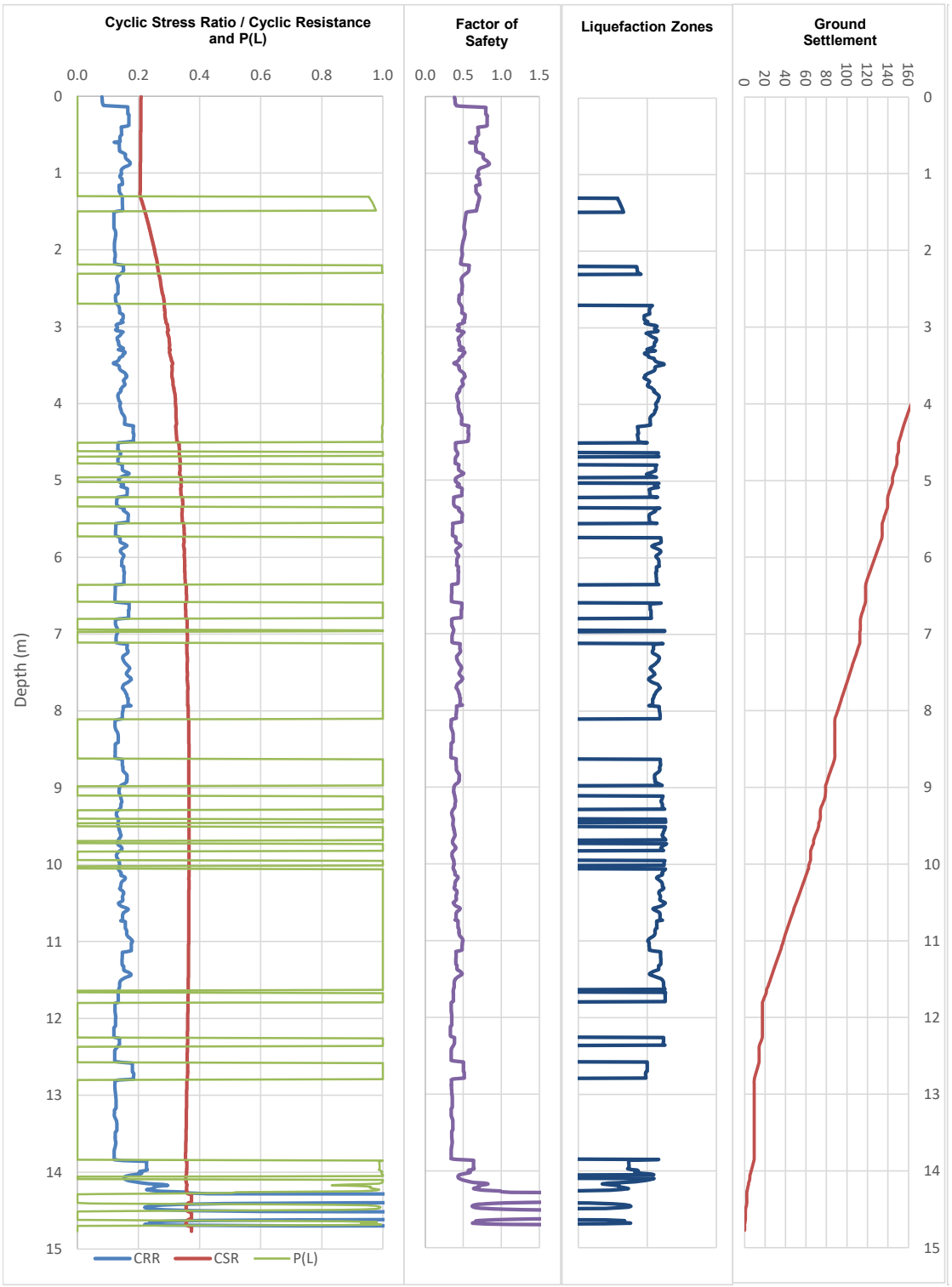
a(g) = 0.35 M 7.5

GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 020**
	Client:	Aphrodite Ltd	Job No:	6096

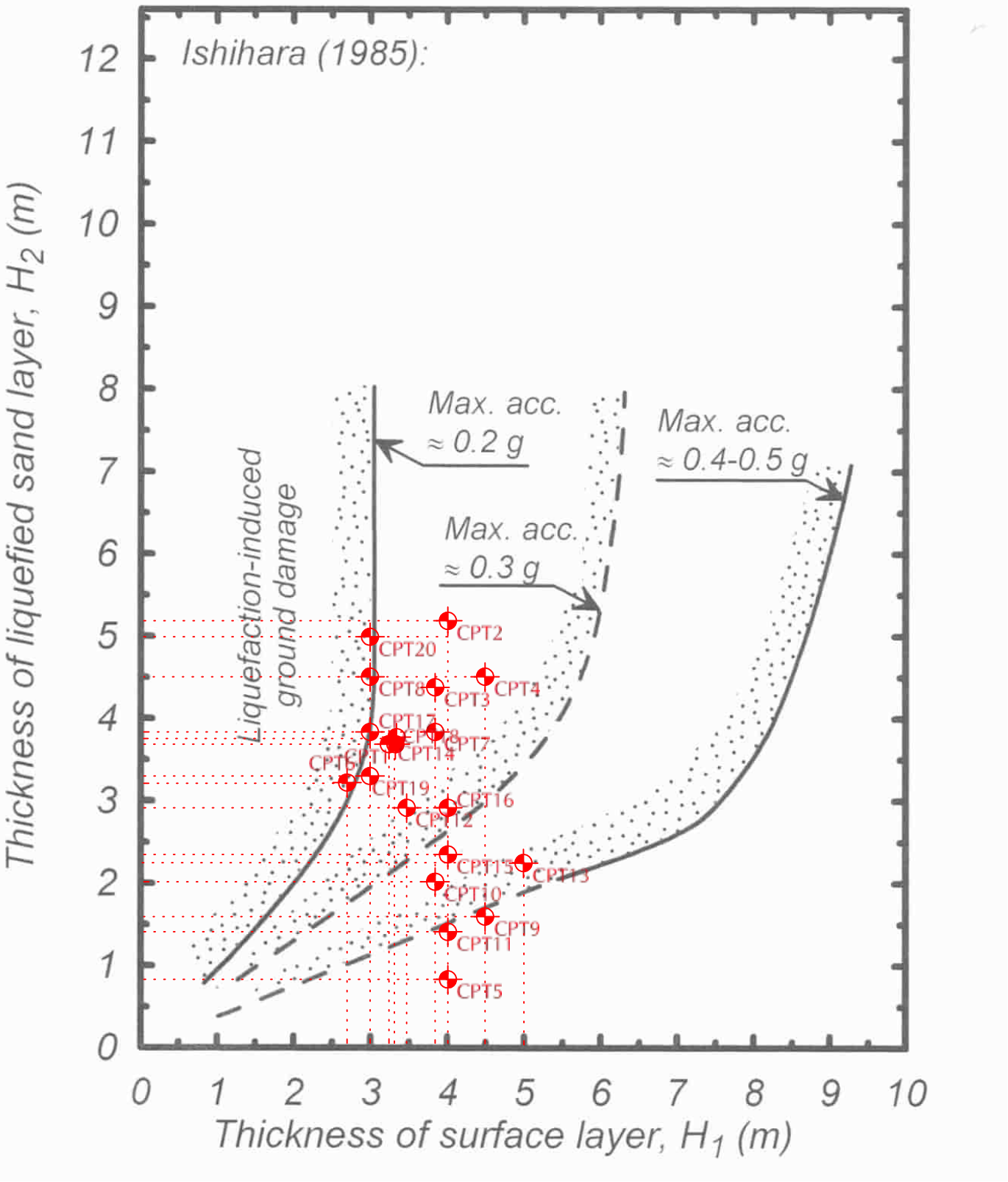


Based on Idriss & Boulanger (2014) and Zhang (2002)	**25 years**
a(g) = 0.19	M 6

GEOTECH	Liquefaction Potential Analysis			
	GEOTECH CONSULTING LTD			
	Project:	275 Highsted Road	Hole No:	**CPT 020**
	Client:	Aphrodite Ltd	Job No:	6096



Based on Idriss & Boulanger (2014) and Zhang (2002)	**500 yrs**
a(g) = 0.35	M 7.5



From Ishihara, K., 1985. "Stability of natural deposits during earthquakes" *Proceedings, 11th International Conference on Soil Mechanics and Foundation Engineering, pp 321-376*

GEOTECH consulting ltd

PROJECT: 275 Highsted Road

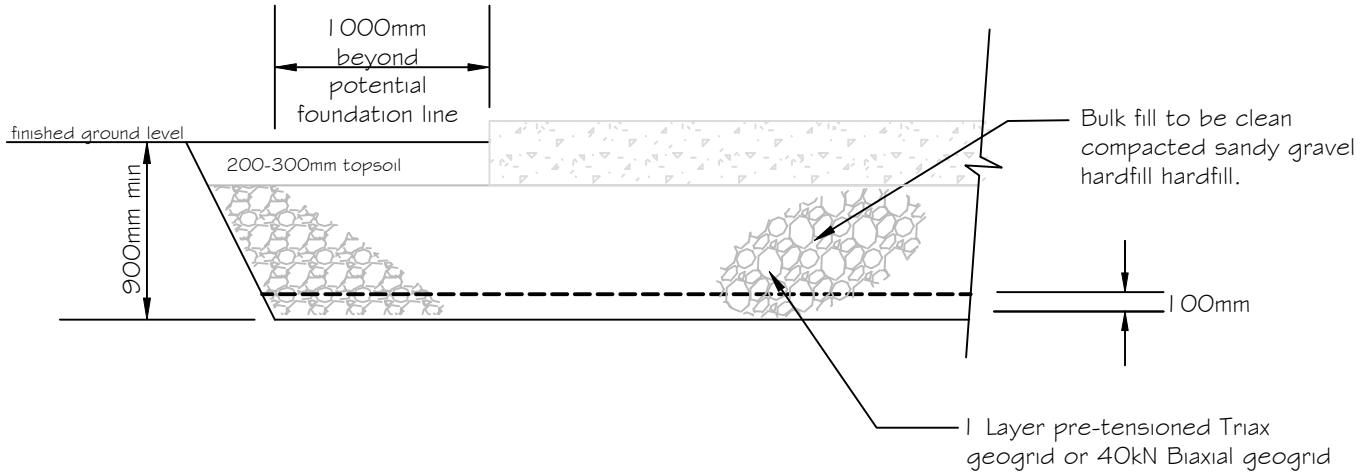
DRAWING: Surface Manefestation of Liquefaction at SLS

SCALES:	DESIGNED	NJT	02/20
N/A	DRAWN	NJT	02/20
	CHECKED		

PROJECT No.	SHEET No.	ISSUE
6096	SK3	A

Appendix 4

Ground Improvement Concept



Note:
Place geogrid on each lot to 1 metre beyond any normal building platform / foundation line.

GEOTECH
consulting ltd

PROJECT:	DRAWING:
275 Highsted Road	Ground Improvement Concept

ISSUE	DATE	AMMENDMENT DETAILS	CHKD

SCALES:	DESIGNED	NJT	09/23
n.t.s.	DRAWN	NJT	09/23
	CHECKED		

PROJECT No.	SHEET No.	ISSUE
6096	SK1	A