Our Ref 9528gs-final.10

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7 April 2011

Mr Steve Twohill
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Dear Steve

GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
DEPOT ROAD, KINGS FOREST

Please find attached a copy of our final geotechnical investigation report for the above project. Further to our draft report ref: 9528gs.10 dated 20 August 2010.

If you have any further queries, please contact the undersigned on 5596 4995 or 0415 380 313.

Yours faithfully

GARY SAMUELS
PRINCIPAL
for **Cardno Bowler**

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Cardno Bowler
Shaping the Future

Geotechnical Investigation
Proposed Residential Subdivision
Depot Road, Kings Forest

Job Number	9528gs.10
Prepared for	Project 28 P/L
Date of Report	7 April 2011

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Document Control

Version	Date	Author		Reviewer	
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1 INTRODUCTION

A geotechnical investigation was carried out for a proposed residential subdivision, Depot Road, Kings Forest, as requested by Project 28 Pty Ltd.

We understand the overall project involves the development of a residential subdivision, infrastructure, culvert, proposed clubhouse, two bridges, road networks and proposed private open space (including lake).

Details on proposed structural loads, types etc were not known at the time of the preparation of this report. Conceptually the lake is proposed to be some 5m deep and have slope edges in the order of 1V in 3H or 4H. Cut/fill heights are understood to vary across the site but may be up to 4.5m in both instances.

The objectives of the investigation as outlined in our proposal Ref: E6708-A dated 23 April 2010 were as follows:

- Determine the nature and certain engineering parameters of subsurface strata.
- Assess the allowable bearing capacity and moisture reactivity of the subsurface strata to allow the indicative selection and design of a suitable footing system for the proposed structures.
- Consider the excavatability of material to be cut and its suitability for use as fill.
- Assess the nature of subsurface strata in the areas to be filled with regards to settlement.
- Provide comment on subsurface conditions and likely foundation options at each proposed structure, including culverts, bridges, club house and pump station/commercial site.
- Carry out computerised stability analysis for existing drain edges at specific locations.
- Comment on depth to groundwater, if encountered.
- Determine the subsurface conditions at the proposed perched lake location near the entrance to the site.
- Carry out an assessment to determine the ground conditions at the proposed lake and undertake computerised stability analysis to determine suitable lake edge batters for long term stability.
- Make note of any potential borrow areas of rock or clay for use as structural fill, clay liners etc.
- Carry out a slope stability assessment.

This report must be read in conjunction with our attached *'General Notes'* and the ASFE publication *'Important Information About Your Geotechnical Engineering Report'* and *'Guidelines for Hillside Construction'*, Australian Geomechanics Society Journal, Volume 37, No. 2, May 2002.

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2 SITE DESCRIPTION

The subject block, was located on the southern side of Depot Road, Kings Forest.

The site, at the time of investigation, was generally flat, low lying pastoral land covered with short slashed grass. The site was irregular in shape and generally vacant. Numerous drainage gullies were located throughout the site and areas of high relief were noted near the western and northwestern extremities. Several residential buildings, sheds etc were noted at or near these high relief areas. Some thickly wooded areas of clumping trees were sporadically scattered throughout the site.

The low lying areas of the site had ponding water at surface in part, and was noted to be poorly drained.

Refer to Plates 1 to 6 for typical site conditions encountered during the investigation.

PLATE 1: TYPICAL SITE VIEW LOOKING WEST

PLATE 2: TYPICAL LOW LYING LAND IN THE FOREGROUND WITH HIGH RELIEF AREAS IN THE BACKGROUND

PLATE 3: TYPICAL VIEW OF LOW LYING LAND LOOKING SOUTH

PLATE 4: TYPICAL VIEW OF LOW LYING LAND LOOKING EAST

PLATE 5: HIGH RELIEF AREA NEAR WESTERN BOUNDARY

PLATE 6: ABANDONED SHED NEAR WESTERN BOUNDARY

3 INVESTIGATION WORK

3.1 Fieldwork

Fieldwork for the investigation was carried out between the 23 June to 18 July 2010 and included the following works:

- Pushing of 39 CPT probes to refusal.
- Drilling of 11 deep boreholes (DBH).
- Drilling of 9 shallow boreholes (SBH) to 6m or refusal

The test locations are shown on the attached site plan, Figure 1. The material encountered at each location is described on borehole/CPT log sheets included in Annex A.

Dynamic Cone Penetrometer tests were carried out beside each shallow borehole and these tabulated test results are included on the shallow borehole logs.

Fieldwork was carried out in accordance with Australian Standard, AS1726-1993 *'Site Investigation Code'*, and the Queensland State Planning Policy 1/03 *'Mitigating the Adverse Impacts of Flood, Bushfire and Landslide'*.

3.2 Laboratory Testing

Samples of representative strata were recovered and returned to our NATA accredited soils laboratory and our subcontractor, Trilabs Pty Ltd, where the following tests were carried out:

- Moisture Content
- Particle Size Distribution
- Atterberg Limits
- Oedometer Testing (Trilabs)

The laboratory test results are included in Annex B. Laboratory testing was carried out in accordance with Australian Standard AS1289 *'Laboratory Testing For Engineering Purposes'*.

4 SUBSURFACE CONDITIONS

4.1 Subsurface Strata

The investigation work indicated that variable subsurface conditions existed at the test locations. However, generally loose to very dense sand and indurated sand were encountered from surface to depth.

The borehole/CPT logs in Annex A should be referred to for the detailed description of material encountered at each investigation location. A summary is detailed in Table 1.

Table 1: Summary of Subsurface Strata

Soil Descriptions/Depth (m)										
Location	**Test No.**	**Topsoil**	**Sand**			**Sandy Clay**		**Weathered Rock**	**TD**	**Ground-water Level (m)**
			Very loose to loose	**Loose to very dense**	**Indurated**	**Soft to firm**	**Stiff or better**			
Commercial site and pump station	CPT39	0.0-0.1	-	0.1-4.0	4.0-TD	-	-	-	4.6	NM
	CPT38/ DBH1	0.0-0.1	-	0.1-4.5	4.5-11.5	-	11.5-18.7	18.7	18.7	0.4
Precinct 5	CPT1	0.0-0.1	-	0.1-3.0	3.0-TD	-	-	-	7.2	NM
	CPT2/ DBH2	0.0-0.1	-	0.1-4.5 12.0-TD	4.5-12.0	-	-	-	20.0	NM
	CPT3	0.0-0.1	-	0.1-1.8 2.6-3.5	1.8-2.6 3.5-TD	-	-	-	5.6	NM
	CPT4	0.0-0.1	-	0.1-4.0	4.0-TD	-	-	-	-	NM
	CPT5	0.0-0.1	-	0.1-5.0	5.0-TD	-	-	-	6.9	NM
	SBH8 (swale)	0.0-0.1	0.1-0.5	0.5-3.5	3.5-TD	-	-	-	6.0	0.4
Area Just North of Precinct 5	CPT6	0.0-0.1	-	0.1-3.0	3.0-TD	-	-	-	5.0	NM
Bridge (Near Hoop Pine)	CPT19	0.0-0.1	-	0.1-21.0 32.0-39.0	-	-	21.0-32.0[(d)]	-	42	NM
	CPT20/ DBH4	0.0-0.1	20.0-34.0	0.1-20.0 34.0-TD	-	-	-	-	40	2.5
Road Alignment from Precinct 5 to Bridge (Hoop Pine)	CPT17	0.0-0.1	-	0.1-4.5	4.5-TD	-	-	-	8.14	NM
	CPT18	0.0-0.1	-	0.1-1.2	1.2-TD	-	-	-	3.9	NM
Precinct 13	CPT27	0.0-0.1	-	0.1-2.2	2.2-TD	-	-	-	5.1	NM
	CPT28	0.0-0.1	-	0.1-6.2	6.2-TD	-	-	-	7.0	2.4

Table 1 continued

Location	Test No.	Topsoil	Sand			Sandy Clay		Weathered Rock	TD	Ground-water Level (m)
			Very loose to loose	Loose to very dense	Indurated	Soft to firm	Stiff or better			
Proposed Clubhouse	CPT29/ DBH5	0.0-0.1	-	0.1-3.5 12.0-20.5 22.5-24.0	3.5-12.0	-	20.5-22.5 24.0-TD	-	30.0	-
Bebo Arch	CPT26/ DBH6	0.0-0.1	-	0.1-2.6 9.0-13.5 16.2-22.7 28.5-TD	2.6-9.0 13.5-16.2	-	22.7-28.5	-	30.0	1.0
Precinct 12	CPT24	0.0-0.1	-	0.1-15.0	-	-	15.0-TD[(d)]	-	19.8	NM
	CPT25	0.0-0.1	-	0.1-2.2	2.2-TD	-	-	-	4.2	NM
Culvert	CPT23/ DBH7	0.0-0.1	-	0.1-14.5	-	14.5-15.7	15.7-22.6	22.6	22.6	2.5
	CPT22/ DBH8	0.0-0.3[(e)]	9.3-12.0	0.3-3.6	-	3.6-9.3	12.0-TD	-	23.5	NM
Approach to culvert from Precinct 12	CPT21	0.0-0.1	20.0-TD	0.1-20.0	-	-	-	-	42	NM
Proposed Lake	CPT30	0.0-0.1	-	0.1-2.0	2.0-TD	-	-	-	2.5	NM
	CPT32	0.0-0.1	-	0.1-1.8	1.8-TD	-	-	-	2.5	NM
	CPT33	0.0-0.1	-	0.1-1.5	1.5-TD	-	-	-	2.3	NM
	SBH6	0.0-0.3	-	0.3-2.0 3.4-TD	2.0-3.4	-	-	-	6.0	1.3
Town Centre	CPT7/ DBH3	0.0-0.1	-	0.1-4.0 9.0-24.0	4.0-9.0	-	24.0-TD	-	25.5	NM
	CPT8	0.0-0.1	-	0.1-3.8	3.8-TD	-	-	-	5.8	NM
	CPT9	0.0-0.1	-	0.1-2.6	2.6-TD	-	-	-	6.5	NM
	CPT10	0.0-0.1	-	0.1-2.2	2.2-TD	-	-	-	3.7	NM
Proposed Perched Lake	SBH9	0.0-0.1	-	0.1-5.6	5.6-TD	-	-	-	6.0	0.4
Drainage Channels	SBH1	0.0-0.3	-	0.3-1.9	1.9-TD	-	-	-	3.1[(c)]	0.8
	SBH2	0.0-0.2	-	0.2-2.1 3.2-TD	2.1-3.2	-	-	-	6.0	-
	SBH7	0.0-0.2[(e)]	0.2-1.2	1.2-TD	-	-	-	-	6.0	0.9

Table 1 continued

Location	Test No.	Topsoil	Sand			Sandy Clay		Weathered Rock	TD	Ground-water Level (m)
			Very loose to loose	Loose to very dense	Indurated	Soft to firm	Stiff or better			
High Topographic Areas	SBH3	0.0-0.2	-	3.8-TD	-	-	0.0-3.8	-	6.0	3.7
	SBH4	0.0-0.2[e]	-	-	-	-	0.2-0.8	0.8-TD	1.1[f]	NE
	SBH5	0.0-0.2	-	-	-	-	0.2-1.5	1.5-TD	1.7[f]	NE
Balance	CTP11	0.0-0.1	-	0.1-2.5	2.5-TD	-	-	-	3.3	NM
	CPT12/ DBH9	0.0-0.1	-	0.1-3.5 7.5-14.8	3.5-7.5	-	14.8-27.0	27.0-TD	3.0	0.3
	CPT13	0.0-0.1	-	0.1-1.4	1.4-TD	-	-	-	3.0	NM
	CPT14	0.0-0.1	-	0.1-2.3	2.3-TD	-	-	-	2.6	NM
	CPT15	0.0-0.1	-	0.1-1.95	1.95TD	-	-	-	2.8	NM
	CPT31	0.0-0.1	0.1-0.6	0.6-1.3 1.7-2.5	1.3-1.7 2.5-TD	-	-	-	3.1	NM
	CPT34/ DBH10	0.0-0.1	-	0.1-2.2 6.0-13.0 16.5-18.0[g] 25.8-TD[g]	2.2-6.0	-	13.0-16.5 18.0-25.8	-	30	0.3
	CPT35	0.0-0.1	-	0.1-1.7	1.7-TD	-	-	-	3.2	NM
	CPT37/ DBH11	0.0-0.1	-	1.8-8.3	-	8.3-10.5	0.1-1.8 10.5-13.8	13.8-TD	16.5	1.8

NOTES:

a) All depths measured in metres below ground level at the time of the investigation.
b) TD = Termination Depth.
c) All above CPT tests were pushed to refusal.
d) Interbedded stiff sandy clay/loose clayey sand.
e) Fill.
f) TC bit refusal for drill rig.
g) Gravel bands throughout.
h) NM = Not measured.
i) NE = Not encountered.

Groundwater levels, where encountered, were generally between 0.3m and 2.5m below existing site level. Refer to Table 1 above for details of where groundwater was encountered and at what depth.

Due to the sites close proximity to Cudgen Creek, groundwater levels could be expected to fluctuate. Groundwater could be expected to be a significant civil issue for cut areas of the site and as such, dewatering is expected to play a major role in the speed at which the civil works are able to progress.

4.2 Laboratory Test Results

A summary of laboratory test results is provided in the Table 2 below. Refer to Annex B for details on the oedometer testing outputs.

Table 2: Classification and Vane Shear Test Results

Particle Size Distribution, Atterberg Limits, Linear Shrinkage and Moisture Content									
Bore No	**Depth (m)**	**% Sand & Gravel**	**% Clay & Silt**	**Moisture Content (%)**	**Liquid Limit (%)**	**Plasticity Index (%)**	**Linear Shrinkage (%)**	**Pocket Penetrometer (kPa)**	**Vane Shear (kPa)**
SHB3	0.8-0.9	10	90	38.8	14.5	19	14.5	-	-
	3.0-3.1	12	88	39.8	39.8	17	13.5	-	-
BH8	7.5-7.95	-	-	-	-	-	-	10-15	15

5 GEOTECHNICAL ASSESSMENT

5.1 Earthworks

Based on supplied earthworks plans (Mortons Urban Solutions), cut/fill levels are expected to be up to 2.5m in both instances.

Site Preparation

All site preparation work should generally be carried out in accordance with AS3798.2007 *'Guidelines on Earthworks for Commercial and Residential Developments'*.

The site should be stripped of all topsoil from the fill footprints, and stockpiled for landscaping usage, if required. A stripping depth in the order of 0.1m is indicated from the information gathered at the investigation locations. Where any minor existing fill was encountered, this fill is expected to be *'uncontrolled'* and as such over excavation in these areas should be undertaken and the fill removed and replaced with select fill or be recompacted.

After stripping and fill removal, the newly exposed surface should be proof rolled using a vibrating 10 tonne (static weight) smooth drum roller. Any loose/soft areas should be removed and recompacted or replaced using a compacted select fill. As discussed, dewatering may be required due to the presence of a high water table in order to avoid heaving during the earthworks process.

Depressions formed by the removal of vegetation, existing structures, underground services etc, should have all disturbed soil cleaned out and be backfilled with compacted select fill material.

Trafficability

During the investigation, the fieldwork plant used became *'bogged'* on numerous occasions, and as such, it is likely that in order to maintain some manoeuvrability around the site, that a series of haul roads will need to constructed.

If at any stage there is a need for haul roads to be developed the following construction method is recommended:

- Strip the grass and organic root zone and allow the surface to dry to promote some surface crust. If necessary, geogrids may be placed over the stripped surface.
- Following stripping and drying, place a minimum thickness of say 500mm to 600mm of granular material of a maximum particle size of 75mm over the stripped surface.
- After the initial lift, subsequent lifts, preferably with granular material can be placed and compacted in the conventional way.

Excavatability

No problems should be encountered in excavating the near surface material on site. Most soils encountered on site should be within the excavation limits of a small dozer (eg Cat D6 or similar) in bulk excavations or medium size backhoe (eg Case 580 or similar) in trench excavations.

'TC' bit limit was achieved in SBH4 and SBH5, in the high relief areas of the site, in weathered rock. While there is no direct reliable relationship between drilling resistance and excavatability, as a rule of thumb the limit of the *'TC'* bit may be taken as indicative of the limit of excavation of a medium sized dozer in bulk excavation (Cat D7E, D8) or a large excavator in trench excavation (Kato or Hymac).

Generally below the *'TC'* bit limit, larger excavation equipment, explosives, compressor driven pneumatic tools, or hydraulic rock breakers would be required for excavation.

Structural Fill Placement

With the exception of the topsoil stratum, all materials encountered during the investigation are considered acceptable for use as structural fill provided that any pre-treatment (moisture conditioning, removal of oversize), is carried out prior to fill placement. The clays on site are highly plastic and could be expected to result in stiff raft foundation types if encountered in significant thicknesses or where used as fill. Given this, the clays are considered poor quality structural fill. However, the sand/weathered rock strata are considered a more suitable material for use as structural fill when compared to the clays on site.

Any structural clay bearing fill should be placed in loose layers not greater than 200mm thick at a moisture content in the range -2% to +3% of the standard optimum moisture content (to minimise the potential for post compaction volume change due to moisture content variations) and be compacted to a minimum dry density ratio of 95% and 98% of the maximum dry density determined by AS1289 5.1.1 (standard compaction) for residential and commercial areas respectively.

Measures should be adopted to ensure that this clay bearing fill material is not allowed to dry out prior to the placement of succeeding layers of fill and final covering with building slabs and road pavements.

Any structural sand fill should be placed in loose layers not greater than 200mm thick, and be compacted to a minimum density index of 70% and 80%, for residential and commercial areas respectively, in accordance with AS1289 5.5.1 using a vibrating smooth roller drum not less than 10 tonne in static weight.

It is recommended that the placement of all structural fill be inspected and tested by Cardno Bowler to Level 1 requirements, during the earthworks operations to ensure that all fill is placed in a *'controlled manner'*, in accordance with AS3798-2007.

The near surface silty sand encountered on the site is known to be particularly difficult to work and compact, especially if it becomes wet. The material has relatively good engineering properties if it is compacted in place to the required density and confined by overlying layers. However, if the moisture content is too high at the time of site preparation work, it tends to be spongy and will heave under the load of construction equipment, can be difficult to traffic and compact, and is slow to drain and dry out. Some dewatering management plan is likely to be required in order to maintain some manoeuvrability of plant during the bulk earthworks.

5.2 Batter Slopes

For initial design purposes, previous experience in the area has indicated that the following maximum unprotected batter slopes may be adopted for the cut and fill batters on the site.

Table 3: Maximum Unprotected Batter Slopes

Material Type	Short Term (Maximum)	Long Term (Maximum)
Residual Clays (cut)	1V:1H	1V:2H
Residual Sands (Cut)	1V:2H	1V:2.5H
Fill Batters(1)	1V:2H	1V:2H
Weathered Rock	1V:1H	*

Notes:

1. [(1)] All fill batters should be overfilled, compacted and cut back at the maximum angles recommended above and with some form of erosion protection to minimise any potential unnecessary scour effects due to weathering.
2. * Denotes requirement for detailed stability assessment.

5.3 Building Footings

Residential Precincts

Final site classifications will be a function of the geometry of the building platforms and the reactivity of the material that comprises said platform. This will need to be confirmed on a site by site basis post construction.

Assuming that the predominate structural fill material to be used is sand/weathered rock and that the fill is placed as per Section 5.1 of this report, then in the cut areas Class 'S' sites are likely and in the fill areas Class 'M' to 'H' sites can be expected.

General Structures

For the following proposed structures, Town Centre, Commercial Site and Pump Station, Bridge (near Hoop Pine), Clubhouse and Bebo Arch, depending on structural loads, both high and deep level footings may be appropriate for these structures. See below for footing options and allowable bearing capacities for design purposes.

High Level Footings

For lightly loaded, small structures such as residential buildings, sheds, etc, high level, strip/pad footings or stiff raft systems may be considered.

The following allowable bearing capacities, as shown in Table 3 below, may be used to assess the footing pressures that may be applied to the various strata by strip/pad footings without causing bearing capacity failure.

Table 4: Allowable Bearing Capacities Strip/Pad footings

Material Type	Allowable Base Bearing Capacity
Controlled Fill	100
Natural Sands	100
Residual Clay	100
Weathered Rock	600

Deep Level Footings

Should loads be such that deep level footings are required to support structures, alternative deep level footing types include bored piles, grout injected piles, driven piles, push piles and screw in steel piles.

Bored Piles

Using the Australian Standard AS2159-1995 *'Piling - Design and Installation'*, the design of a bored or grout injected pile footing system may be based on the following formulae:

$S^* \leq R_g^*$

where $R^*_g = \phi_g R_{ug}$

R^*_g = Design Geotechnical Strength

S^* = design action effect (design load as the combination of factored loads which produce the most adverse effect on the pile).

ϕ_g = Geotechnical Reduction Factor

R_{ug} = Ultimate Geotechnical Strength

$R_{ug} = f_s A_s + f_b A_b$

f_s = Ultimate skin friction pressure

f_b = Ultimate base bearing pressure

A_b = Plan area of pile base

A_s = Surface area of pile

For piles founding into clay or weathered rock:

$f_s = S \alpha$

$f_b = S N_c$

where α = Adhesion factor

N_c = Bearing capacity factor which varies between 5 and 9 depending on the depth of the pile

S = Undrained shear strength

For piles founding into sands or gravels:

$f_s = K_s \sigma'_v \tan \delta$

$f_b = \sigma'_{vb} N_q$

where σ'_v = vertical effective stress at relevant depth

σ'_{vb} = vertical effective stress at the base of pile or at limiting depth

N_q = Bearing capacity factor due to overburden pressure

K_s = Earth pressure co-efficient

δ = Angle of sidewall friction

The parameters shown in Table 4 may be used for footing design purposes. However, if bored piles are adopted, the base of the piles must be inspected during construction to ensure that material of adequate capacity supports each pile. It is essential that the base of each pile is free from any water-softened materials and any debris. Pile bases should be **cleaned using a clean out bucket or cleaning plate.** This instruction should be made **explicit** to the piling contractor.

However, due to the presence of a high water table, there may be a need for pumps to be utilised and or a full casing sealed into the rock or an impermeable layer to maintain the integrity of the pier base depending on the water influx into the pier hole.

If the pumping of water is not considered a satisfactory method to keep the water influx low, other possibilities include drilling the bore under bentonite suspension to the end bearing rock. Concrete is placed into the bore by tremie, and the bentonite suspension is displaced by the concrete. The major disadvantages with this method is that unless the waste suspension is collected, the site can become very wet. There are also difficulties with the checking of base cleanliness.

If may be prudent to drill a test pier on this site if bored pier construction methods are to be utilised to assess the suitability of this method and to determine if water inflow can be controlled.

Grout injected piles are another construction type that may be suitable. However, this piling technique is not favoured as some difficulties with base cleanliness and end resistance can occur with grout injected piles socketted through clay into rock.

Table 5: Geotechnical Parameters for Bored Piles

Material Type			Design Equivalent Skin Friction $\phi_g f_s$ (kPa)	Design Equivalent Base Bearing Capacity $\phi_g f_b$ (kPa)
Fill			NR	NR
Natural Sands	› Loose [f] or better	Depth 1 to 2m	4	100
		3	5	200
		4	6	270
		5	7	400
		6	9	560
Indurated Sand [g]			20	600
Clay	› Soft		NR	NR
	› Stiff or better		6	180
Weathered Rock			35	1000

Notes:

a) NR = Not Recommended

b) Ignore top 1.5m of profile in pile capacity calculations.

c) The above values were compiled assuming that the pile depth will be at least 5 times that of its pile diameter.

d) A geotechnical strength reduction factor (ϕ_g) of 0.4 has been applied to the ultimate parameters in the calculation of the above design equivalent capacities.

e) The geotechnical strength reduction factor could be increased should dynamic or static pile testing be carried out. If this is the case, then Cardno Bowler should be contacted.

f) For sands, the values shown above are indicative only and will vary depending on depth and strength of a material at a given location. As such these values should be used for preliminary design purposes only and confirmed with a more detailed assessment once structural loads are known.

g) The thickness of the indurated sand layer would need to be checked to ensure that it is sufficient, in comparison with the dimensions of the footing, to support the applied load.

If, during bored pier or other operations, suspected weaker material is encountered below the limit of the investigation work, Cardno Bowler should be contacted immediately to assess the nature of this strata.

Screw Piles

This deep foundation method is performed by screwing in a compression auger head which has a hollow steel tube connected to a hollow helix.

When the bearing strata is reached the steel cage is placed down the hollow tube and the tube filled with concrete. The auger head and steel tube are then unscrewed. The auger head is slowly withdrawn and concrete pumped out the end of the head under pressure filling the bore with concrete whilst being removed.

Nominal screw pile sizes are shown in Table 5.

Table 6: Nominal Screw Pile Sizes

Minor Diameter (mm)	Maximum Helix Diameter (mm)
410	550
460	510
510	660
560	700

In the calculation of allowable base bearing and allowable skin friction capacity, the following shaft sizes may be adopted:

- Base bearing = minor diameter + 150mm
- Skin friction = minor diameter + 100mm

The major advantage with this form of pile installation is that high ground water levels have not effect on pile construction.

The disadvantage with this piling technique is that subsurface materials, including the founding stratum, cannot be visually assessed during the construction process.

Driven Piles

Driven precast concrete piles are a possible foundation type where the founding stratum is at depth. These have the advantage of not being effected by groundwater during construction.

Piles driven to near refusal into weathered rock can generally be designed based on the pile section capacity rather than on a consideration of the soil or rock properties. Typical precast concrete pile sizes and nominal capacities are provided in Table 6 below.

Table 7: Indicative Pile Sizes and Capacities

Pile Size (mm square)	Nominal Capacity (kN)
235	600-700
275	1000-1200
300	1400-1500
350	1600-1800

The range in capacity for a given size reflects variation between individual piling contractors.

Piles would be expected to refuse in weathered rock with consecutive SPT ‘N’ values of about 50 or greater.

Vibrations and the pile cap associated with this type of installation are the major drawbacks related to driven pile construction. The vibrations of a driven pile drop hammer may potentially cause structural damage to existing pipes etc, this must be considered carefully if this technique is to be utilised.

Cast insitu concrete driven piles with enlarged bases are another piling option. This is a method where a withdrawable tube containing a plug of gravel or dry concrete is driven down by blows from an internal drop hammer to the founding depth. When the founding depth is reached the concrete is

placed and the concrete plug hammered out to form a bulb end. A reinforcing cage and concrete are then placed and the tube is withdrawn.

Nominal pile capacities for this type of construction are displayed in Table 7.

Table 8: Cast – Insitu (Enlarged Base) Driven Pile Capacities

Shaft Diameter	Working Load (kN)
400	1000
500	1500
600	2500

Loads are based on a base diameter of at least 1.5 times the shaft diameter.

A specialist piling contractor should be consulted to confirm pile capacities.

Culvert

For the culvert, based on existing ground conditions, some settlement could be expected under fill plus culvert loads (say 60kPa). This settlement could be in the order of up to 195mm and take some 6 to 12 months to achieve the near completion (say 90%) of primary consolidation. Preload of this area may be considered to increase the rate of settlement or piling of the structure may be an alternative which would alleviate any settlement issues. Settlement is discussed in more detail below.

Note: Laboratory testing is still currently underway and as such the values mentioned above are based on previous experience with soft clays and as such are subject to variation based on the results of the laboratory testing and subsequent analysis.

5.4 Settlement

Based on provided fill heights, the subsurface profile encountered during the investigation and anticipated building loads, some settlement could be expected across the site. However, given the predominately sand nature of the subsurface profiles encountered, this settlement could be expected to be elastic and occur almost immediately upon loading. This elastic settlement could be expected to be in the order of up to 100mm. Given the requirement for proof rolling and the anticipated compression of the subsurface strata under loads imposed by haul trucks, plant etc, the majority of the site is not expected to require any additional pre-treatment prior to the commencement of the earthworks.

However, at the culvert location and CPT37/DBH11 (Precinct 16) compressible soft clay was encountered. In both areas, some filling is proposed. Consolidation settlement could be expected under structure plus fill loads.

The consolidation settlement, which will occur in the soft clays, is time and load dependent. Primary settlement occurs under loading as pore pressures are dissipated. In the loose to medium dense sands settlement is expected to occur quickly, essentially upon loading.

Compressible clay thicknesses of 1.2m and 5.7m were encountered at the culvert and 2.2m at DBH11. Given these thicknesses and using an Mv (coefficient of compressibility) of 1.6×10^{-3} kPa^{-1}, the following theoretical primary consolidation is anticipated.

Table 9: Estimated Consolidation Rates for Various Marine Clay Thicknesses

Location	Indicative Primary Consolidation (mm)
Culvert	75-365
DBH11	160

In addition to the above, up to 100mm of elastic settlement may also occur.

The rate of settlement is expected to be in the order of 6 to 12 months in order to achieve T_{90} (90% consolidation under structural fill loads only.

Surcharge

If time is available, it would be prudent to surcharge the culvert alignment in order to accelerate the consolidation. The maximum height of fill/surcharge placed must be controlled to prevent bearing capacity failure in the underlying soft soils. Based on the shear strength of the soft soils, a maximum initial fill height of 4 metres is recommended (including surcharge), with fill batter slopes not steeper than 3H:1V. Additional fill, if required, may be placed once some consolidation of the underlying soft clay soils has occurred giving some increase in strength following dissipation of excess pore pressure.

Based on 2m of structural fill and 2m of surcharge (4m total fill height), T_{90} could be expected to occur within approximately 3 months.

Monitoring

The settlement times discussed in Table 8 are dependent upon the drainage achieved in the compressible clays. These times are provided for planning purposes only. Monitoring of the settlement must be carried out on site to determine when settlements are complete. This should consist of the use of settlement plates installed across the site once stripping has been completed and prior to the placement of fill. Settlement plates should be monitored once each week during the filling program and fortnightly thereafter for a period of 6 weeks. The frequency of readings after this initial monitoring may vary depending upon the results recorded.

5.5 Proposed Lake

It is understood that a 1V:3H cut lake edge batter, some 5.0m deep, is proposed to construct the lake.

Based on the fieldwork conducted to date, the stratigraphy in the lake area comprises predominately of loose to medium dense and indurated sands. Given this our preliminary findings indicate that the lake will be suitable for the proposed lake edge batter of 1V:3H with regards to stability.

With regards to suitability of spoil materials for use as structural fill during lake excavation, the sand spoil is considered good material for use as structural fill.

The residual clay encountered in the higher topographic areas of the site appear suitable for use as a clay liner for the lake base and edges, however, this is based on a visual and classification assessments only. It is recommended that further testing of this strata be conducted to determine its permeability if it is to be considered for a clay liner usage.

5.6 Existing Drains

Based on the existing geometry of the drains and the proposal to add surcharge to the drain edges with structural fill, a series of analyses were undertaken to assess the long term stability of the drainage channels given the predominate sand subsurface strata.

In order to maintain an adequate factor of safety against instability, it is recommended that the drains be remodelled so that the drain batters do not exceed 1V:3H. Alternatively the drains could be steeper but would need to be retained (i.e. gabion wall) and given the significant lengths of the drainage system, this would seem impractical.

Some form of erosion protection may also need to be considered on the drainage channel batters, i.e. rip/rap in order to minimise potential erosional effects and batter/edge deterioration.

5.7 Slope Stability Assessment

Fieldwork for this component of the investigation was carried out by a Senior Engineering Geologist on 28 June 2010.

The fieldwork exercise included a broadscale inspection, where possible, of the entire site to assess the following;

- Determine slope angle
- Observe vegetation
- Note any evidence of tension cracking
- Note any evidence of seepage
- Note any evidence of soil creep
- Note any evidence of previous slips
- Geological features
- Subsurface conditions
- Drainage issues

No physical evidence of previous movement, seepage, soil creep etc was observed during the mapping exercise across the site in its current state.

Slope angles varied from less than 10^{o} (17%) to greater than 17^{o} (30%) across the high relief areas of the site and over possible individual building areas.

For sloping blocks, it is recommended that cut/filling construction be restricted to the area on the blocks where **natural** slope angles are less than 14^{o} (say 25%) and where residual soils/weathered rock existed. This cut and fill should be limited to heights not exceeding 1m without more detailed geotechnical investigation work. Where slopes exceed 14° (say 25%) it is recommended that no cut/fill be undertaken without detailed geotechnical assessment.

Where the lot varies significantly in slope percentage, the final proposed building location will have a significant bearing on the most likely dwelling type. Should the building be constructed over an area which is less than 15% slope and residual soils or weathered rock are encountered, then a slab-on-ground may be considered. Where the slope exceeds 15%, or where colluvium was encountered, pole type or split level homes should be considered. A combination slab-on-ground, split level, pole type dwelling may be considered where slope percentages vary across a proposed building platform and appropriate soils allow for this type of construction. Where slopes exceed 25%, pole type homes should be considered only. A final decision on the most appropriate building type will need to be made at the design stage of the proposed building.

The above should be considered 'indicative' only and subject to variation depending on the results of the site specific geotechnical investigation required to be carried out to finalise site classifications for footing design.

The above assumes that appropriate subsurface and surface drainage control measures will be designed, installed and certified in order to control groundwater and surface runoff.

If pole type dwellings are proposed, these dwellings should be of a lightweight, flexible construction using timber/steel, suspended timber floors and cladding. Also pole supports should be designed to resist any lateral loading due to creep within the soils.

Once final cut/fill levels are known for the bulk earthworks, it is recommended that a detailed slope stability assessment, using cross sectional drawings, be carried out by Cardno Bowler to provide recommendations for slope stability.

The stability of an area under construction will largely be a function of adequate drainage control. Therefore, it is assumed that stormwater management will be designed and constructed in accordance with recognised building practices/standards to control all drainage issues.

For sloping land, it is recommended that removal of vegetation (with the exception of topsoil stripping) be kept to a minimum and that any vegetation removal only be undertaken where it is necessary in order to construct building platforms.

Based on the mapping exercise and fieldwork to date, no physical evidence was observed to indicate previous instability or potential future instability across proposed allotments in their existing state, nor was any literature noted to indicate any previous movement.

Further to the above, a quantitative hazard rating has been assigned to the sloping areas of the site, the results of this assessment indicated that lots varied in hazard rating from very low to low. For details of this analysis, refer to Annex C of this report.

The development of this site is not expected to adversely affect the current stability of adjoining properties provided the recommendations above are adhered to and adequate civil/hydraulic and structural issues are addressed.

Given the results of our assessment, the site is considered acceptable for its proposed usage with regards to stability.

As this investigation is *'broadscale'* all findings should be considered preliminary only. It is recommended that proposed cut/fill levels for building pad construction be reviewed and analysed by Cardno Bowler prior to the commencement of any earthworks to confirm the theoretical stability factor of safety (FOS) against failure is $\geq$1.5. Further, during the construction phase of the project, Cardno Bowler should be engaged to inspect the cut/fill batters and certify that the required FOS can be achieved or whether remediation works are required.

6 CONSTRUCTION INSPECTIONS

It is recommended that placement of all structural fill and footing excavations be inspected, tested and certified where necessary, by Cardno Bowler Pty Ltd to ensure recommendations made in this report have been adhered to.

Should subsurface conditions other than those described in this report be encountered, Cardno Bowler Pty Ltd should be consulted immediately and appropriate modifications developed and implemented if necessary.

7 CONCLUSIONS AND RECOMMENDATIONS

The following is a summary of the conclusions and recommendations in regard to the geotechnical investigation for the proposed residential subdivision at Depot Road, Kings Forest. However, the preceding sections of this report should be read for a full description of the conclusions and recommendations.

1. The subsurface conditions at the site generally consisted of loose to vey dense sand and indurated sand from surface to depth.

2. The site preparation work should generally be carried out in accordance with AS3798.2007 *'Guidelines on Earthworks for Commercial and Residential Developments'*.

3. Based on proposed earthworks and assuming fill types and adequacy of fill placement, the classification of allotments across the site is likely to vary from Class 'S', 'M' and 'H' in accordance with AS2870-1996 *'Residential Slabs and Footings'*.

4. Depending on structural loads both high and deep level footings may be appropriate to support the proposed development on the subject site. Recommended bearing capacity parameters to allow the proportioning of footings, depending on the applied load, are included in Section 5.3. Recommended geotechnical parameters for pile design are included in Section 5.3.

5. Refer to Section 5.4 of this report for issues relating to potential settlements.

6. Section 5.5 should be reviewed for comments with regards to lake stability and the use of on site borrow material as a clay liner.

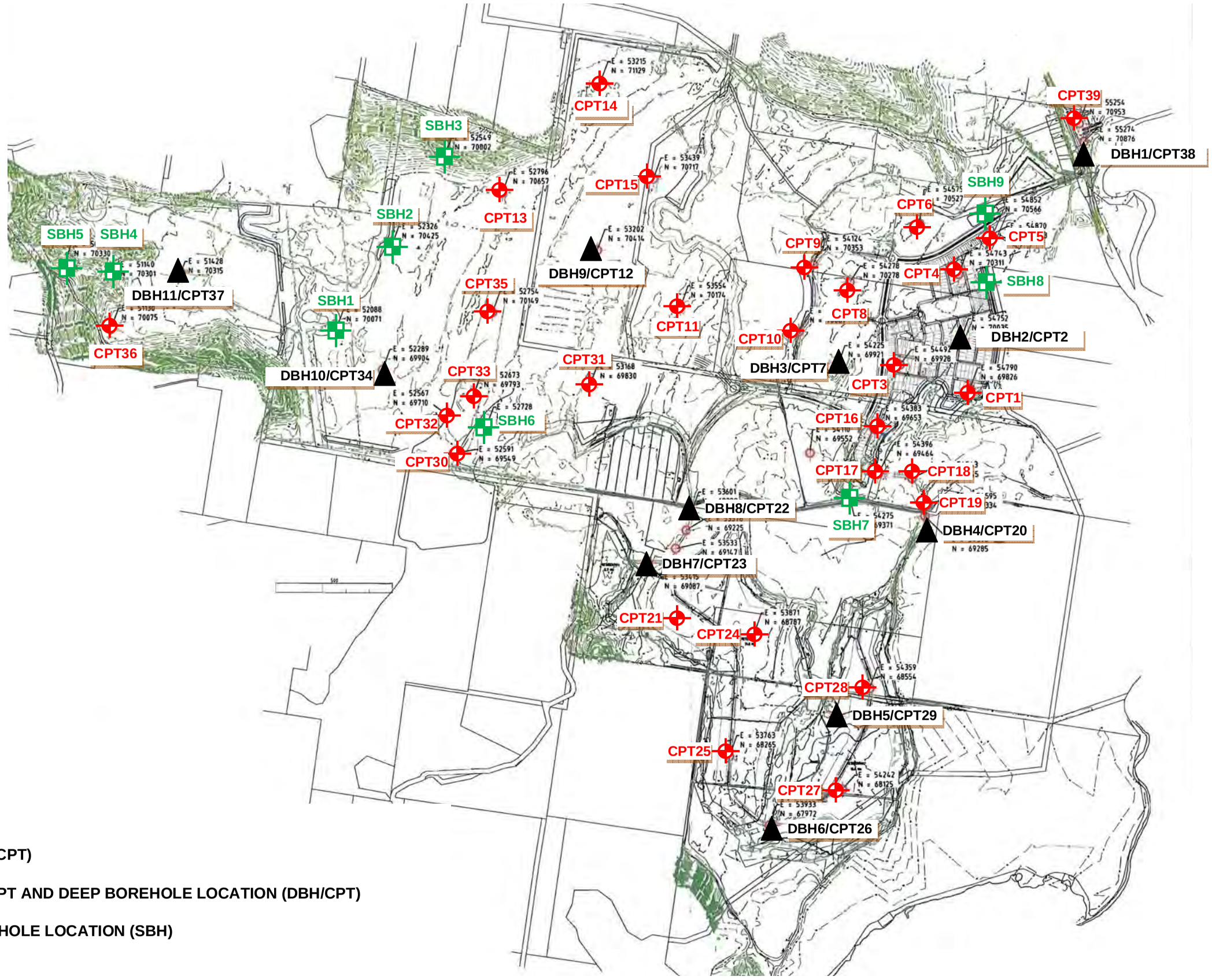
7. Refer to Section 5.6 for issues relating to existing drainage channel stability.

8. Refer to Section 5.8 for comments on existing slope stability in the high topographic areas of the site.

Yours faithfully

GARY SAMUELS
PRINCIPAL

DAVID BOWLER
SENIOR PRINCIPAL



KEY

- APPROXIMATE CPT LOCATION (CPT)
- APPROXIMATE COMBINATION CPT AND DEEP BOREHOLE LOCATION (DBH/CPT)
- APPROXIMATE SHALLOW BOREHOLE LOCATION (SBH)

NOT TO SCALE

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SITE INVESTIGATION LOCATION PLAN

PROPOSED RESIDENTIAL SUBDIVISION

KINGS FOREST ESTATE

JOB NO.: 9528

FIGURE 1

GENERAL NOTES

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April 2005

GENERAL

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the introduction section(s) of the document. The report should not be used by other parties or for other purposes as it may not contain adequate or appropriate information.

TEST HOLE LOGGING

The information on the Test Hole Logs (Boreholes, Backhoe Pits, Exposures etc.) has been based on a visual and tactile assessment except at the discrete locations where test information is available (field and/or laboratory results).

Reference should be made to our standard sheets for the definition of our logging procedures (Soil and Rock Descriptions).

GROUNDWATER

Unless otherwise indicated the water levels given on the test hole logs are the levels of free water or seepage in the test hole recorded at the given time of measuring. The actual groundwater level may differ from this recorded level depending on material permeabilities. Further variations of this level could occur with time due to such effects as seasonal and tidal fluctuations or construction activities. Final confirmation of levels can only be made by appropriate instrumentation techniques and programmes.

INTERPRETATION OF RESULTS

The discussion and recommendations contained within this report are normally based on a site evaluation from discrete test hole data. Generalised or idealised subsurface conditions (including any cross-sections contained in the report) have been assumed or prepared by interpolation/extrapolation of these data. As such these conditions are an interpretation and must be considered as a guide only.

CHANGE IN CONDITIONS

Local variations or anomalies in the generalised ground conditions used for this report can occur, particularly between discrete test hole locations. Furthermore, certain design or construction procedures may have been assumed in assessing the soil structure interaction behaviour of the site.

Any change in design, in construction methods, or in ground conditions as noted during construction, from those assumed in this report should be referred to this firm for appropriate assessment and comment.

FOUNDATION DEPTH

Where referred to in the report, the recommended depth of any foundation (piles, caissons, footings, etc.) is an engineering estimate of the depth to which they should be constructed. The estimate is influenced and perhaps limited by the fieldwork method and testing carried out in connection with the site investigation, and other pertinent information as has been made available. The depth remains, however, an estimate and therefore liable to variation. Footing drawings, designs and specifications based upon this report should provide for variations in the final depth depending upon the ground conditions at each point of support.

REPRODUCTION OF REPORTS

Where it is desired to reproduce the information contained in this report for the inclusion in the contract documents or engineering specification of the subject development, such reproduction should include at least all the relevant test hole and test data, together with the appropriate standard description sheets and remarks made in the written report of a factual or descriptive nature.

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions that any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE / The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used:*

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predications. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage*, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional test are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use*. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical Information in Construction Contracts" published by The Institution of Engineers Australia, National Headquarters, Canberra, 1987.

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Annex A

Fieldwork Results

September, 2001

SOIL DESCRIPTION

This procedure involves the description of a soil in terms of its visual and tactile properties, and relates to both laboratory samples and field exposures as applicable. A detailed soil profile description, in association with local geology and experience, will facilitate the initial (and often complete) site assessment for engineering purposes.

The method involves an evaluation of each of the items listed below and is in general agreement with the Site Investigation Code AS1726-1993.

SOIL TYPE
The soil is described on the basis of the grain size composition of the constituent particles, and the plasticity of the fraction of material passing the 425μm sieve.

Furthermore, as most natural soils are part combinations of various constituents, the primary soil is described and modified by minor components. In brief, the system is as follows;

SILT OR CLAY AS MINOR COMPONENT		GRAVEL OR SAND AS MINOR COMPONENT	
% Fines	**Modifier**	**% Coarse**	**Modifier**
≤5 >5 ≤12 >12	omit, or use "trace" describe as "with clay/silt" as applicable prefix soil as "silty/clayey" as applicable	≤15 >15 ≤30 >30	omit, or use "trace" describe as "with sand/gravel" as applicable prefix soil as "sandy/gravelly' as applicable

Note: For soils containing both sand and gravel the minor coarse fraction is omitted if less than 15%, or described as "with sand/gravel" as applicable when greater than 15%.

The appropriate classification group symbol for soil classification is also given before the soil type description in accordance with AS1726-1993, Table A1.

For granular soils, an assessment of grading (well, uniform, gap or poor), particle size (fine, medium etc), angularity, shape and particle composition may also be given.

COLOUR
Colour is important for correlation of data between test holes and for subsequent excavation operations. The prominent colour is noted, followed by (spotted, mottled, streaked etc.) secondary colours as applicable. Colour should be described in the "moist" condition, though both wet and dry colours may also be appropriate.

MOISTURE
The moisture condition of the soil is described by the appearance and feel of the soil using one of the following terms:
Dry cohesive soils - hard, friable or powdery; granular soils - cohesionless, free funning.
Moist soil cool, darkened colour: cohesive soils - can be moulded; granular soils - tend to cohere.
Wet soil cool, darkened colour: cohesive soils - usually weakened, free water on hands when handling; granular soils - tend to cohere.

In addition, the presence of any seepage or free water is noted on all test hole logs.

CONSISTENCY/RELATIVE DENSITY
Granular soils are generally described in terms of relative density (density index) as listed in Table A5 AS1726. These soils are inherently difficult to assess and normally a penetration test procedure (SPT, DCP or CPT) is used in conjunction with published correlation tables. Alternatively, insitu density tests can be conducted in association with minimum and maximum densities performed in the laboratory.

Cohesive soils can be assessed by direct measurement (shear vane), or estimated approximately by tactile means and/or the aid of a geological pick as given on the following table. It is emphasised that a "design shear strength" must take cognisance of the insitu moisture content and the possible variations of moisture with time.

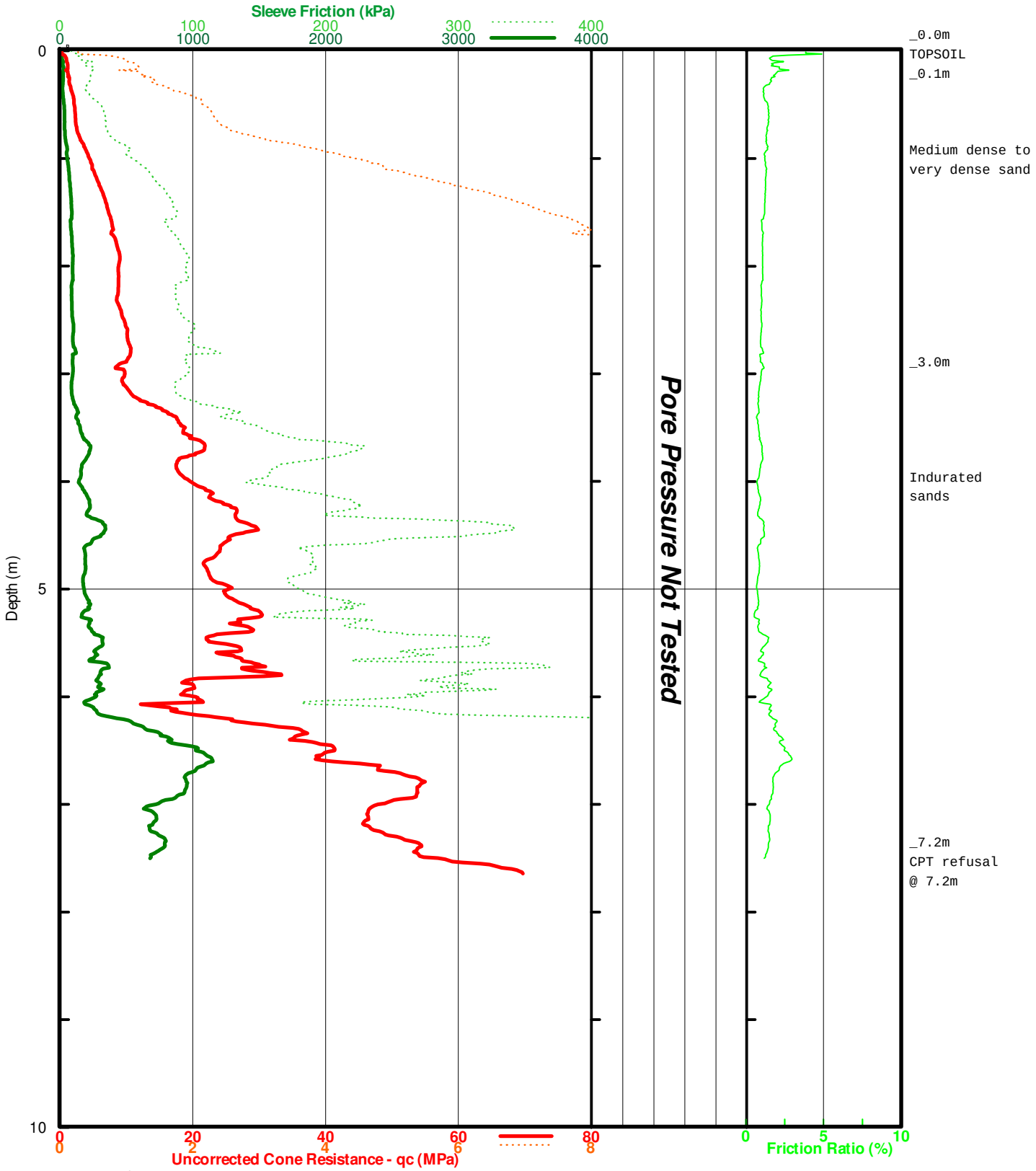
Term	Tactile Properties	Undrained Shear Strength (kPa)
Very Soft	Exudes between the fingers when squeezed in the hand.	≤12
Soft	Easily penetrated by thumb about 30-40mm. Pick head can be pushed in up to shaft. Moulded by light finger pressure.	>12 ≤25
Firm	Penetrated by thumb 20-30mm with moderate effort. Sharp end of pick pushed in some 30-40m. Moulded by strong finger pressure.	>25 ≤50
Stiff	Indented by thumb about 4mm with moderate effort. Pick pushed in up to 10mm. Cannot be moulded in fingers.	>50 ≤100
Very Stiff	Readily indented by thumb nail. Slight indentation produced by pushing pick into soil.	>100 ≤200
Hard	Difficult to indent with thumb nail. Requires power tools for excavation.	>200

STRUCTURE/OTHER FEATURES
The structure of the soil may be described with reference to: zoning, where soils consist of separate zones differing in colour, grain size or other properties; defects, including fissures, cracks, root-holes and the like; cementing, with the strength (weakly to strongly), and nature of the cementing agent; additional observations including geological origin, odour and the like. In addition, the presence of other features (ferricrete nodules, organic inclusions) should also be noted as applicable.

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-01



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Test Date : 22/06/2010
DGPS Position :56 J 0554891, 6870004
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

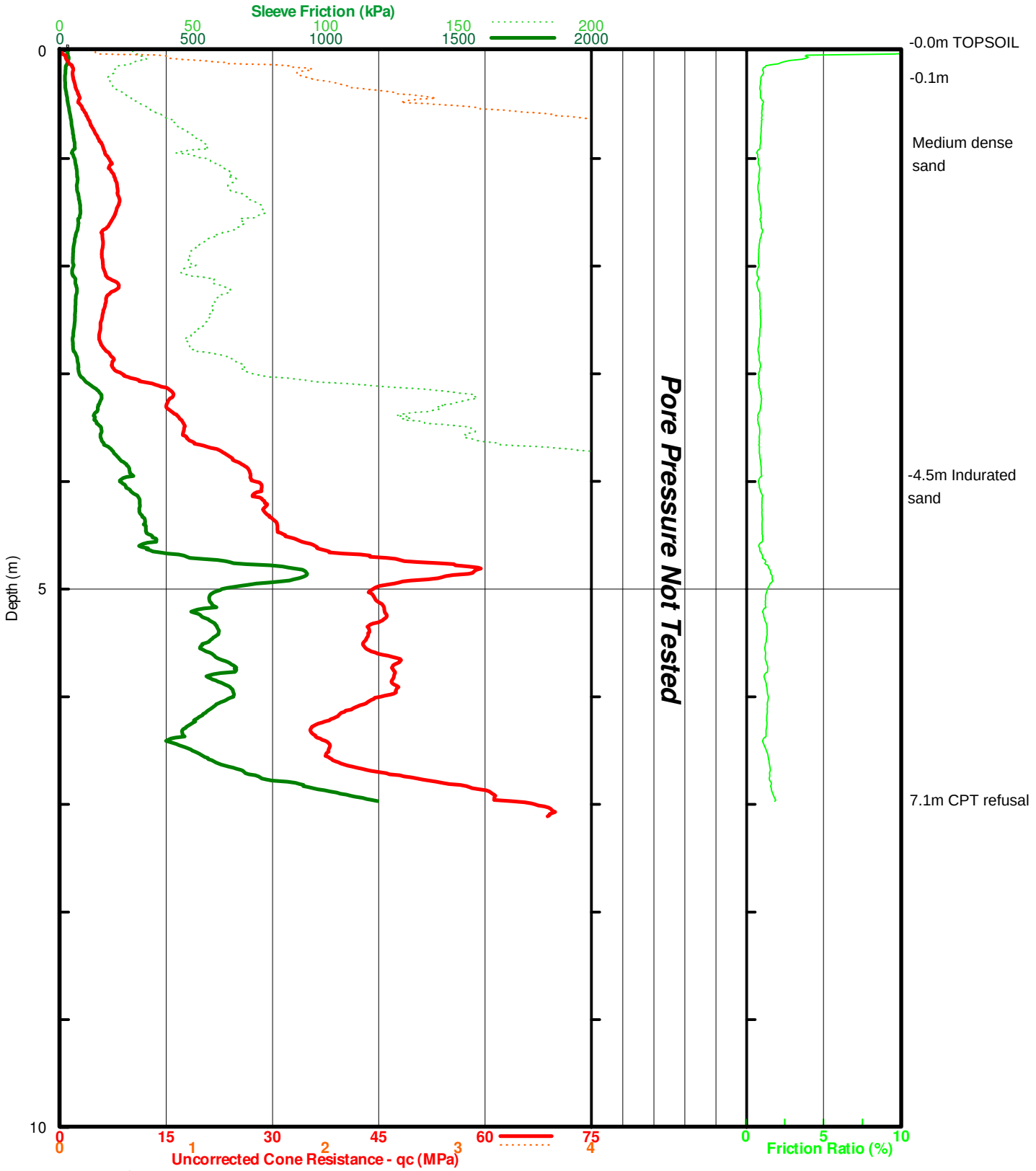
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-02



Job Number : G1006-105
Test Date : 22/06/2010
DGPS Position : ,
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

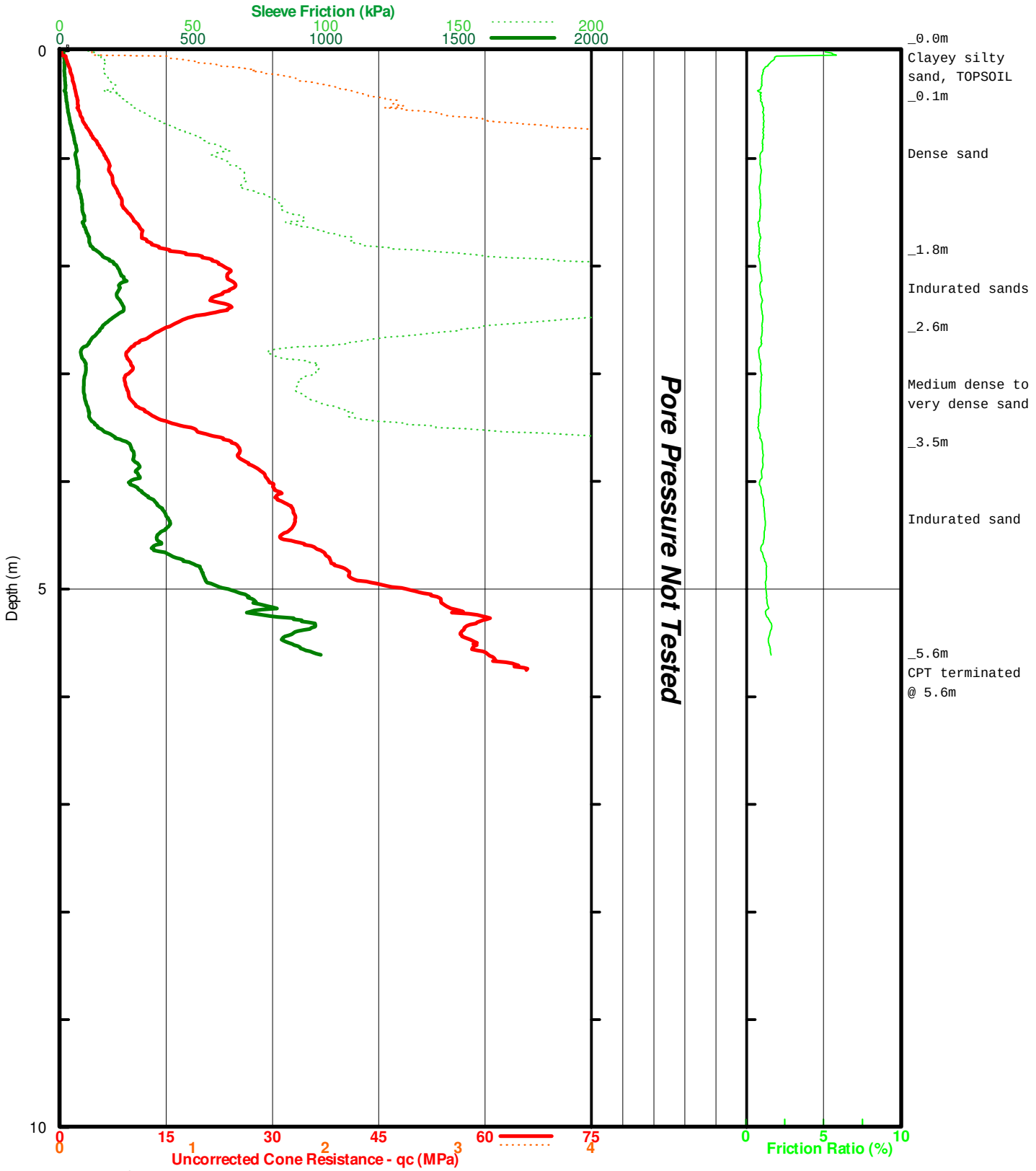
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-03



Job Number : G1006-105
Test Date : 23/06/2010
DGPS Position : 56 J 0554608, 6870113
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

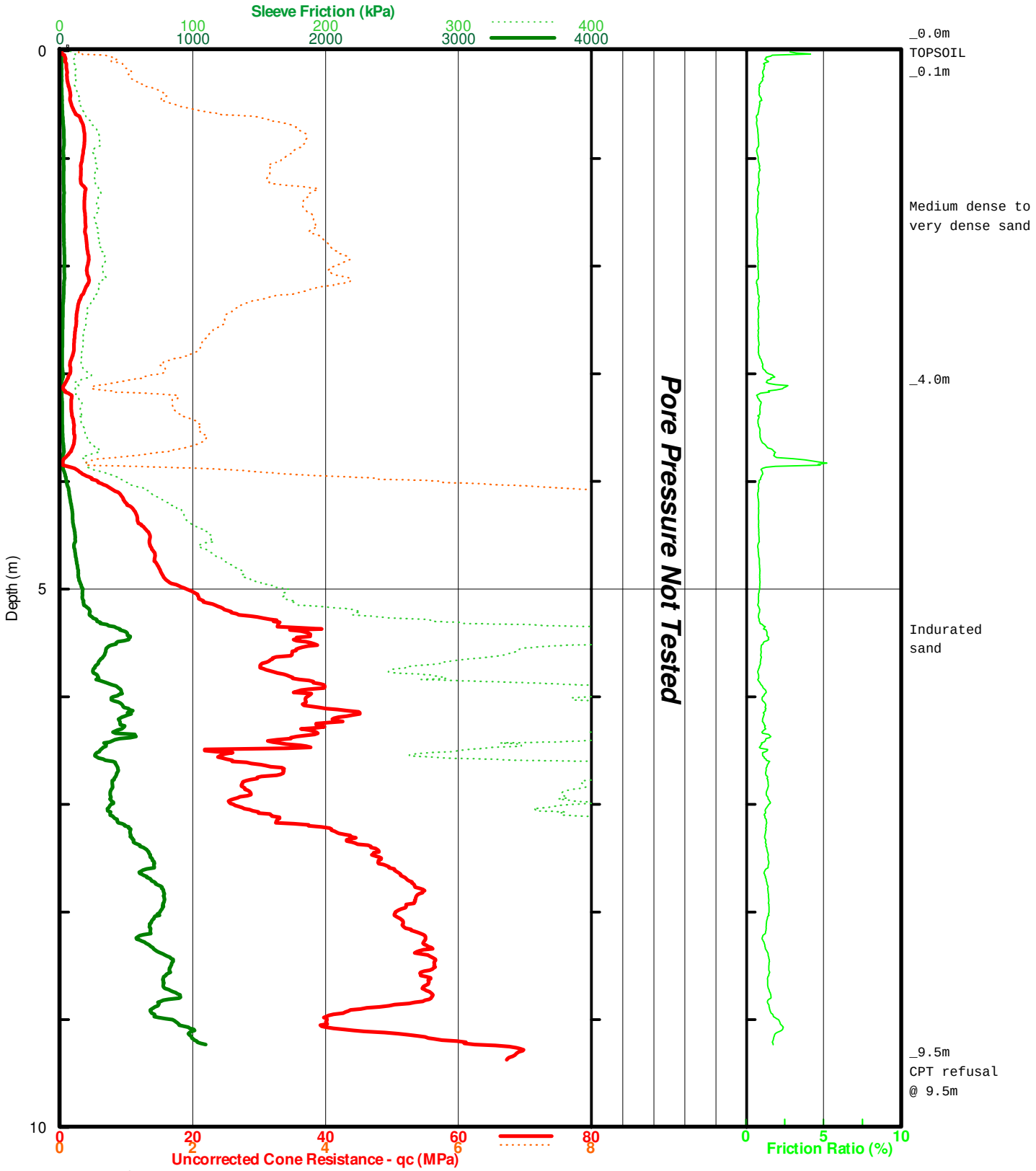
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-04



Job Number : G1006-105
Test Date : 29/06/2010
DGPS Position : 56 J 0554847, 6870498
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

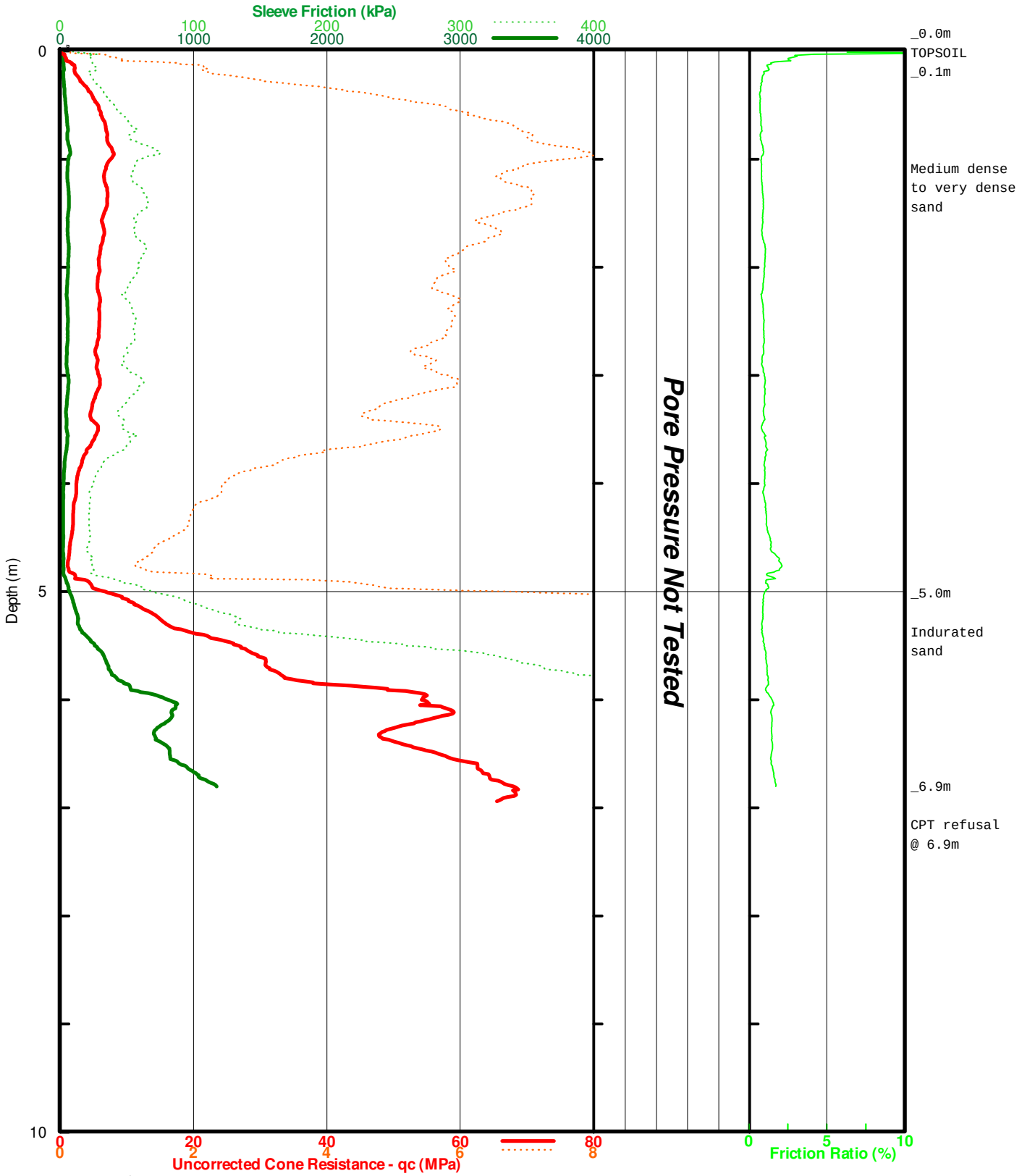
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-05



Job Number : G1006-105
Test Date : 29/06/2010
DGPS Position : 56 J 0554991, 6870626
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

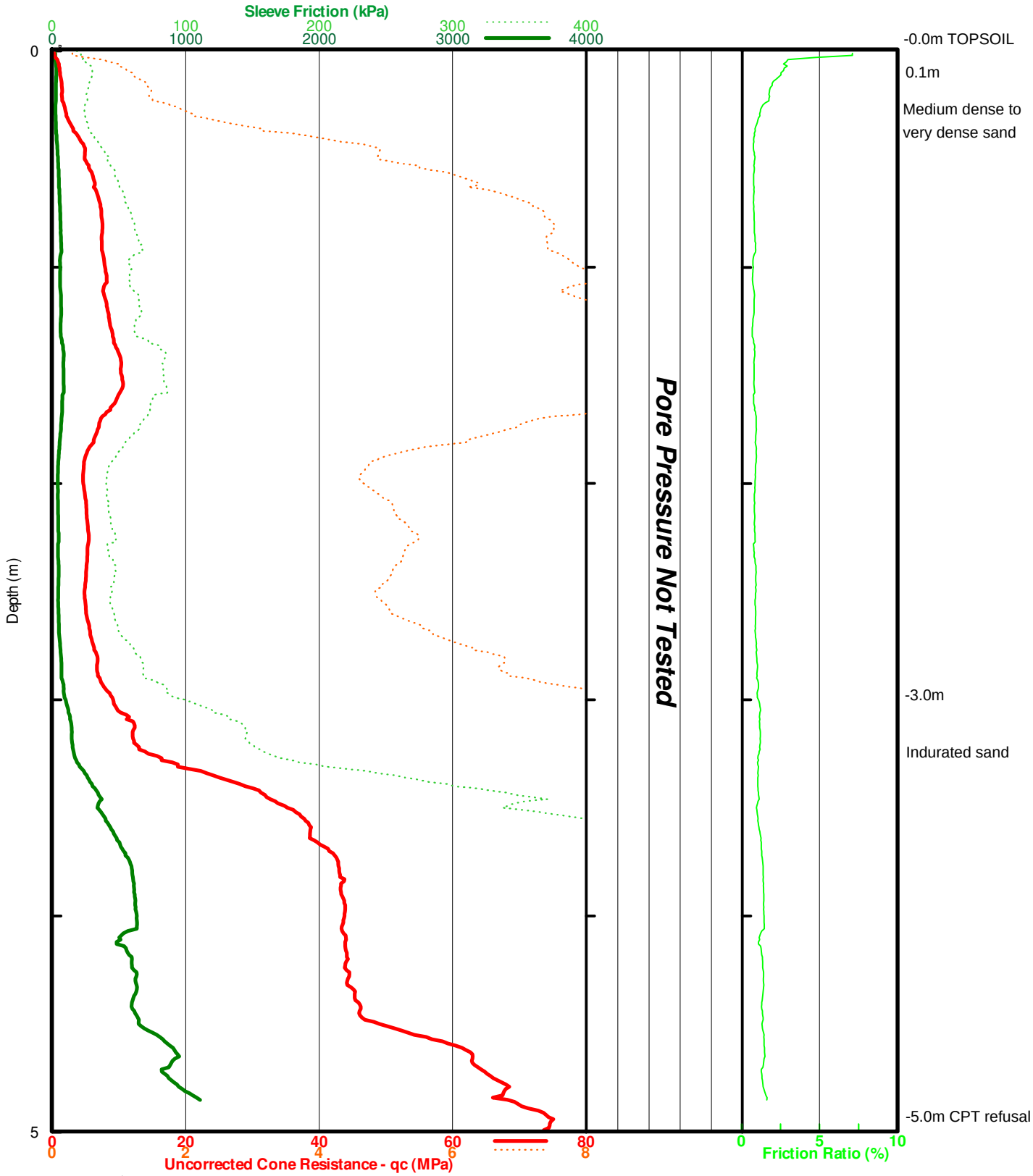
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-06



Job Number : G1006-105
Test Date : 29/06/2010
DGPS Position : 56 J 0554565, 6870551
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

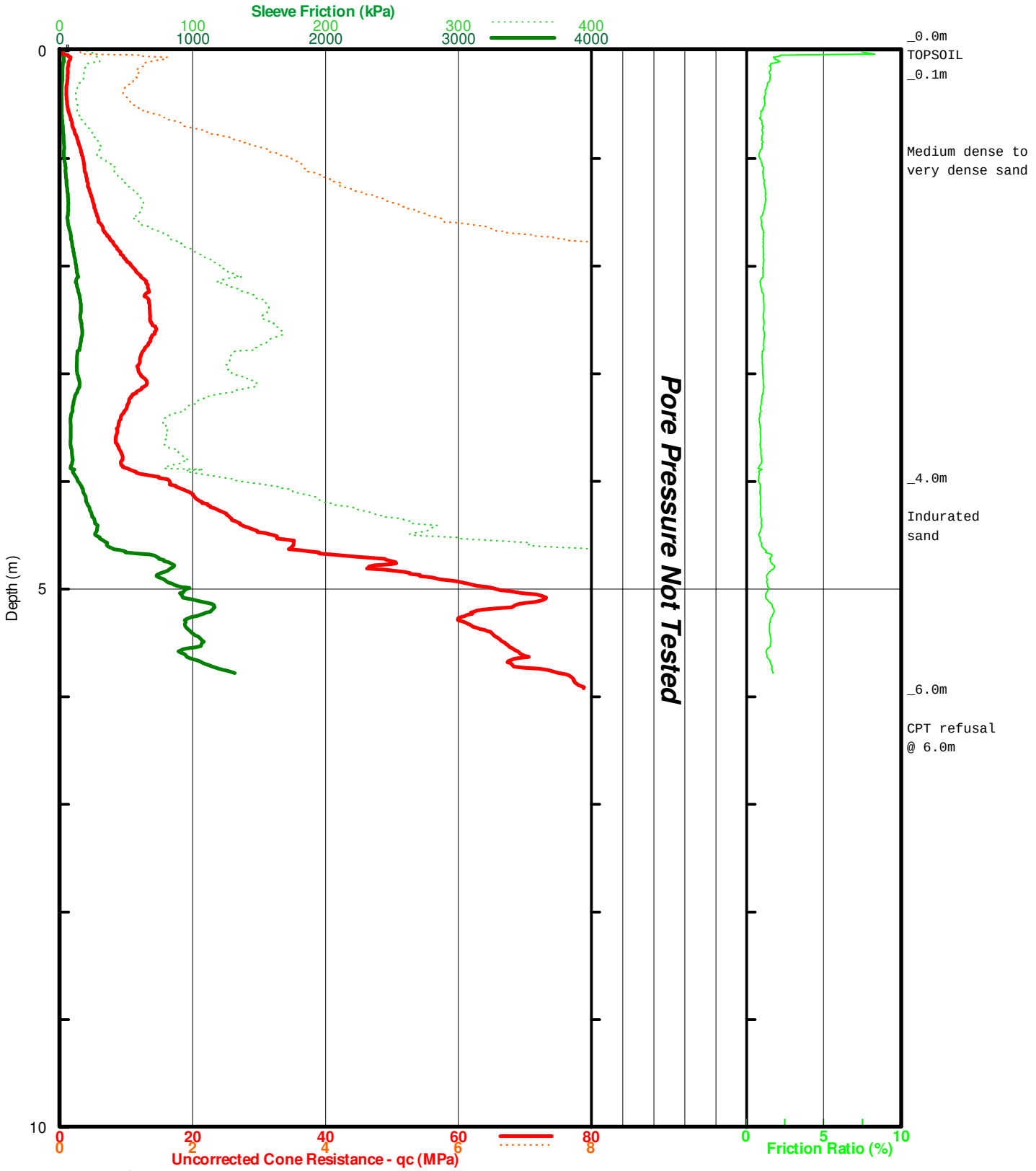
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-07



Job Number : G1006-105
Test Date : 02/07/2010
DGPS Position : 56 J 0554326, 6870108
DGPS Format : WGS 84

Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

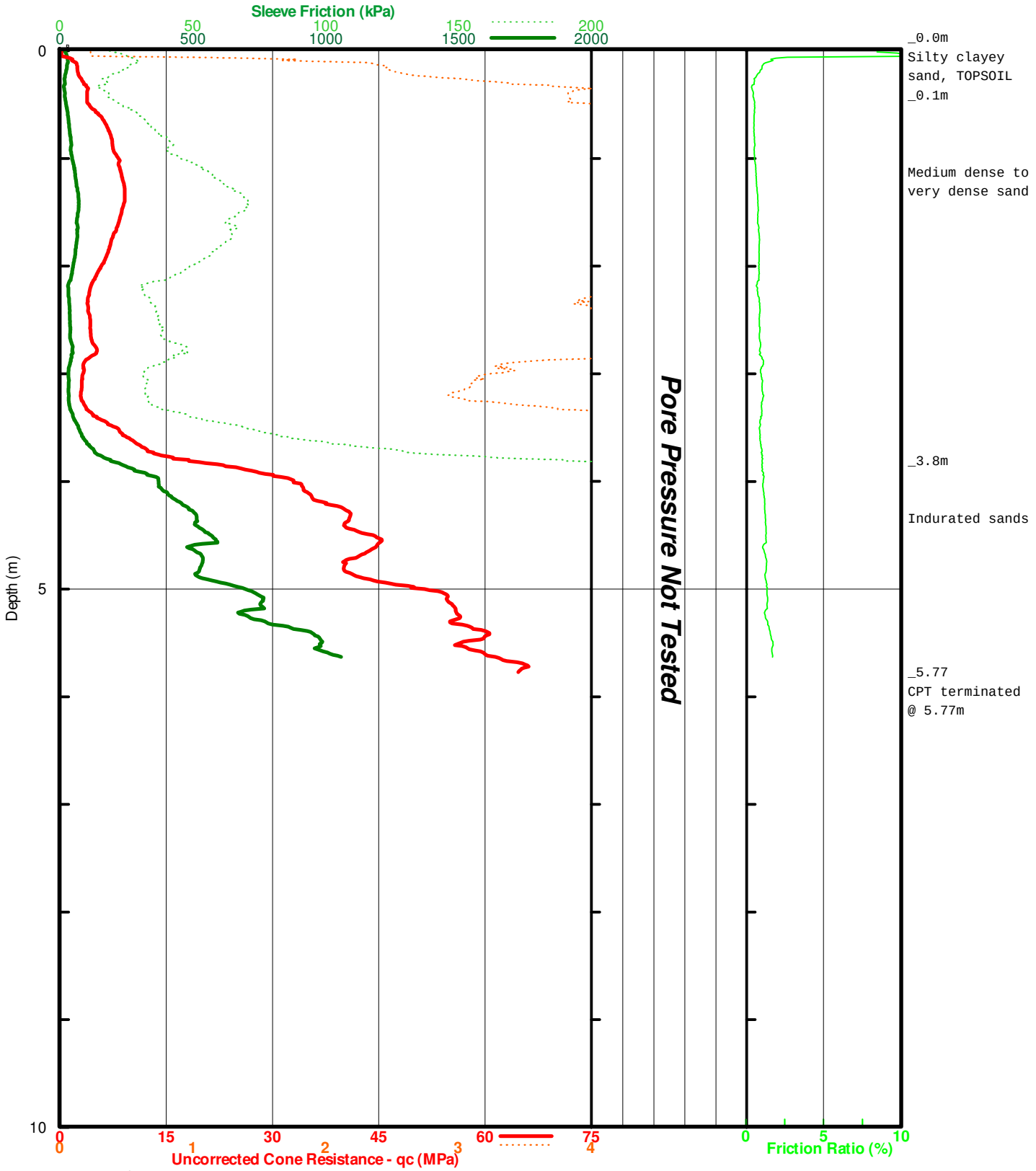
Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-08



Job Number : G1006-105
Test Date : 23/06/2010
DGPS Position : 56 J 0554381, 6870456
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

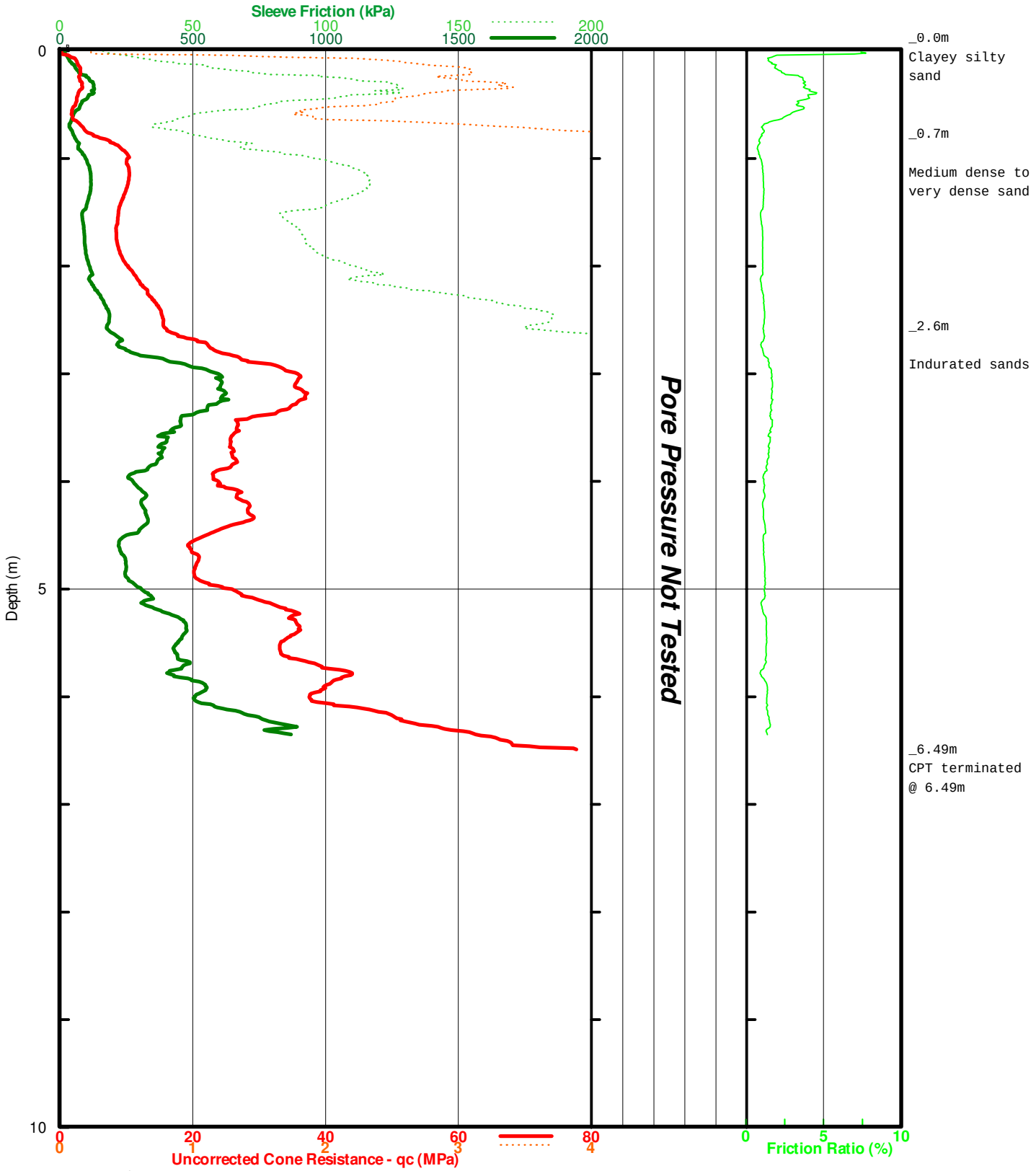
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-09



Job Number : G1006-105
Test Date : 23/06/2010
DGPS Position : 56 J 0554214, 6870481
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

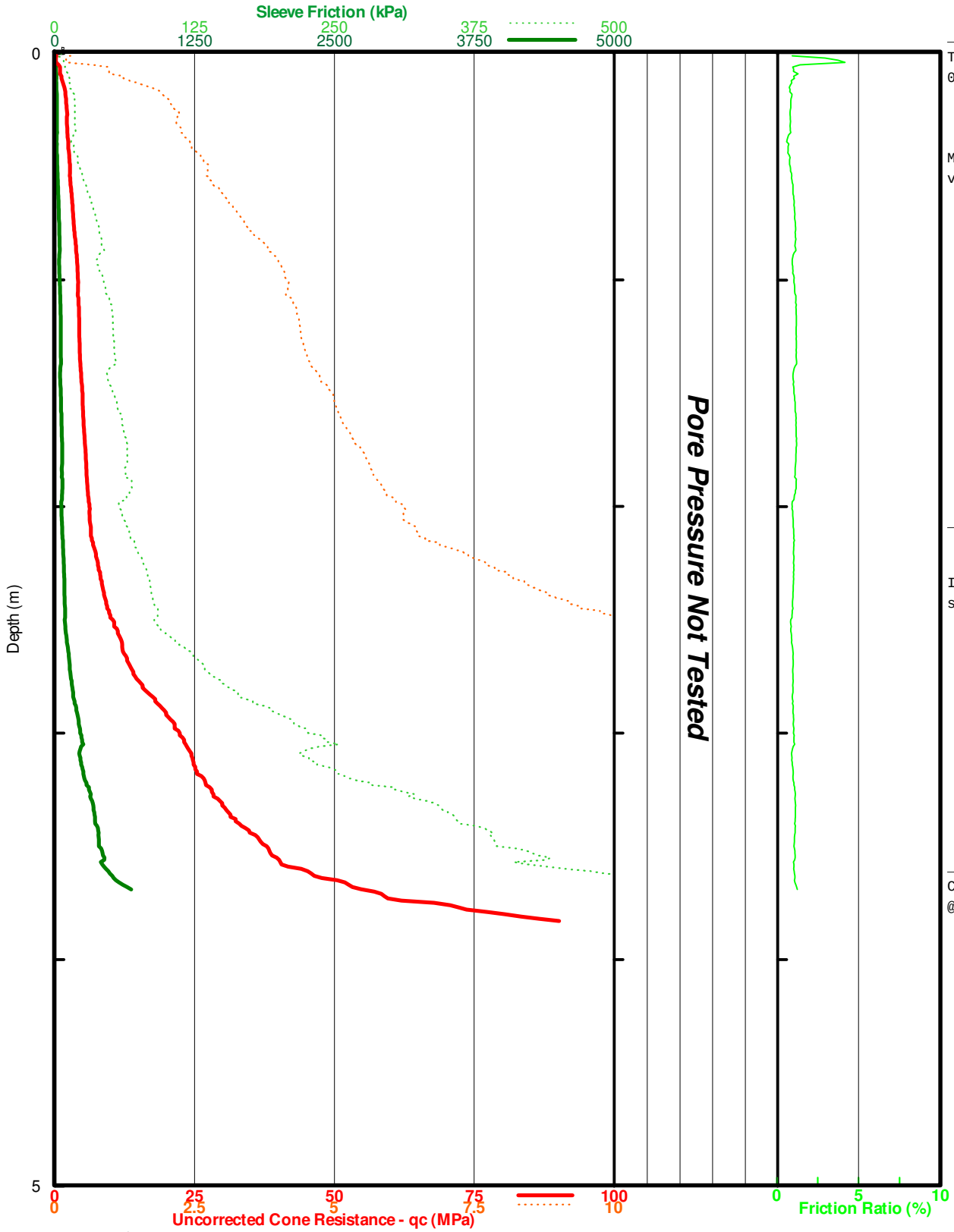
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-10



Job Number : G1006-105
Test Date : 02/07/2010
DGPS Position : 56 J 0554164, 6870253
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

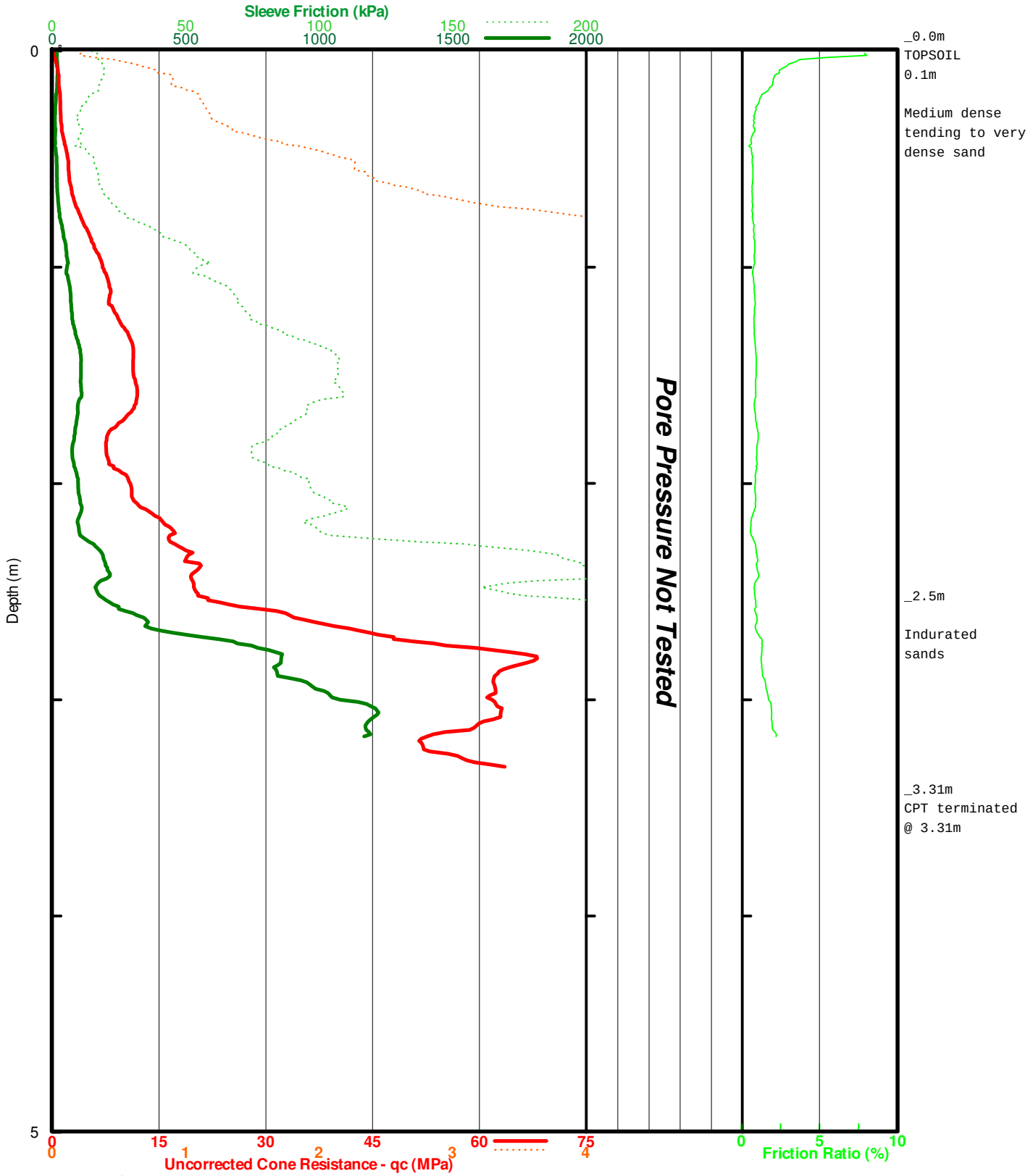
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-11



Job Number : G1006-105
Test Date : 24/06/2010
DGPS Position : 56 J 0553588, 6870159
DGPS Format : WGS 84

Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

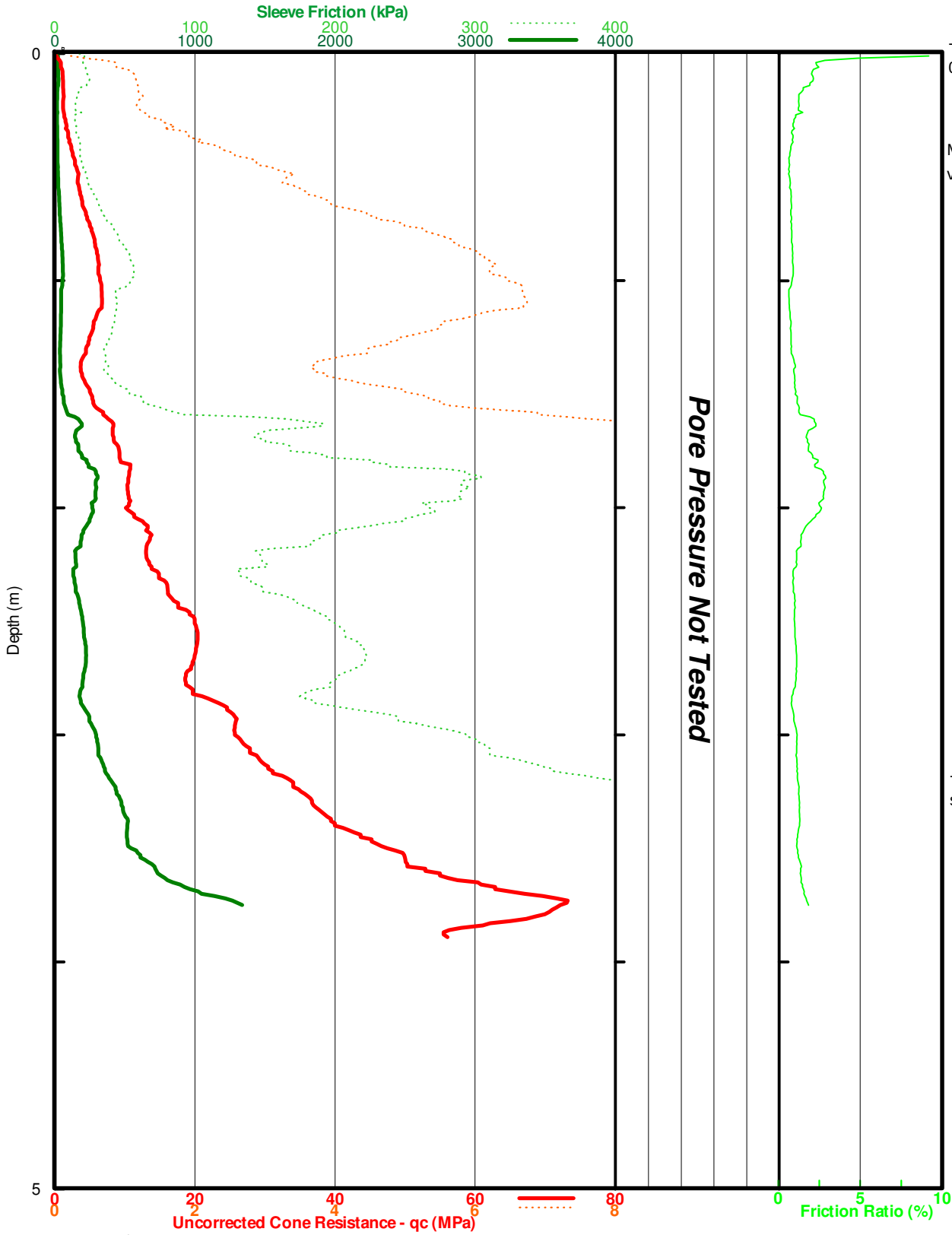
Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-12



- 0.0m TOPSOIL
0.1m

Medium dense to very dense sand

-3.5m Indurated sand

- 3.9m CPT refusal

Job Number : G1006-105
Test Date : 02/07/2010
DGPS Position : 56 J 0553210, 6870395
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

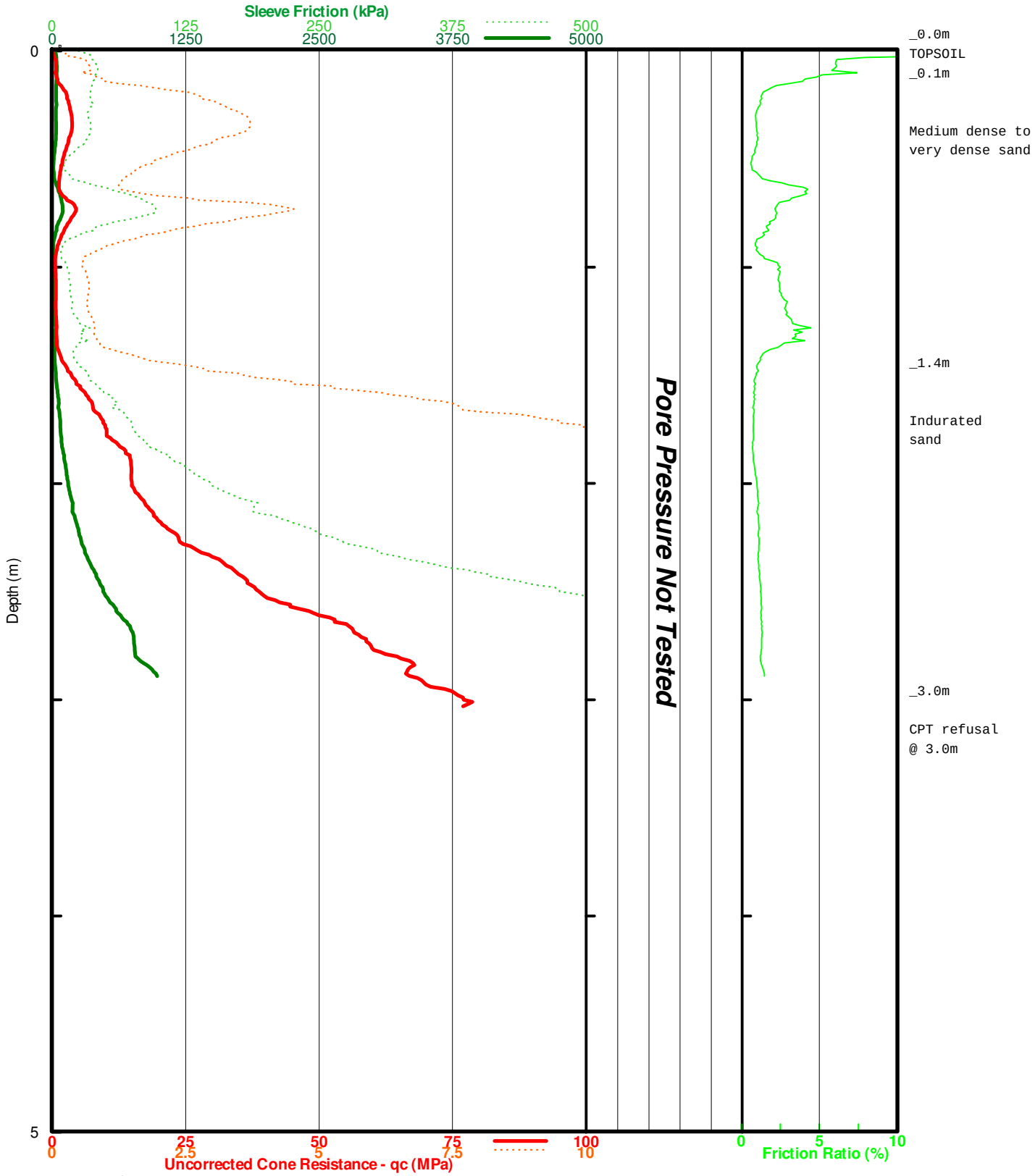
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-13



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0552756, 6870667
DGPS Format : WGS 84

Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

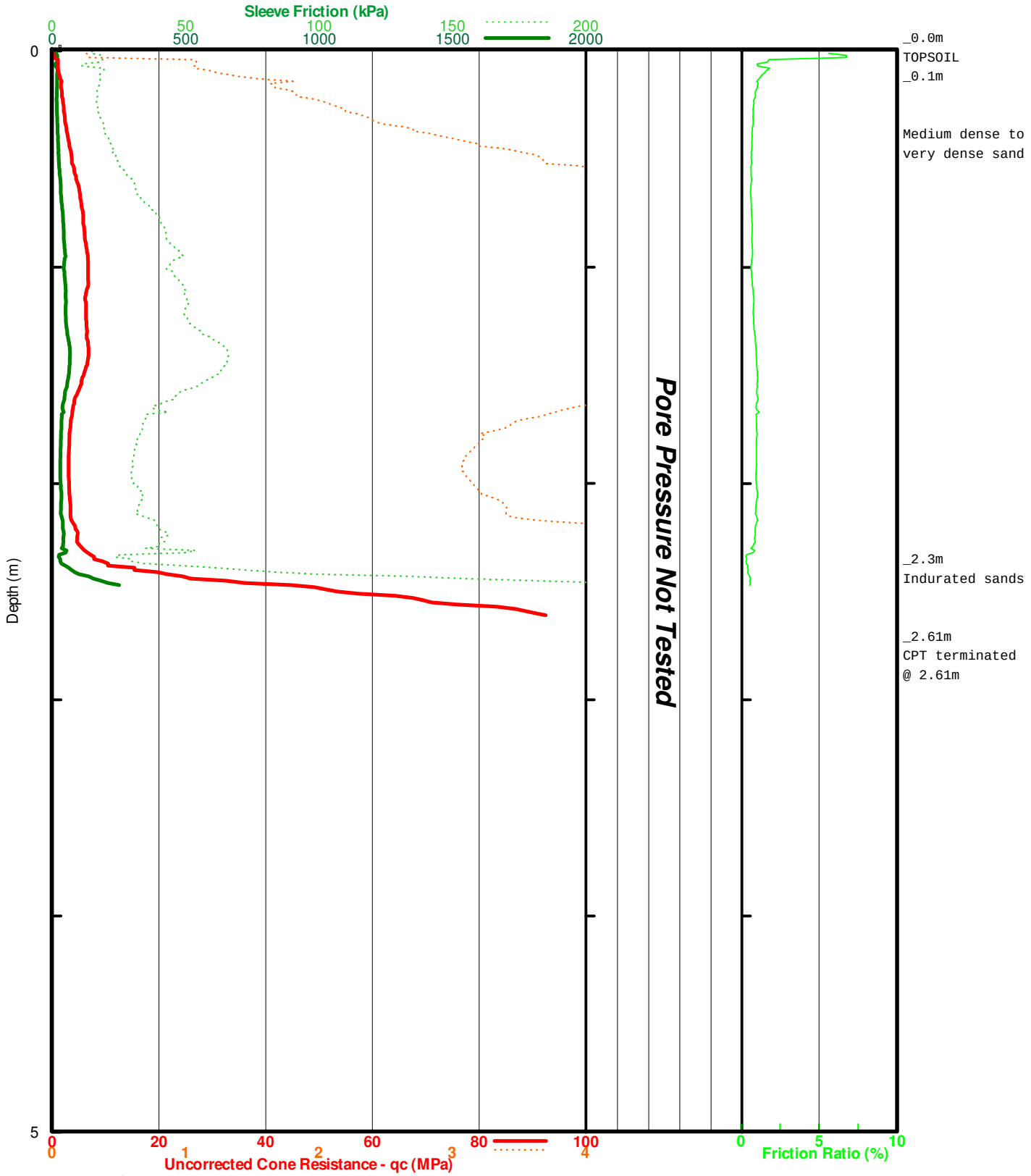
Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-14



Job Number : G1006-105
Test Date : 24/06/2010
DGPS Position : 56 J 0553236, 6871105
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

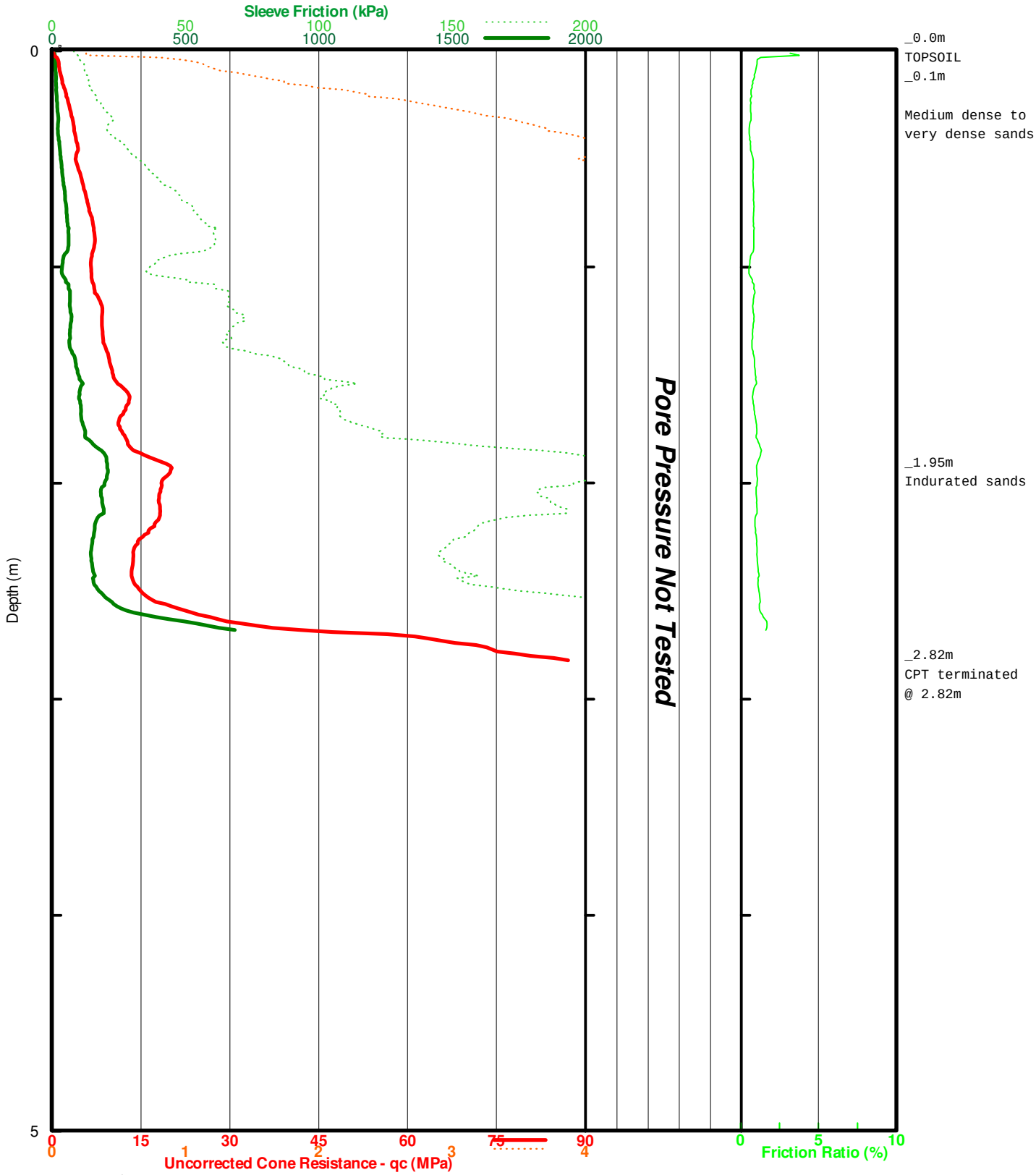
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-15



Job Number : G1006-105
Test Date : 24/06/2010
DGPS Position : 56 J 0553420, 6870732
DGPS Format : WGS 84

Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

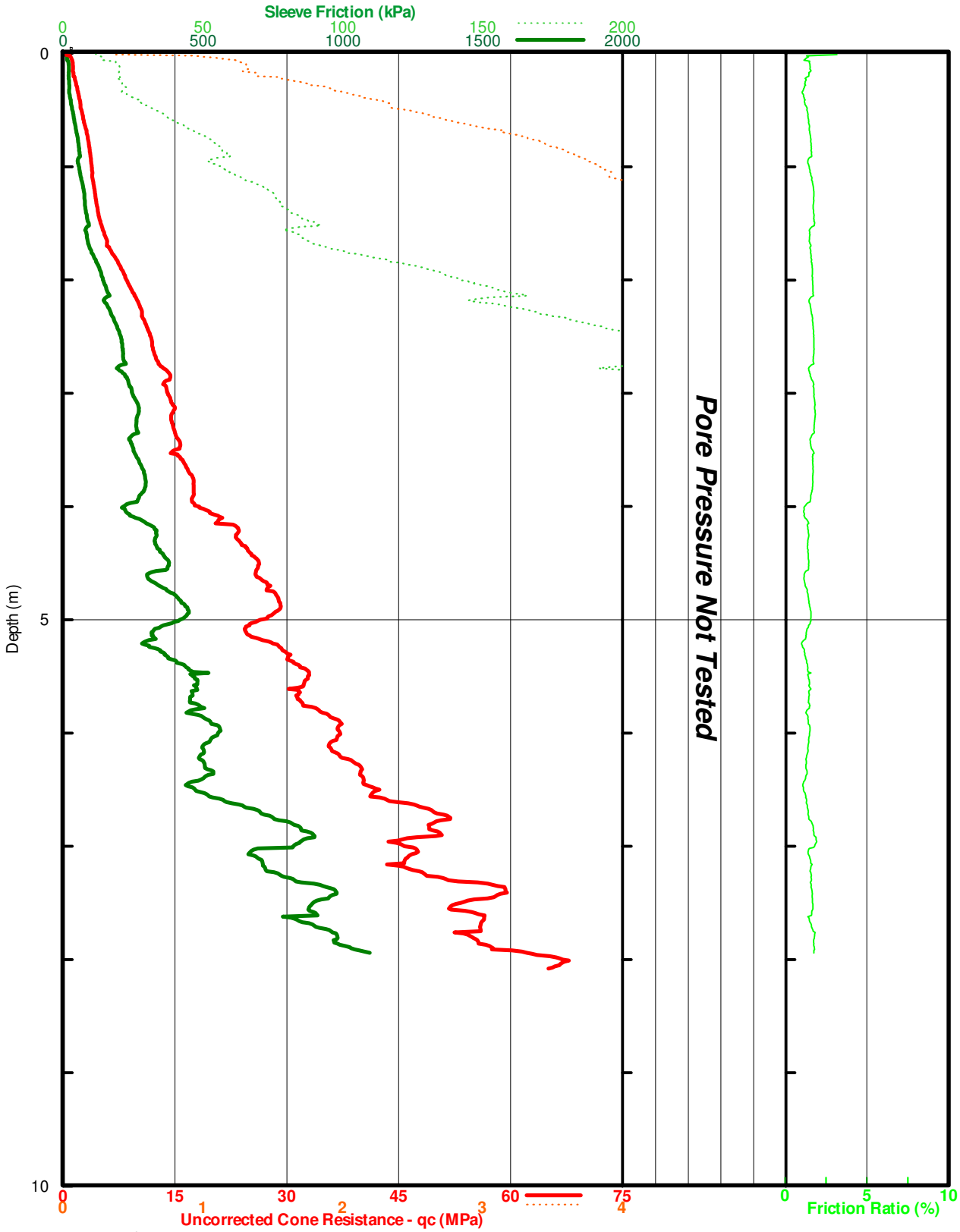
Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-16



Job Number : G1006-105
Test Date : 22/06/2010
DGPS Position : ,
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

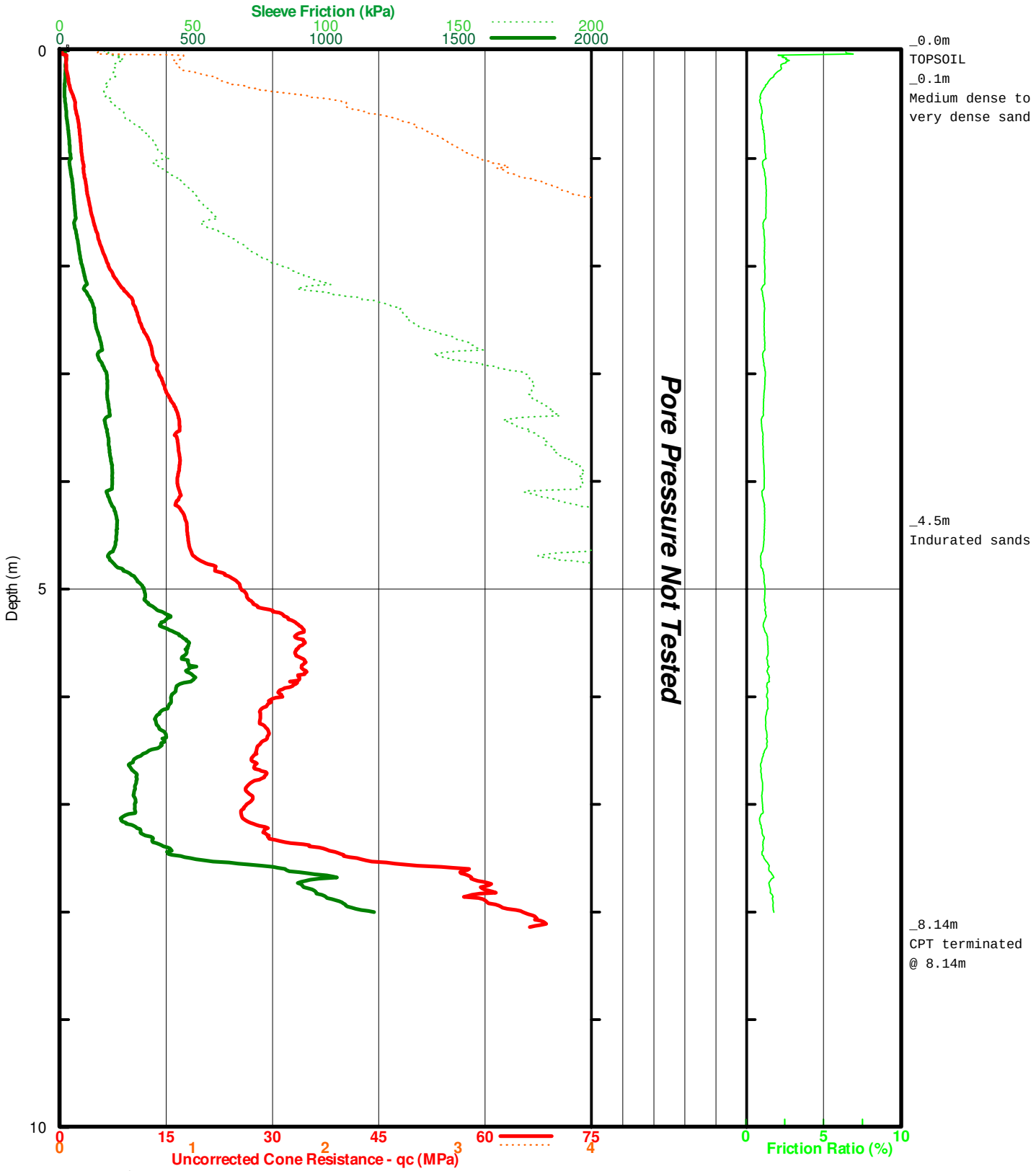
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-17



Job Number : G1006-105
Test Date : 23/06/2010
DGPS Position : 56 J 0554472, 6869650
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

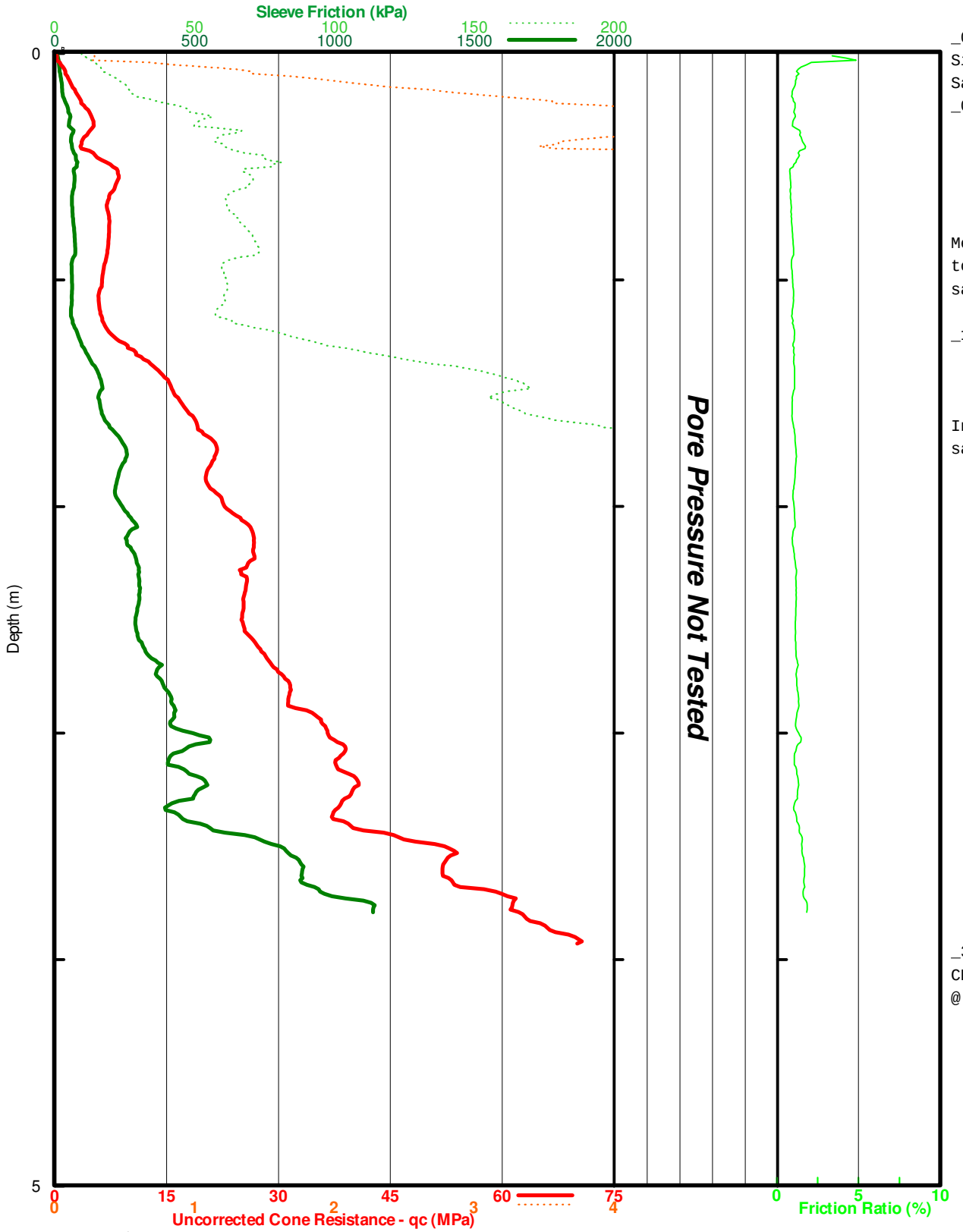
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-18



Job Number : G1006-105
Test Date : 22/06/2010
DGPS Position : ,
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

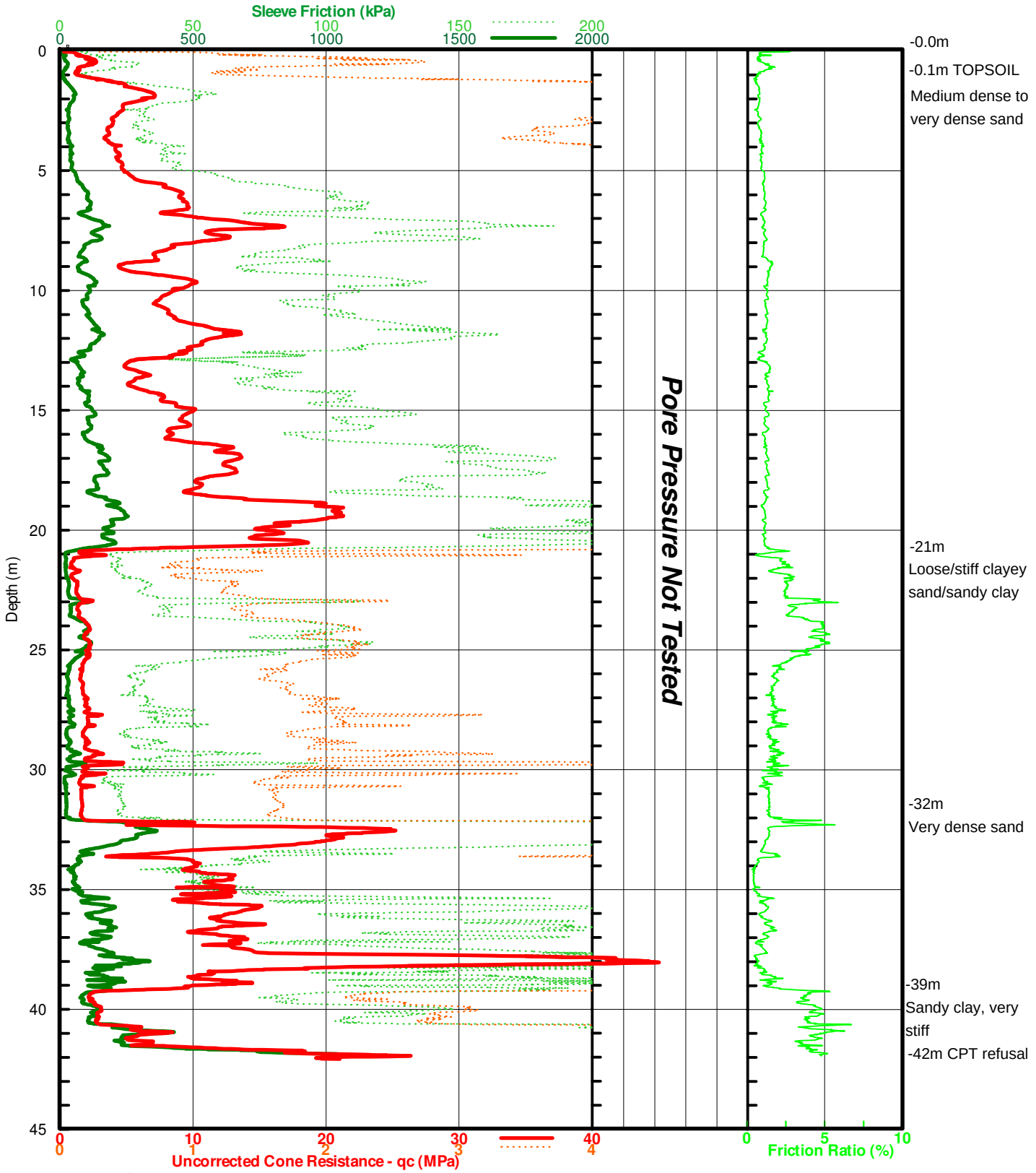
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-19



Job Number : G1006-105
Test Date : 03/07/2010
DGPS Position : 56 J 0554577, 6869312
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

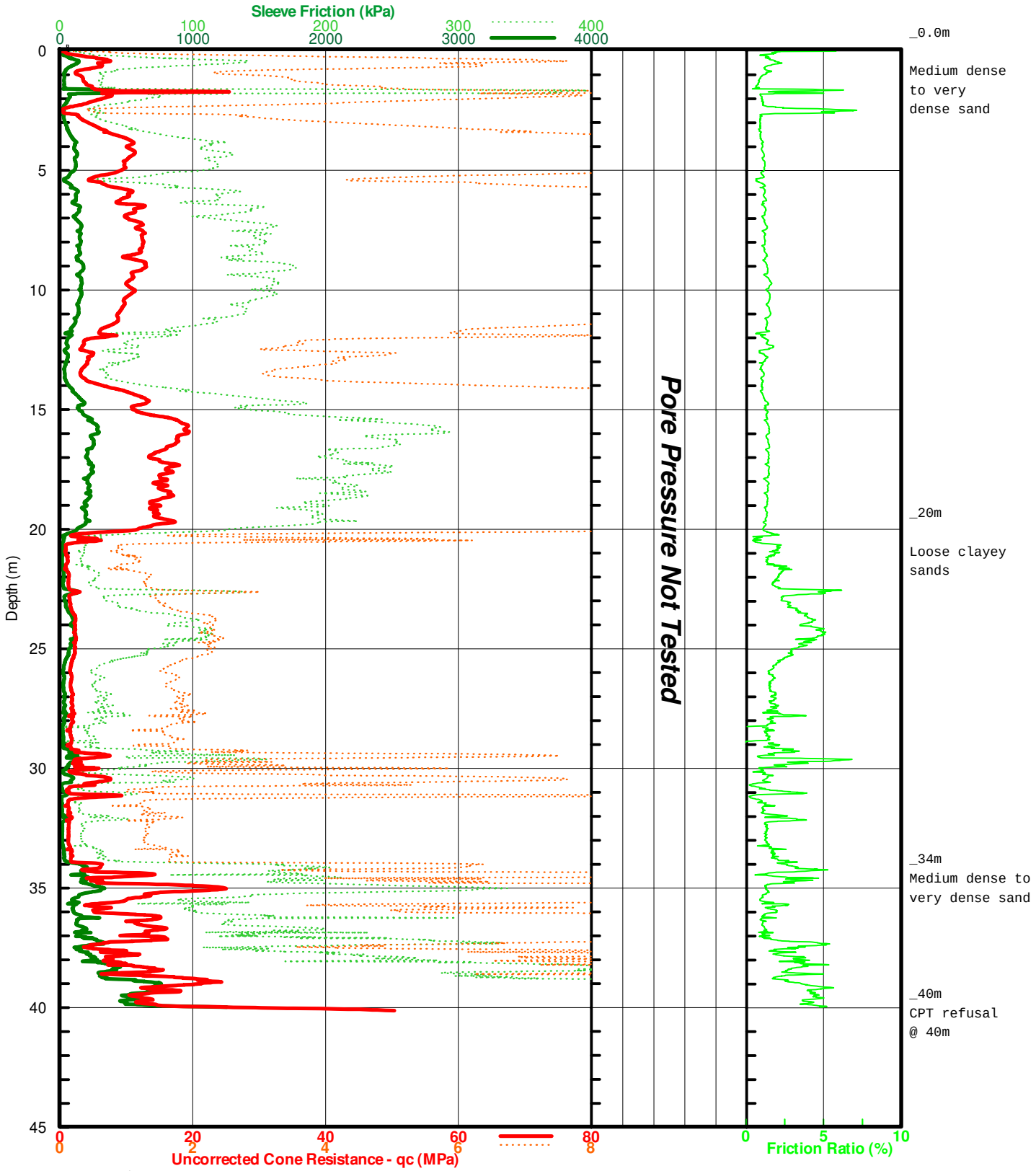
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-20



Job Number : G1006-105
Test Date : 01/07/2010
DGPS Position : 56 J 0554593, 6869299
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

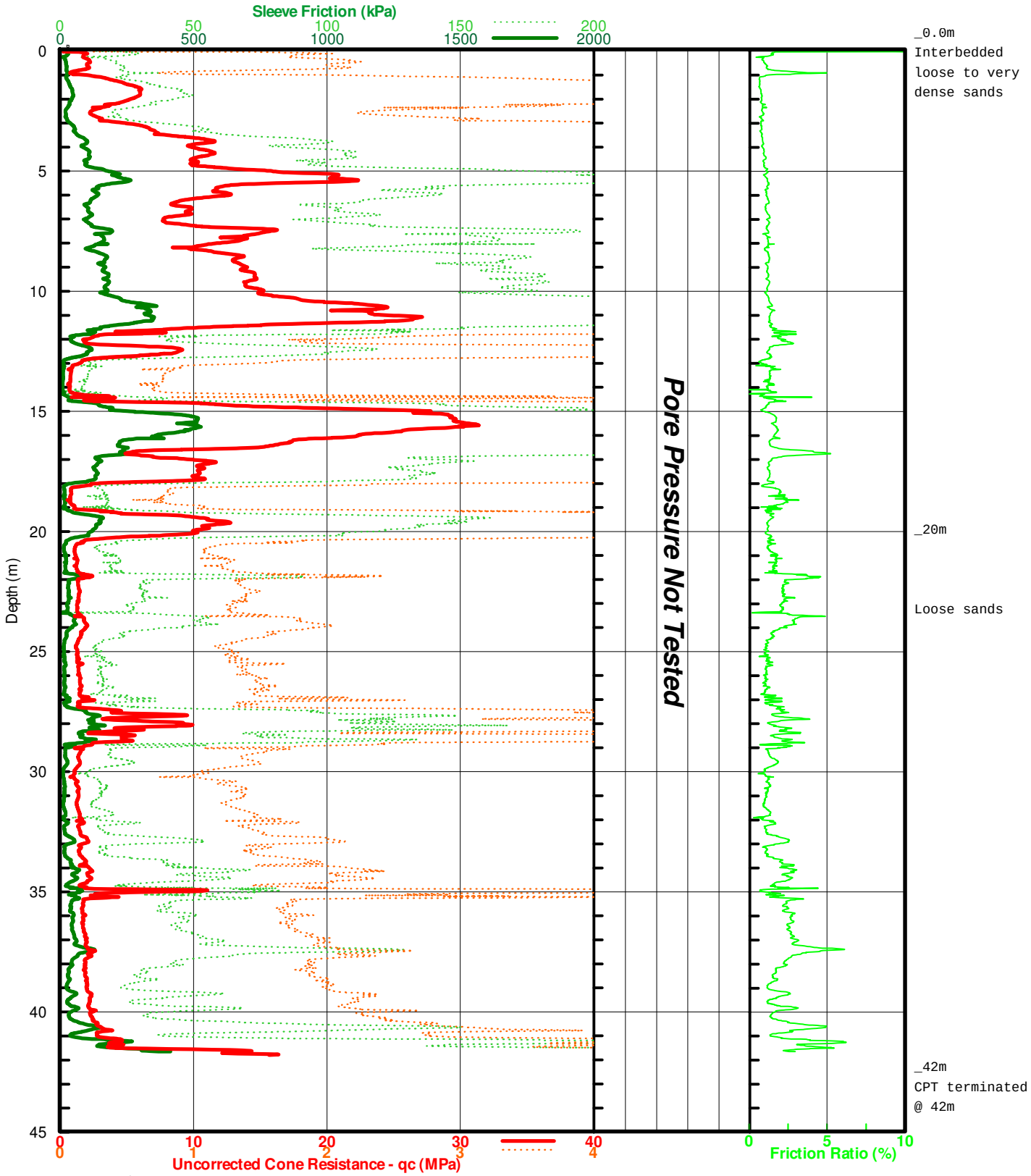
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-21



Job Number : G1006-105
Test Date : 01/07/2010
DGPS Position : 56 J 0554322, 6869346
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

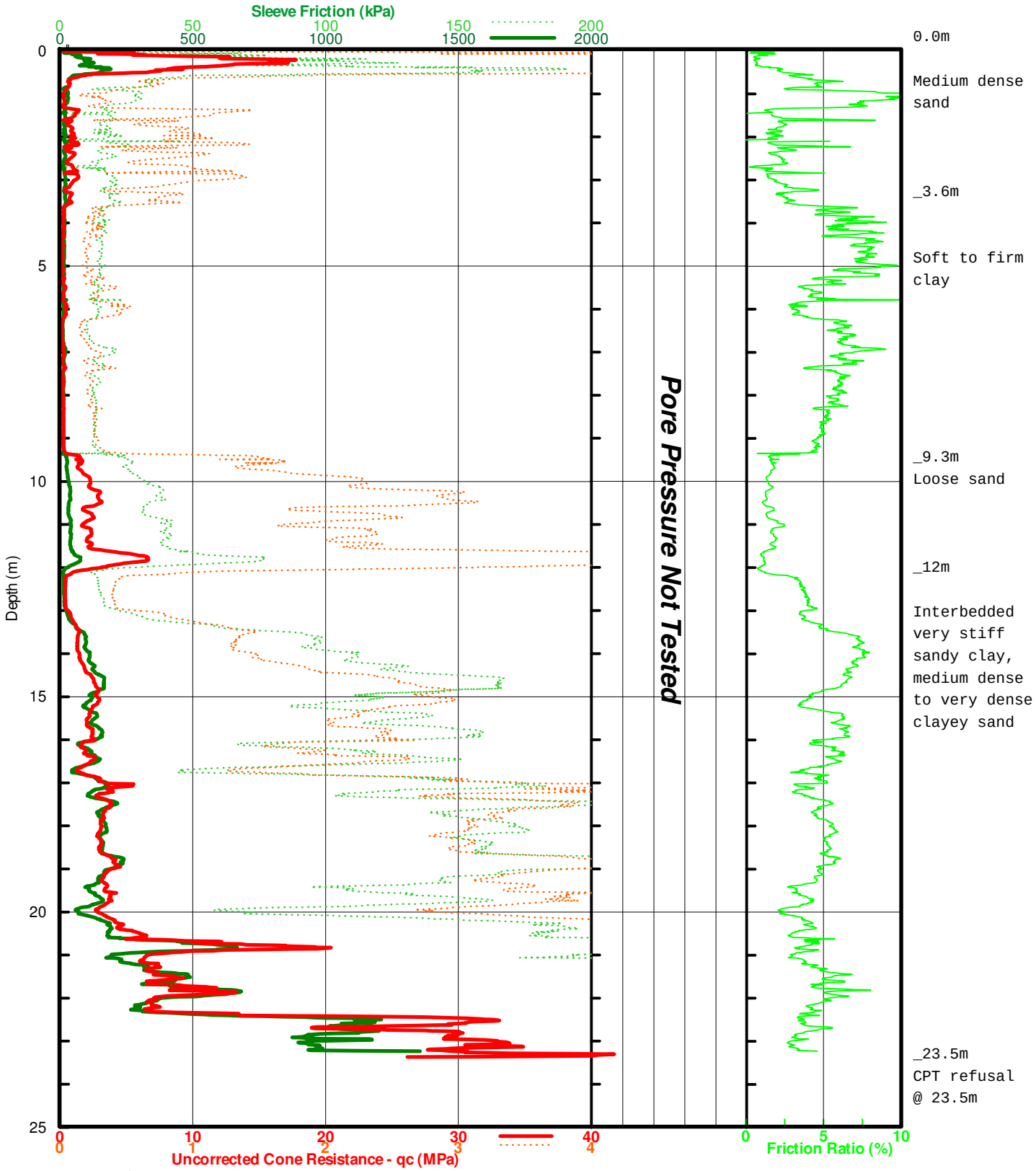
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Engineers Request

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-22



Job Number : G1006-105
Test Date : 01/07/2010
DGPS Position : 56 J 0553589, 6869328
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

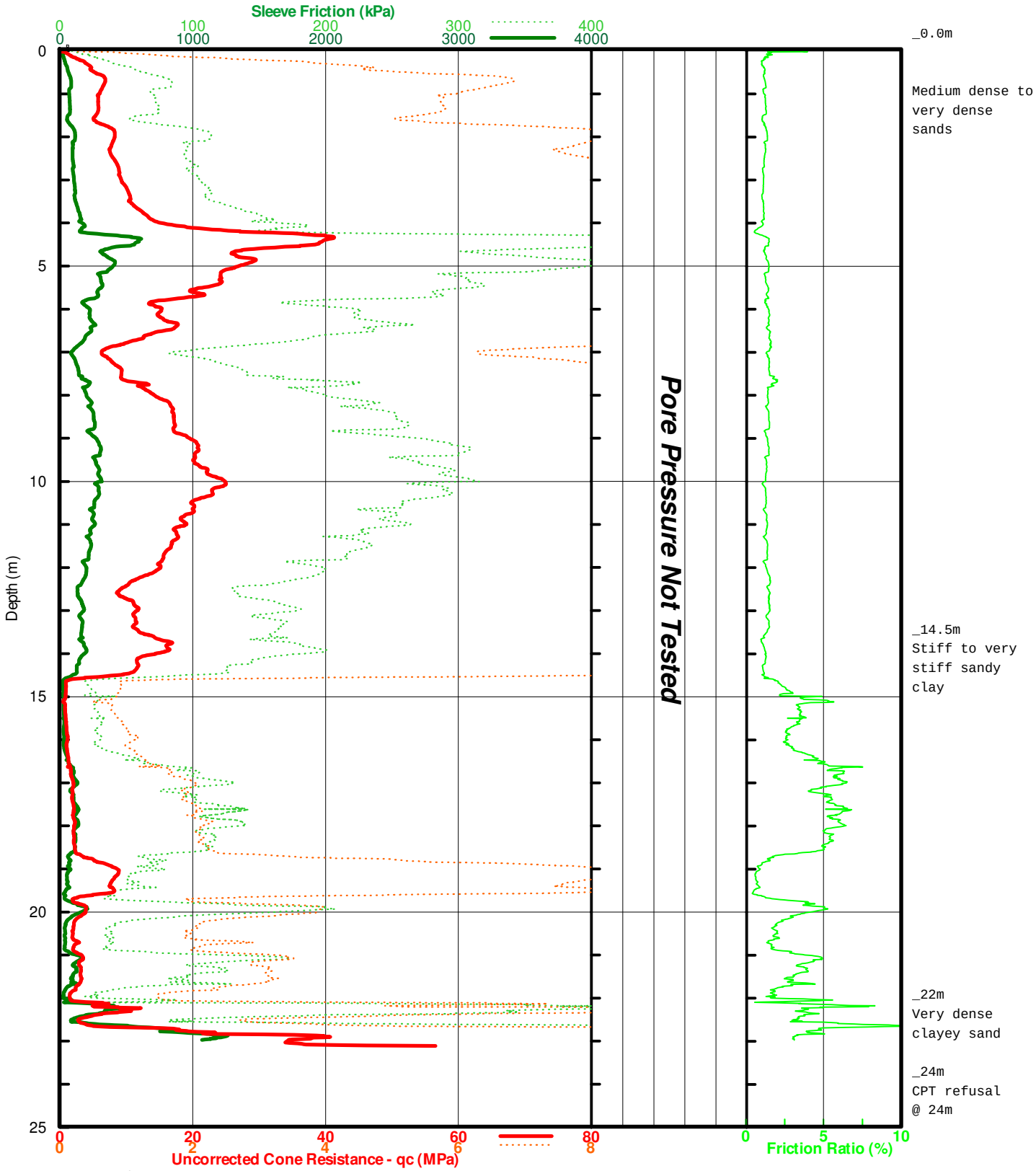
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-23



Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0553481, 6869021
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

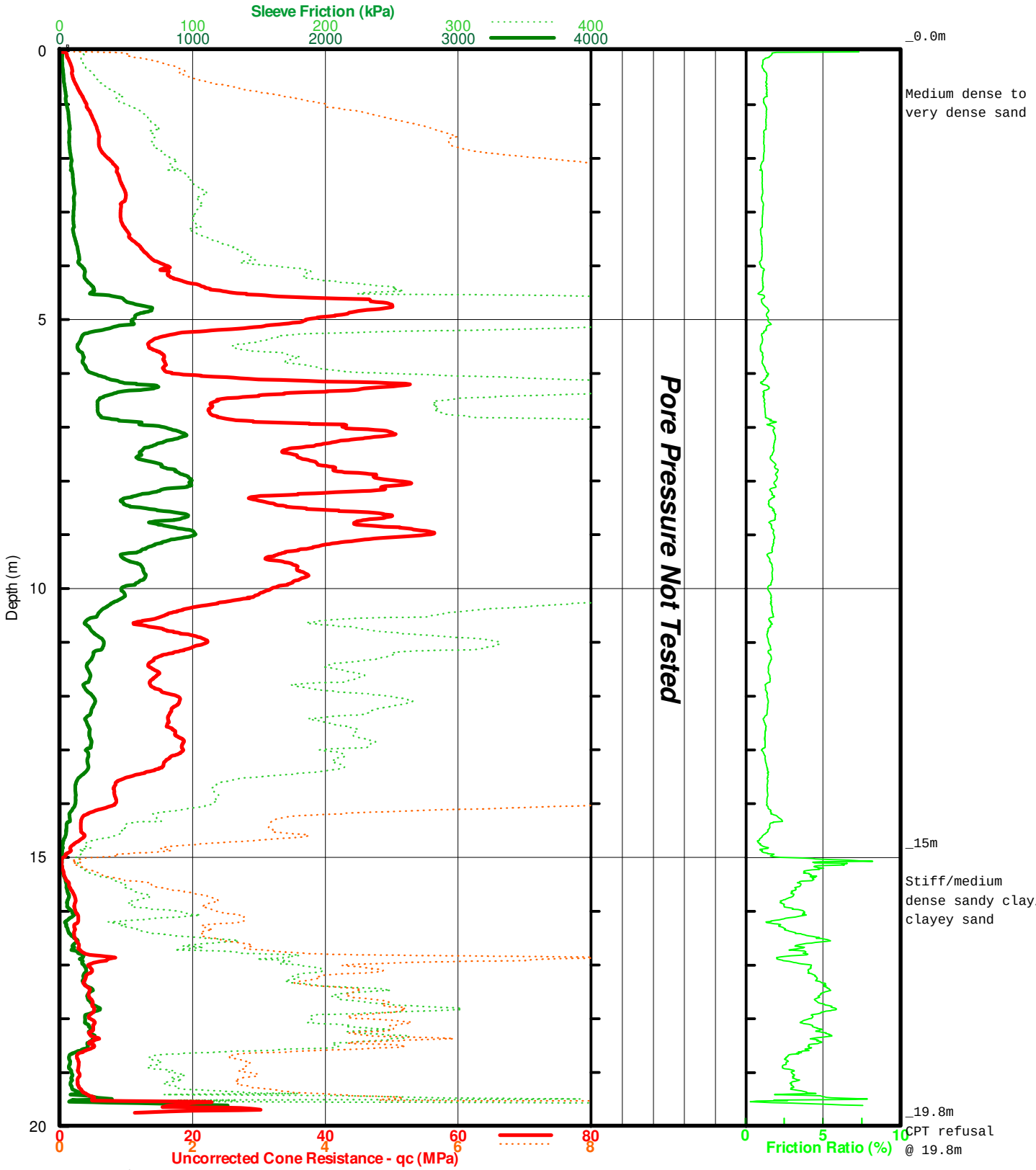
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-24



Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0553841, 6868863
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

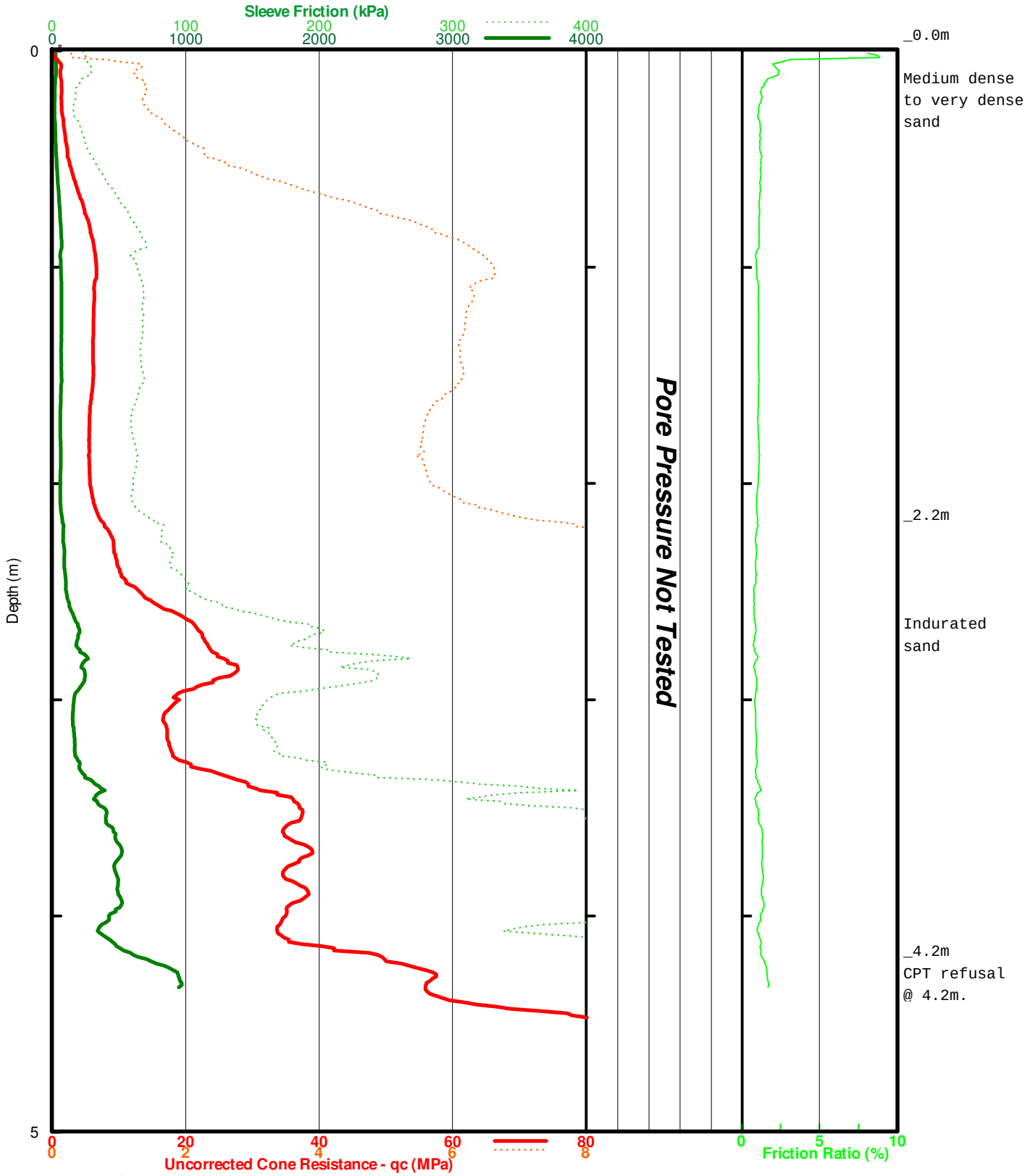
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-25



Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0553672, 6868293
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

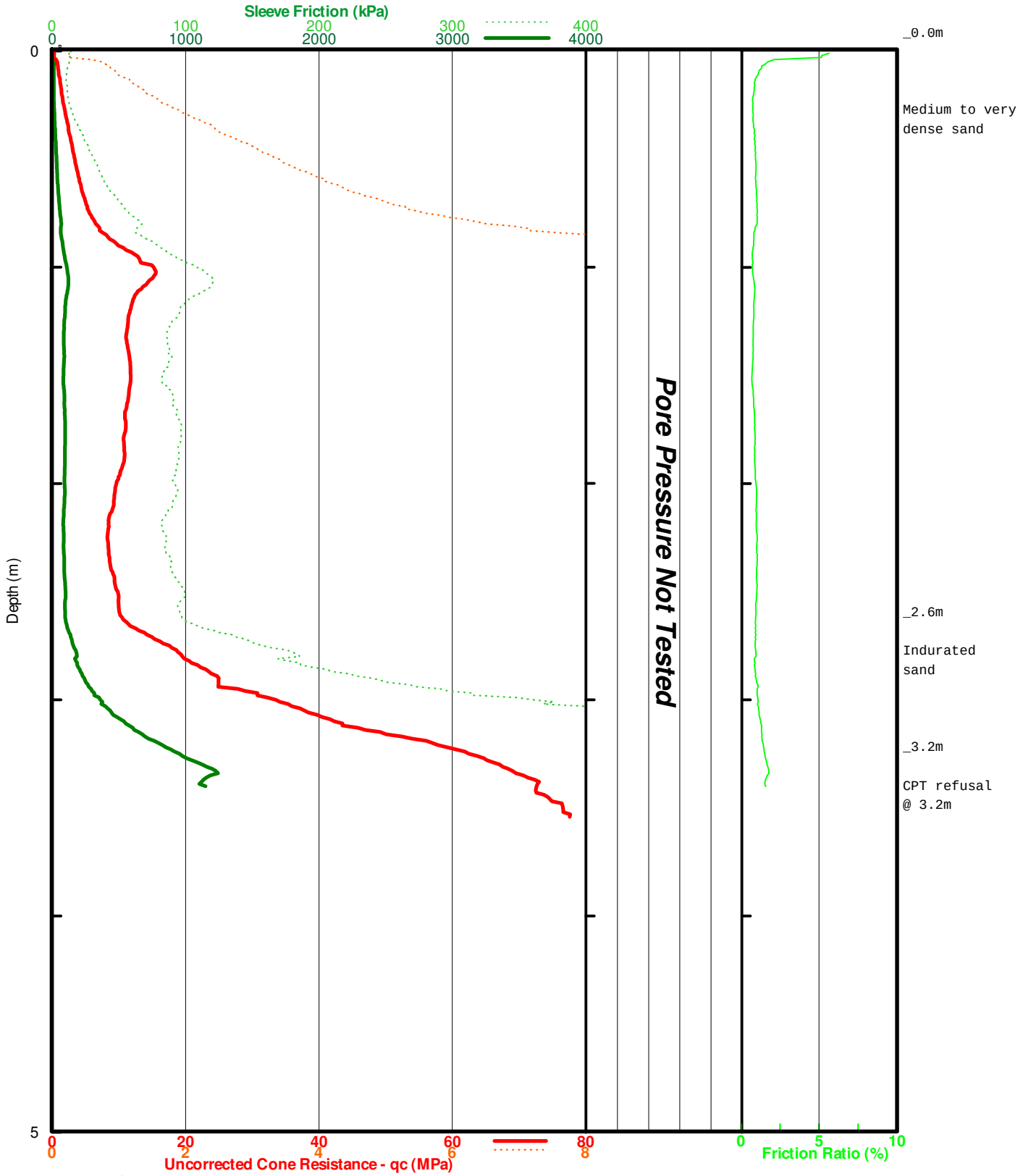
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-26



Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0553937, 6867892
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michel O'Rourke

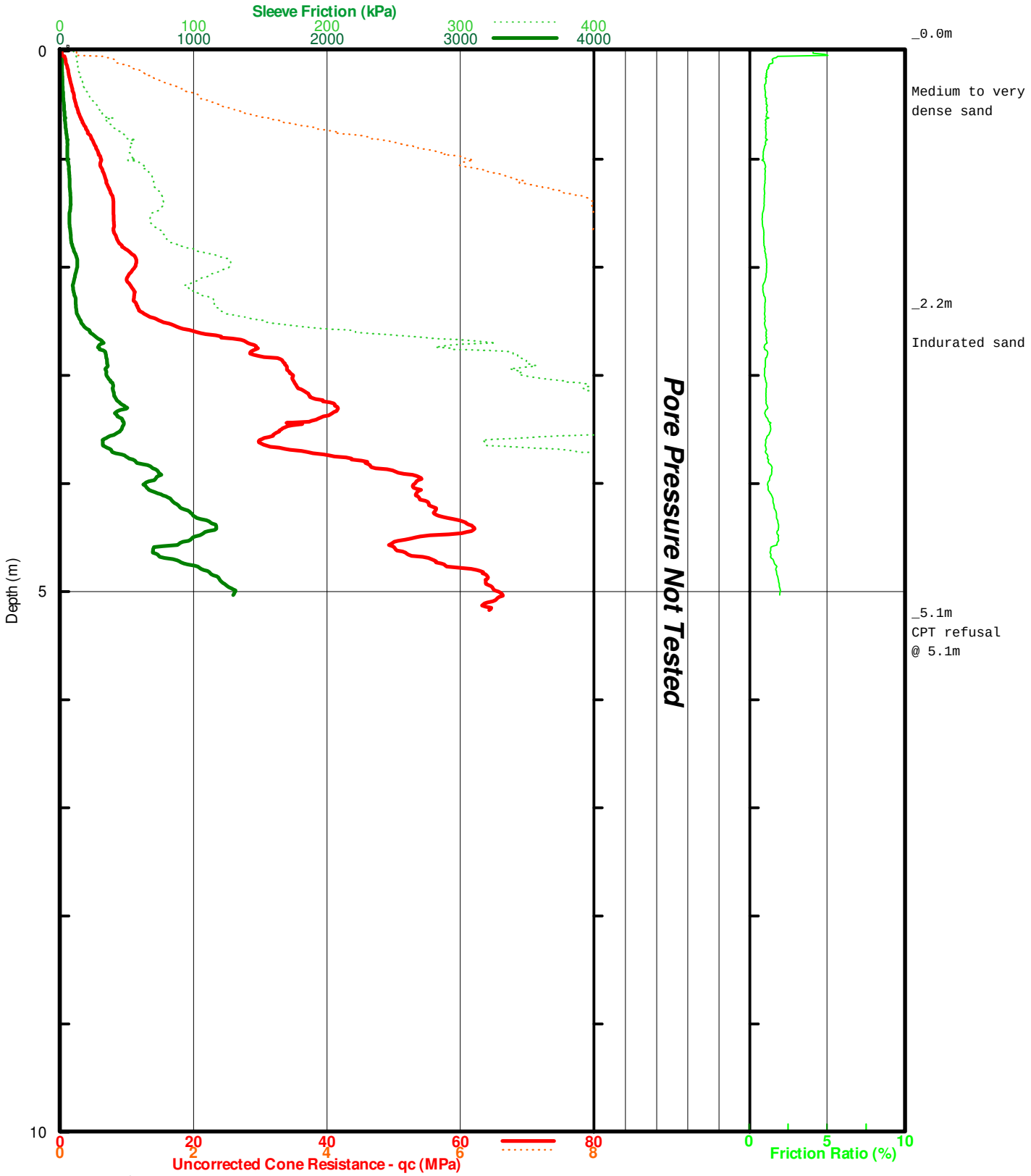
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-27



Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0554231, 6868112
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

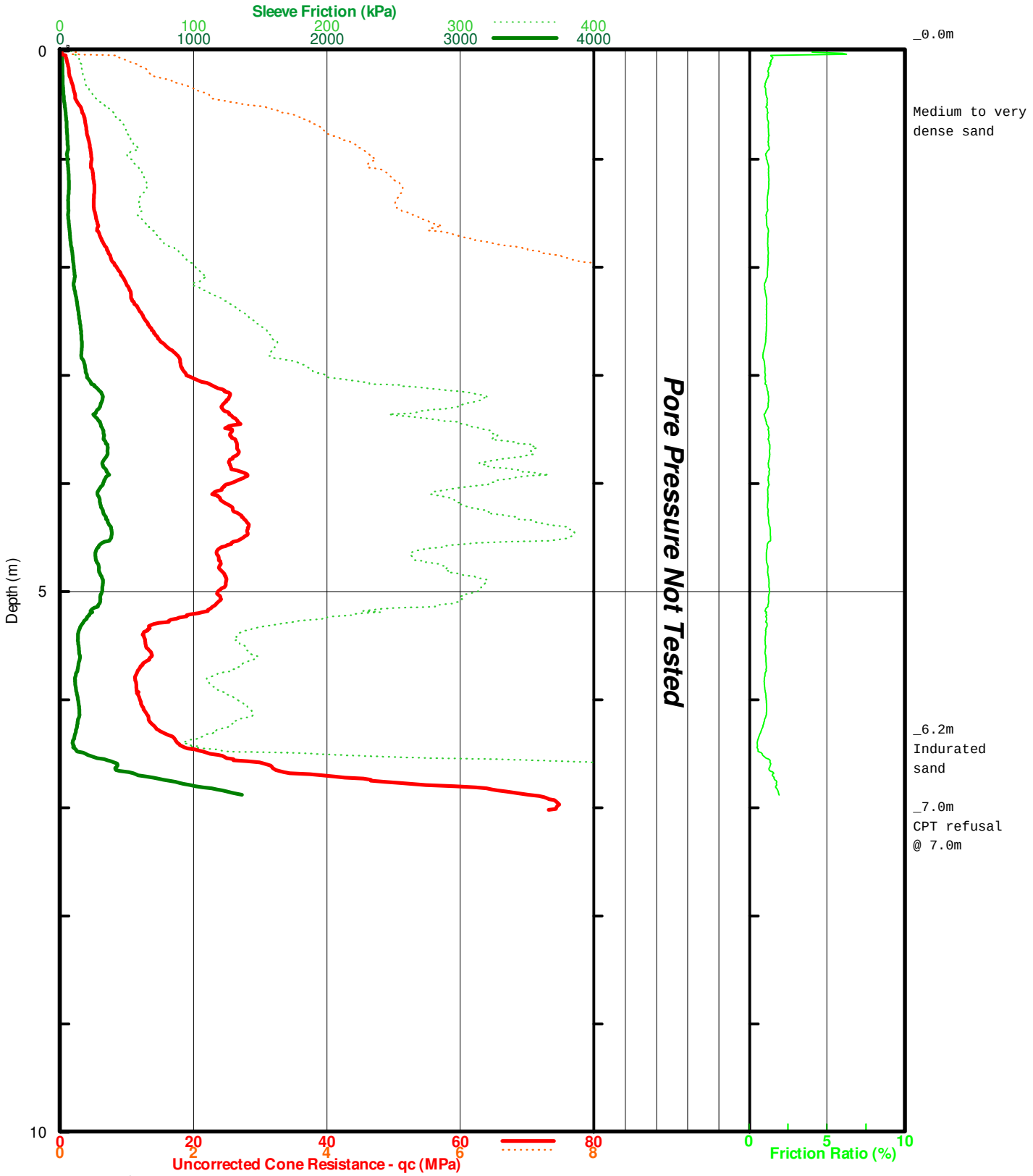
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-28



Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0554183, 6868493
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

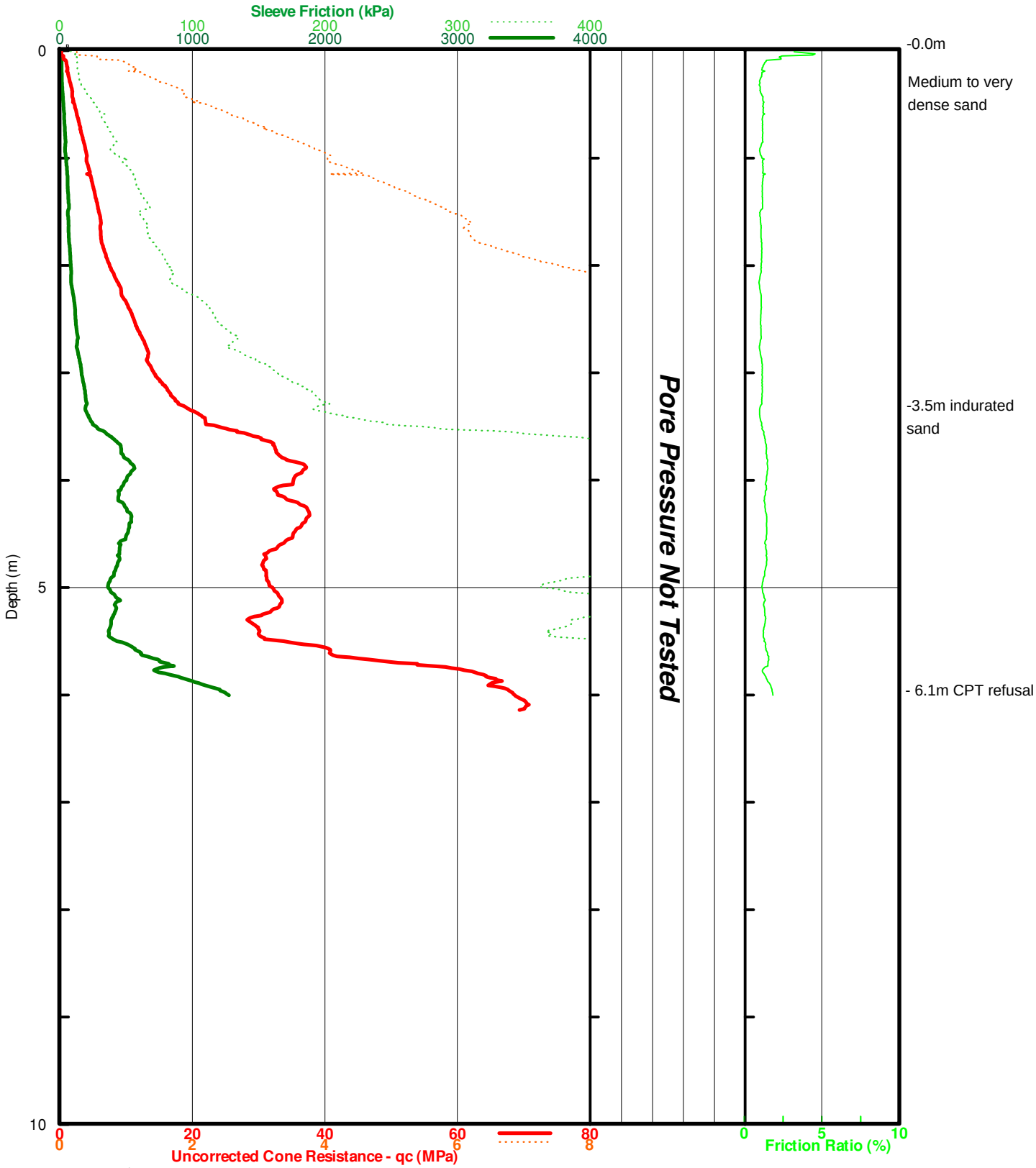
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-29



-0.0m

Medium to very dense sand

-3.5m indurated sand

- 6.1m CPT refusal

Job Number : G1006-105
Test Date : 30/06/2010
DGPS Position : 56 J 0554011, 6868614
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

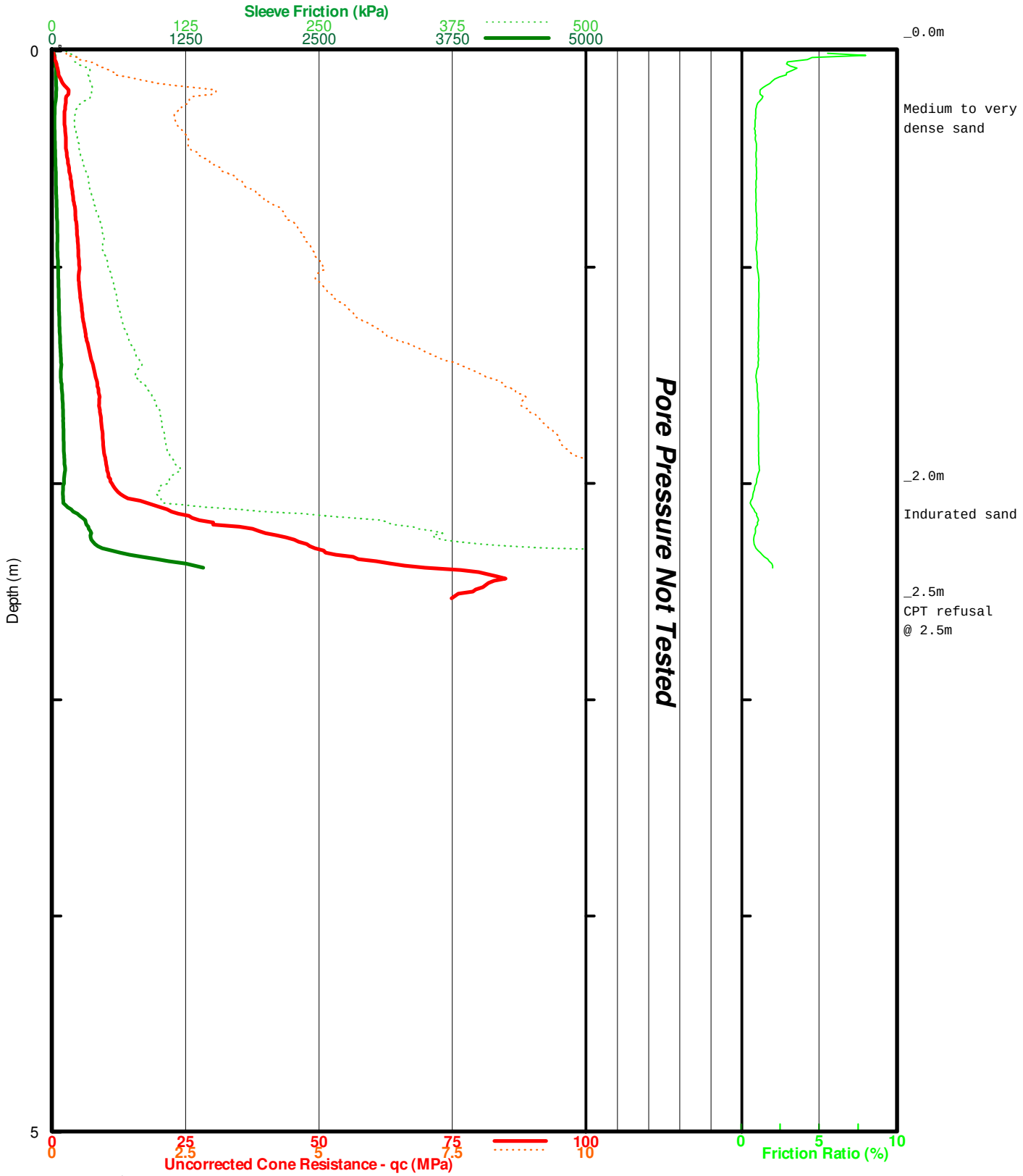
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-30



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0552587, 6869541
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

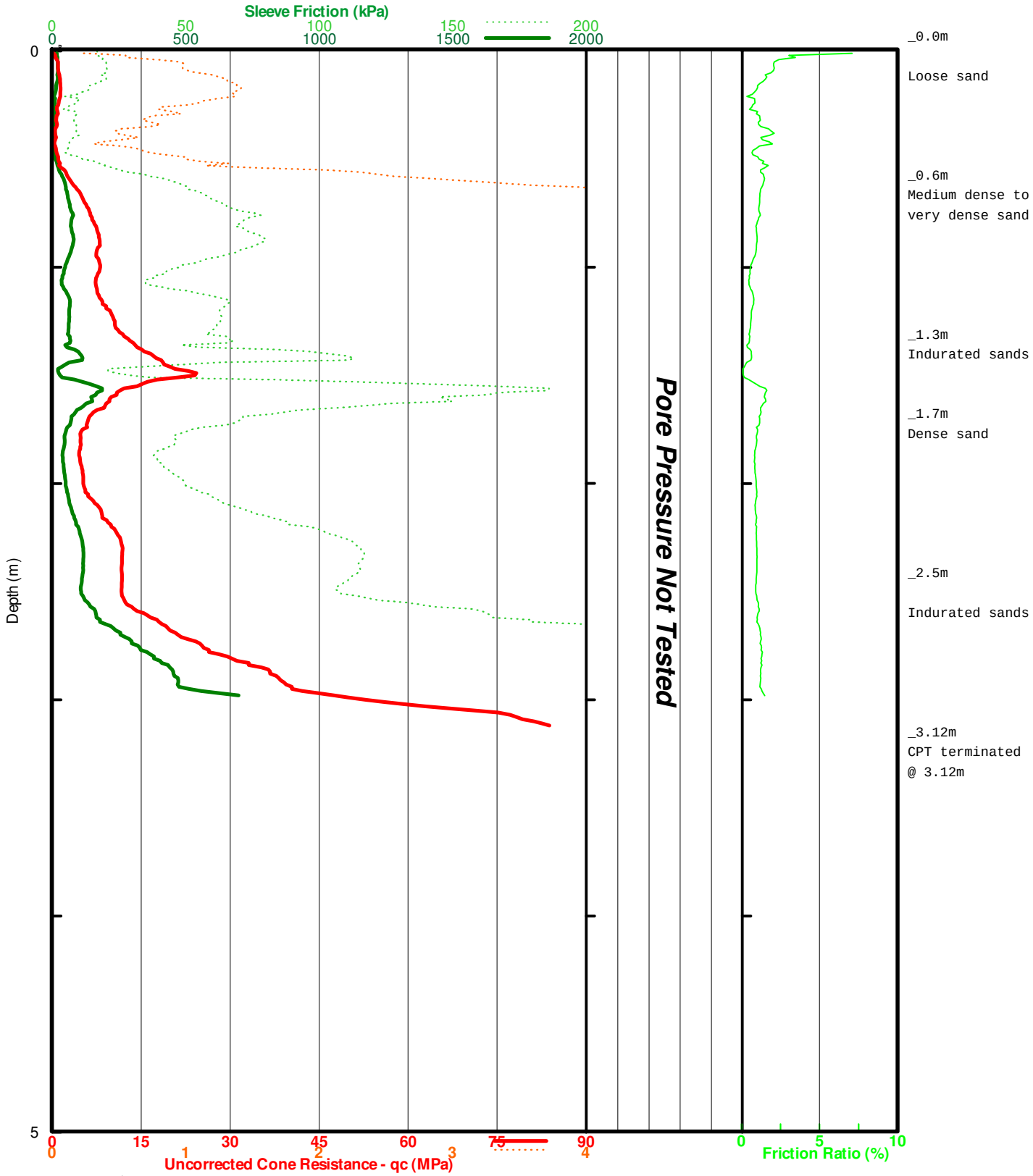
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-31



Job Number : G1006-105
Test Date : 24/06/2010
DGPS Position : 56 J 0553162, 6869833
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

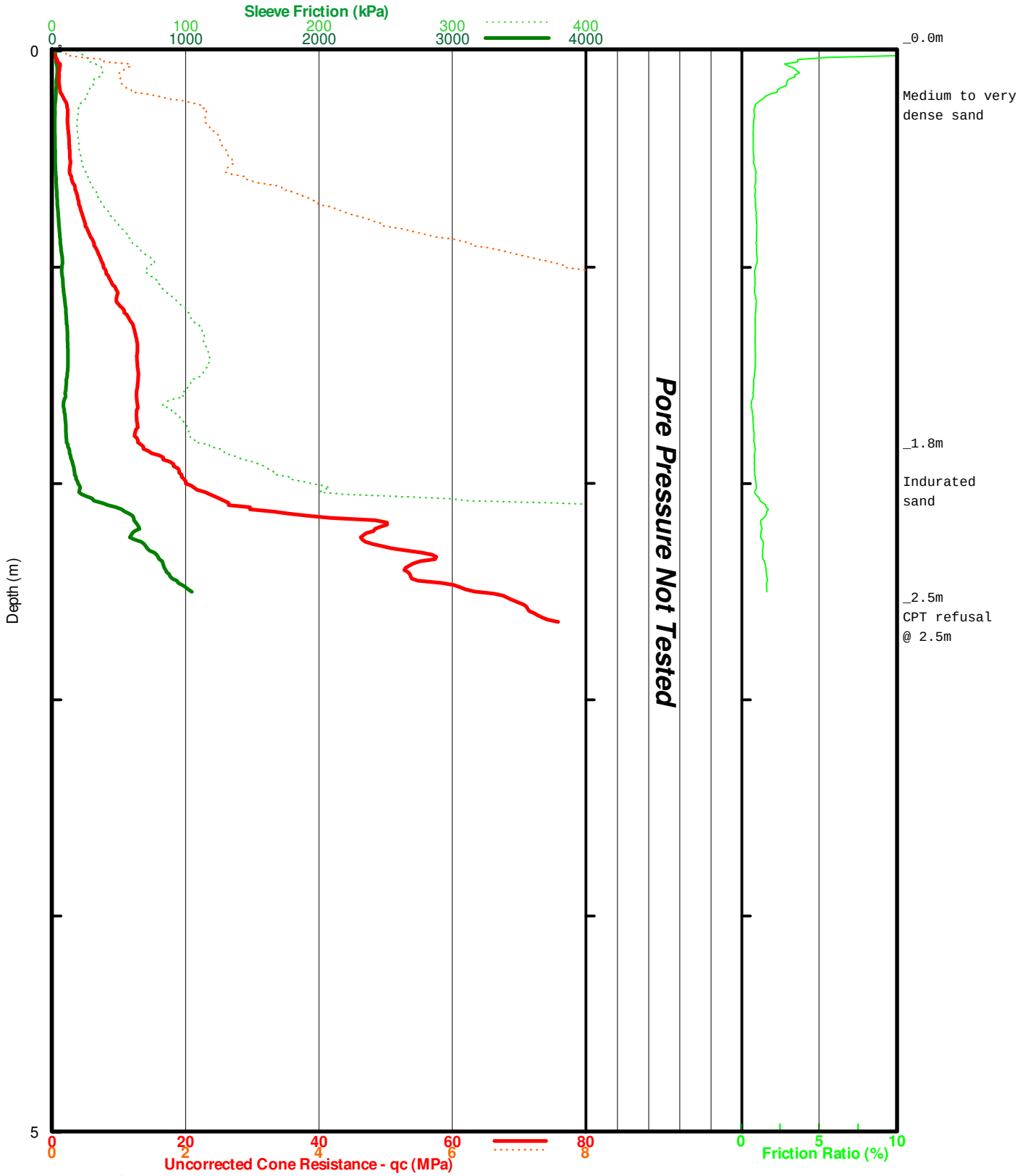
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-32



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0552562, 6869708
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

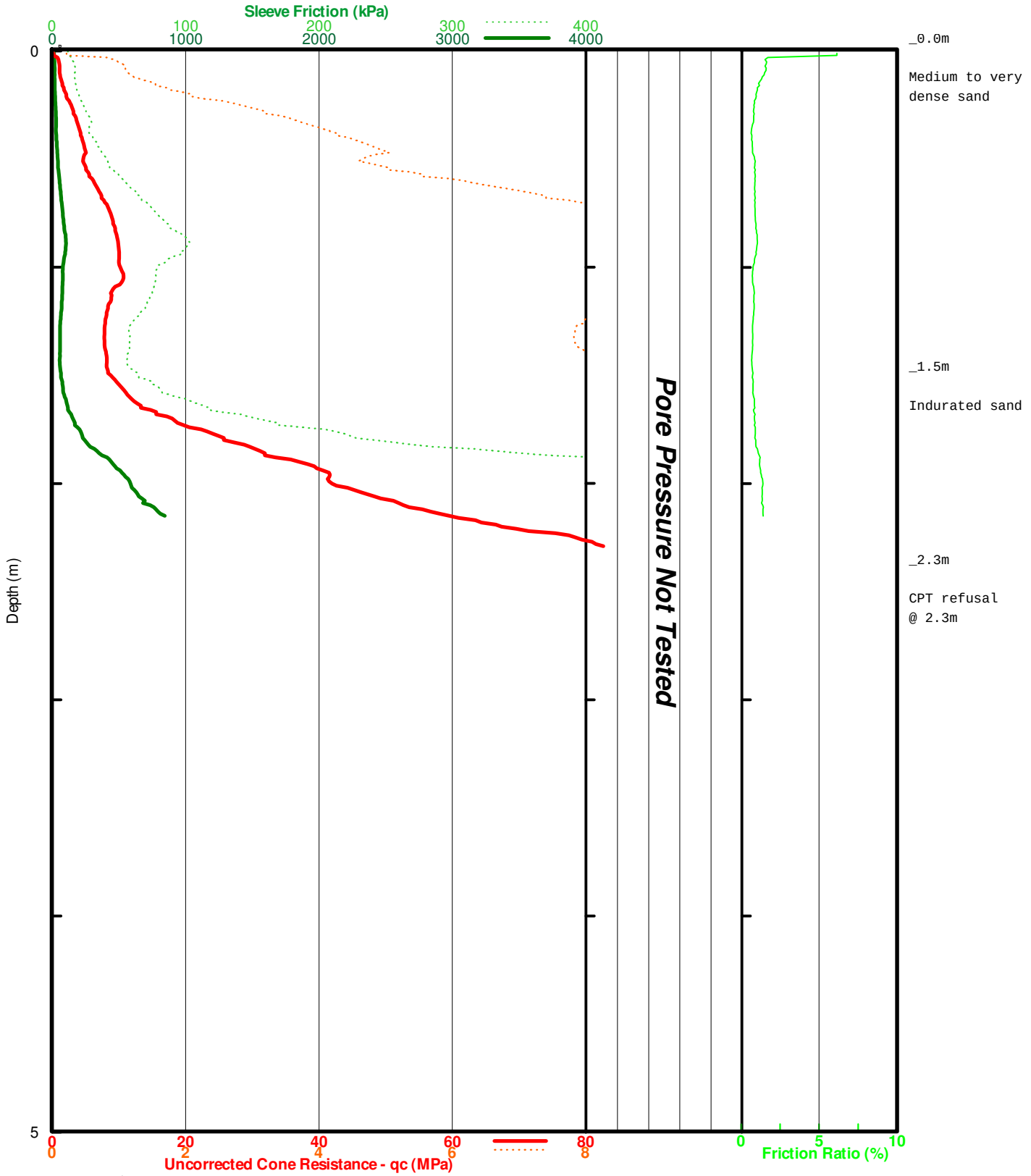
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-33



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0552666, 6869784
DGPS Format : WGS 84

Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

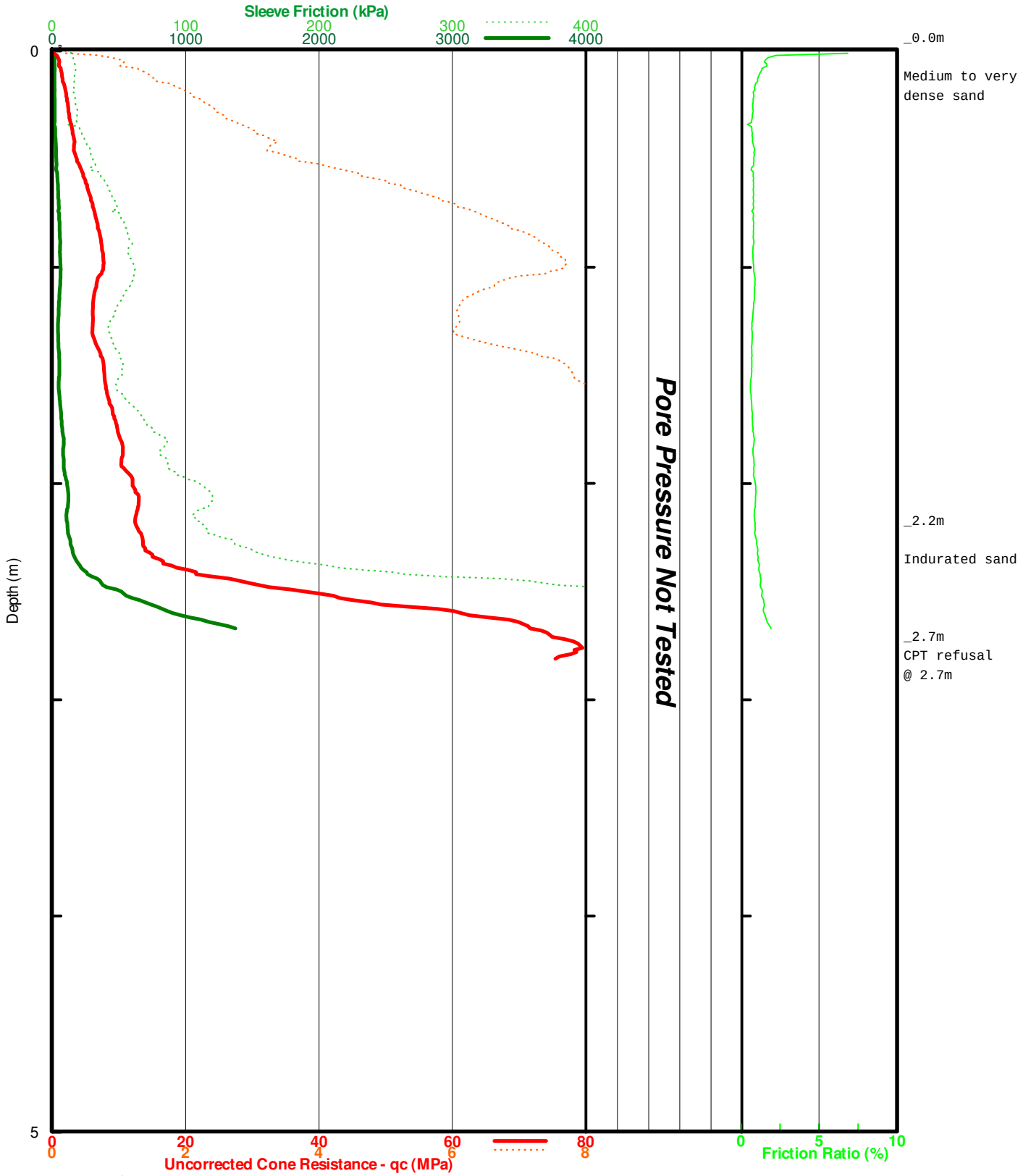
Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-34



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0552295, 6869901
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

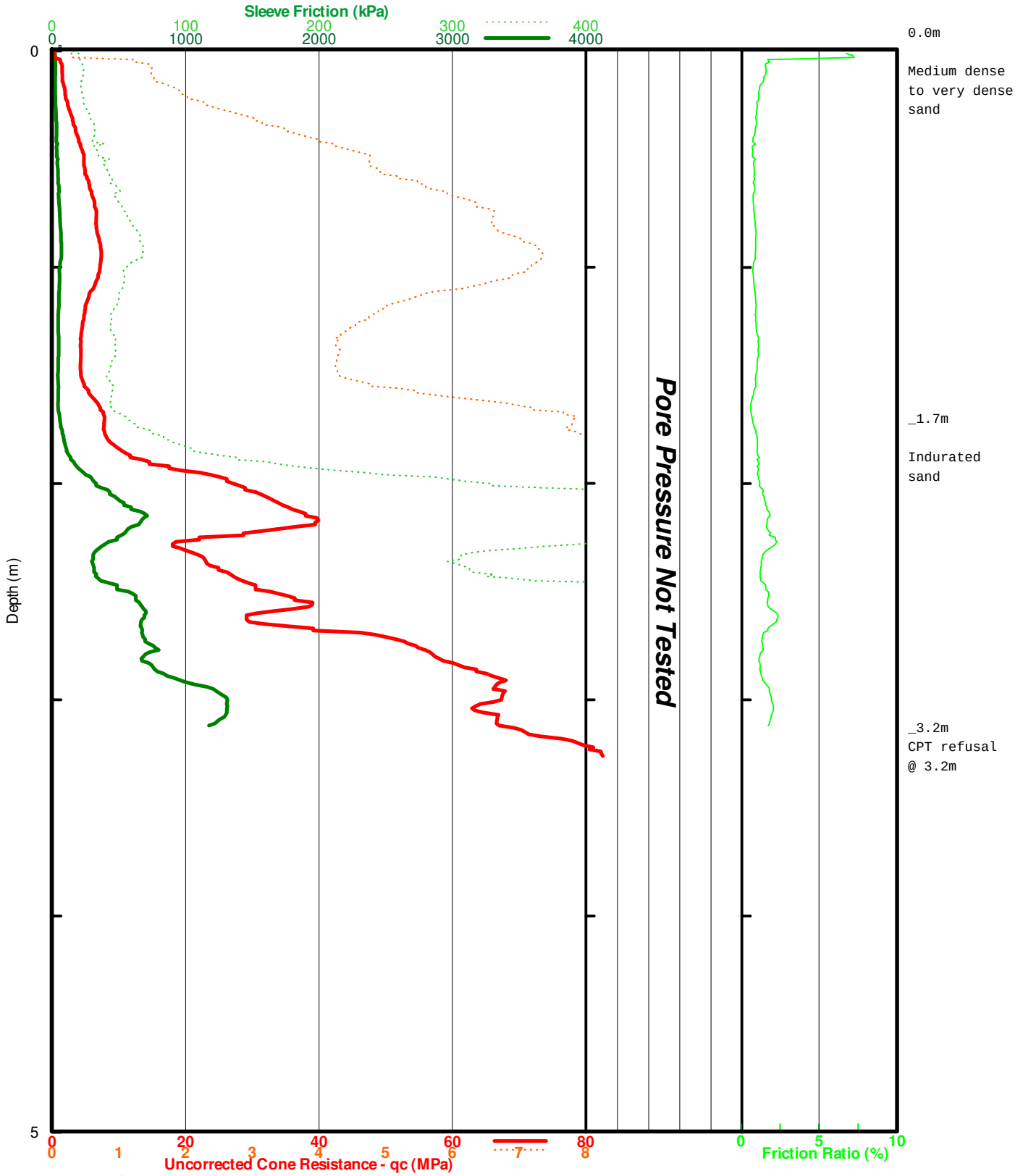
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-35



Job Number : G1006-105
Test Date : 02/07/2010
DGPS Position : 56 J 0552753, 6870161
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

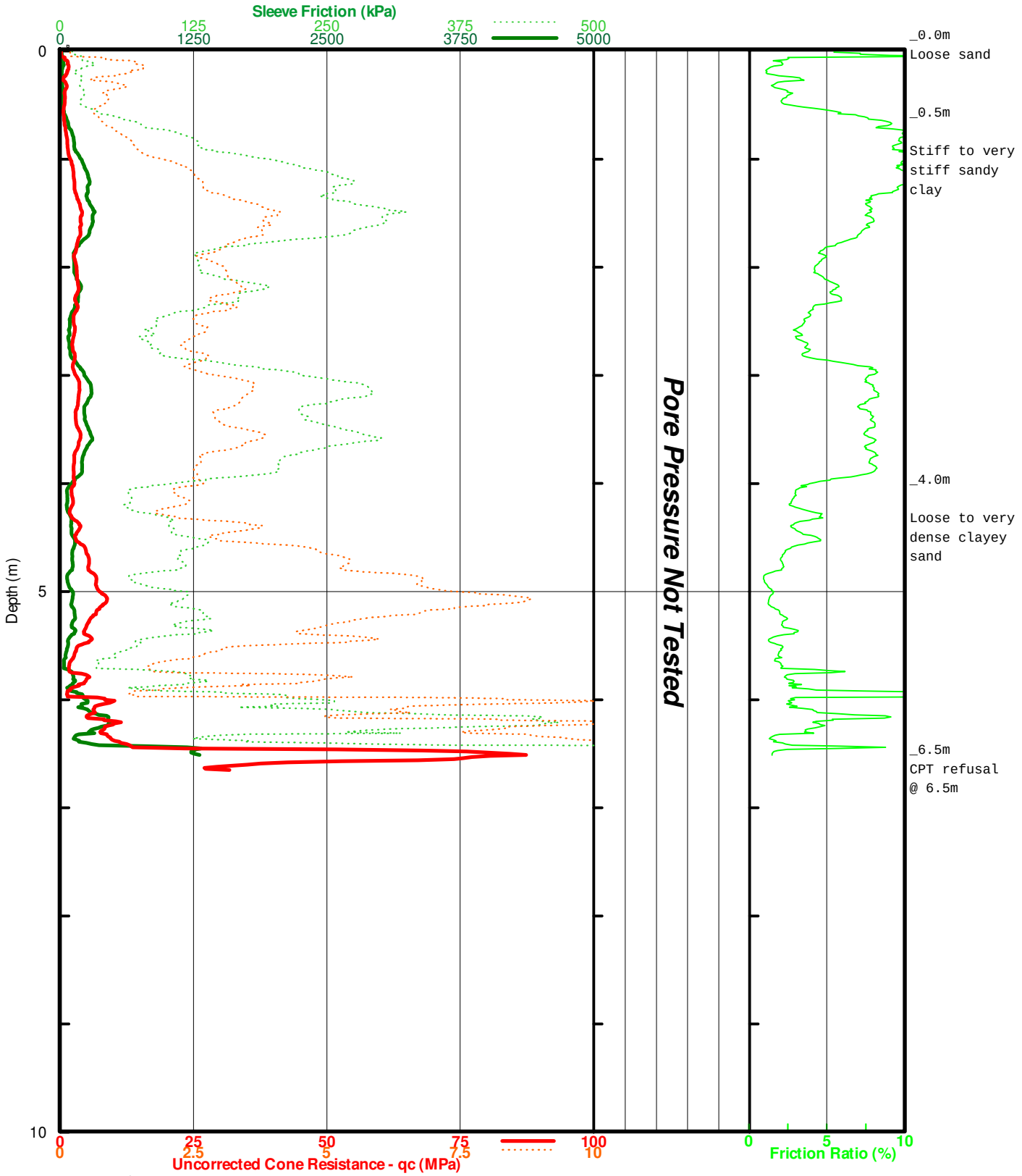
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-36



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0551147, 6870101
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

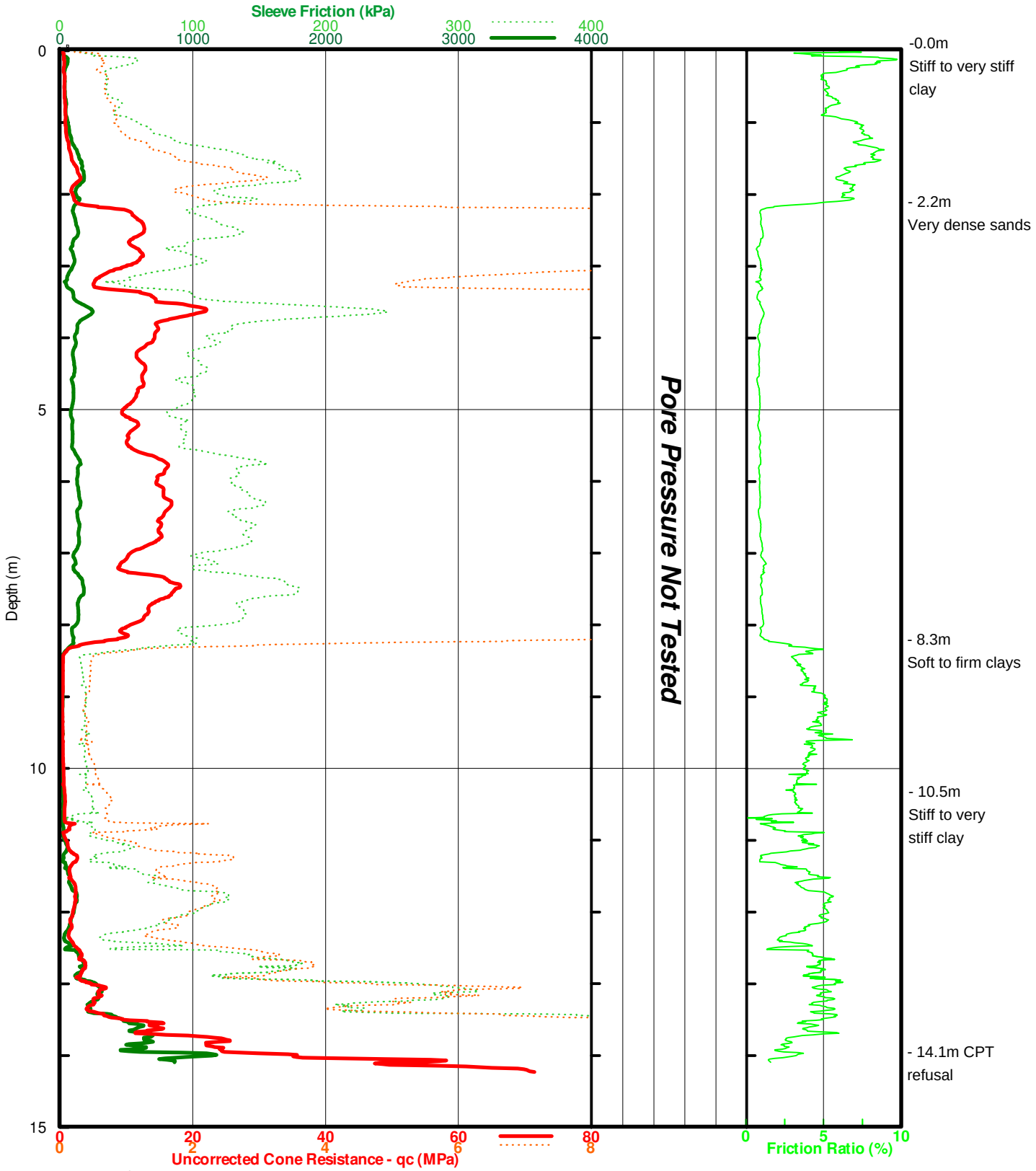
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Sleeve Refusal

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-37



Job Number : G1006-105
Test Date : 25/06/2010
DGPS Position : 56 J 0551524, 6870216
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

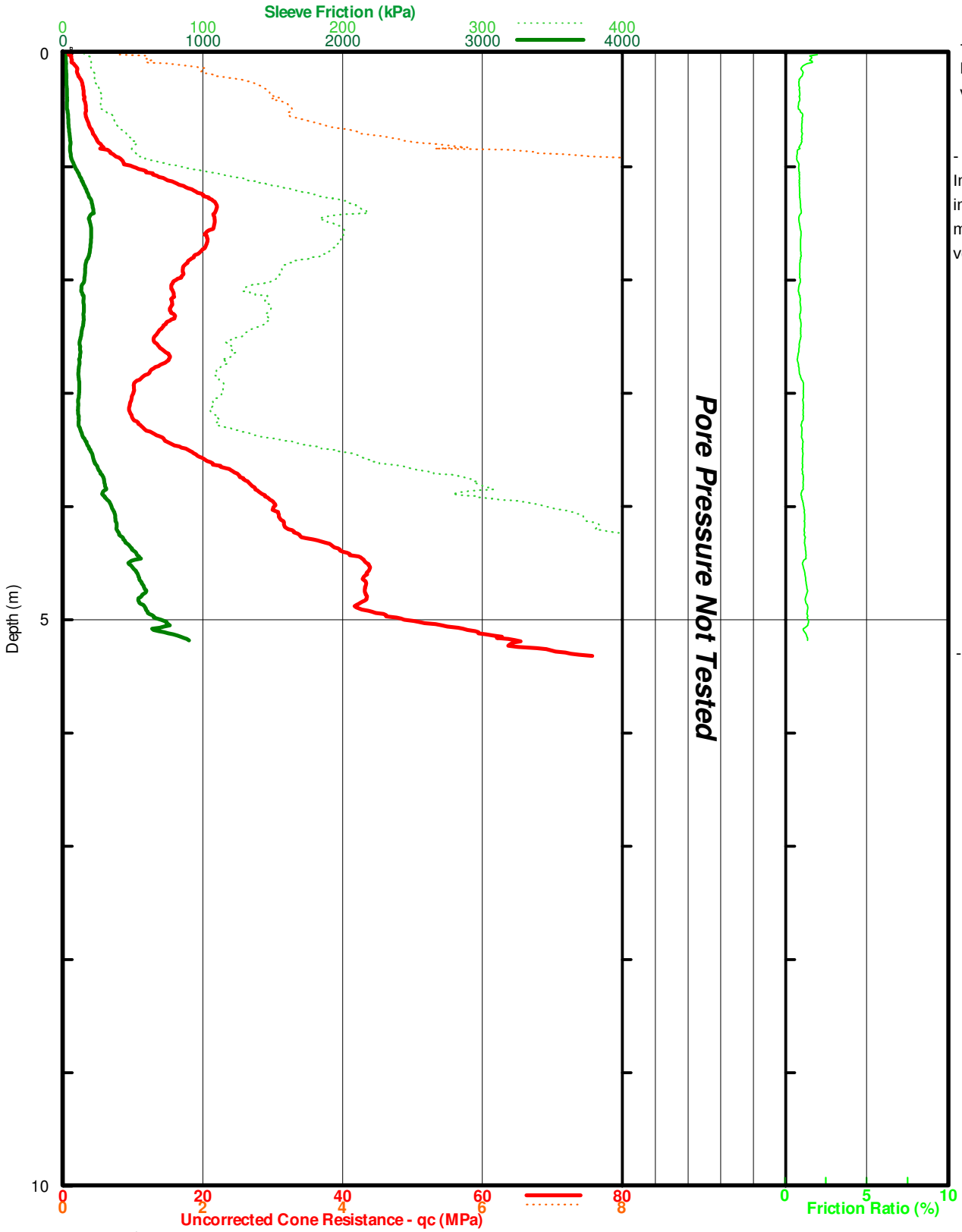
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-38



- 0.0m
Medium dense to very dense sand

- 1.0m
Interbedded indurated sand and medium dense to very dense sand

- 5.2m CPT refusal

Job Number : G1006-105
Test Date : 29/06/2010
DGPS Position : 56 J 0555281, 6870925
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

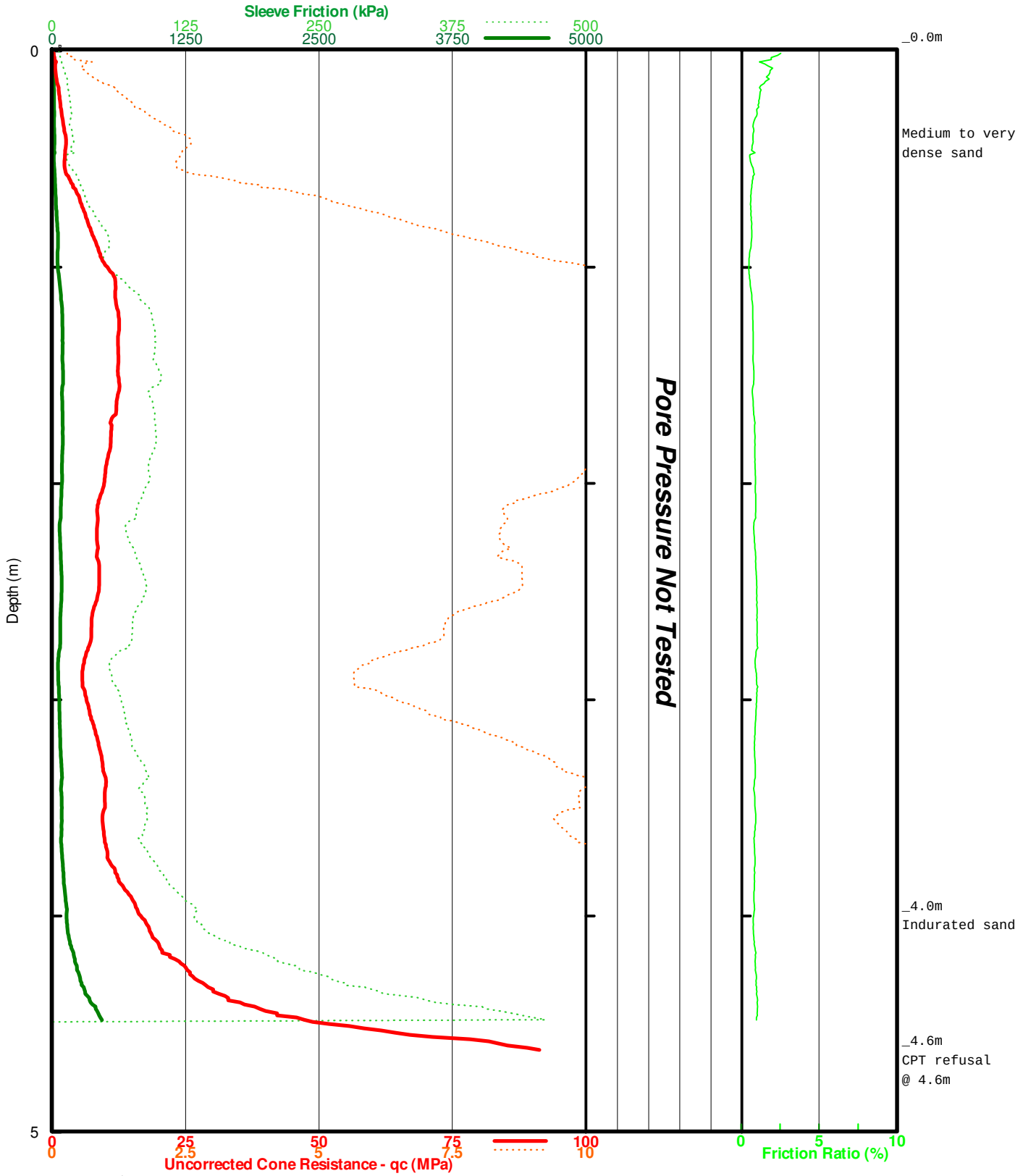
Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

CONE PENETROMETER TEST RESULT

Cardno Bowler
Kings Forest
Casuarina NSW

CPT-39



Job Number : G1006-105
Test Date : 29/06/2010
DGPS Position : 56 J 0555261, 6870996
DGPS Format : WGS 84

Tested By : Russell Vincenzi
Test Class : IGS-3
Checked By : Michael O'Rourke

Cone Number : S15CFII.E48
Predrill Depth : 0.00m
Dissipation Tests @ : N/A
Terminated Due To : Equipment at Risk

Insitu Geotech Services Pty Ltd IGS

BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH1 - CTP38

Job No: 9528 **Sheet:** 1 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5						▶							SILTY SAND, fine to medium grained, grey brown, wet, dense, NATURAL Rootzone 0.1m
1.0												SM	
1.5							1.50 - 1.95 m SPT 13, 20, 22 N=42						
2.0													SILTY SAND, fine to medium grained, dark brown, wet, medium dense, organic odour
2.5													
3.0							3.00 - 3.45 m SPT 5, 11, 17 N=27					SM	
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH1 - CTP38

Job No: 9528 **Sheet:** 2 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, organic odour
4.5							4.50 - 4.95 m SPT 26, 30/120mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, indurated, organic odour, cemented
5.0													
5.5												SM	SILTY SAND, fine to medium grained, dark brown, with clay and small gravel, wet, very dense, indurated, organic odour, cemented
												SM	SILTY SAND, fine to medium grained, dark brown, with fine gravel, wet, very dense, indurated, organic odour, cemented
6.0							6.00 - 6.45 m SPT 30/85mm N>50						
6.5													
7.0													
7.5							7.50 - 7.95 m SPT 30/90mm N>50						

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH1 - CTP38

Job No: 9528 **Sheet:** 3 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, dark brown, with fine gravel, wet, very dense, indurated, organic odour, cemented
9.0							9.00 - 9.45 m SPT 29, 30/105mm N>50						
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 30/90mm						
11.0													
11.5												CI	SANDY CLAY, intermediate plasticity, fine to medium grained sand, trace of silt, dark brown/grey, wet, moist, stiff, ALLUVIAL

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH1 - CTP38

Job No: 9528 **Sheet:** 4 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							U 12.00 - 12.45 m Tube 160kPa						SANDY CLAY, intermediate plasticity, fine to medium grained sand, trace of silt, dark brown/grey, wet, moist, stiff, ALLUVIAL
12.5												CI	
13.0													SILTY CLAY/SANDY CLAY, high to medium plasticity, fine to coarse grained sand, grey, moist, stiff
13.5							U 13.50 - 13.95 m PP=120kPa						
14.0												CI-CH	
14.5													
15.0													SANDY CLAY/CLAYEY SAND, medium to high plasticity, fine to coarse grained sand, blue grey, with silt, hard/dense, moist
15.5							15.20 - 15.60 m SPT 6, 21, 22 N=43					SC-CI-CH	

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH1 - CTP38

Job No: 9528 **Sheet:** 5 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SC-CI-CH	SANDY CLAY/CLAYEY SAND, medium to high plasticity, fine to coarse grained sand, blue grey, with silt, hard/dense, moist
16.5							16.50 - 16.95 m SPT 7, 7, 7 N=14					CI-CH	SILTY CLAY, intermediate to high plasticity, blue grey, trace sand and XW fragments, moist, stiff, NATURAL
17.0													
17.5													
18.0							18.00 - 18.45 m SPT 1, 1, 9 N=10					CI-CH	SILTY CLAY, intermediate to high plasticity, blue grey, trace sand and XW fragments, moist, NATURAL
18.5													
													TC BIT REFUSAL IN WEATHERED ROCK BOREHOLE TERMINATED AT 18.70 m
19.0													
19.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD			**Hole No: DBH2 - CTP2**
Project: KING FOREST ESTATE			
Location:	**Job No: 9528**		**Sheet: 1 of 5**
Position: REFER TO FIGURE 1	**Angle from Horizontal: 90°**		**Surface Elevation:**
Rig Type: Hydropower Scout	**Bit:**		**Driller: Tony**
Casing Diameter:	**Contractor: DRILLSURE**		
Date Started : 12/7/10	**Date Completed: 12/7/10**	**Logged By: LB/RH**	**Date Logged: 12/7/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5												SM	SILTY SAND, coarse to fine grained sand, light brown, moist, loose, NATURAL Rootzone 0.1m
1.0													
1.5							1.50 - 1.95 m SPT 6, 7, 8 N=13					SP	SAND, medium grained sand, light brown, moist, medium dense
2.0												SM	SILTY SAND, fine to medium grained sand, dark brown, wet, medium dense, poorly cemented, organic odour
2.5													
3.0							3.00 - 3.45 m SPT 2, 3, 11 N=14						
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH2 - CTP2

Job No: 9528 **Sheet:** 2 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained sand, dark brown, wet, medium dense, poorly cemented, organic odour
4.5							4.50 - 4.95 m SPT 17, 30/180mm N>50						SILTY SAND, fine to medium grained sand, dark brown, wet, very dense, well cemented, indurated, strong organic odour
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 25, 30, 30 N=60					SM	
6.5													
7.0													
7.5							7.50 - 7.95 m SPT 30/90mm N>50						

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH2 - CTP2

Job No: 9528 **Sheet:** 3 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5													SILTY SAND, fine to medium grained sand, dark brown, wet, very dense, well cemented, indurated, strong organic odour
9.0							9.00 - 9.45 m SPT 20, 30/135mm N>50						
9.5													
10.0												SM	
10.5							10.50 - 10.95 m SPT 17, 26, 30/75mm N>50						
11.0													
11.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH2 - CTP2

Job No: 9528 **Sheet:** 4 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Hydropower Scout **Bit:** **Driller:** Tony

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							12.00 - 12.45 m SPT 9, 14, 19 N=33						SILTY SAND, fine to medium grained sand, dark brown, wet, dense, well cemented, indurated, strong organic odour
12.5													
13.0													
13.5							13.50 - 13.95 m SPT 6, 11, 12 N=23						SILTY SAND, fine to medium grained, brown, wet, medium dense, NATURAL
14.0												SM	
14.5													
15.0							15.00 - 15.45 m SPT 10, 13, 10 N=23						SILTY SAND, fine to medium grained, brown, trace clay and small gravel, wet, medium dense, NATURAL
15.5												SM	

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH2 - CTP2

Job No: 9528 **Sheet:** 5 of 5
Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**
Rig Type: Hydropower Scout **Bit:** **Driller:** Tony
Casing Diameter: **Contractor:** DRILLSURE
Date Started : 12/7/10 **Date Completed:** 12/7/10 **Logged By:** LB/RH **Date Logged:** 12/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
													SILTY SAND, fine to medium grained, brown, trace clay and small gravel, wet, dense, NATURAL
16.5							16.50 - 16.95 m SPT 15, 21, 17 N=38						
17.0													
17.5													
18.0							18.00 - 18.45 m SPT 19, 21, 20 N=41						
18.5													
19.0													
19.5							19.50 - 19.95 m SPT 15, 23, 25 N=48						
													BOREHOLE TERMINATED AT 19.95 m

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 1 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5													SAND, fine to medium grained, grey/light brown, dry to moist, loose, NATURAL Rootzone 0.1m
1.0													
1.5							1.50 - 1.95 m SPT 2, 3, 4 N=7					SP	
2.0													
2.5													
3.0							3.00 - 3.45 m SPT 6, 72, 16 N=28						SAND, fine to medium grained, grey/light brown, dry to moist, medium dense, NATURAL
3.5												SP	

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 2 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5							4.50 - 4.95 m SPT 30/115mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, poorly cemented, indurated, organic odour
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 18, 24, 17 N=41					SM	SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, dense, poorly cemented, indurated, organic odour
6.5													
7.0													
7.5							7.50 - 7.95 m SPT 30/125mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, very dense, poorly cemented, indurated, organic odour

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 3 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, very dense, poorly cemented, indurated, organic odour
9.0							9.00 - 9.45 m SPT 32, 24, 24 N=48					SM	SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, dense, organic odour
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 28, 22, 23 N=45						
11.0													
11.5												SM	SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, dense, well cemented, indurated, organic odour

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 4 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
12.5							12.00 - 12.45 m SPT 18, 19, 12 N=31						SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, dense, organic odour
13.0													
13.5							13.50 - 13.95 m SPT 26, 26, 15 N=47					SM	SILTY SAND, fine to medium grained, dark brown, wet, dense, organic odour
14.0													
14.5													
15.0							15.00 - 15.45 m SPT 8, 8, 8 N=16						SILTY SAND, fine to medium grained, brown, medium dense, trace of clay, wet, NATURAL
15.5												SM	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 5 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, brown, medium dense, trace of clay, wet, NATURAL
16.5							16.50 - 16.95 m SPT 6, 9, 17 N=26					SM	SILTY SAND, fine to medium grained, light brown, medium dense, trace of clay, wet, NATURAL
17.0													
17.5												SM	SILTY SAND, fine to medium grained, light brown, medium dense, trace of clay, wet, NATURAL
18.0							18.00 - 18.45 m SPT 6, 4, 8 N=12						
18.5													
19.0												SM	SILTY SAND, fine to medium grained, light brown, medium dense, wet, NATURAL
19.5							19.50 - 19.95 m SPT 10, 12, 14 N=26						

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 6 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
20.5													SILTY SAND, fine to medium grained, light brown, medium dense, wet, NATURAL
21.0							21.00 - 21.45 m SPT 10, 12, 13 N=25					SM	
21.5													
22.0													
22.5							22.50 - 22.95 m SPT 22, 23, 20 N=43						SILTY SAND, fine to medium grained, blue grey, dense, wet, NATURAL
23.0												SM	
23.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH3 - CTP7

Job No: 9528 **Sheet:** 7 of 7

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							24.00 - 24.45 m SPT 2, 5, 5 N=10					SM	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to medium grained sand, wet, blue/grey, stiff, NATURAL
24.5												CI-CH	SILTY CLAY, blue grey, wet, stiff, NATURAL
25.0													
25.5							25.50 - 25.95 m SPT 2, 5, 5, N=10						BOREHOLE TERMINATED AT 25.50 m
26.0													
26.5													
27.0													
27.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 1 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5													SILTY SAND, fine to medium grained sand, dark brown, dry to moist, loose, NATURAL Rootzone 0.1m
1.0													
1.5							1.50 - 1.95 m SPT 2, 3, 4 N=7					SM	
2.0													
2.5						▶							Water level
3.0							3.00 - 3.45 m SPT 4, 7, 8 N=15						SILTY SAND, fine to medium grained sand, light brown, dry to moist, medium dense, NATURAL
3.5												SM	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 2 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5							4.50 - 4.95 m SPT 7, 7, 7 N=14						SILTY SAND, fine to medium grained sand, light brown, dry to moist, medium dense, NATURAL
5.0												SM	
5.5													
6.0							6.00 - 6.45 m SPT 6, 7, 7 N=14						SILTY SAND, fine to medium grained sand, dark brown, dry to moist, medium dense, NATURAL
6.5												SM	
7.0													SILTY SAND, fine to medium grained, dark brown, wet, medium dense, organic odour, NATURAL
7.5							7.50 - 7.95 m SPT 9, 11, 12 N=23					SM	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 3 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, organic odour, NATURAL
9.0							9.00 - 9.45 m SPT 8, 10, 10 N=21					SM	SILTY SAND, fine to medium grained, brown, wet, medium dense, small bands of indurated, organic odour, NATURAL
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 6, 9, 10, N=19					SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, organic odour, NATURAL
11.0													
11.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 4 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							12.00 - 12.45 m SPT 6, 7, 6 N=13					SM	SILTY SAND, fine to medium grained sand, dark brown, wet, medium dense, organic odour, NATURAL
12.5													SILTY SAND, fine to medium grained, light brown, wet, medium dense, organic odour, NATURAL
13.0													
13.5							13.50 - 13.95 m SPT 5, 6, 10 N=16					SM	
14.0													
14.5													
15.0							15.00 - 15.45 m SPT 9, 18, 21 N=39						SILTY SAND, fine to medium grained, dark brown, wet, dense, strong organic odour, NATURAL
15.5												SM	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 5 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
16.5							16.50 - 16.95 m SPT 7, 21, 23 N=44					SM	SILTY SAND, fine to medium grained, dark brown, wet, dense, strong organic odour, NATURAL
17.0													
17.5													SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, dense, strong organic odour, NATURAL
18.0							18.00 - 18.45 m SPT 12, 19, 23 N=42						
18.5												SM	
19.0													
19.5							19.50 - 19.95 m SPT 10, 7, 7 N=14						
												SM-SC	SILTY SAND/CLAYEY SAND, fine to medium grained sands, grey wet, medium dense, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 6 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
20.5													SILTY SAND/CLAYEY SAND, fine to medium grained sands, grey wet, loose, NATURAL
21.0							21.00 - 21.45 m SPT 0, 0, 5 N=5						SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, grey, moist, stiff, NATURAL
21.5												CH	
22.0													
22.5							U 22.50 - 22.95 m PP=250kPa						SANDY CLAY/SILTY CLAY, high plasticity, dark brown, moist, very stiff, NATURAL
23.0												CH	
23.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 7 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
24.5							U 24.00 - 24.45 m PP=300kPa					CH	SANDY CLAY/SILTY CLAY, high plasticity, blue grey, moist, very stiff, NATURAL
25.0													
25.5							U 25.50 - 25.95 m PP=110kPa					CH	SANDY CLAY/SILTY CLAY, high plasticity, dark brown, moist, stiff, NATURAL
26.0													
26.5													
27.0							U 27.00 - 27.45 m PP=140kPa						
27.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH4 - CTP20

Job No: 9528 **Sheet:** 8 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CH	SANDY CLAY/SILTY CLAY, high plasticity, dark brown, moist, stiff, NATURAL
28.5							U 28.50 - 28.95 m PP=sand					SC-SM	CLAYEY SAND/SILTY SAND, fine to medium grained sand, grey brown, moist to wet, stiff, NATURAL
29.0													
29.5													
30.0							30.00 - 30.45 m SPT 7, 4, 5, N=9						BOREHOLE TERMINATED AT 30.00 m
30.5													
31.0													
31.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 1 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0													SILTY SAND, fine to medium grained, grey/brown, dry to moist, loose, NATURAL Rootzone
1.5							1.50 - 1.95 m SPT 2, 4, 5 N=9					SM	
3.0						▶	3.00 - 3.45 m SPT 4, 12, 26 N=38					SM	SILTY SAND, fine to medium grained, grey, dry to moist, dense, NATURAL Becoming indurated at 3.5m

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 2 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
													SILTY SAND, fine to medium grained, grey, dry to moist, very dense, indurated, NATURAL
													Drilling becoming harder
4.5							4.50 - 4.95 m SPT 18, 28, 30/140mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, dry to moist, very dense, NATURAL
5.0													SILTY SAND, fine to medium grained, dark brown, wet, very dense, well cemented, indurated, organic odour, NATURAL
5.5													
6.0							6.00 - 6.45 m SPT 30/135mm						
6.5												SM	
7.0													
7.5							7.50 - 7.95 m SPT 30/95mm N>50						

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 3 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, well cemented, indurated, organic odour, NATURAL
9.0							9.00 - 9.45 m SPT 30/120mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, well cemented, indurated, NATURAL
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 23, 30/140mm N>50						
11.0													
11.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 4 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
12.5							12.00 - 12.45 m SPT 12, 19, 27 N=46						SILTY SAND, fine to medium grained, dark brown, wet, dense, NATURAL
13.0													
13.5							13.50 - 13.95 m SPT 12, 17, 20 N=37					SM	
14.0													
14.5													
15.0							15.00 - 15.45 m SPT 8, 12, 12 N=24						SILTY SAND, fine to medium grained, light brown, wet, medium dense, NATURAL
15.5												SM	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 5 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, light brown, wet, medium dense, NATURAL
16.5							16.50 - 16.95 m SPT 13, 22, 28 N=50					SM	SILTY SAND, fine to medium grained, dark grey, wet, dense to very dense, NATURAL
17.0													
17.5													
18.0							U 18.00 - 18.45 m PP=50kPa					CL-CI	SANDY CLAY/SILTY CLAY, low to medium plasticity, dark grey, moist to wet, soft to firm, NATURAL
18.5												SC-SM	CLAYEY SAND/SILTY SAND, fine to medium grained, dark grey, moist to wet, loose, NATURAL
19.0													
19.5							19.50 - 19.95 m SPT 8, 10, 12 N=22					SM	SILTY SAND, fine to medium grained, dark brown, medium dense, organic odour, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 6 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, dark brown, medium dense, organic odour, NATURAL
20.5													SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained, blue grey, moist, stiff, NATURAL
21.0							21.00 - 21.45 m SPT 1, 5, 4 N=9						Interbedded layers of blue grey sandy clay and clayey sand
21.5												CH	
22.0													
22.5							22.50 - 22.95 m SPT 5, 4, 6 N=10						CLAYEY SAND/SILTY SAND, fine to medium grained, grey green, moist to wet, medium dense, NATURAL
23.0												CH	
23.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 7 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							24.00 - 24.45 m SPT 8, 12, 15 N=27					CH	SANDY CLAY/SILTY CLAY, high plasticity, grey with brown, moist, stiff, NATURAL
24.5													
25.0													
25.5							U 25.50 - 25.95 m PP=400kPa					CH	SANDY CLAY/SILTY CLAY, high plasticity, grey with brown, moist, very stiff to hard, NATURAL
26.0													
26.5													
27.0							27.00 - 27.45 m SPT 9, 11, 14 N=25					CH	SANDY CLAY/SILTY CLAY, high plasticity, brown, moist, very stiff, NATURAL
27.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH5 - CTP29

Job No: 9528 **Sheet:** 8 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CH	SANDY CLAY/SILTY CLAY, high plasticity, brown, moist, very stiff, NATURAL
28.5							28.50 - 28.95 m SPT 8, 8, 9 N=17						
29.0												CH	SANDY CLAY/SILTY CLAY, high plasticity, dark grey, clayey sand band, moist, very stiff, NATURAL
29.5													
30.0							30.00 m SPT 6, 7, 9 N=16						BOREHOLE TERMINATED AT 30.00 m
30.5													
31.0													
31.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 1 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0						▶						SM	SILTY SAND, fine to medium grained, light to dark brown, dry to moist, medium dense, NATURAL Root zone 0.1m
1.5							1.50 - 1.95 m SPT 10, 13, 15 N=28						
2.0												SM	SILTY SAND, fine to medium grained, dark brown, wet, dense, organic odour, indurated, well cemented, NATURAL Becoming denser
3.0							3.00 - 3.45 m SPT 7, 30/110mm N>50						
3.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 2 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, with clay, dark brown, wet, dense, organic odour, indurated, well cemented, NATURAL
4.5							4.50 - 4.95 m SPT 30/100mm N>50						SILTY SAND, fine to medium grained, dark brown, trace of gravel, wet, dense, organic odour, indurated, well cemented, NATURAL
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 30, 30/95mm N>50					SM	
6.5													
7.0													
7.5							7.50 - 7.95 m SPT 21, 26, 27 N>50					SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 3 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, NATURAL
9.0							9.00 - 9.45 m SPT 9, 10, 12 N=22					SM	SILTY SAND, fine to medium grained, light brown, wet, medium dense, NATURAL
9.5													
10.0												SM	SILTY SAND, fine to medium grained, light brown, trace of clay and gravel, wet, medium dense, NATURAL
10.5							10.50 - 10.95 m SPT 30/95mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, moist to wet, very dense, indurated, NATURAL
11.0													
11.5												SM	SILTY SAND, fine to medium grained, brown, moist to wet, medium dense, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 4 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							12.00 - 12.45 m SPT 8, 11, 16 N=27					SM	SILTY SAND, fine to medium grained, brown, moist to wet, medium dense, NATURAL
12.5												SM	SILTY SAND, fine to medium grained, brown, trace of clay in cuttings, moist to wet, medium dense, NATURAL
13.0													
13.5							13.50 - 13.95 m SPT 30/100mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, indurated, organic odour, NATURAL
14.0													
14.5													
15.0							15.00 - 15.45 m SPT 24, 30/130mm N>50						
15.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 5 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, indurated, organic odour, NATURAL
													SILTY SAND, fine to medium grained, dark grey, wet, medium dense, NATURAL
16.5							16.50 - 16.95 m SPT 9, 14, 15 N=29						
17.0												SM	
17.5													
18.0							18.00 - 18.45 m SPT 9, 17, 19 N=36						SILTY SAND, fine to medium grained, dark grey, wet, dense, NATURAL
18.5												SM	
19.0													
19.5							19.50 - 19.95 m SPT 21, 28, 30/140mm N>50						SILTY SAND, fine to medium grained, brown/grey, wet, very dense, NATURAL
												SM	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 6 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
20.5												SM	SILTY SAND, fine to medium grained, brown/grey, wet, very dense, NATURAL
21.0							21.00 - 21.45 m SPT 20, 30/120mm N>50					SM	SILTY SAND, fine to medium grained, grey, wet, very dense, NATURAL
21.5													
22.0													
22.5							22.50 - 22.95 m SPT 2, 2, 3 N=5					SC-SM	CLAYEY SANDS/SILTY SANDS, fine to medium grained sand, grey, moist to wet, loose, NATURAL
23.0												CL-CI	SANDY CLAY/SILTY CLAY, low to medium plasticity, grey, fine to medium grained sand, moist to wet, firm, NATURAL
23.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 7 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							U 24.00 - 24.45 m PP=90kPa						SANDY CLAY/SILTY CLAY, low to medium plasticity, grey, fine to medium grained sand, moist to wet, firm, NATURAL
24.5												CL-CI	
25.0													
25.5							U 25.50 - 25.95 m PP=160kPa						SANDY CLAY/SILTY CLAY, low to medium plasticity, blue grey, fine to medium grained sand, moist to wet, stiff, NATURAL
26.0												CL-CI	
26.5													
27.0							U 27.00 - 27.45 m PP=80kPa						SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained, brown, moist, firm, NATURAL
27.5												CH	
												CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, stiff to very stiff, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH6 - CTP26

Job No: 9528 **Sheet:** 8 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 18/7/10 **Date Completed:** 18/7/10 **Logged By:** LB **Date Logged:** 18/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, stiff to very stiff, NATURAL
28.5							28.50 - 28.95 m SPT 18, 30/140mm N>50						Couldn't push a tube, too stiff, SPT instead, sands in the bottom 50-60mm of the tube
												SM	SILTY SAND, fine to coarse grained, dark grey, wet, very dense, NATURAL
29.0													
29.5													
30.0							30.00 m SPT 9, 9, 14 N=23						BOREHOLE TERMINATED AT 30.00 m
30.5													
31.0													
31.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH7 - CTP23

Job No: 9528 **Sheet:** 1 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 17/7/10 **Date Completed:** 17/7/10 **Logged By:** LB **Date Logged:** 17/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0												SM	SILTY SAND, fine to medium grained, grey/dark grey, dry, loose to medium dense, NATURAL Rootzone 0.1m
1.5							1.50 - 1.95 m SPT 3, 3, 5 N=8					SM	SILTY SAND, fine to medium grained, grey/dark grey, dry to moist, loose, NATURAL
3.0						▶	3.00 - 3.45 m SPT 5, 9, 12 N=21					SM	SILTY SAND, fine to medium grained, grey/dark grey, wet, medium dense, NATURAL

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH7 - CTP23

Job No: 9528 **Sheet:** 2 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 17/7/10 **Date Completed:** 17/7/10 **Logged By:** LB **Date Logged:** 17/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5							4.50 - 4.95 m SPT 14, 19, 20 N=39					SM	SILTY SAND, fine to medium grained, dark brown, wet, dense, NATURAL
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 7, 7, 11 N=18					SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, NATURAL
6.5													
7.0												SM	SILTY SAND, fine to medium grained, brown, wet, medium dense, NATURAL
7.5							7.50 - 7.95 m SPT 4, 9, 12 N=21						

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH7 - CTP23

Job No: 9528 **Sheet:** 3 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 17/7/10 **Date Completed:** 17/7/10 **Logged By:** LB **Date Logged:** 17/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, brown, wet, medium dense, NATURAL
9.0							9.00 - 9.45 m SPT 12, 16, 17 N=33					SM	SILTY SAND, fine to medium grained, dark brown, wet, dense, NATURAL
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 12, 15, 16 N=31						
11.0													
11.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH7 - CTP23

Job No: 9528 **Sheet:** 4 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 17/7/10 **Date Completed:** 17/7/10 **Logged By:** LB **Date Logged:** 17/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							12.00 - 12.45 m SPT 9, 12, 12 N=24					SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, NATURAL
12.5													
13.0													
13.5							13.50 - 13.95 m SPT 11, 11, 12 N=23					SM	SILTY SAND, fine to medium grained, grey, wet, medium dense, NATURAL
14.0													
14.5												CI-CH	SILTY SANDY CLAY/SILTY CLAY, intermediate to high plasticity, fine to medium grained sand, grey, moist to wet, firm, NATURAL
15.0							U 15.00 - 15.45 m PP=50kPa						
15.5												CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, very stiff, NATURAL

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH7 - CTP23

Job No: 9528 **Sheet:** 5 of 6
Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**
Rig Type: **Bit:** **Driller:**
Casing Diameter: **Contractor:** DRILLSURE
Date Started : 17/7/10 **Date Completed:** 17/7/10 **Logged By:** LB **Date Logged:** 17/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, very stiff, NATURAL
16.5							U 16.50 - 16.95 m PP=280kPa					CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey red/brown, trace of XW fragments, moist, very stiff, NATURAL
17.0													
17.5													
18.0							U 18.00 - 18.45 m PP=350kPa					CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, very stiff, NATURAL
18.5													
19.0													
19.5							U 19.50 - 19.95 m PP=250kPa						

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH7 - CTP23

Job No: 9528 **Sheet:** 6 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 17/7/10 **Date Completed:** 17/7/10 **Logged By:** LB **Date Logged:** 17/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
20.5													SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, very stiff, NATURAL
21.0							21.00 - 21.45 m SPT 6, 8, 12 N=20					CH	
21.5													
22.0													CLAYEY SAND/SILTY SAND, fine to medium grained sand, brown, moist, medium dense, NATURAL. Extremely weathered
22.5							22.50 - 22.95 m SPT 30/20mm hammer bouncing					SC-SM	
													TC BIT REFUSAL IN WEATHERED ROCK BOREHOLE TERMINATED AT 22.60 m
23.0													
23.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH8 - CTP22

Job No: 9528 **Sheet:** 1 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
													GRAVELLY CLAY, drilling on laneway with boulders, FILL
0.5												SC-SM	CLAYEY SAND/SILTY SAND, fine to medium grained, dark brown, with organics, organic odour, very loose, moist, NATURAL
1.0													
1.5						▶	1.50 - 1.95 m SPT 2, 1, 0 N=1					SC-SM	CLAYEY SAND/SILTY SAND, fine to medium grained, dark brown, very loose, moist, NATURAL
2.0													
2.5													
3.0							3.00 - 3.45 m SPT WOH					SC-SM	CLAYEY SAND/SILTY SAND, fine to medium grained, dark brown, with less, clay, very loose, moist, NATURAL
3.5													
4.0													SANDY CLAY, high plasticity, dark grey, fine grained sand, soft, wet, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH8 - CTP22

Job No: 9528 **Sheet:** 2 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							4.50 - 4.95 m SPT WOH N=0						SANDY CLAY, high plasticity, dark grey, fine grained sand, soft, wet, NATURAL
5.0													
5.5													
6.0							6.00 - 6.45 m SPT WOH N=0						
6.5													
7.0													
7.5							U 7.50 - 7.95 m PP=30kPa						
8.0													
8.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH8 - CTP22

Job No: 9528 **Sheet:** 3 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							U 9.00 - 9.45 m PP=150kPa						SANDY CLAY, high plasticity, dark grey, fine grained sand, stiff, wet, NATURAL
9.5													SILTY SAND, fine to medium grained sand, grey/brown mottled, with organics, organic odour, wet, loose, NATURAL
10.0													
10.5							10.50 - 10.95 m SPT 2, 2, 4 N=6					SM	
11.0													
11.5												SP	INDURATED SAND
													SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, dark grey, wet, very soft, NATURAL
12.0							12.00 - 12.45 m SPT WOH N=0					CI-CH	
12.5													
13.0													Clay becoming harder
												CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, grey, moist, very stiff, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH8 - CTP22

Job No: 9528 **Sheet:** 4 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							U 13.50 - 13.95 m PP=360kPa						SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, grey, moist, very stiff, NATURAL
14.0												CH	
14.5													
15.0							U 15.00 - 15.45 m PP=440kPa						SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, grey red light brown mottle, moist, hard, NATURAL
15.5												CH	
16.0													
16.5							16.50 - 16.95 m SPT 7, 9, 9, N=18						SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, grey, trace of XW, more sand content, moist, very stiff, NATURAL
17.0												CH	
17.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH8 - CTP22

Job No: 9528 **Sheet:** 5 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
18.5							18.00 - 18.45 m SPT 11, 18, 20 N=38					CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained sand, red grey brown, with XW fragments, moist, hard, NATURAL
19.0													
19.5							19.50 - 19.95 m SPT 13, 19, 21 N=40					CH	SANDY CLAY/SILTY CLAY, high plasticity, fine to medium grained, grey, hard, NATURAL
20.0													
20.5													
21.0							21.00 - 21.45 m SPT 10, 18, 25 N=43					XW	WEATHERED ROCK, light brown and grey green, extremely weathered, extremely low strength
21.5													
22.0													Drilling becoming stronger with depth

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH8 - CTP22

Job No: 9528 **Sheet:** 6 of 6

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 16/7/10 **Date Completed:** 16/7/10 **Logged By:** LB **Date Logged:** 16/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
23.0							22.50 - 22.95 m SPT 30, 30/100mm N>50					XW	WEATHERED ROCK, light brown and grey green, extremely weathered, extremely low strength
23.5													
24.0							24.00 - 24.45 m SPT 30/100mm N>50						BOREHOLE TERMINATED AT 24.00 m
24.5													
25.0													
25.5													
26.0													
26.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 1 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5						▶						SM	SILTY SAND, fine to medium grained, light brown, moist, medium dense, wet, NATURAL
1.0													
1.5							1.50 - 1.95 m SPT 5, 9, 19 N=19					SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, NATURAL
2.0													
2.5													
3.0							3.00 - 3.45 m SPT Fall in - no results					SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, NATURAL
3.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 2 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, NATURAL
4.5							4.50 - 4.95 m SPT 30/100mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, trace of clay, wet, very dense, indurated, NATURAL
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 31, 30/90mm N>50					SM	SILTY SAND, fine to medium grained, dark brown, wet, very dense, indurated, NATURAL
6.5													
7.0													
7.5							7.50 - 7.95 m SPT 10, 9, 13 N=22					SM	SILTY SAND, fine to medium grained, dark brown, wet, medium dense, indurated, NATURAL

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 3 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, dark brown, with clay, wet, medium dense, indurated, NATURAL
9.0							9.00 - 9.45 m SPT 6, 8, 12 N=20						SILTY SAND, fine to medium grained sand, brown, wet, medium dense, NATURAL
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 12, 11, 10 N=25					SM	
11.0													
11.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 4 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
12.5							12.00 - 12.45 m SPT 11, 12, 18 N=30					SM	SILTY SAND, fine to medium grained sand, light brown, wet, medium dense, NATURAL
13.0													
13.5							13.50 - 13.95 m SPT 14, 18, 29 N>50					SM	SILTY SAND, fine to medium grained sand, grey, wet, very dense, NATURAL
14.0													
14.5													
15.0							U 15.00 - 15.45 m PP=150kPa					CL	SANDY CLAY, low plasticity, fine to medium grained sand, grey, trace silts, moist, stiff, NATURAL
15.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 5 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CL	SANDY CLAY, low plasticity, fine to medium grained sand, grey, trace silts, moist, stiff, NATURAL
												CL	SANDY CLAY, low plasticity, fine to medium grained sand, grey, trace silts, moist, stiffer, NATURAL
16.5							U 16.50 - 16.95 m PP=450kPa					CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey, moist, hard, NATURAL
17.0													
17.5												CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey, moist, soft, NATURAL
18.0							18.00 - 18.45 m SPT 4, 6, 7 N=13					CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey, moist, stiff, NATURAL
18.5													
19.0													
19.5							U 19.50 - 19.95 m PP=340kPa					CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey with light brown mottle, moist, very stiff, NATURAL

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 6 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
20.5												CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey with light brown mottle, moist, very stiff, NATURAL
21.0							21.00 - 21.45 m SPT 7, 9, 13 N=22					CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey with light brown red, moist, very stiff, NATURAL
21.5													
22.0													
22.5							U 22.50 - 22.95 m PP=230kPa					CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey with light brown mottle, moist, very stiff, NATURAL
23.0													
23.5												CI-CH	SANDY CLAY/SILTY CLAY, medium to high plasticity, fine to medium grained sand, grey with light brown mottle, with quartz gravels, moist, very stiff, NATURAL
												CI-CL	SANDY CLAY/SILTY CLAY, fine to medium grained sands, low to medium plasticity, grey green, dry to moist, very stiff, NATURAL

See Standard Sheets for details of abbreviations & basis of descriptions

Cardno Bowler
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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 7 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							24.00 - 24.45 m SPT 6, 9, 10 N=19						SANDY CLAY/SILTY CLAY, fine to medium grained sands, low to medium plasticity, grey green, dry to moist, very stiff, NATURAL
24.5												CI-CL	
25.0													Drilling becoming harder
25.5							25.50 - 25.95 m SPT 14, 18, 21 N=39						SANDY CLAY/SILTY CLAY, low plasticity, fine to medium grained sand, grey green/brown, dry to moist, hard, NATURAL
26.0													Drilling becoming harder
26.5												CL	
27.0							27.00 - 27.45 m SPT 14, 27, 25 N>50						SANDY CLAY/SILTY CLAY, medium to low plasticity, fine to medium grained sands, grey green, dry to moist, NATURAL
27.5												CI-CL	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH9 - CTP35

Job No: 9528 **Sheet:** 8 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 15/7/10 **Date Completed:** 15/7/10 **Logged By:** LB **Date Logged:** 15/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CI-CL	SANDY CLAY/SILTY CLAY, medium to low plasticity, fine to medium grained sands, grey green, dry to moist, NATURAL
28.5							28.50 - 28.95 m SPT 18, 23, 23 N=46					XW	WEATHERED ROCK, white with some brown colouration/staining, extremely weathered, extremely low strength
29.0													
29.5													
30.0							30.00 - 30.45 m SPT 30/135mm N>50						BOREHOLE TERMINATED AT 30.00 m
30.5													
31.0													
31.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 1 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5						▶						SM	SILTY SAND, fine to medium grained, light brown, dry to moist, medium dense, NATURAL Water level
1.0													
1.5							1.50 - 1.95 m SPT 5, 10, 12 N=22						
2.0													
2.5												SM	SILTY SAND, fine to medium grained sand, dark brown, wet, dense, indurated, NATURAL
3.0							3.00 - 3.45 m SPT 10, 30/130mm N>50						
3.5												SM	SILTY SAND, fine to medium grained sand, dark brown, wet, very dense, indurated, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 2 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5							4.50 - 4.95 m SPT 19, 31, 30 N>50					SC-SM	CLAYEY SAND/SILTY SAND, fine to coarse grained sand, wet, very dense, indurated, NATURAL
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 9, 9, 10 N=19					SM	SILTY SAND, fine to medium grained sand, dark brown, wet, medium dense, NATURAL
6.5													
7.0													
7.5							7.50 - 7.95 m SPT 7, 9, 9 N=18					SM	SILTY SAND, fine to medium grained, brown, wet, medium dense, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 3 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
8.5												SM	SILTY SAND, fine to medium grained, brown, wet, medium dense, NATURAL
9.0							9.00 - 9.45 m SPT 6, 9, 13 N=22					SM	SILTY SAND, fine to medium grained, light brown, wet, medium dense, NATURAL
9.5													
10.0													
10.5							10.50 - 10.95 m SPT 9, 18, 19 N=37					SM	SILTY SAND, fine to medium grained, light brown, wet, dense, NATURAL
11.0													
11.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 4 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							12.00 - 12.45 m SPT 11, 19, 23 N=42						SILTY SAND, fine to medium grained, light brown, wet, dense, NATURAL
12.5												SM	
13.0													SANDY/SILTY CLAY, intermediate plasticity, fine to medium grained sand, blue grey, wet, very stiff, NATURAL
13.5							U 13.50 - 13.95 m PP=320kPa					CI	
14.0													SANDY/SILTY CLAY, intermediate plasticity, fine to medium grained sand, blue grey, with sandstone gravels/fragments, wet, very stiff, NATURAL
14.5												CI	
15.0							15.00 - 15.45 m SPT 6, 7, 9 N=16						SANDY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, very stiff, NATURAL
15.5												CH	

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 5 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												CH	SANDY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, moist, very stiff, NATURAL
16.5							16.50 - 16.95 m SPT 5, 7, 7 N=14					SC	CLAYEY SAND, high plasticity, fine to medium grained sand, blue grey, with silt, dry to moist, medium dense, NATURAL
17.0													
17.5													
18.0							18.00 - 18.45 m SPT 5, 7, 7 N=14					CH	SANDY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey with brown XW, dry to moist, stiff, NATURAL
18.5													
19.0													
19.5							19.50 - 19.95 m SPT 10, 14, 15 N=29					CH	SANDY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey with brown XW, dry to moist, very stiff, NATURAL

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 6 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
20.5												CH	SANDY/SILTY CLAY, high plasticity, fine to medium grained sand, blue grey with brown XW, dry to moist, hard, NATURAL
21.0							21.00 - 21.45 m SPT 12, 16, 18 N=34						
21.5													
22.0													
22.5							22.50 - 22.95 m SPT 8, 10, 10 N=20					CH	SANDY SILTY CLAY, high plasticity, fine to medium grained sands, blue grey/red yellow with XW rock, dry to moist, very stiff, NATURAL
23.0												CH	SANDY SILTY CLAY, high plasticity, fine to medium grained sand, blue grey, very stiff, NATURAL
23.5													

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 7 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							24.00 - 24.45 m SPT 3, 6, 5 N=11					CH	SANDY SILTY CLAY, high plasticity, fine to medium grained sand, dark brown, stiff, NATURAL
24.5													
25.0												CH	SANDY SILTY CLAY, high plasticity, fine to medium grained sand, dark brown, stiff, NATURAL
25.5							U 25.50 - 25.95 m PP=150kPa						
26.0												GC	SANDY GRAVEL/CLAYEY GRAVEL, fine to coarse grained sands, brown, small to medium gravel, grey with silt, wet, stiff, NATURAL
26.5													SILTY SAND, fine to medium grained, blue grey, trace clay, wet, medium dense, NATURAL
27.0							27.00 - 27.45 m SPT 3, 9, 8 N=17					SM	
27.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH10 - CTP34

Job No: 9528 **Sheet:** 8 of 8

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 13/7/10 **Date Completed:** 13/7/10 **Logged By:** LB **Date Logged:** 13/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained, blue grey, trace clay, wet, medium dense, NATURAL
28.5							28.50 - 28.95 m SPT 6, 4, 6 N=10					GC	SANDY GRAVEL/CLAYEY GRAVEL, low plasticity, fine to coarse grained sand, small to medium gravel, blue grey, with silt, wet, loose to medium dense, NATURAL
29.0													
29.5												SC-SM	CLAYEY SAND/SILTY SAND, low plasticity, fine to medium grained sand, blue green, with small gravel, dry to moist, dense NATURAL
30.0							30.00 - 30.45 m SPT 14, 18, 19 N=37						BOREHOLE TERMINATED AT 30.00 m
30.5													
31.0													
31.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH11 - CTP37

Job No: 9528 **Sheet:** 1 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.5												CH-CI	SILTY CLAY/SANDY CLAY, fine grained sand, dark brown, dry to moist, hard, NATURAL
1.0													
1.5						▶	1.50 - 1.95 m PP-500kPa						
2.0													
2.5												SM	SILTY SAND, fine to medium grained, light brown, with clay and XW gravels/fragments, wet, medium dense, NATURAL
3.0							3.00 - 3.45 m SPT 3, 3, 12 N=15						
3.5												SM	SILTY SAND, fine to medium grained, light brown, trace of clay and small gravels/fragments, wet, medium dense, NATURAL

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH11 - CTP37

Job No: 9528 **Sheet:** 2 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5							4.50 - 4.95 m SPT 6, 7, 7 N=14					SM	SILTY SAND, fine to medium grained sand, light brown, wet, medium dense, NATURAL
5.0													
5.5													
6.0							6.00 - 6.45 m SPT 8, 9, 10 N=19						
6.5												SM	SILTY SAND, fine to medium grained sand, grey, wet, loose to medium dense, NATURAL
7.0													
7.5							7.50 - 7.95 m SPT 4, 6, 4 N=10						

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH11 - CTP37

Job No: 9528 **Sheet:** 3 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
												SM	SILTY SAND, fine to medium grained sand, grey, wet, loose to medium dense, NATURAL
8.5												CL-CI	SILTY CLAY, low to medium plasticity (low), blue grey, trace of sand, moist, soft, NATURAL. Also contains sea shells
9.0							U 9.00 - 9.45 m PP=40kPa						
9.5													
10.0													
10.5							U 10.50 - 10.95 m PP=350kPa					CI-CH	SANDY CLAY, intermediate to high plasticity (high) fine to medium grained sand, blue green, trace silt, moist, very stiff, NATURAL/RESIDUAL
11.0													
11.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH11 - CTP37

Job No: 9528 **Sheet:** 4 of 5

Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: **Bit:** **Driller:**

Casing Diameter: **Contractor:** DRILLSURE

Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
							12.00 - 12.45 m SPT 7, 8, 8 N=16						SANDY CLAY, intermediate to low plasticity, fine to medium grained sand, green, with silt, dry to moist, very stiff, NATURAL/RESIDUAL
12.5												CI-CL	
13.0												CI-CL	SANDY CLAY, intermediate to low plasticity, fine to medium grained sand, green, with silt, with brown XW, dry to moist, very stiff, NATURAL/RESIDUAL
13.5							13.50 - 13.95 m SPT 17, 30/95mm N>50						WEATHERED ROCK, brown, extremely weathered, extremely low to low strength
14.0													
14.5													
15.0							15.00 - 15.45 m SPT 30/65mm Hammer Bouncing N>50						
15.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: DBH11 - CTP37

Job No: 9528 **Sheet:** 5 of 5
Position: REFER TO FIGURE 1 **Angle from Horizontal:** 90° **Surface Elevation:**
Rig Type: **Bit:** **Driller:**
Casing Diameter: **Contractor:** DRILLSURE
Date Started : 14/7/10 **Date Completed:** 14/7/10 **Logged By:** LB **Date Logged:** 14/7/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
													WEATHERED ROCK, brown, extremely weathered, extremely low to low strength
16.5							16.50 - 16.95 m SPT 30/40mm Hammer Bouncing N>50						BOREHOLE TERMINATED AT 16.50 m
17.0													
17.5													
18.0													
18.5													
19.0													
19.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH1

Job No: 9528 **Sheet:** 1 of 1

Position: 56J 0552002 UTM 6869881 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0									1 2 2			SM	SILTY SAND, fine to coarse grained sand, black dark brown, with some root matter, moist to dry, loose, TOPSOIL
0.5						▶	D 0.50 - 0.60 m		3 3 3 4 5 7 7 8			SM	SILTY SAND, fine to coarse grained sand, grey cream, moist, loose to medium dense, NATURAL
1.0									11 13 11			SM	SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
1.5							D 1.40 - 1.50 m		10 11 10 18 +20			XW	COFFEE ROCK
2.0													
2.5							D 2.50 - 2.60 m						
3.0							D 3.00 - 3.10 m						TC BIT REFUSAL BOREHOLE TERMINATED AT 3.10 m
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

Cardno Bowler
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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH2

Job No: 9528 **Sheet:** 1 of 2

Position: 56J 0552228 UTM 6870244 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0									2			SM	SILTY SAND, fine to coarse grained sand, black dark brown, with some root matter, moist to dry, loose, TOPSOIL
									2				
									3			SM	SILTY SAND, fine to coarse grained sand, grey cream, moist, loose to medium dense, NATURAL
									4				
0.5									5				
									5				
									4				
									7				
									18				
									+20				
1.0							D 1.10 - 1.20 m					SM	SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
1.5													
2.0												XW	COFFEE ROCK
2.5													
3.0												SM	SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH2

Job No: 9528 **Sheet:** 2 of 2

Position: 56J 0552228 UTM 6870244 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5													SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
5.0												SM	
5.5							D 5.50 - 5.60 m						Grey, medium plasticity clay with fine to coarse grained and and fine gravel found on end of auger)
6.0													BOREHOLE TERMINATED AT 6.00 m
6.5													
7.0													
7.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH3

Job No: 9528 **Sheet:** 1 of 2

Position: 56J 0552458 UTM 6870784 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0							D 0.00 - 0.10 m		3			CI-CH	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to coarse grained sand, red, with some roots, dry to moist, very stiff, FILL
									4				
									7			CI-CH	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to coarse grained sand, red, with some roots and fine gravel, dry to moist, very stiff, NATURAL
									5				
0.5									4				
									4				
									4				
									4				
							D 0.80 - 0.90 m		4				
1.0									5				
									6				
									5				
									5				
									5				
1.5							D 1.40 - 1.50 m		5				
									5				
									6				
									5				
									7			CI-CH	SILTY CLAY/SANDY CLAY, medium to low plasticity, fine to coarse grained sand, red brown, with some fine to trace of medium gravel, dry to moist, very stiff, NATURAL
2.0									9				
									7				
									7				
									8				
									7				
									7				
2.5									7				
									8				
									9				
									8				
									8				
3.0							D 3.00 - 3.10 m		9				
									8				Trace of fine white gravel
									8				
									8				
									8				
3.5									7				
									8				
									9				
									11			SM	SILTY SAND, fine to coarse grained sand, cream yellow, wet, medium dense to dense, NATURAL
									10				

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD			**Hole No: SBH3**
Project: KING FOREST ESTATE			
Location:	**Job No: 9528**		**Sheet: 2 of 2**
Position: 56J 0552458 UTM 6870784	**Angle from Horizontal: 90°**		**Surface Elevation:**
Rig Type: Q Drill 3000	**Bit:**		**Driller: DL**
Casing Diameter:	**Contractor: CARDNO BOWLER**		
Date Started : 28/6/10	**Date Completed: 28/6/10**	**Logged By: DL**	**Date Logged: 28/6/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5							D 4.00 - 4.10 m		10 9 10 10 10 +20			SM	SILTY SAND, fine to coarse grained sand, cream yellow, wet, medium dense to dense, NATURAL
5.0													
5.5							D 5.40 - 5.50 m						
6.0													BOREHOLE TERMINATED AT 6.00 m
6.5													
7.0													
7.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH4

Job No: 9528 **Sheet:** 1 of 1

Position: 56J 0550894 UTM 6870122 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
									10 20			GM-CL	SANDY CLAY/SILTY GRAVEL, low plasticity clay, fine to coarse grained sand, fine to coarse gravel, brown, trace of some roots, dry to moist, hard, FILL
							D 0.20 - 0.30 m					CI-CH	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to coarse grained sand, brown cream, with trace of fine gravel, dry to moist, very stiff
0.5												CI-CH	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to coarse grained sand, cream white, with trace of fine gravel, dry, hard
							D 0.90 - 1.00 m					XW	SILTSTONE, NATURAL
1.0													TC BIT REFUSAL BOREHOLE TERMINATED AT 1.10 m
1.5													
2.0													
2.5													
3.0													
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD **Project:** KING FOREST ESTATE **Location:**			**Hole No: SBH5**
		Job No: 9528	**Sheet: 1 of 1**
Position: 56J 0550825 UTM 6870122		**Angle from Horizontal: 90°**	**Surface Elevation:**
Rig Type: Q Drill 3000		**Bit:**	**Driller: DL**
Casing Diameter:		**Contractor: CARDNO BOWLER**	
Date Started : 25/6/10	**Date Completed: 25/6/10**	**Logged By: DL**	**Date Logged: 25/6/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
									4 7			CI-CH	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to coarse graines and, red, with some roots, dry to moist, very stiff, FILL
							D 0.20 - 0.30 m		6			CI-CH	SILTY CLAY/SANDY CLAY, medium to high plasticity, fine to coarse graines and, red, with some roots and fine gravel, dry to moist, very stiff, NATURAL
									6 4				
0.5									10 9 8 6			CI-CL	SILTY CLAY/SANDY CLAY, medium to low plasticity, fine to coarse grained sand, red brown, with some fine to trace of medium gravel, dry to moist, very stiff, NATURAL
1.0							D 0.90 - 1.00 m		6 8 8 15 19 +20				
1.5							D 1.50 - 1.60 m					XW	ROCK
2.0													TC BIT REFUSAL BOREHOLE TERMINATED AT 1.70 m
2.5													
3.0													
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH6

Job No: 9528 **Sheet:** 1 of 2

Position: 56J 0552619 UTM 6869485 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
									2			SM	SILTY SAND, fine to coarse grained sand, grey cream, moist, loose to medium dense, FILL
									3				SILTY SAND, fine to coarse grained sand, grey cream, moist, loose to medium dense, NATURAL
							D 0.40 - 0.50 m		3				
0.5									3				
									4			SM	
									4				
									4				
1.0									4				
									4				
									5				
									6				SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
									6				
1.5							D 1.50 - 1.60 m		7				
									7			SM	
									11				
									13				
									14				
2.0									+20				COFFEE ROCK, wet, NATURAL
2.5												XW	
3.0													
													SILTY SAND, fine to coarse grained sand, brown, wet, dense, NATURAL
3.5												SM	

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD **Project:** KING FOREST ESTATE **Location:**			**Hole No: SBH6**
		Job No: 9528	**Sheet: 2 of 2**
Position: 56J 0552619 UTM 6869485		**Angle from Horizontal: 90°**	**Surface Elevation:**
Rig Type: Q Drill 3000		**Bit:**	**Driller: DL**
Casing Diameter:		**Contractor: CARDNO BOWLER**	
Date Started : 28/6/10	**Date Completed: 28/6/10**	**Logged By: DL**	**Date Logged: 28/6/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5													SILTY SAND, fine to coarse grained sand, brown, wet, dense, NATURAL
5.0												SM	
5.5							D 5.70 - 5.80 m						
6.0													BOREHOLE TERMINATED AT 6.00 m
6.5													
7.0													
7.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD **Project:** KING FOREST ESTATE **Location:**			**Hole No: SBH7**
	Job No: 9528		**Sheet: 1 of 2**
Position: 56J 0554193 UTM 6869485	**Angle from Horizontal: 90°**		**Surface Elevation:**
Rig Type: Q Drill 3000	**Bit:**		**Driller: DL**
Casing Diameter:	**Contractor: CARDNO BOWLER**		
Date Started : 28/6/10	**Date Completed: 28/6/10**	**Logged By: DL**	**Date Logged: 28/6/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0									10 7			GC-SM	CLAYEY GRAVEL/SILTY SAND, roadbase, fine to coarse grained sand, fine to coarse gravel, pale brown, dry, dense, FILL
									2 2 2 1 2 1			SM	SILTY SAND, fine to coarse grained sand, grey cream, moist, very loose, NATURAL
0.5						▶			1 1 1 2				Wet
1.0									3 3 5 5 6 7 7 6 7 7 8 8				SILTY SAND, fine to coarse grained sand, grey cream, moist, medium dense, NATURAL
1.5													
2.0													
2.5									12 11 15 +20				Wet
3.0													
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH7

Job No: 9528 **Sheet:** 2 of 2

Position: 56J 0554193 UTM 6869485 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5													SILTY SAND, fine to coarse grained sand, grey cream, moist, medium dense, NATURAL
5.0													
5.5												SM	SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
6.0													BOREHOLE TERMINATED AT 6.00 m
6.5													
7.0													
7.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH8

Job No: 9528 **Sheet:** 1 of 2

Position: 56J 0554770 UTM 6870009 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0						▶			1 2 2 3 2				SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
0.5							D 0.50 - 0.60 m		3 3 4 5 5				
1.0									6 9 9 12 11				
1.5									12 12 13 14 14			SM	
2.0									17 +20				
2.5													
3.0													
3.5												XW	COFFEE ROCK

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD **Project:** KING FOREST ESTATE **Location:**			**Hole No: SBH8**
		Job No: 9528	**Sheet: 2 of 2**
Position: 56J 0554770 UTM 6870009		**Angle from Horizontal: 90°**	**Surface Elevation:**
Rig Type: Q Drill 3000		**Bit:**	**Driller: DL**
Casing Diameter:		**Contractor: CARDNO BOWLER**	
Date Started : 28/6/10	**Date Completed: 28/6/10**	**Logged By: DL**	**Date Logged: 28/6/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5													COFFEE ROCK
5.0												XW	
5.5													
6.0													BOREHOLE TERMINATED AT 6.00 m
6.5													
7.0													
7.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD
Project: KING FOREST ESTATE
Location:

Hole No: SBH9

Job No: 9528 **Sheet:** 1 of 2

Position: 56J 0554732 UTM 6870382 **Angle from Horizontal:** 90° **Surface Elevation:**

Rig Type: Q Drill 3000 **Bit:** **Driller:** DL

Casing Diameter: **Contractor:** CARDNO BOWLER

Date Started : 28/6/10 **Date Completed:** 28/6/10 **Logged By:** DL **Date Logged:** 28/6/10

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
0.0						▶	D 0.00 - 0.10 m		1				SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
									2				
									3				
									3				
0.5									4				
									5				
									7				
									7				
									8				
1.0									8				
									7				
									6				
									6				
									6				
1.5									5				
									3				
									4				
									5				
									6				
2.0									6			SM	
									6				
									6				
									6				
2.5									5				
									6				
									7				
									8				
									10				
									16				
3.0									+20				
3.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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BOREHOLE LOG SHEET

Client: LEDA MANORSTEAD **Project:** KING FOREST ESTATE **Location:**			**Hole No: SBH9**
		Job No: 9528	**Sheet: 2 of 2**
Position: 56J 0554732 UTM 6870382		**Angle from Horizontal: 90°**	**Surface Elevation:**
Rig Type: Q Drill 3000		**Bit:**	**Driller: DL**
Casing Diameter:		**Contractor: CARDNO BOWLER**	
Date Started : 28/6/10	**Date Completed: 28/6/10**	**Logged By: DL**	**Date Logged: 28/6/10**

Depth (m)	Drilling: Auger 'V' Bit	Drilling: Auger 'TC' Bit	Drilling: Washbore	Drilling: Casing	Drilling: Coring	Groundwater (m)	Sample or Field Test	Recovered	DCP	RL (m AHD)	Graphic Log	USCS Symbol	Description (SYMBOL, SOIL NAME, plasticity/particle characteristics, colour, minor components, moisture, consistency, structure, ORIGIN)
4.5												SM	SILTY SAND, fine to coarse grained sand, dark brown black, wet, loose to medium dense, NATURAL
5.0													
5.5												XW	COFFEE ROCK
6.0													BOREHOLE TERMINATED AT 6.00 m
6.5													
7.0													
7.5													

See Standard Sheets for details of abbreviations & basis of descriptions

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Annex B

Laboratory Test Results

September, 2001

LABORATORY TESTING

GENERAL

Samples extracted during the fieldwork stage of a site investigation may be "disturbed" or "undisturbed" (as generally indicated on the test hole logs) depending upon the nature and purpose of the sample as well as the method of extraction. Nominally "undisturbed" samples may suffer a varying degree of disturbance during extraction, transportation, extrusion and testing. This aspect should be taken into account when assessing test results which must of necessity reflect the effects of such disturbance.

All soil properties (as measured by laboratory testing) exhibit inherent variability and thus a certain statistical number of tests is required in order to predict an average property with any degree of confidence. The site variability of soil strata, future changes in moisture and other conditions, and the discrete sampling positions must also be considered when assessing the representative nature of the laboratory programme.

Certain laboratory test results provide interpreted soil properties as derived by conventional mathematical procedures. The applicability of such properties to engineering design must be assessed with due regard to the site, sample condition, procedure and project in hand.

TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 as amended, or Queensland Transport Standards when specified. The routine Australian Standard tests are as follows:

Sample Preparation	Test 1
Moisture Content	Test 2.1.1
Liquid Limit	Test 3.1.1)
Plastic Limit	Test 3.2.1) collectively known as Atterberg Limits
Plasticity Index	Test 3.3.1)
Linear Shrinkage	Test 3.4.1
Particle Density	Test 3.5.1
Particle Size Distribution	Tests 3.6.1, 3.6.2, 3.6.3
Emerson Class Number	Test 3.8.1)
Percent Dispersion	Test 3.8.2) collectively, Dispersion Classification
Pinhole Dispersion Classification	Test 3.8.3)
Organic Matter	Test 4.1.1
Sulphate content	Test 4.2.1
pH Value	Test 4.3.1
Resistivity	Test 4.4.1
Standard Compaction	Test 5.1.1
Modified Compaction	Test 5.2.1
Dry Density Ratio	Test 5.4.1
Minimum/Maximum Density	Test 5.5.1
Density Index	Test 5.6.1
California Bearing Ratio	Tests 6.1.1, 6.1.2
Undrained Triaxial Shear	Test 6.4.1
One Dimensional Consolidation	Test 6.6.1
Constant Head Permeability	Test F7.1
Shrink Swell Index	Test 7.1.1

Where tests are used which are not covered by appropriate standard procedures, details are given in the report.

LABORATORY

Our laboratory is a Registered Laboratory with the National Association of Testing Authorities (NATA).

Cardno Bowler
Shaping the Future
Geotechnical Engineering Consultants
Construction Testing Services
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QUALITY ASSURED SUPPLIER
QUEENSLAND GOVERNMENT

SOIL CLASSIFICATION TEST REPORT

SAMPLING PROCEDURES: A.S.1289.1.2.1-6.5.3 TEST PROCEDURES: AS1289.2.1.1, .3.1.2, .3.2.1, .3.3.1, .3.4.1

CLIENT:	**LEDA MANORSTEAD**	*JOB No.: GC*	**2494 / 9528**
PROJECT:	**KINGS FOREST SUBDIVISION, KINGSCLIFF**	*REPORT No:*	**1**
		DATE ISSUED:	**25/08/10**
TEST ITEM:	**DISTURBED SAMPLE**		

SITE TEST No.:	**Q 1**	*LOCATION:*	**BOREHOLE No. SBH3**
SAMPLE No.:	**86544**		
DATE SAMPLED:	**17/08/10**	*SOIL DESCRIPTION:*	**MH SILTY CLAY with traces of sand, red brown**
MATERIAL SOURCE:	**INSITU**		
PROPOSED MATERIAL TYPE:	**-**	*ELEVATION m:*	**0.8 - 0.9**

ATTERBERG LIMITS & LINEAR SHRINKAGE

SAMPLE HISTORY: Air Dried

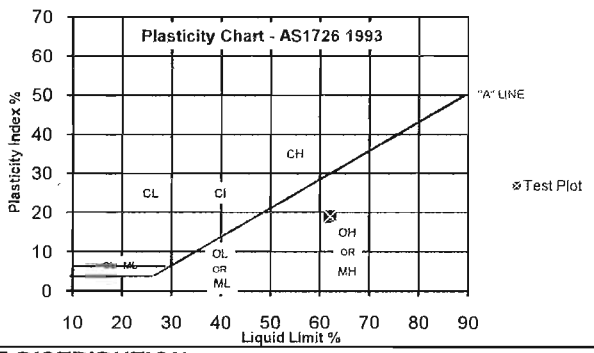
METHOD OF PREPARATION: Dry Sieved

RESULTS

LIQUID LIMIT	**62**	%
PLASTIC LIMIT:	**43**	%
PLASTICITY INDEX	**19**	%
LINEAR SHRINKAGE:	**14.5**	%
FIELD MOISTURE CONTENT:	**38.8**	%

PLASTICITY

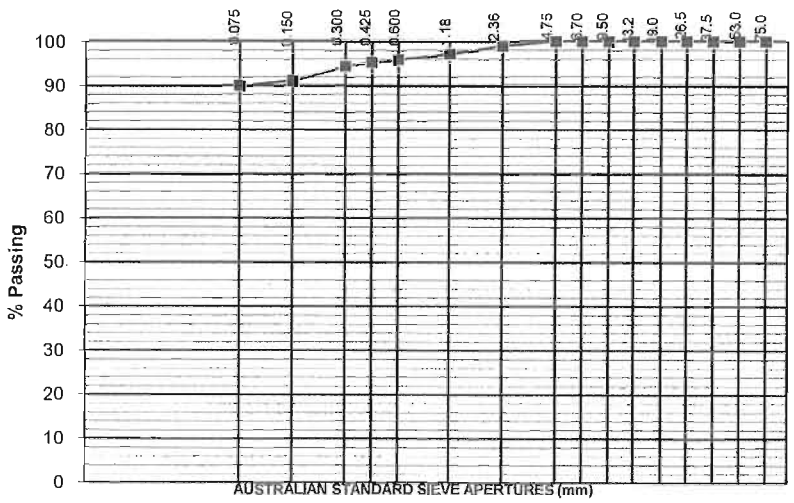
Descriptive Term	Range of L.L.
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50



PARTICLE SIZE DISTRIBUTION

TEST PROCEDURES AS1289 3 6.1 - WET SIEVED

SIEVE SIZE (mm)	% PASSING (by mass)
75.0	**100**
53.0	**100**
37.5	**100**
26.5	**100**
19.0	**100**
13.2	**100**
9.5	**100**
6.7	**100**
4.75	**100**
2.36	**99**
1.18	**97**
0.600	**96**
0.425	**95**
0.300	**94**
0.150	**91**
0.075	**90**



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Mr S. Thomas
(Approved Signatory)

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SOIL CLASSIFICATION TEST REPORT

SAMPLING PROCEDURES: A.S.1289.1.2.1-6.5.3 TEST PROCEDURES: AS1289.2.1.1, .3.1.2, .3.2.1, .3.3.1, .3.4.1

CLIENT:	**LEDA MANORSTEAD**	*JOB No.: GC*	**2494 / 9528**
PROJECT:	**KINGS FOREST SUBDIVISION, KINGSCLIFF**	*REPORT No:*	**2**
		DATE ISSUED:	**25/08/10**
TEST ITEM:	**DISTURBED SAMPLE**		
SITE TEST No.:	**Q 2**	*LOCATION:*	**BOREHOLE No. SBH3**
SAMPLE No.:	**86545**		
DATE SAMPLED:	**17/08/10**	*SOIL DESCRIPTION:*	**MH SILTY CLAY with traces of sand, red brown**
MATERIAL SOURCE:	**INSITU**		
PROPOSED MATERIAL TYPE:	**-**	*ELEVATION m:*	**3.0 - 3.1**

ATTERBERG LIMITS & LINEAR SHRINKAGE

SAMPLE HISTORY: Air Dried

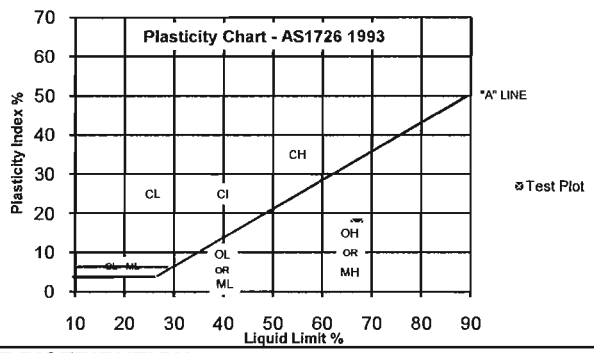
METHOD OF PREPARATION: Dry Sieved

RESULTS

LIQUID LIMIT	**67**	%
PLASTIC LIMIT:	**50**	%
PLASTICITY INDEX	**17**	%
LINEAR SHRINKAGE:	**13.5**	%
FIELD MOISTURE CONTENT:	**39.8**	%

PLASTICITY

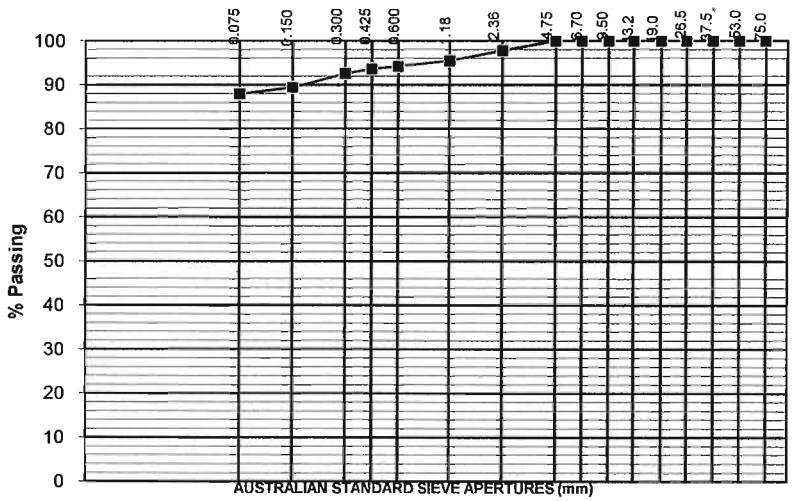
Descriptive Term	Range of L.L.
Of low plasticity	≤ 35
Of medium plasticity	> 35 ≤ 50
Of high plasticity	> 50



PARTICLE SIZE DISTRIBUTION

TEST PROCEDURES: AS1289.3.6.1 - WET SIEVED

SIEVE SIZE (mm)	% PASSING (by mass)
75.0	**100**
53.0	**100**
37.5	**100**
26.5	**100**
19.0	**100**
13.2	**100**
9.5	**100**
6.7	**100**
4.75	**100**
2.36	**98**
1.18	**95**
0.600	**94**
0.425	**94**
0.300	**93**
0.150	**89**
0.075	**88**



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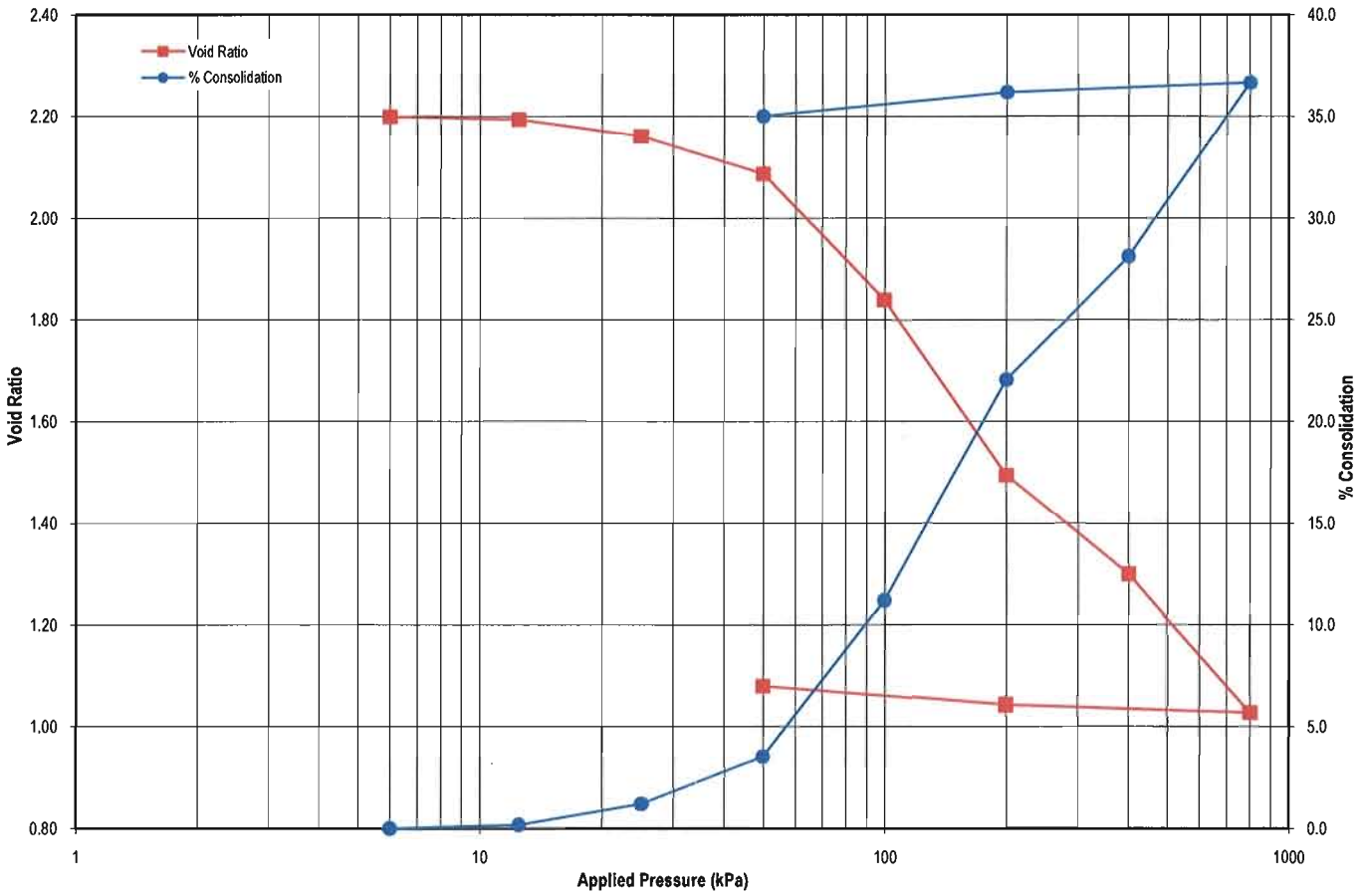
OEDOMETER TEST REPORT

Test Method: AS1289.6.6.1, 3.5.1

Client:	Cardno Bowler Pty Ltd	**Report No.:**	10080357 - OED
Project:	9528	**Test Date:**	16/08/2010
		Report Date:	7/09/2010
Client Id.:	BH8	**Depth (m):**	7.50-7.95

Description: Clay - dark grey



Wet Density (t/m^3):	1.40	Initial Moisture (%):	80.4	Test Condition: Inundated on load	
Particle Density (t/m^3):	2.49	Initial Voids Ratio:	2.199	Initial Degree of Saturation (%):	91.0
Undisturbed sample supplied by the client		Remarks: Tested as Received			Page 1 of 2

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Authorised Signatory
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OEDOMETER TEST REPORT

Test Method: AS1289.6.6.1, 3.5.1

Client:	Cardno Bowler Pty Ltd	**Report No.:**	10080357 - OED
Project:	9528	**Test Date:**	16/08/2010
		Report Date:	7/09/2010
Client Id.:	BH8	**Depth (m):**	7.50-7.95
Description:	Clay - dark grey		

TEST RESULTS

Stage	Load (kPa)	Cc	Cv (m^2/yr) t_{50}	Cv (m^2/yr) t_{90}	Mv ($kPa^{-1}x10^{-3}$)	C_a x 10^{-3}	% Consolidation
1	6-12.5	0.017	316.24	1093.75	0.254	0.16	0.2
2	12.5-25	0.110	7.14	42.78	0.830	0.34	1.2
3	25-50	0.246	7.76	16.93	0.938	3.97	3.5
4	50-100	0.819	0.52	3.70	1.598	7.46	11.2
5	100-200	1.148	0.58	1.45	1.218	9.69	22.0
6	200-400	0.643	1.91	2.44	0.388	9.88	28.1
7	400-800	0.909	0.64	1.20	0.297	13.29	36.6
8	800-200	0.025	5.46	5.78	0.012	1.16	36.2
9	200-50	0.062	0.59	1.64	0.123	2.91	35.0

Remarks: Tested as Received

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VISUAL Description TEST REPORT

AS1726 Appendix A

Client:	Cardno Bowler Pty Ltd	Report No.	10080357-PP
Project:	9528	Test Date:	14/8/10
		Report Date:	7/9/10

Sample No.	10080357	Client ID: BH8	Depth (m): 7.5-7.95
Classification: Clay – dark grey with sand			
Hand Vane (kPa): 15		Pocket Penetrometer (kPa) : 10-15	

Sample/s supplied by the client

Annex C

Quantitative Hazard Rating Assessment

Appendix B1

LANDSLIDE FREQUENCY ANALYSIS

Analysis No.: ☐

NATURAL SHALLOW LANDSLIDES

KINGS FOREST (WORST CASE SCENARIO)

LOCATION: **Site No.** **Site name:**

1 Basic Frequency ☐

2 Slope Angle

Site		Level	Factor
	Less than 5 degrees	L	0.1
	Between 5 and 15 degrees	M	0.5
	Between 15 and 30 degrees	M	0.8
*	Between 30 and 45 degrees	H	1.2
	More than 45 degrees	M	0.8

3 Slope Shape

Site		Level	Factor
	Crest or ridge	L	0.7
*	Planar	M	0.9
	Convex	M	0.9
	Concave	H	1.5

4 Site geology

Site		Level	Factor
	Volcanic rock	H	1.1
	Sedimentary rock	M	1
*	Low grade metamorphic rock	M	1
	High grade metamorphic rock	L	0.9
	Granitic rock	M	1

5 Material strength

Site		Level	Factor
	Rock at surface	VL	0.1
	Residual soil < 1 m deep	L	0.5
*	Residual soil 1-3 m deep	M	0.9
	Residual soil >3 m deep	H	1.5
	Colluvial soil < 1 m deep	H	1.5
	Colluvial soil 1-3 m deep	VH	2
	Colluvial soil > 3 m deep	VH	4
	Fill (slope regrading)	VH	5

6 Concentration of surface water

Site		Level	Factor
	Ridge	L	0.7
	Crest	M	0.8
	Upper slope	M	0.9
	Mid slope	H	1.2
*	Lower slope	H	1.5

7 Evidence of groundwater

Site		Level	Factor
*	None apparent	L	0.7
	Minor moistness	M	0.9
	Generally wet	H	1.5
	Surface springs	VH	3

8 Evidence of instability

Site		Level	Factor
*	No sign of instability	L	0.5
	Trees bent	H	1.5
	Minor irregularity	VH	2
	Major irregularity	VH	5
	Scarps	VH	10

Summary

		Factor
2	Slope Angle	1.2
3	Slope Shape	0.9
4	Site geology	1
5	Material strength	0.9
6	Concentration of surface water	1.5
7	Evidence of groundwater	0.7
8	Evidence of instability	0.5
9	**Relative Frequency (2x3x4x5x6x7x8)**	0.51

Site Frequency (1 x 9) ☐