

**Port of Gladstone
Gatcombe and Golding Cutting
Channel Duplication Project**

Environmental Impact Statement



Gladstone Ports Corporation
Growth. Prosperity. Community.

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**Appendix E2
Port of Gladstone
DMPA and Western
Basin – Final
Geotechnical Report**



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**Port of Gladstone
DMPA and Western Basin
Preliminary Geotechnical Report
Gladstone Ports Corporation**

28 September 2015

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Port of Gladstone DMPA and Western Basin

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Executive summary

Objectives

The purpose of this report is to detail the geotechnical conditions and present the subsurface materials including soil and rock encountered within the proposed Dredge Material Placement Areas (DMPA) of Port Central Expansion, Western Banks Island and Western Basin.

The objectives of the geotechnical investigation were to provide geotechnical information at each of the DMPA for future design of earth structures of comprising impounded dredge material.

Methodology

A site investigation was carried out in the proposed reclamation bund alignments by Aurecon in accordance with the Geotechnical and Geochemical Investigations for the Port of Gladstone. The geotechnical fieldwork was undertaken between 13 February and 19 May 2015 and comprised:

- A total of two (2) boreholes and two (2) CPT's were completed as part of the Port Central Expansion (PCE) DMPA area.
- A total of three (3) boreholes and eight (8) CPT's were completed as part of the Western Banks Island (WBI) area.
- A total of one (1) borehole and two (2) CPT's were completed as part of the Western Basin Expansion (WBS) area.

Aurecon engaged geotechnical drilling contractor J&S Drilling to supply all plant and personnel to perform the physical works. Borehole drilling was undertaken over water from a jack-up barge Ocean Driller II. CPT testing was undertaken by Probedrill from the same barge. The barge was manoeuvred to pre-determined borehole and CPT locations by means of RTK and DGPS instruments using a tug.

Aurecon geotechnical and geological engineers supervised the geotechnical drilling full time, logging all soils and rock recovered from the beneath the seabed and overseeing in situ testing in accordance with Australian Standards.

During drilling in situ Standard Penetration Tests (SPT's) were performed to characterise the submarine soils. In addition, hand shear vane and pocket penetrometer tests were performed on cohesive soil samples retrieved during the drilling process.

After logging and photographing the soil and rock core, selected samples were selected and scheduled for laboratory testing at a NATA accredited laboratory. Testing included moisture content tests, Atterberg limits and particle size distribution tests etc as well as point load and UCS testing on rock samples.



Results

As expected from review of the available literature and previous reports, unconsolidated soils and sediments were encountered within each of the three sites investigated.

For the Port Central Expansion Area, predominantly cohesive material was found to overlie a layer of sand, which in turn overlies bedrock from the Wandilla Formation at a depth of approximately 9m below sea floor level (-10.9 m LAT).

The geotechnical model for the Western Banks Island was found to comprise mainly sand material with variably impersistent lenses of stiff clay material, overlying rounded to sub rounded gravel and cobbles near the coast. Toward the south west of this material bedrock of the Wandilla Formation was encountered at approximately 9 m below sea bed.

A simple model comprising soft cohesive (clay/silt) material to approximately 5.5 m and then firm becoming very stiff cohesive material over principally sand to greater than 10 m depth was encountered within the Western Basin.

Conclusions

The geotechnical investigation has confirmed that unconsolidated soils are present within all three DMPA. These soils are a mixture of soft becoming very stiff clay materials, and medium dense becoming very dense granular material. Rock was encountered at depth at all sites, except in the Western Basin.

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1 Introduction

1.1 Background

Gladstone Ports Corporation (GPC) is responsible for the control and management of port infrastructure and cargo handling operations for coal and other products at the Port of Gladstone, Port of Rockhampton and Port of Bundaberg. GPC provides and maintains vital shipping channels within the Port. The Port of Gladstone is located along the Capricorn Coast of Central Queensland, approximately 525 km north of Brisbane.

The Port of Gladstone is Queensland's largest multi-commodity port, with RG Tanna Coal Terminal in the 2013/14 reporting period being the world's fourth largest coal export terminal (by throughput). Cumulatively, the Port handles the export of mineral resources from Central Queensland and products (such as sugar, grain and tallow) from local industries, and the import of raw materials from national and international sources (GPC 2014).

The Port of Gladstone is also one of the busiest ports in Australia, vital to the local, state and national economies. Major exports from the Port include coal, alumina, cement, petroleum, aluminium and agricultural resources.

GPC has identified a future need to improve the Port of Gladstone's operational safety efficiencies and to mitigate a future potential shipping incident risk as the port throughput increases.

Eventual duplication of the existing shipping channels will facilitate improved flexibility for vessel passing within the Port, which will address the above mentioned need. This report addresses the requirement to understand ground conditions underlying proposed bund alignments for Dredge Material Placement Area options.

1.2 Purpose of this report

Aurecon Australasia Pty Ltd (Aurecon) undertook a programme of offshore Geotechnical and Geochemical Investigations within Gladstone Harbour.

The geotechnical investigations carried out includes drilling within the pre-determined Dredge Material Placement Areas (DMPA), namely:

- West Bank Island Reclamation
- Port Central Expansion Reclamation
- Western Basin



1.3 Objectives

The primary objectives of the Geotechnical Investigations are to provide geotechnical information below the sea floor and underlying soils where a reclamation bund wall may potentially be constructed around each of the proposed DMPA.

1.4 Layout of this report

This report is a factual account of the geotechnical investigation implemented by Aurecon. The report includes:

- A detailed account of the scope of work
- A description of the site details, including expected geological conditions
- A review of productivity of the investigation
- The investigation methodology
- Schedule of laboratory testing
- Discussion of the findings from each of the three locations investigated
- A list of conclusions
- List of references
- Limitations to the report

Appended to this report are:

- Appendix A Borehole location plans
- Appendix B Explanatory notes
- Appendix C Borehole logs and core photos
- Appendix D Geotechnical laboratory testing
- Appendix E Geological sections
- Appendix F Cone penetration tests

2 Scope of work

2.1 Background

Aurecon engaged J&S Drilling supported by Fodico marine to undertake the geotechnical borehole drilling using the Ocean Driller II jack-up barge (JUB).

The fieldwork was carried out between 13 February 2015 and 19 May 2015.

2.2 Borehole drilling and CPT testing

The original scope for the geotechnical investigation works in the DMPAs was to comprise the drilling of two boreholes and two Cone Penetration Tests (CPTs) at Port Central Expansion reclamation and five boreholes and eight CPTs at West Banks Island reclamation. Further to the above, a single borehole and two CPT tests were scheduled in the Western Banks area.

The boreholes were to extend 2 m into bedrock, with nominal depths ranging from 5 to 20 m depth below existing seabed surface. CPTs were to be undertaken to refusal with dissipation tests (one per CPT) and vane shear tests in soft clay materials where present.

Details of the design locations of these boreholes and CPT are provided in Table 1.

Table 1 Coordinates of geotechnical borehole design locations and estimated drill depths (GPC, 2014)

Name	Easting (GDA 1994)	Northing (GDA 1994)	Estimated seabed level (m LAT)
PCE1	325344.03	7361229.8	-3.5
PCE2	325712.88	7361394.7	-3.5
PCE3	326245.12	7361293	-5.5
PCE4	326595.26	7361147.8	-6.5
WBI1	330698.52	7359304.6	-5.5
WBI2	331384.52	7358475.9	-5.5
WBI3	331900.83	7357852.1	-8.5
WBI4	332404.98	7357243.1	-9.5
WBI5	332982.09	7356545.9	-6.5
WBI6	333556.67	7355851.8	-5.5
WBI7	334111.44	7355181.6	-4.5
WBI8	333648.94	7354566.3	-2.5
WBI9	332916.49	7355167.7	-3.5
WBI10	332184.05	7355769.2	-5.0

Name	Easting (GDA 1994)	Northing (GDA 1994)	Estimated seabed level (m LAT)
WBI11	331773.64	7356397.2	-4.0
WBI12	331187.07	7357369.7	-3.5
WBI13	330588.31	7358540.9	-3.0

The investigation methodology is provided in Section 4 of this report.

2.3 Geotechnical testing

Geotechnical laboratory testing was undertaken on selected samples retrieved from drilling primarily to provide data for sediment characterisation, excavatability and wear and tear. The laboratory testing provided information on the following:

- Composition of the material (i.e. percentage of clay, silt, sand and gravel)
- Behavioural characteristics of the material potentially underlying the reclamation bunds defined by density, water content and Atterberg limits
- Material strength, in particular classification of soils with undrained shear strengths
- Strength testing of the underlying rock

More detail on the geotechnical laboratory testing undertaken is provided in Section 5 of this report.

3 Site details

3.1 Location of works

The Port of Gladstone is situated approximately 525 km north of Brisbane. In the event of future dredging within the harbour, three (3) potential Dredge Material Placement Areas (DMPA) were identified for investigation by GPC:

- Port Central Expansion
- Western Banks Island
- Western Banks
- The Western Basin is located on the coast to the north of Gladstone and was identified as a site for investigation by GPC (Figure 1)

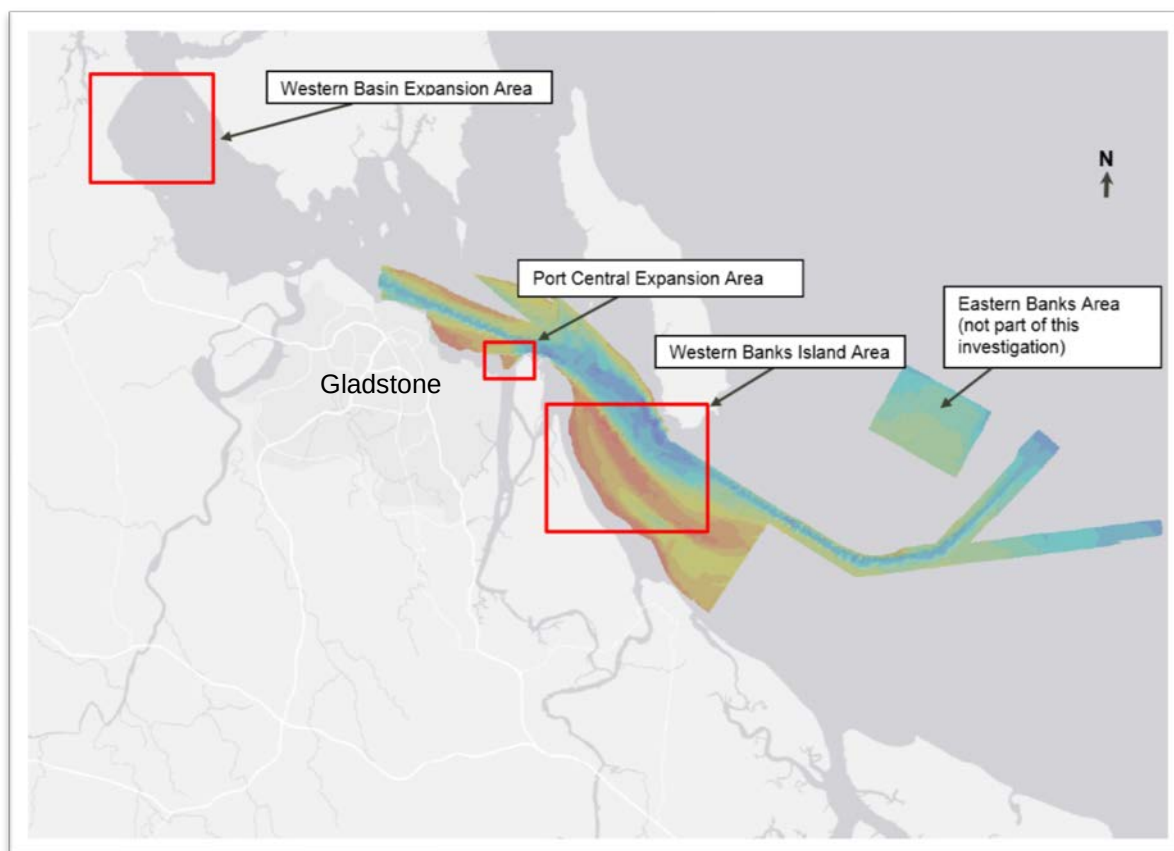


Figure 1 Location of DMPA areas

3.2 Gatcombe Head tidal planes

Tidal planes for Gatcombe Head are given in Table 2. The close proximity of the geotechnical investigation area to Gatcombe Head, which is located on the southern tip of Facing Island, this tidal plane data is considered most appropriate for this project due to its close proximity to the site.

Table 2 2014 Semidiurnal Tidal Planes Gatcombe Head (GPC, 2014)

Tidal Plane	Tidal level (m LAT)
Highest Astronomical Tide (HAT)	4.29
Mean High Water Springs (MHWS)	3.45
Mean High Water Neaps (MHWN)	2.71
Australian Height Datum (AHD)	2.21
Mean Low Water Neaps (MLWN)	1.37
Mean Low Water Springs (MLWS)	0.56
Lowest Astronomical Tide (LAT)	0.00

3.3 Expected geological conditions

3.3.1 Published geology

The offshore geology of the Port of Gladstone is not presented on published geological maps (Figure 2 and Figure 3).

The 1:100,000 scale geological map for Gladstone (Queensland Government Department of Natural Resources and Mines, Sheet 9150 and part 9151, March 2006) indicates that bedrock for the onshore areas adjacent to the region under investigation generally comprises Late Devonian-Early Carboniferous rocks of the Curtis Island Group; specifically the Wandilla Formation and the Shoalwater Formation.

The rocks of the Curtis Island Group were locally subjected to amphibolite grade metamorphism and are structurally complex moderately to steep dipping beds, tight folds and slaty and crenulation cleavage (State of Queensland (SoQ), 2013).

According to Geoscience Australia (2015), the Wandilla Formation comprises mudstone, lithic sandstone, siltstone, jasper, chert, slate and local schist. SoQ (2013) describe the Wandilla Formation as being dominated by rhythmically interbedded mudstone and graded sandstone derived from intermediate to felsic volcanics. Large chert lenses within this Formation form prominent ridges, particularly on Curtis Island. Sandstone beds within the Formation show soft-sediment deformation and in the middle of the unit is an interval with calcareous or silicified ooids (rounded particles).

The Shoalwater Formation is the easternmost Formation of the Curtis Island Group and is likely to represent “bedrock” for the majority of the dredge channels. The Formation comprises quartzose sandstone beds up to 3 m thick alternating with thinner mudstone beds and rare bands of chert and felsic tuff forming strike ridges. Geoscience Australia (2015) describes this Formation as quartzose sandstone, mudstone, local quartz-muscovite-biotite schist and strongly foliated metasediments.

From geological interpretation of the material, overlying bedrock will comprise a combination of unconsolidated Quaternary (Holocene and Pleistocene) aged marine and fluvial sediments.



The tectonic history of the Gladstone area is complex and involves three major north-northwest-trending structural belts; the Coastal Block, the Rockhampton Block and the Eungella-Cracow Mobile Belt (Bureau of Mineral Resources, Geology and Geophysics, 1975).

The Coastal Block comprises Palaeozoic sedimentary rock (Curtis Island Group) that have probably undergone repeated tectonism and were finally deformed and metamorphosed in the Early Permian before being uplifted in the Late Permian. Bedding trends from north to northwest and dips steeply to the east.

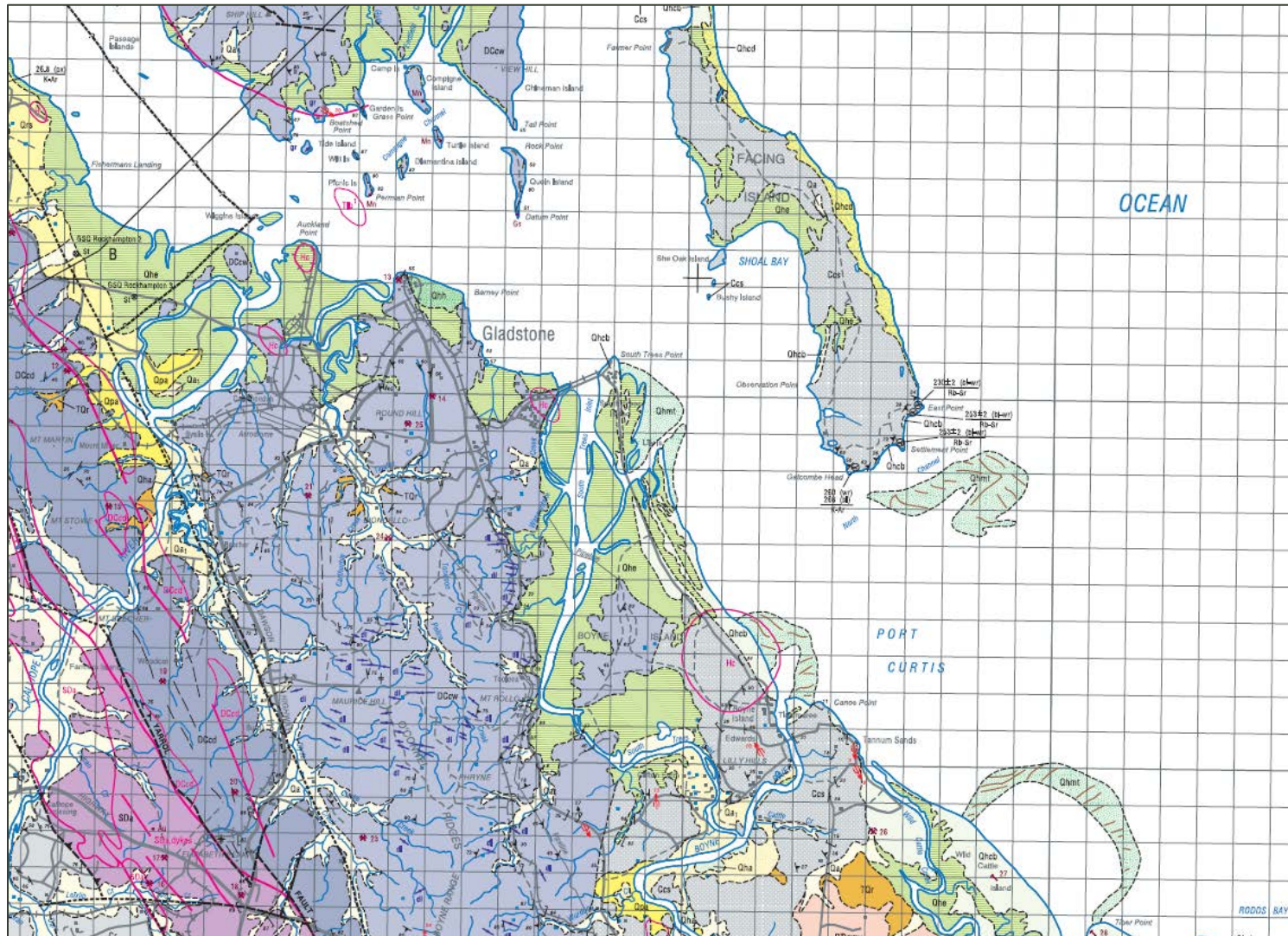


Figure 2 Excerpt from the 1:100,000 scale geological map Gladstone Special (sheet 9150 and part 9151)
(Queensland Government Department of Natural Resources and Mines, 2006)

QUATERNARY	
Qha	Clay, silt, sand, gravel; active stream channel and low terraces
Qhh	Gravel, sand and mud; man-made deposits associated with landfill
Qhcb	Sand, some gravel; beach ridges, cheniers
Qhcd	Quartz sand; blow-out frontal dune
Qhmt	Sand, gravel, mud; tidal delta
Qhe	Mud, sandy mud, muddy sand and minor gravel; estuarine channels and banks, supratidal flats and coastal grasslands
Qa ₁	Clay, silt, sand, gravel; intermediate terraces of Boyne River flood plain alluvium
Qa	Clay, silt, sand, gravel; flood plain alluvium
Qrs	Sand, silt, mud, gravel; residual soil
Qpa	Sand, mud and gravel; alluvium on higher terraces, commonly with melon holes
TERTIARY - QUATERNARY	
TQa	Sand, mud and gravel; high-level alluvium and colluvium
TQr	Clay, silt, sand, gravel and soil; colluvial and residual deposits
TQr ₁	Red soil derived from mafic rocks

EARLY CARBONIFEROUS - EARLY PERMIAN	
Undivided Rockhampton Group, Berserker Group	Cr.Pk Mudstone, siltstone, felsic volcanoclastic sandstone, ooid-bearing sandstone and conglomerate with mudstone rip-up clasts, minor limestone and rhyolitic ignimbrite; siltstone, sandstone, intrusive and extrusive domes, volcanic breccia
EARLY CARBONIFEROUS	
Rockhampton Group	Cr Dark grey mudstone and siltstone; felsic volcanoclastic sandstone; ooid-bearing sandstone; ooid-bearing conglomerate with dark grey mudstone rip-up clasts; rounded polymictic conglomerate, oolitic limestone
Shoalwater Formation	Ccs Quartzose sandstone, mudstone; local quartz-muscovite-biotite schist
LATE DEVONIAN - EARLY CARBONIFEROUS	
Wandilla Formation	DCcw Mudstone, lithic sandstone, siltstone, jasper, chert, slate and schist
Doonside Formation	DCcd Chert, jasper, mudstone, siltstone, lithic sandstone, tuff, limestone and altered basalt; low to moderate magnetic domain
Balnagowan Volcanic Member	DCcd ₁ Basaltic to andesitic lava and volcanoclastic rocks, felsic volcanoclastic rocks, chert, mudstone, limestone
Mount Alma Formation	DCa Thinly interbedded fine-grained sandstone and siltstone and thick beds of conglomerate with andesitic to dacitic volcanic clasts and siltstone rip-up clasts; moderate magnetic domain

Figure 3 Selected Geological Legend from 1:100,000 scale geological map Gladstone (Queensland Government Department of Natural Resources and Mines Special, 2006 (sheet 9150 and part 9151)

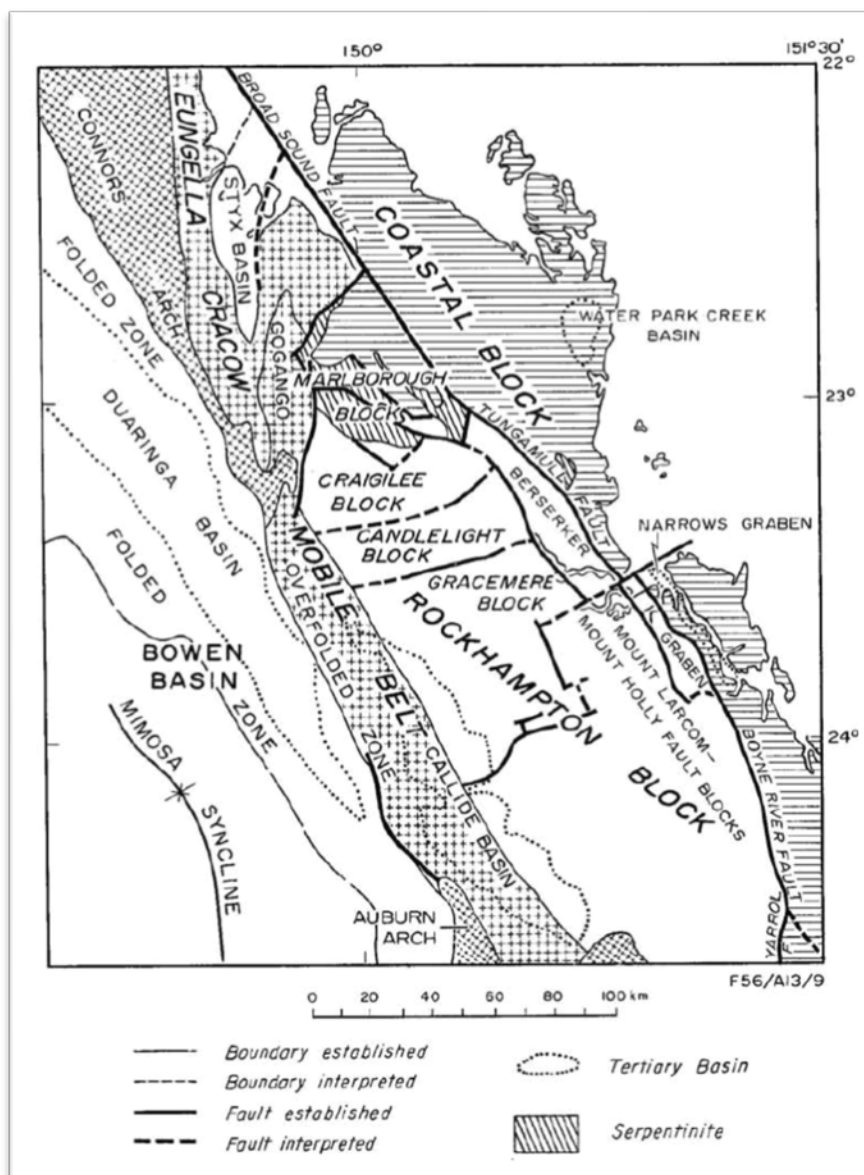


Figure 4 Structural elements of the Rockhampton/Gladstone area (Bureau of Mineral Resources, Geology and Geophysics, 1975)

3.3.2 Previous reports

A number of ground investigations have been undertaken previously in the vicinity of the proposed DMPA. This report uses the following previous investigations as background information:

- Blain Bremner & Williams, 1980, A Study of the Sub-Surface Materials for Dredging in the Approach Channels to the Port of Gladstone
- Macdonald Wagner, 1987, Offshore Drilling – Clinton Wharf Extensions Gladstone Harbour
- Connell Hatch, 2005, Wiggins Island Coal Terminal: Initial Advice Statement
- Coffey Geotechnics, 2007, Marine Seismic Survey Channel Dredging Study Port of Gladstone
- Connell Wagner, 2008, Gladstone Liquefied Natural Gas Plant Curtis Island –Offshore Geotechnical Investigations – Offshore Structures
- Seismic Survey by Marine & Earth Science 2011

- Aurecon, 2012. Clinton Bypass Channel Investigation, Gladstone Ports Corporation
- Aurecon Hatch, 2013, WICET Expansion Phase 1 – WEXP1

All of the above geotechnical investigations indicate a mixture of soil types present within the soil profile underlying potential reclamation bunds. Quaternary alluvial deposits comprising clays, sands, gravels and mixtures of all of the above soil types (eg Gravelly Sand) occur. Bedrock levels varied across the site and were encountered within the footprint of the reclamation bunds.

3.3.3 Quaternary (Holocene) sediments

Typically, the Quaternary aged soils comprise unconsolidated marine/intertidal sediments over older coarse and fine grained soils being marine or fluvial in their deposition. It is likely that the fluvial deposits were carried down by the action of large river systems such as the Boyne River. The undifferentiated fluvial material typically comprises a mixture of clay, silt, sand and gravel. Intertidal sediments carried by strong tidal currents may also be encountered throughout the Port Curtis area and are shown on the geological map.

Previous investigations have shown the presence of a thin layer of Holocene-aged estuarine clay and recently deposited marine sediments in the Port Curtis area. The Holocene-aged material is typically 0.5 m thick to approximately 5 m thick in un-dredged areas, and is described as soft clay and loose sand/gravel with shell fragments. In areas where seabed topography is variable, pockets of thicker sediment can be anticipated.

This young Holocene-aged alluvium is typically underlain by residual soils, comprising sandy clay, clayey sand, gravelly sand and clay.

3.3.4 Quaternary (Pleistocene) sediments

Below the softer surface marine and alluvial sediments, the area is typically underlain by dense or stiff consolidated sediments interpreted as being Pleistocene in age 11,700 years ago to 2.5 million years ago. These sediments are typically composed of stiff to very stiff high plasticity clays as well as dense sands.

Coarse gravel layers with clasts up to boulder size, possibly deposited during the uplift of the Mount Larcom and Curtis blocks, are known to exist in the Port Curtis area. These gravels are typically comprised of quartz, chert and metasediments.

3.3.5 Bedrock

Variability in the level of rock head is known to exist throughout the Port Curtis area due to the existence of numerous faults and the nature of the resistant zones known to exist in the Wandilla and Shoalwater Formations. Any bedrock encountered would potentially be comprised of medium to high strength metasediments.

3.3.6 Structure

From the published geological maps it is also apparent that extensive faulting exists within the area of the proposed channel to be dredged. These faults are not thought to be active at the present time, however their existence can produce large variations in the underlying geology. This may introduce changes in rock type that potentially produce significant changes to rock head level. Known seabed topography in the area supports the presence of complex underlying structures in the geology which will in turn impact on the depositional relationships.



3.4 Work progress

The port Central area is relatively sheltered therefore boreholes were drilled here when weather and sea state environments would not allow drilling to be carried out in the outer harbour during investigation of the shipping channel duplication sites where the barge was exposed to stronger wind and swell conditions

Figure 5 demonstrates the actual drilling progress, showing metres drilled per day over the duration of the fieldwork program.

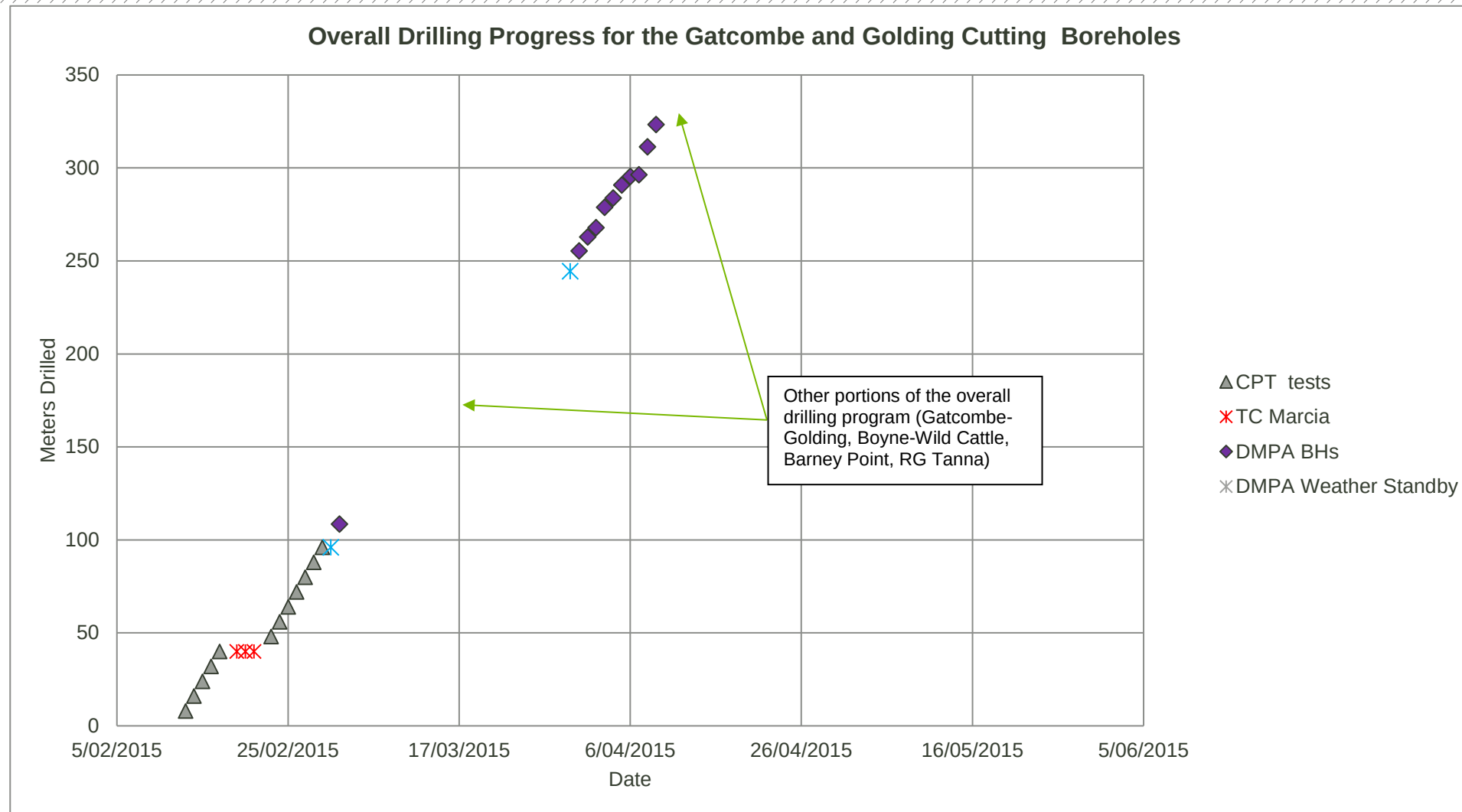


Figure 5 Overall drilling progress for the program of work within DMPAs including the Western Basin



4 Investigation methodology

4.1 General

Aurecon engaged J&S Drilling to perform the offshore drilling investigation. Aurecon site staff were present throughout and were responsible for detailed logging of the recovered soil and drill core, recording in situ testing and sampling, boxing of recovered drill core and core photography. In addition, the Aurecon site engineers supervised operational procedures, including positioning of the barge.

- **Port Central Expansion (PCE)** - A total of two (2) boreholes and two (2) CPT's were completed
- **Western Banks Island (WBI)** - A total of three (3) boreholes and eight (8) CPT's were completed
- **Western Basin Expansion (WBS)** - A total of one (1) borehole and two (2) CPT's were completed.

The as constructed borehole locations are presented in Table 3. Borehole coordinates were adjusted from the design locations because of currents and undulating seabed topography creating difficulty in positioning the barge in equilibrium.

Borehole locations were typically drilled within 5 m of the design locations.

Table 3 “As Constructed” borehole and CPT locations and depths

Hole ID	Type	Location	Final Depth (m)	Eastings	Northings	SeaBed (m LAT)	Final Level (m LAT)
PCE01	BH	Port Central Expansion	12.00	325497	7361369	-1.86	-13.86
PCE02	CPT	Port Central Expansion	9.14	325717.1	7361397	-3.12	-12.26
PCE03	BH	Port Central Expansion	16.00	326246.4	7361292	-5.46	-21.46
PCE04	CPT	Port Central Expansion	4.70	326583.4	7361200	-7.48	-12.18
WBI7	CPT	Western Banks Island	15.04	334113.7	7355181	-4.10	-19.14
WBI03	BH	Western Banks Island	16.00	331899.3	7357857	-9.05	-25.05
WBI1	CPT	Western Banks Island	8.90	330694.9	7359306	-5.97	-14.87
WBI10	BH	Western Banks Island	12.00	332189.9	7355767	-5.10	-17.10
WBI11	CPT	Western Banks Island	5.06	331768.8	7356398	-4.22	-9.28
WBI12	CPT	Western Banks Island	8.50	331190.6	7357377	-3.70	-12.20
WBI13	BH	Western Banks Island	18.15	330584.1	7358541	-3.24	-21.39
WBI2	CPT	Western Banks Island	8.00	331380.1	7358474	-5.98	-13.98
WBI4	CPT	Western Banks Island	7.60	332401	7357247	-10.21	-17.81
WBI5	CPT	Western Banks Island	7.75	332980.2	7356545	-6.15	-13.90
WBI9	CPT	Western Banks Island	7.52	332911.9	7355170	-2.89	-10.41
WBS03	BH	Western Basin Expansion	12.45	312835.2	7371460	0.16	-12.29
WBS1	CPT	Western Basin Expansion	15.30	312809.5	7371738	0.10	-15.20
WBS2	CPT	Western Basin Expansion	14.82	312932.6	7371100	-0.23	-15.05

A borehole location plant is provided in Appendix A of this report.

4.2 Jack-up barge and drilling program

The geotechnical investigation comprised a series of boreholes all drilled within the harbour from a Jack Up Barge (JUB). A series of in situ tests comprising Standard Penetration Tests (SPTs) were carried out at regular intervals. Samples were recovered from the SPT testing and from drilling. Samples were strategically selected for geotechnical laboratory testing and transported to a NATA accredited laboratory in Brisbane.

Personnel were transferred to the barge from Gladstone Marina by the support vessel MV Alkira operated by Fodico to undertake the support duties for the drilling program. The MV Alkira was also used to tow the JUB to each borehole location.

Site investigations commenced on Friday 13 February 2015 and comprised forty four (44) boreholes and 12 cone penetration tests (CPT). The fieldwork was terminated by GPC on Tuesday 19 May 2015. This report details the five (5) boreholes and twelve (12) CPT tests for the DMPA and Western Basin drilling program.

The J&S JUB is a modular 4 legged jack-up platform with a total deck load capacity of approximately 44 tonnes. Once in position over a borehole, the barge is jacked up to its operational height above sea level. Operational height is determined by tides and prevailing sea state conditions. In general, the barge is jacked up to have a 1 m air gap during high tide to account for waves. This relatively small air gap was chosen due to the sheltered harbour location, although the barge could be jacked higher during stormy conditions to account for prevailing sea state and surge conditions when necessary. The JUB was equipped with an Edson 3000 G rotary drilling rig, along with portable storage facilities for equipment and consumables. A photograph of the Ocean Driller 2 JUB is presented below in Photograph 1. Select photographs from the investigation, including JUB and location, are provided in Appendix D.



Photograph 1 View of the J&S Jack up barge "Ocean Driller II"

4.3 JUB positioning and reduced level determination

The predetermined coordinates for each borehole position were input into a Real Time Kinetic (RTK) Global Positioning System (GPS) on the barge, into a handheld stored GPS operated by the skipper of the accompanying tug boat, and into a smaller handheld GPS controlled by the Barge Master. When moving to a new borehole location, the tug towed the barge toward the borehole location using the GPS to maintain the correct heading. During this process, the Barge Master was in constant radio contact with the tug, verifying the movement with his handheld GPS. Once over the borehole position, the JUB legs were lowered from the barge and the barge is then jacked-up just above the buoyancy level.

The position was verified through the Barge Master's GPS and the on-board RTK GPS. The ability to close in on the required location was heavily dependent on the weather conditions, the tug captain's skill and tug's capabilities.

Once all measurements were recorded, the seabed level could be calculated. This was achieved by subtracting the recorded table height and deck to seabed measurements, from the RTK GPS height. The RTK GPS value is given in Australian Height Datum (AHD) and therefore the calculated value had to be converted into Lowest Astronomical Tide (LAT). The elevation of AHD above the LAT varies depending on site location and the value of 2.21 m was adopted for this conversion. Depths to seabed and deck to water were measured with a lead line.

To confirm the calculated seabed reduced level, an alternative calculation was performed. This was achieved by subtracting the deck to water line from the deck to seabed measurement, then subtracting this calculated distance from the tide height estimated at the location from published tide charts. Figure 6 presents a depiction of the relevant measurements required to determine the seabed RL during the offshore investigation.

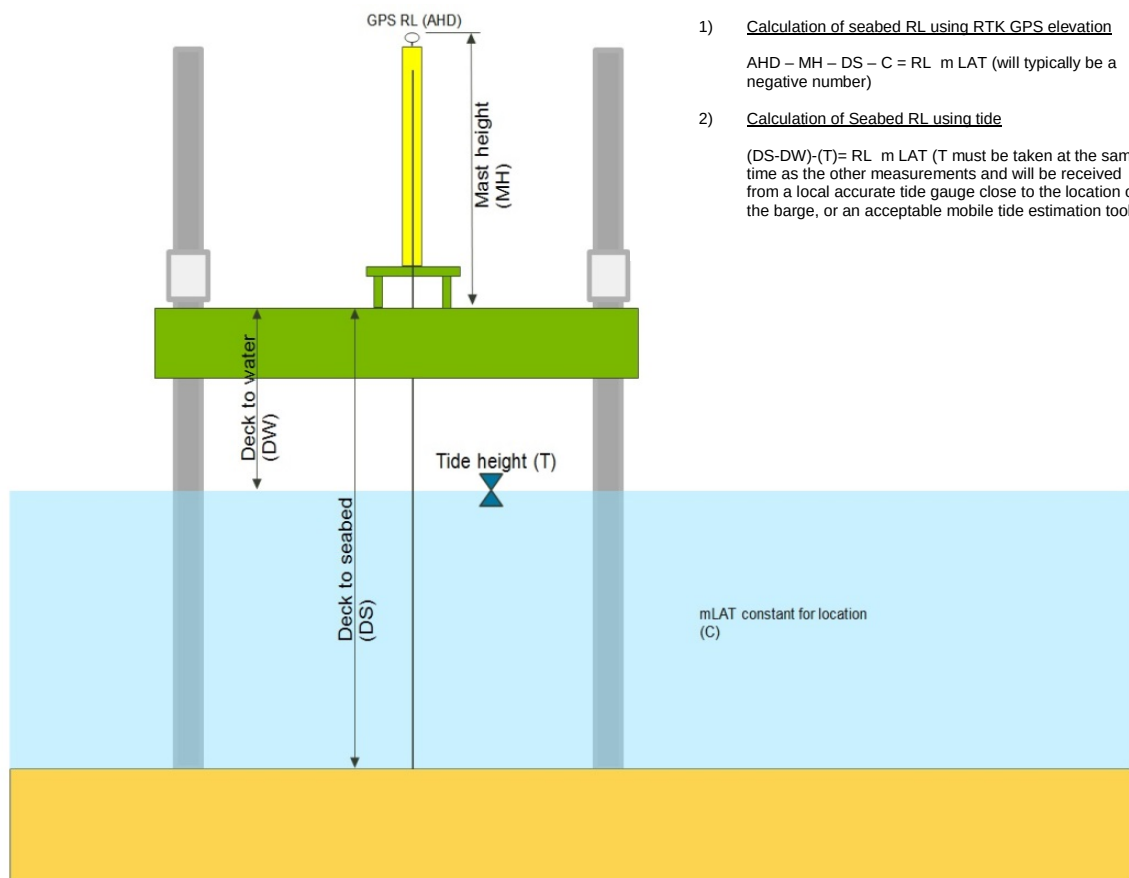


Figure 6 Description of required levels to determine seabed RL during overwater drilling

4.4 Drilling methodology

Drilling consisted of lowering 150 mm outside diameter casing on to the seabed and drilling through the casing with a PQ3 (140 mm) size bit. The large diameter outer casing was pushed into the loose surface sediments and generally sunk under its own weight until firmer material was encountered. The inner and outer PQ3 casing, armed with a diamond drill bit was lowered to the seabed after an initial SPT test was taken at seabed level. The coring used water circulation to lubricate the cutting surface of the bit which tended to wash away any soft / loose material collected in the outer casing.

The inner core barrel was lowered to the bottom of the PQ3 casing where it was mechanically locked in place. The PQ3 casing was advanced an additional distance until just above where the next SPT test was taken which equates to the total length of the inner core barrel. Following the 1.0 m run, the core barrel was retrieved from the bottom of the PQ3 casing using a wire line winch system. PQ3 drill bits produce rock core with a diameter of 83.6 mm. The core collected on the previous run was only extruded from the barrel with water pressure from the on board water pump when rock was encountered, otherwise soils were gently removed from the splits and processed (ie logged, photographed, wrapped and stored).

Core recovery in marine sediments was variable and dependent on the nature of the sediment encountered. Where fine-grained sediment was present, recovery was typically good but in coarser sand and gravelly material, recovery tended to be poor. Core recovery in weathered rock was again variable due to the presence of weak layers and fractured rock. Recovery generally improved with depth.

Intact soil and rock core was logged, photographed, wrapped in plastic, sealed in core boxes and transferred to the tug boat and brought ashore for storage. Hand written logs were produced at the time of drilling, recording all relevant details, including:

- Drilling methods, elevation referenced to LAT
- Details of colour, plasticity or particle characteristic and consistency
- Comments on sampling and in situ testing
- Rock descriptions including: weathering, colour strength, jointing and structure
- Estimation of rock strength, Rock Quality Designation (RQD) and defect spacing
- Defect description including depth, type, angle, roughness and infill

4.5 In situ testing and undisturbed sampling

Standard Penetration Tests SPTs were undertaken in accordance with AS 1289.6.3.1 within the marine sediments, typically at seabed level and at 0.5 to 1.0 m intervals thereafter. SPT samples recovered from the test spilt spoon were sealed in airtight bags, labelled and stored on board the JUB before transfer to storage or the geotechnical laboratory.

Undisturbed tube (U63) or piston tube samples were taken when suitable sediments were encountered, and where this sampling technique was successful, samples were scheduled for subsequent laboratory testing.

Borehole logs and core photographs are provided in Appendix B of this report

4.6 Cone Penetration Tests (CPT)

Cone Penetration Testing was undertaken within the Western Banks Island and Port Central Expansion areas, and was also undertaken within the Western Basin.

In the Cone Penetration Test (CPT), a cone on the end of a series of rods is pushed into the ground at a constant rate and continuous measurements are made of the resistance to penetration of the cone and of a surface sleeve (Robertson, P.K. and Cabal, K.L, 2010). The total force acting on the cone, Q_c , divided by the projected area of the cone, A_c , produces the cone resistance, q_c . The total force acting on the friction sleeve, F_s , divided by the surface area of the friction sleeve, A_s , produces the sleeve friction, f_s . In a piezocone, pore pressure is also measured, typically behind the cone in the u_2 location.

The CPT has major advantages over traditional methods of field site investigation such as drilling and sampling as it is fast, repeatable and economical. In addition, it provides near continuous data and has a strong theoretical background (Robertson, 1990).

For this project, cone penetration testing was undertaken by Probedrill Pty Ltd (Probedrill) between 13 February and 2 March 2015. The work was undertaken using a 300kN Portable CPT Pushing Frame that was attached to the drilling rig upon the jack up barge. All CPT work was undertaken in accordance with AS 1289.6.5.1 – 1999, under the supervision of Aurecon engineers.

To reduce the potential for damage to the electronic cones or breaking or snapping of unsupported the CPT rods during testing, tests a staged approach was adopted.

Borehole casing was not advanced below the test depth when the CPT test was underway as this may interfere with the in situ results due to disturbance caused by the casing. In these cases, the supporting casing was set approximately 200mm into the seabed at the beginning of the test, and the CPT rods were then pushed to a depth where the CPT Operator determined that no unnecessary stress was being applied to the rods. In very soft and soft material this typically equated to a depth of 4m below sea bed level.

The rods were then removed and the supporting casing was lowered to the depth reached by the first run of CPT test. The test was then restarted as a second test from the depth where testing stopped in the initial push.

In soft sediments such as those encountered in the Port Central Expansion area and the Western Basin area this method was developed to advance the tests into the underlying denser and or harder sediments until CPT refusal was reached, as determine by the CPT operator. The series of tests were then combined into one complete CPT plot for that location.

Due to difficulties encountered removing the CPT rods, installing casing and then reinstalling the CPT rods, small gaps in data were produced between CPT runs. The requirement for multiple tests only occurred when extremely soft sediments were encountered for a significant depth from the surface.

The CPT plots and interpretations of the CPT data are provided in Appendix F of this report.

5 Laboratory testing

5.1 Introduction

Geotechnical laboratory testing was scheduled on selected and rock samples of sediment retrieved from the boreholes throughout the drilling operation by Aurecon Engineers, following logging and photographing the core boxes. The selected samples were shipped to a NATA accredited geotechnical testing laboratory (Tri Labs) in Brisbane. The laboratory testing certificates as well as summary plots of the test results for the DMPA boreholes are presented in Appendix D of this report. A discussion of the results of the testing is included in Section 6.

The following tests were undertaken on rock and sediment samples:

- In situ moisture content
- Atterberg limits
- Linear shrinkage
- Particle Size Distribution or Grading (both sieved and hydrometer)
- Particle density
- Triaxial test
- Unconfined compressive strength (UCS) of rock
- Point load (Is50)

Details of the type, Australian Standard used, and number of samples for each geotechnical laboratory test is presented in Table 4.

Table 4 Laboratory Testing Summary

Laboratory Test	Australian Standard	Number of Tests Scheduled		
		PCE	WBI	WBS
Moisture content	AS 1289.2.1.1	16	19	7
Atterberg limits	AS 1289 3.1.1, 3.1.2, 3.2.1, 3.3.1	4	5	2
Linear shrinkage	AS 12893.3.4.1	4	5	2
Particle size distribution (wet sieve method)	AS 1289.3.6.3, 3.5.1, 6.6.1	6	10	3
Particle size distribution (hydrometer method)	AS 1289.3.6.3,3.5.1	3	3	2

Particle density	AS 1289.3.5.1	3	3	2
Triaxial Consolidated with pwp Cu test	AS1289.6.4.2	1	0	0
Unconfined compressive strength (UCS)	AS 4133.4.2.1	4	0	0
Point Load (Is 50)	AS 4133.4.1	11	9	0

PCE – Port Central Expansion
WBI – Western Banks Island
WBS – Western Basin

In addition to the laboratory tests, in situ testing in the form of Standard Penetration Tests (SPT's) were performed in accordance with AS1289.6.3.1 at regular intervals within each borehole. Where predominantly cohesive material was encountered, undisturbed U63 tube samples were retrieved instead of performing SPT tests. Hand shear vane tests were undertaken within cohesive material to provide an indication of shear strength.

6 Discussion of findings

6.1 Geological models

In general, the results of the intrusive geotechnical fieldwork agreed well with the expected conditions as interpreted from the geological map and the previous reports; that is

- Holocene soils
- Pleistocene soils
- Bedrock

Gladstone Harbour's dynamic fluvial and marine erosional and depositional environment has resulted in a complex soil profile.

An attempt to separate Holocene and Pleistocene soils based on SPT "N" values proved equally difficult as values in excess of 50 blows were encountered at seabed level in some areas, and low values were also reported at depth. That notwithstanding, the majority of SPT "N" values increased with depth.

For the purposes of this report, it is considered that the majority of the soils encountered during the investigation are Pleistocene in age, with only the very soft or very loose layer of sea floor material representing soils of Holocene age.

A series of indicative geological section were produced based on the results of the boreholes.

- Section through Port Central Expansion (1-1')
- Section through Western Banks Island (2-2' East)
- Section through Western Banks Island (3-3' West)
- Section through Western Basin (4-4')

It should be noted that the indicative geological sections include interpreted CPT data. The interpretation, based on soil behaviour types based on the method described by Robertson (1990) rather than observed soil samples as observed in CPT logs the sections do not account for small and / or numerous changes within a soil type and should, therefore, be regarded as indicative.

Scaled sections are provided in Appendix E.

6.1.1 Port Central Expansion

An indicative geological section has been prepared through Port Central Expansion area using data from the boreholes and interpretations of the CPT data. Figure 7 shows the location of the section and data used.

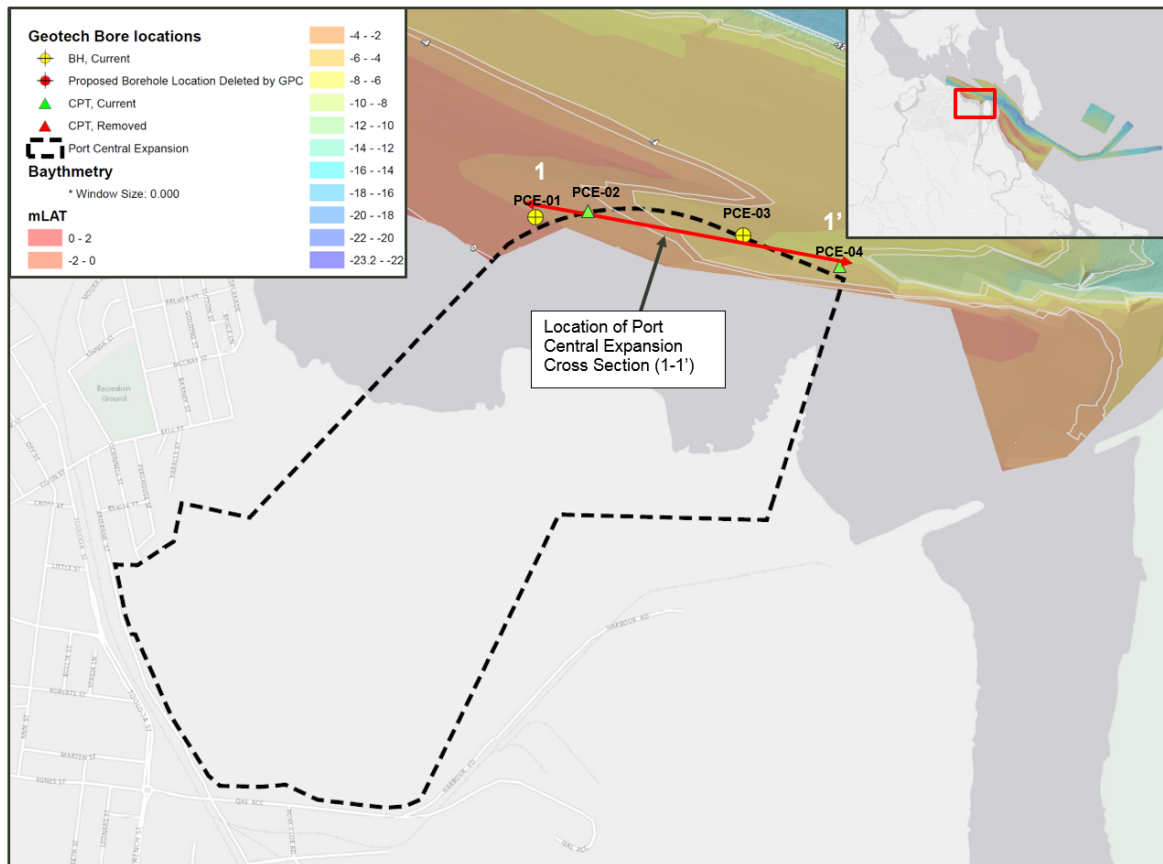


Figure 7 Location of Port Central Expansion borehole and CPT locations as well as the geological interpretative section.

The seafloor surface at the Port Central Expansion (PCE) slopes down from east to west from -1.8 m LAT at PCE01 to -7.4 m LAT at PCE04, as shown on the bathymetric contours in Figure 7.

The layers within the indicative geological cross section (

Figure 8) generally mirror the seafloor surface trend, with a profile of principally high (CH) and intermediate (CI) plasticity clay soils overlying a 2 m layer of clayey sand (SC), above interpreted rock directly below CPT refusal level.

The predominantly clay material is typically wet, very soft to firm and contained shells.

Toward the west, the typically clay dominated layer is interpreted to interdigitate with clayey sand (SC) around location PCE03 but was absent from the CPT interpretation at PCE04.

The fines content of the principally clayey sand was typically found to be of high plasticity and, where described as poorly graded or well graded sand (SP or SW), the sand was orange brown and grey

A small layer (350mm) of mainly clayey gravel material was recorded in PCE03.

Rock, in the form of "metasediments" and described on the logs as Metasiltstone or Siltstone / Metasiltstone was observed in boreholes PCE01 and PCE03 at 9.0 m depth (-10.9 m LAT) and 12.7 m depth (-18.2 m LAT), respectively. Typically extremely (XW) and highly weathered (HW), becoming moderately weathered (MW), rock strength was recorded as being low to very high strength.

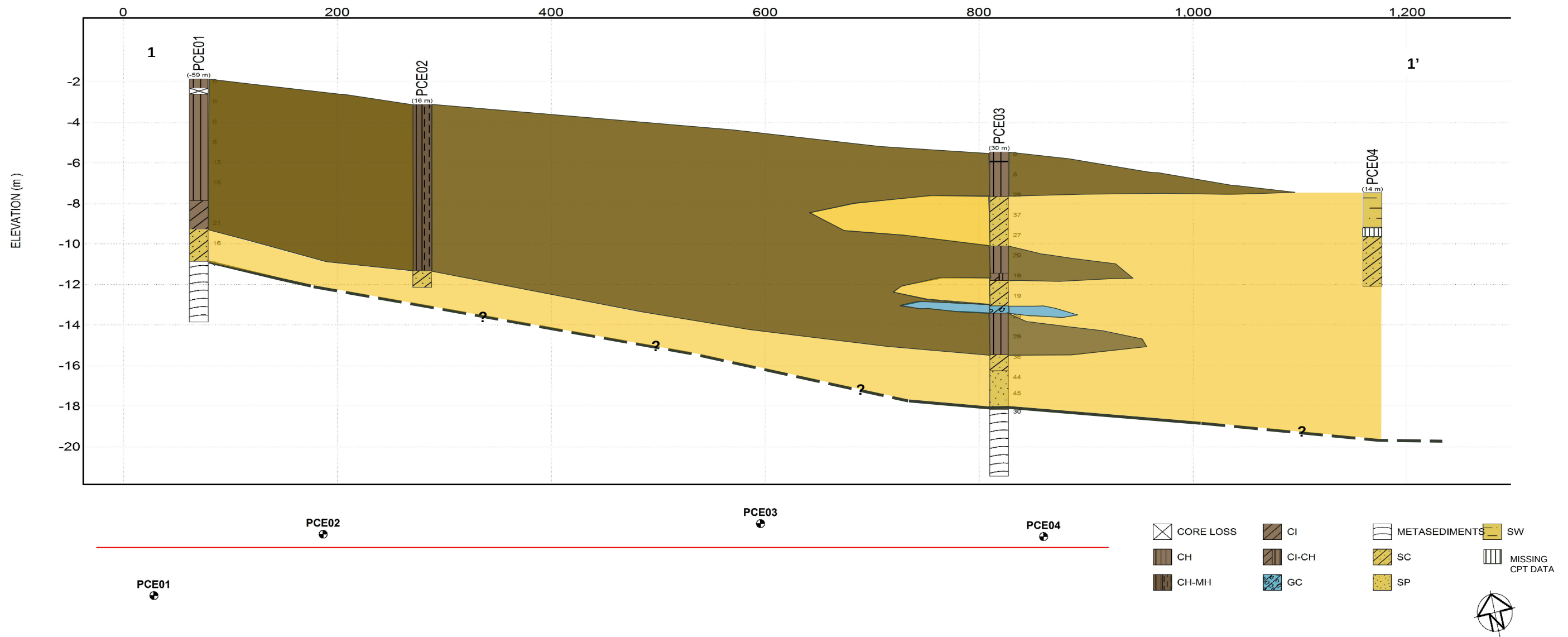


Figure 8 Port Central Expansion Geological Interpretative Section (1-1')

6.1.2 Western Banks Island

Two (2) indicative geological section have been prepared through Western Banks Island using data from the boreholes and interpretations of the CPT data. Figure 9 shows the location of the sections.

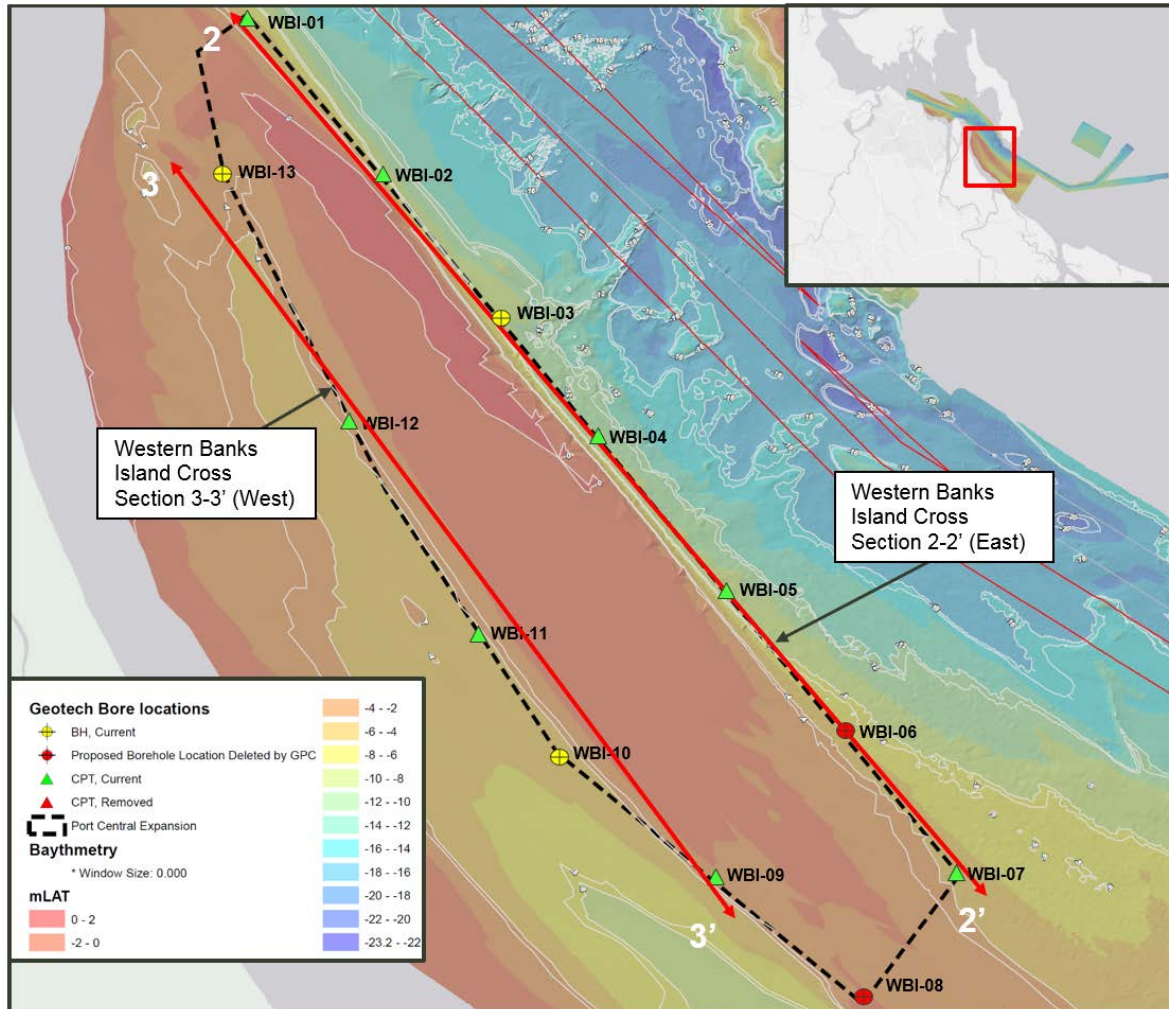


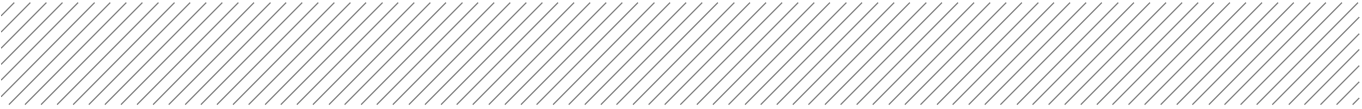
Figure 9 Western Banks Island borehole and CPT locations, and location of geological interpretative sections (2-2' East) and (3-3' West)

The indicative eastern cross section within the Western Bank Island (2-2', Figure 10) is based largely on interpreted CPT data, comprising five (5) CPT's and only a single borehole (WBI03).

The seafloor surface as shown on the section reflects this level at the line of section as given in Figure 9; that is a sea floor level of around -6 m LAT at the northern and southern ends of the section, and a depression in the centre to around -10 m LAT. The apparent channel is a product of the alignment of the section which steps up then down out of the shallows and does not indicate that a channel is present.

According to the CPT interpretation, the sea floor materials along this section are dominated by a layer of gravel material (GP) up to 1.5m thick. The surface gravel layer is underlain by clayey sand (SC) and poorly sorted (SP) and well sorted (SW) sand which contains impersistent lenses of principally cohesive (clay) material and some gravel (GP).

From the single borehole (WBI03), the sand dominated material is underlain by sub rounded to rounded gravel material with cobbles until a depth of at least -25.1 m LAT. As all CPT tests terminated within the sand layer, the exact horizontal extent of this gravel (GP) is not known.



The indicative western section within the Western Bank Island (3-3', Figure 10) is based on interpreted CPT data, comprising three (3) CPT's and two boreholes (WBI10 and WBI13).

Unlike the eastern side, the sea floor along the western section is generally constant at around -4 m LAT (between -3.2 m LAT and -5.1 m LAT), with a slight depression at borehole location WBI10.

Toward the north of the section (WBI13), clayey sand (SC) and well graded sand (SW) soils dominate near the sea floor to a depth of around -18 m LAT. This material is underlain by medium to high (CI-CH) and high plasticity (CH) clay soils, over mainly gravel material proved to a depth of -21.4 m LAT within borehole WBI13.

Low, medium and high plasticity clay soils (CL, CI, CI-CH and CH) overlap the sand dominated soils to the south of the section.

Rock, recorded as "metasediments", was encountered in borehole BHWBI10 at -14.3 m LAT.

In general, the geotechnical model for Western Banks Island comprises granular soils of sand and gravel at sea floor level. This is underlain by a variable thickness of sand throughout, except for the southern end of the western section at WBI09 where clay soils dominate.

Within the sand layer, lenses of cohesive material were observed.

To the north, the sand is underlain at a depth of about -12 m LAT by sub rounded gravel material with cobbles, as observed within borehole WBI13 and WBI03. The provenance of these sub rounded gravels is likely linked to fluvial deposition associated with the Boyne River.

Toward the south, bedrock considered to be from the Shoalwater Formation, was recorded in WBI10 at -14.3 m LAT. However, due to the lack of borehole data at the southern end of the Western Banks Island, the horizontal and vertical extent of the top of this bedrock could not be ascertained.

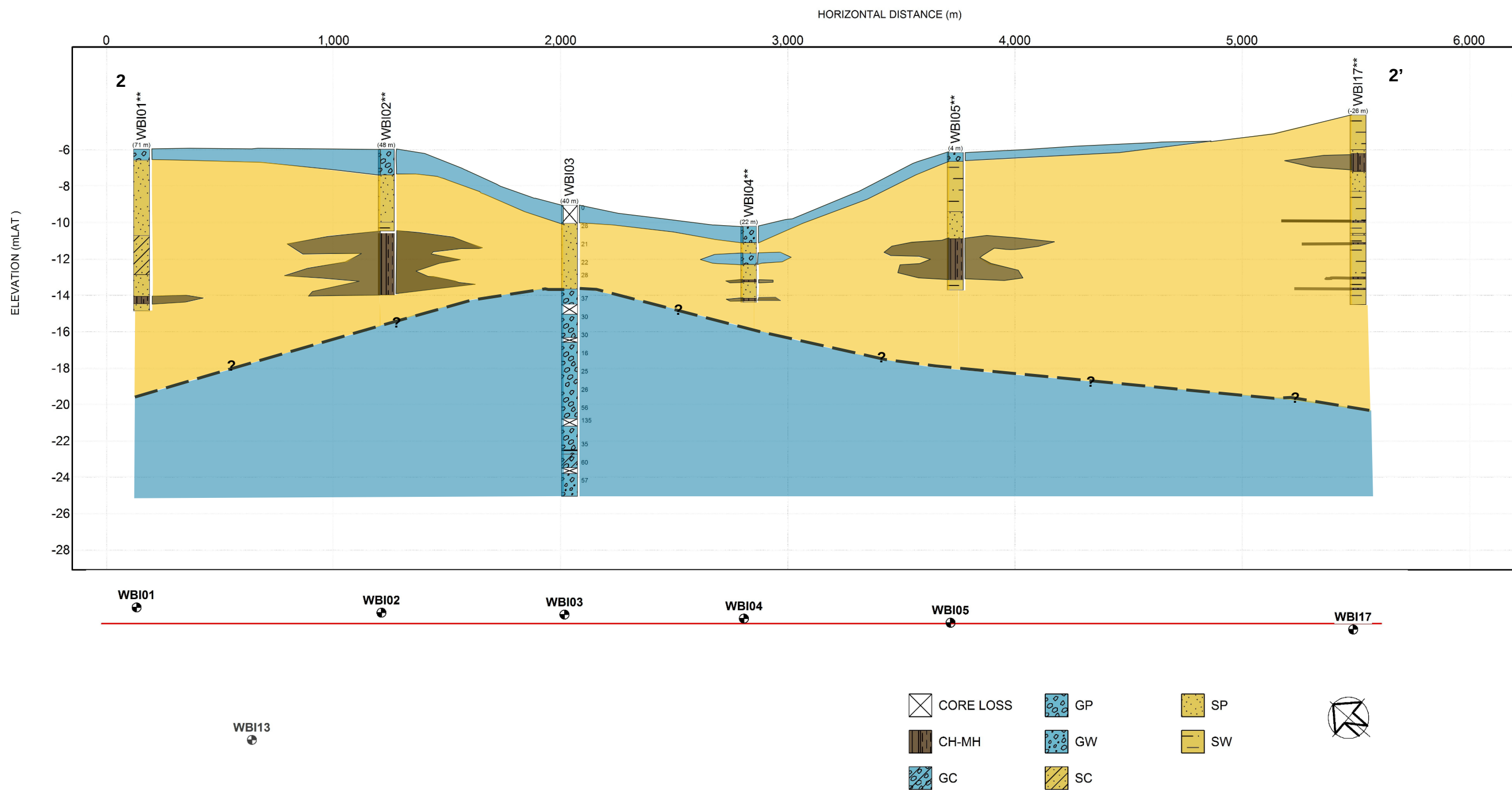


Figure 10 Western Banks Island Geological Interpretative Cross Section (East) (2-2')

6.1.3 Western Basin

An indicative geological section has been prepared through Western Basin using data from a single borehole and interpretations of two (2) CPT tests. Figure 12 shows the location of the section.

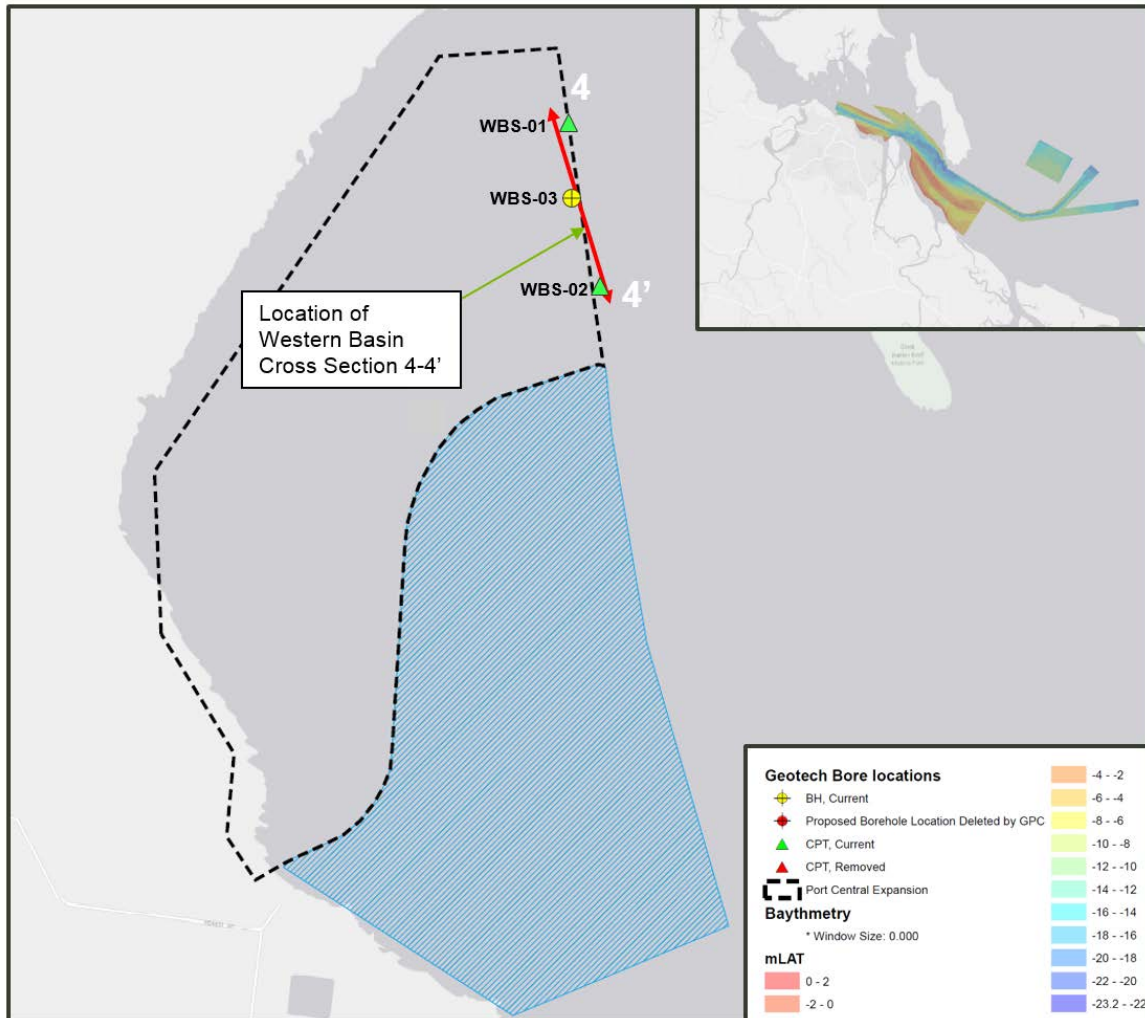


Figure 12 Plan showing the section line for the combined Western Basin Area (NTS) and the general distribution of materials within the two channels.

The indicative model for the Western Basin is provided in Figure 13 and indicates a simple horizontally layered sequence.

The section shows a generally flat sea floor at around 0 m LAT, which is dominated by a thin layer of sand dominated material to the south, and principally cohesive material to the north.

A thick layer of cohesive material, recorded as low plasticity silt (ML) over typically high plasticity clay (CH) was encountered within borehole WBS03 to a depth of -12.29 m LAT and to -15m LAT within WBS02 (CPT test).

Beneath the cohesive material, soils of mostly clayey sand (SC) material was recorded.

This simple model is indicative of a low energy depositional environment, as would be expected in an area that is protected from higher energy wave action experienced in other (outer) parts of Gladstone Harbour.

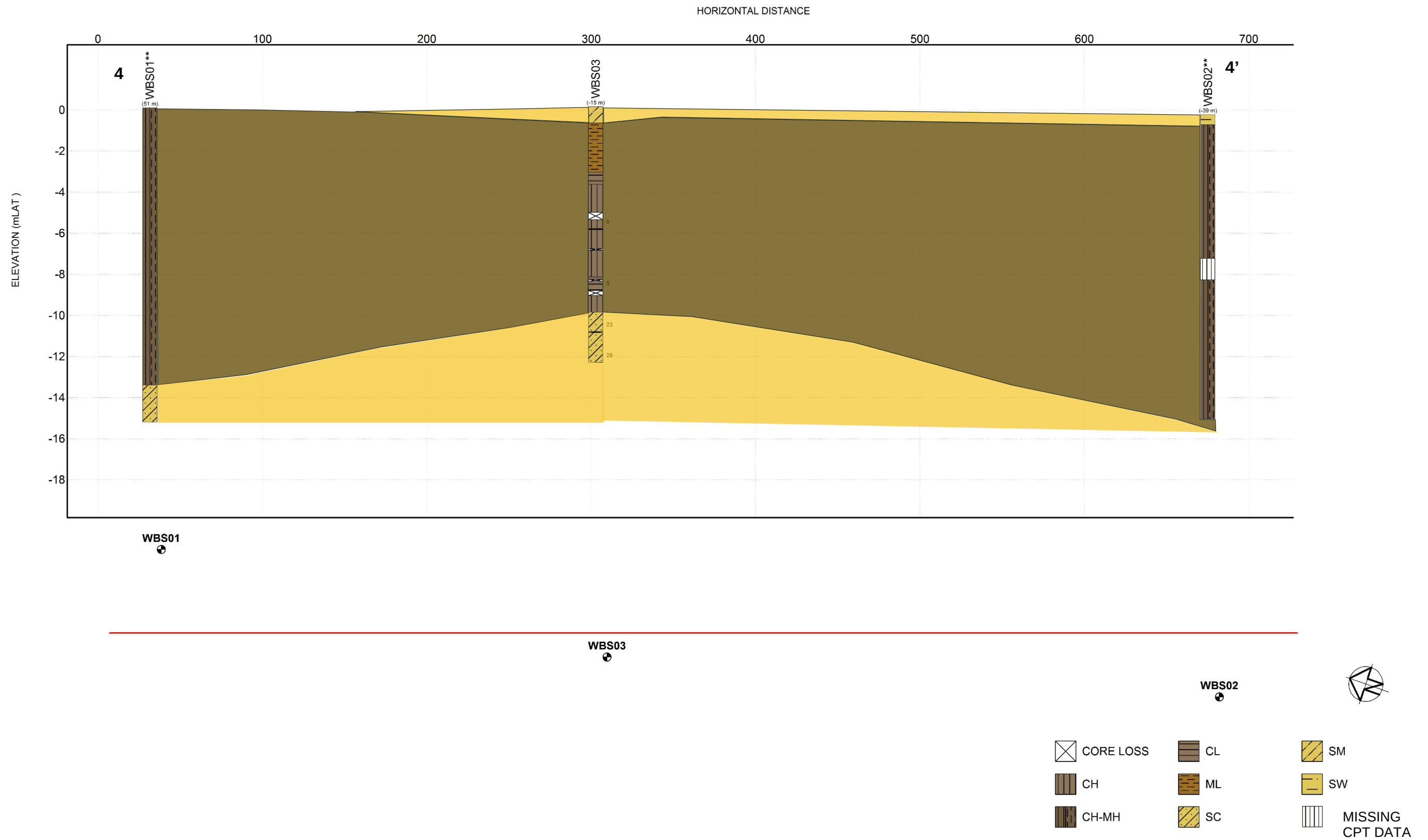


Figure 13 Western Basin Geological Interpretative Cross Section 4-4'

6.1.4 Comparison between Blain, Bremner and Williams, 1980 and Aurecon 2015 findings

A review of the borehole data from Blain, Bremner and Williams 1980 report entitled A study of the sub-surface materials for dredging in the approach channels to the port of Gladstone, was undertaken. A total of 15 boreholes from the Blain, Bremner and Williams report (79/50 to 79/53, 79/62 and 79/63) were reviewed to assess the conditions adjacent to the Port Central Area, with boreholes (79/37 to 79/46) reviewed parallel to Western Banks Island. The subsurface conditions observed in these historic boreholes were compared to the boreholes and CPTs completed by Aurecon in these areas including (PCE-01 to PCE-04) in the Port Central Area, and (WBI-01 to WBI-05 and WBI-07) for Western Banks Island.

The boreholes drilled for the Blain, Bremner and Williams investigation were drilled along the proposed channel alignment and were not specifically targeted within the Port Central Area or Western Banks Island area. Some similarities were observed in the Blain, Bremner and Williams boreholes when compared to the Aurecon Boreholes though other zones did not correlate as closely. The Blain, Bremner and Williams boreholes parallel to Western Banks Island did at times encounter loose sands, dense gravelly sands and clayey gravels (79/37, 79/41 to 79/46). Similar materials were observed along the eastern flanks of Western Banks Island during the Aurecon drilling in locations WBI-01 to WBI-05, and were interpreted to be a combination of finer sand sediments which have been deposited on older coarser gravel alluvial fans which appear to make up a majority of the banks. The Blain, Bremner and Williams report does indicate that a "Quartz mica schist" was encountered in 79/38 & 38A. The occurrence of this rock type was not confirmed in any of the boreholes conducted during the Aurecon borehole drilling, and is anticipated to be associated with bedrock from the Shoalwater Formation which makes up most of Facing Island to the north of Gatcombe Channel.

The boreholes drilled as part of the Blain, Bremner and Williams investigation adjacent to the Port Central Area indicated the existence of thicker deposits of loose sands with underlying stiff to very stiff silty clays and clayey gravels. The Blain, Bremner and Williams report does indicate that seismic survey results show a significant thickening of softer clayey and sandy sediments to the south of the channel alignment in the vicinity of Port Central. Results from the Aurecon investigation support these assumptions as test locations PCE-01 to PCE-04 encountered up to 10 m soft to stiff clay sediments overlying metasedimentary bedrock to the west, with increasingly granular dense sands and interbedded stiff clays to the east.

6.1.5 Comparison between existing Western Basin geotechnical information with Aurecon 2015 findings

A review of the Western Basin EIS report prepared by GHD indicates that existing geotechnical information in the Western Basin shows the existence of thick deposits of soft marine sediments (URS 2009) in the vicinity of the recently conducted Aurecon test locations WBS-01 to WBS-03. These sediments are typically composed of soft silts, and clays overlying harder residual clays which typically have weathered from the underlying Wandilla Formation. The test locations drilled by Aurecon encountered similar materials as noted in these earlier reports with up to 14m of soft marine clays being observed overlying medium dense sands in the area.

6.2 Geotechnical laboratory testing results

The following sections summarise the finding of the geotechnical tests undertaken on soil and rock retrieved from the borehole investigation.

All test certificates are provided in Appendix E.

6.2.1 Atterberg limits and linear shrinkage

6.2.1.1 Port Central Expansion (PCE)

Four (4) tests were undertaken on samples retrieved from boreholes drilled within the PCE (Figure 14).

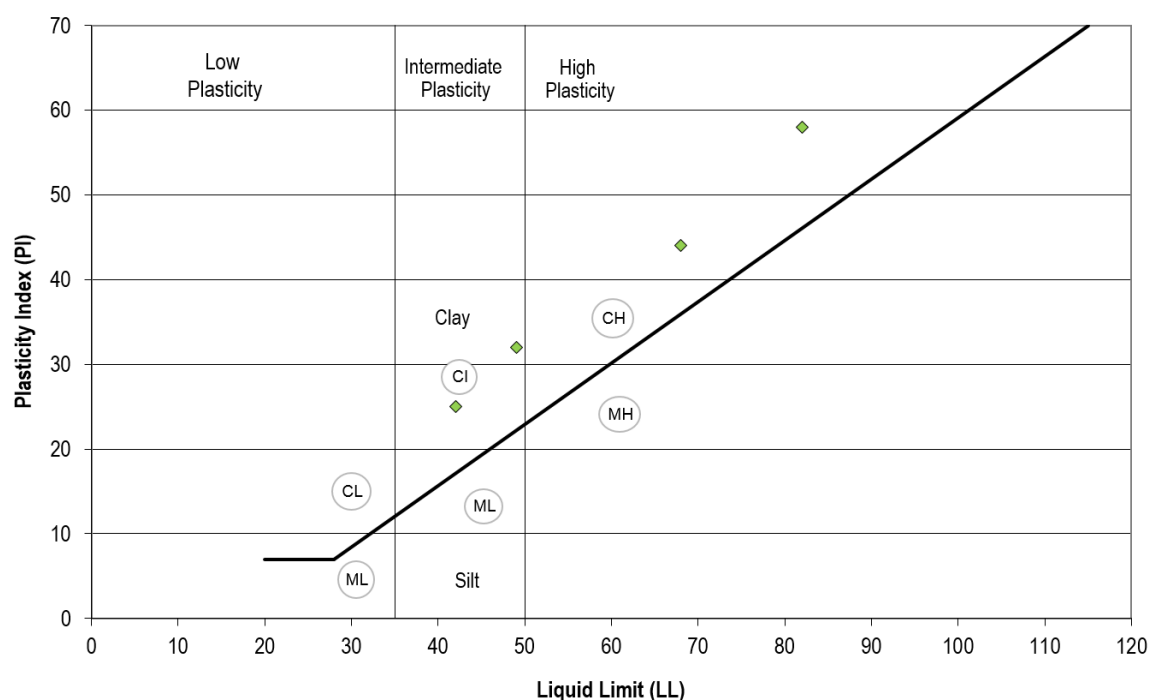


Figure 14 Combined Atterberg Limits Results from Port Central Expansion

Four (4) linear shrinkage tests were undertaken and the results are presented in Table 5.

Borehole	Depth		Linear Shrinkage
	m	m LAT	%
PCE01	3.00	-13.47	25.0
PCE01	7.00	-17.47	11.0
PCE03	0.00	-5.46	17.5
PCE03	6.00	-11.46	15.5

Table 5 Linear shrinkage test results of samples tested from Port Central Expansion (PCE)

The results of the Atterberg limits and linear shrinkage tests indicate that the samples tested can be classified as being of medium plasticity (CI) or high plasticity (CH), and may reduce in volume when dried by up to 25%.

6.2.1.2 Western Banks Island (WBI)

Four (4) tests were undertaken on samples retrieved from boreholes drilled within the WBI (Figure 15).

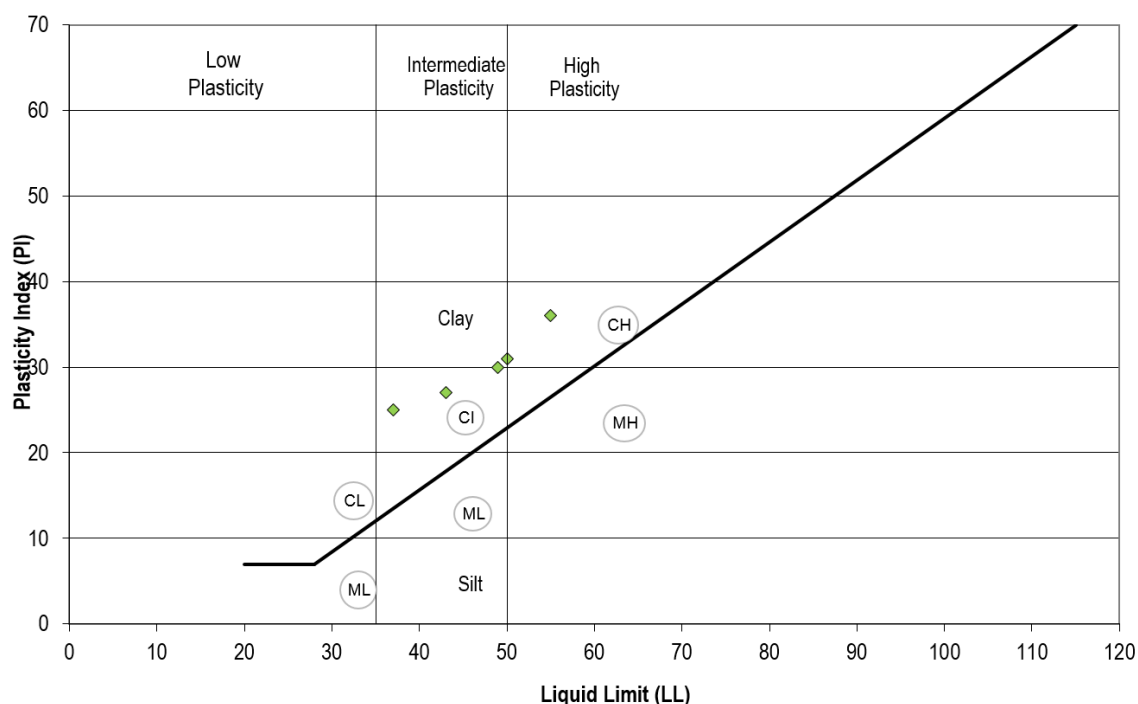


Figure 15 Combined Atterberg Limits Results from Western Banks Island (WBI)

Four (4) linear shrinkage tests were undertaken and the results are presented in Table 5.

Borehole	Depth		Linear Shrinkage
	m	m LAT	%
WBI10	0.00	-5.095	14.0
WBI10	1.00	-6.095	16.0
WBI10	2.00	-7.095	12.5
WBI10	3.00	-8.095	12.5
WBI13	7.00	-10.24	14.5

Table 6 Linear shrinkage test results of samples tested from Western Banks Island (WBI)

The results of the Atterberg limits and linear shrinkage tests indicate that the samples tested can be classified as being of medium plasticity (CI) or high plasticity (CH), and may reduce in volume when dried by up to 16%.

6.2.1.3 Western Basin (WBS)

Two (2) tests were undertaken on samples retrieved from the borehole drilled within the WBS (Figure 16).

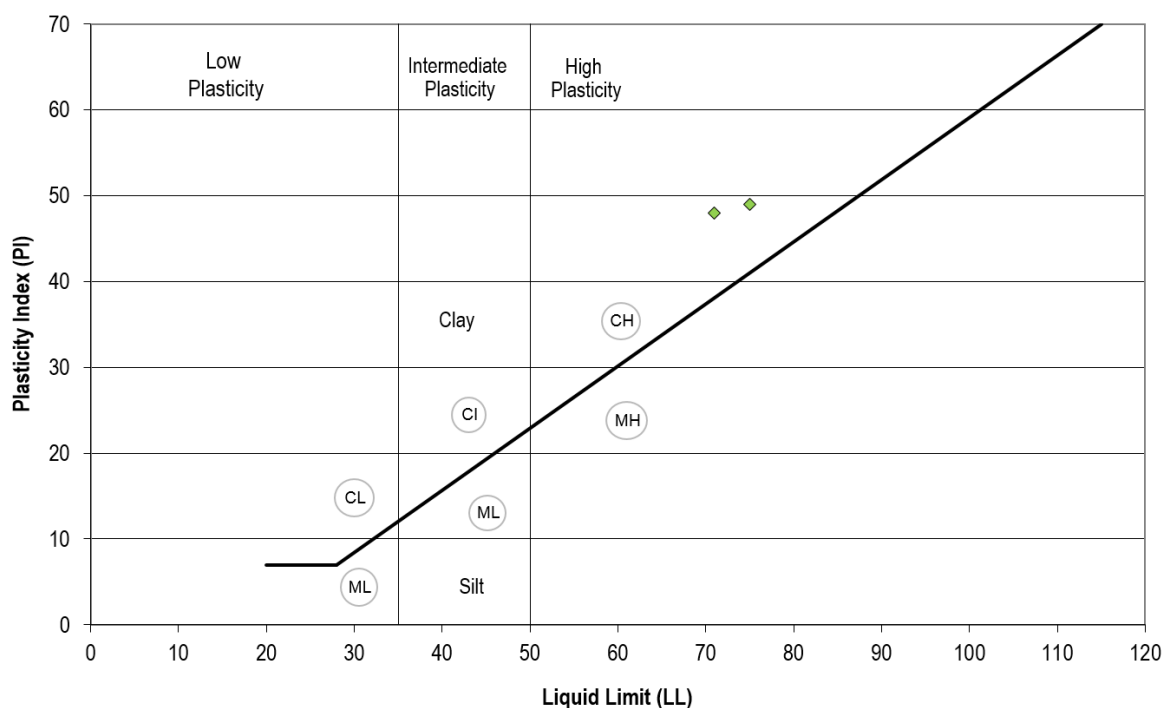


Figure 16 Combined Atterberg Limits Results from Western Basin (WBS)

Two (2) linear shrinkage tests were undertaken and the results are presented in Table 7 Linear shrinkage test results of samples from Western Basin (WBS).

Table 7 Linear shrinkage test results of samples from Western Basin (WBS)

Borehole	Depth		Linear Shrinkage
	m	m LAT	
WBS03	4.00	-3.84	16.5
WBS03	7.00	-6.84	19.5

The results show that the samples tested were of high plasticity (CH) and may reduce in volume by up to 19.5% when dried.

6.2.2 Particle size distribution

Particle Size Distribution (PSD) tests were used to assist with the classification of cohesive and non-cohesive materials. PSD tests were performed on SPT, core and “undisturbed” U63 samples typically using the wet sieve method. Where the fines content of a samples was judged to be sufficiently high, hydrometer tests were performed.

Laboratory test certificates are provided in Appendix D.

6.2.2.1 Port Central Expansion (PCE)

Figure 17 shows the grading results from samples of cohesive material taken from within the Port Central Expansion. The results clearly demonstrate that clays and silts dominate within the soil profile in this area, with between 55% and 80% fines content.

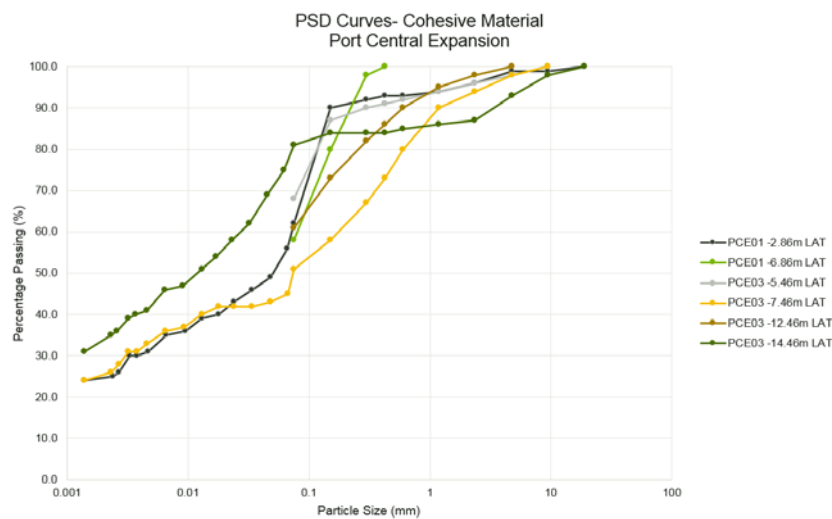


Figure 17 PSD graph of cohesive material tested within the Port Central Expansion

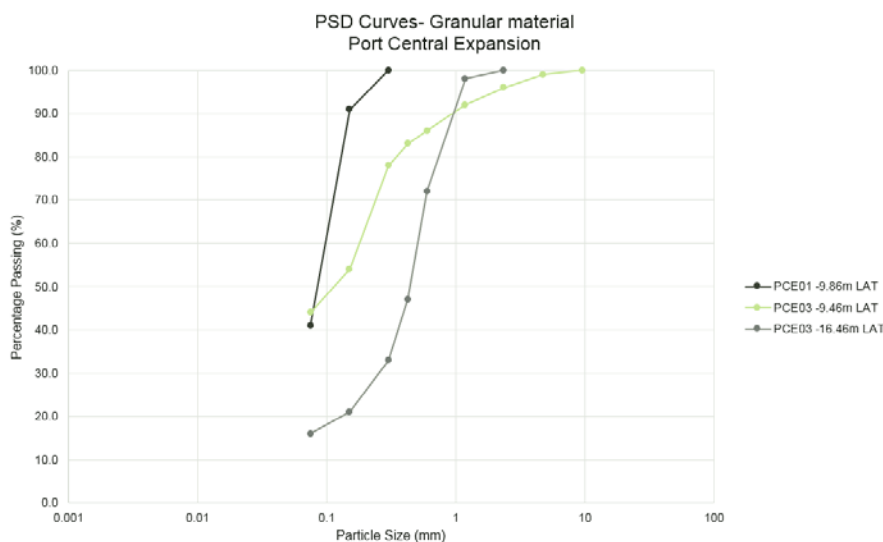


Figure 18 PSD graph showing the particle size variations in principally sand within the Port Central Expansion

The PSD plots for the sand material (Figure 18) demonstrate the variability of the particle sizes within this layer, which shows a fines content ranging between 16% and 45%.

6.2.2.2 Western Banks Island

Figure 19 shows the grading results from samples of principally sand material taken from Western Banks Island. Medium sand-sized particles dominate in the samples tested, with between 0% and 28% gravel content and up to 24% fines content.

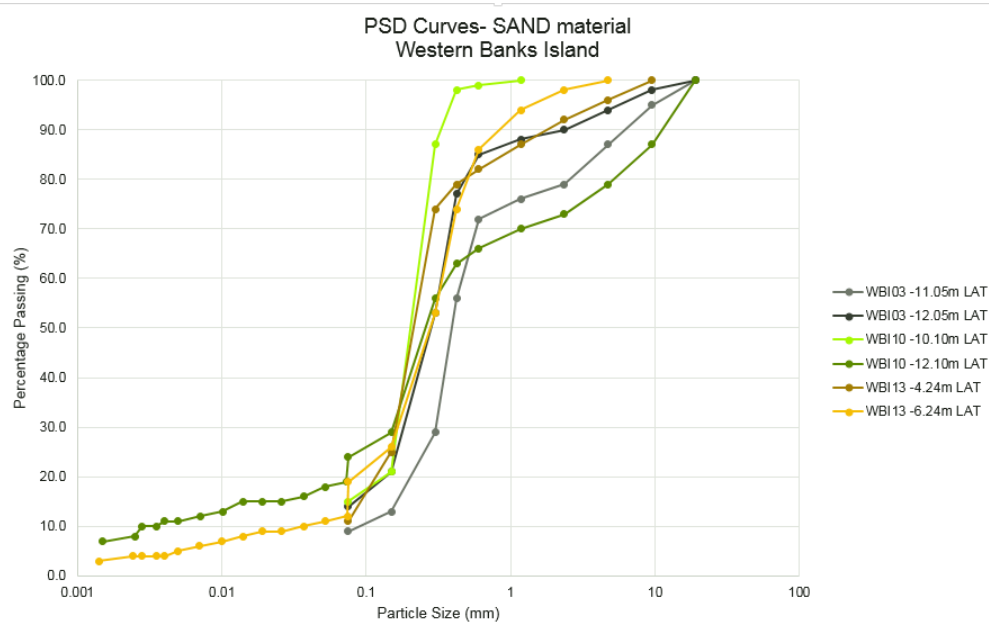


Figure 19 PSD graph showing the particle distribution curves for SAND material within the Western Banks Island

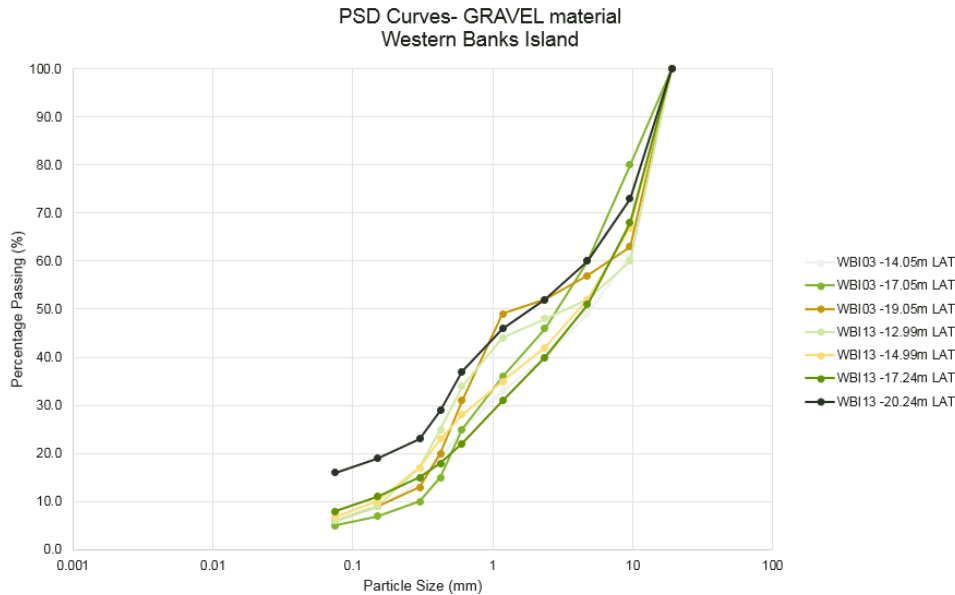


Figure 20 PSD graph showing the particle distribution curves for GRAVEL material within the Western Banks Island

Comparisons of the Layer 3 gravel material test results from the Western Banks Island show good correlation, and can generally be defined as medium gravel with sand and trace of fines (Figure 20).

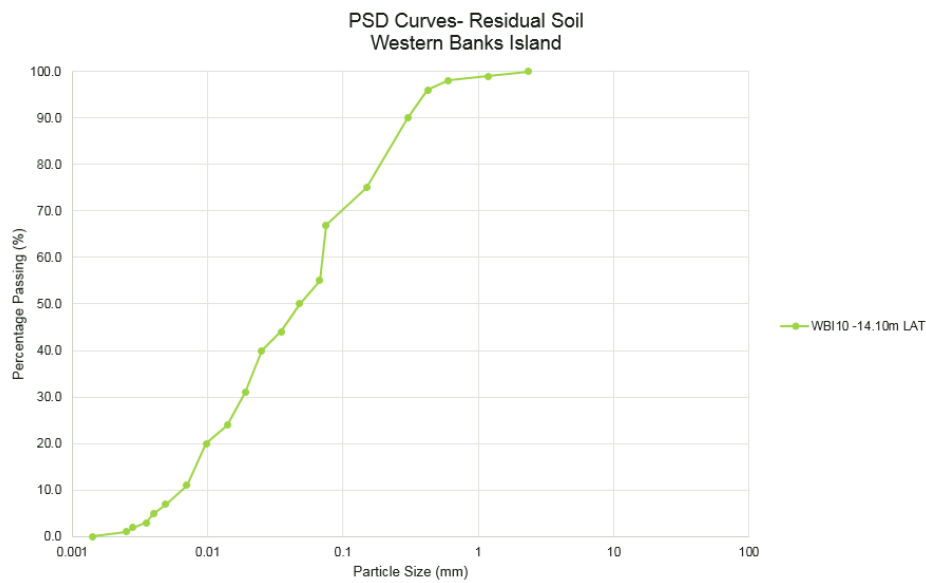


Figure 21 PSD graph showing the particle distribution curves for Residual Soil within the Western Banks Island

A single PSD test was performed on the residual soil at WBI10 at -14.1 m LAT (Figure 21). The results show over 60% of the sample comprised silt-sized particles with 33% sand.

6.2.2.3 Western Basin

Figure 22 shows the grading results from all samples tested from the Western Basin (WBS03)

Samples taken from the top of the borehole completed in this area (0.16 m LAT, -0.24 m LAT and -1.04 m LAT) show good correlation with an almost a 50:50 split between fine sand-sized particles and “fines”.

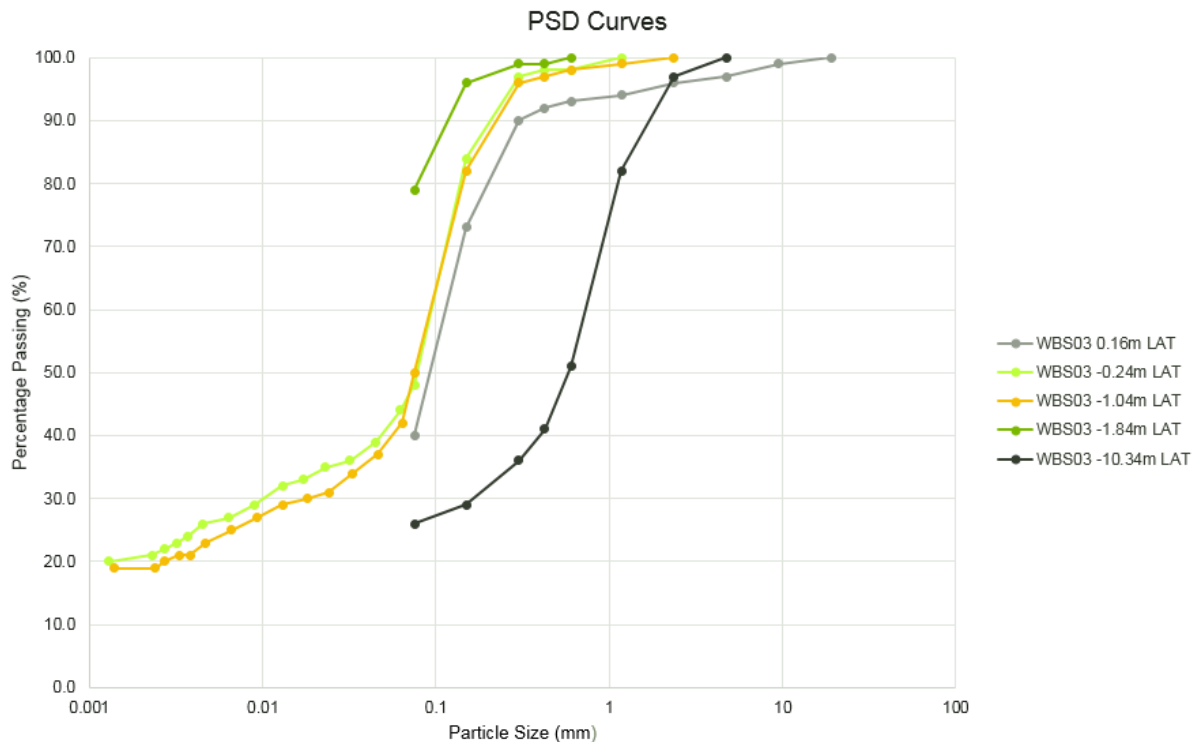


Figure 22 PSD graph showing the particle distribution curves for all materials within the Western Basin

Just below this layer, at -1.84 m LAT, the material change to a predominantly cohesive clay/silt material with sand, which is in keeping with the interpreted CPT data.

The gradings test undertaken on the sample retrieved from -10.34 m LAT clearly shows a change in material type from cohesive to granular, which is dominated by coarse sand, as identified during the fieldwork.

6.2.3 Unconfined compressive strength (UCS)

Four (4) unconfined compressive strength tests were on undertaken on rock samples from the Port Central Expansion in accordance with AS 4133 4.2.2.

Table 8 Summary of UCS test results from the Port Central Expansion

Borehole	Depth (m)	Depth (m LAT)	UCS (MPa)	Description
PCE01	9.56	-20.03	11.5	Medium strength
PCE01	10.37	-20.84	22.3	High strength
PCE03	14.00	-19.46	0.7	Low strength
PCE03	15.23	-20.69	1.2	Low strength

The results show that rock samples retrieved from PCE01 were of medium to high strength, whereas the rock tested from PCE03 was of a much lower strength.

No suitable rock sample could be retrieved from the Western Banks Island area and rock was not encountered at the Western Basin.

6.2.4 Point Load Test (Is50)

Point load tests (axial and diametric) were performed on samples taken from Port Central Expansion (PCE01 and PCE03) and Western Banks Island (WBI10) in accordance with AS 4133.4.1. The results are summarised in Table 9 and Table 10.

As with the UCS test, the results show that the samples tested from PCE01 (metasiltstone) (medium to very high strength) was of consistently higher strength than rock tested from PCE03 (siltstone / metasiltstone) (very low to low strength)

Table 9 Summary of Is 50 test results from the Port Central Expansion

Borehole	Depth (m)	Depth (m LAT)	Axial/ Diametric	Is 50 (MPa)	Description
PCE01	9.45	-19.92	A	0.84	Medium
PCE01	9.45	-19.92	D	1.48	High
PCE01	9.90	-20.37	A	3.06	Very high
PCE01	9.90	-20.37	D	0.87	Medium
PCE01	10.30	-20.77	A	2.29	High
PCE01	10.30	-20.77	D	1.51	High
PCE01	10.64	-21.11	A	3.31	Very High
PCE01	10.64	-21.11	D	0.40	Low
PCE01	11.30	-21.77	A	5.89	Very High
PCE01	11.30	-21.77	D	1.69	High
PCE01	11.77	-22.24	A	9.20	Very High
PCE01	11.77	-22.24	D	5.86	Very High
PCE03	13.45	-18.91	A	0.28	Low
PCE03	13.45	-18.91	D	0.25	Low
PCE03	13.95	-19.41	A	0.28	Low
PCE03	13.95	-19.41	D	0.22	Low
PCE03	14.66	-20.12	A	0.04	Very Low
PCE03	14.66	-20.12	D	0.30	Low
PCE03	15.13	-20.59	A	0.33	Low
PCE03	15.13	-20.59	D	0.24	Low
PCE03	15.90	-21.36	A	0.28	Low
PCE03	15.90	-21.36	D	0.29	Low

Rock samples tested from WBI10 (metasediments) were found to be consistently of very low to extremely low strength.

Table 10 Summary of Is 50 test results from the Western Banks Island

Borehole	Depth (m)	Depth (m LAT)	Axial/ Diametral	Is 50 (MPa)	Description
WBI10	9.40	-14.49	A	0.03	Extremely Low
WBI10	9.40	-14.49	D	0.03	Extremely Low
WBI10	9.79	-14.88	A	0.06	Very Low
WBI10	9.79	-14.88	D	0.05	Extremely Low
WBI10	10.33	-15.42	A	0.01	Extremely Low
WBI10	10.33	-15.42	D	0.02	Extremely Low
WBI10	11.40	-16.49	A	0.02	Extremely Low
WBI10	11.40	-16.49	D	0.03	Extremely Low
WBI10	11.95	-17.04	D	0.06	Extremely Low

6.2.5 Petrographic analysis

Two (2) petrographic analyses of rock samples retrieved from the boreholes were undertaken by Geochempet Services Pty Ltd, and are provided in Appendix E.

Sample: PCE03 (-19.76 m LAT)

The sample was described in the petrographic report as pale greyish orange to light brown variably weathered clayey siltstone which is seen to be moderately ferruginised, and was identified as a clayey labile siltstone. For engineering purposes the sample was also noted to be contain about 79% of weak or otherwise non-durable components, was generally “soft” and was apparently of low dry strength.

Sample: WBI10 (-16.90 m LAT)

The sample was described in the petrographic report as pale greyish orange light brown, strongly weathered, clay-cemented quartzose sandstone, which is moderately ferruginised. The rock is soft and friable and can be carved by fingernail. For engineering purposes the sample was also noted to be contain about 48% of weak or otherwise non-durable components, was generally “soft” and was apparently of low dry strength.

The petrographic descriptions of the rock differs slightly from the descriptions on the borehole log, which described the rocks as a “metasediment”.

The minor differences between the borehole description and the petrographic description of the rock sample is probably due to the fact that the field engineer logged the entire rock core from the borehole using a holistic approach, whereas the petrographic examination concentrated on a single small sample of rock.

Both rock samples are considered to be from the Wandilla Formation and part of the Curtis Island Group, which comprises sedimentary rock such as siltstone that have been subjected to amphibolite grade metamorphism.

6.3 In situ testing results

6.3.1 Cone penetration tests (CPT)

Results of the Cone Penetration Test (CPT) testing were provided by the operator, Probedrill. The results recorded cone tip resistance (q_c), friction ratio (R_f) and pore water pressure (u_2) against depth. The plots of the results are provided in Appendix F

In addition to the hardcopy plots of the results, raw .csv data files containing the electronic data generated for each CPT test were also provided. This electronic data was input into specialist CPT software for analysis. From the interpretation, the following parameters were interpreted:

- Soil behaviour type (after Robertson, 1990)
- Undrains shear strength (S_u) (kPa)
- Friction angle (Φ°)
- Unit weight (γ) (kN/m³)
- SPT “N₆₀”

A summary of the interpreted CPT test results are provided in the following sections. Plots of the CPT interpretations are also provided in Appendix F

6.3.1.1 Port Central Expansion (PCE)

Table 11 and Table 12 show the CPT interpretations for PCE02 and PCE04 respectively.

Table 11 Summary of the CPT interpretation at PCE02

PCE02	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-3.18	-5.1	15	0	Very Soft to Soft	15
	-5.1	-6.2	60	0	Stiff	19
	-6.2	-7.3	100	0	Stiff to very stiff	19
	-7.3	-8.9	100-200	0	Very stiff	19
	-8.9	-11.4	>200	0	Hard	19
	-11.4	-12.1	0	35	Medium dense	19

From the sea floor level in PCE02, the principally cohesive (clay/silt) material is found to be very soft to soft from -3.18 m LAT to -5.1 m LAT. This material then becomes stiff to very stiff and then hard with depth from -5.1 m LAT to -11.4 m LAT, at which point predominantly sand material is encountered. This is in keeping with the findings from the nearest borehole, PCE01 located approximately 2km to the west.

Sand dominated material was interpreted within PCE02 from sea floor level to -12.1 m LAT (i.e. end of test) with only a 500mm layer of hard cohesive material between -10.5 m LAT and -11.0 m LAT noted. The sand material is recorded as being medium dense, becoming more dense with depth. No interpretation was possible from -9.1 m LAT to -10.5 m LAT

Table 12 Summary of the CPT interpretation at PCE04

PCE04	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-7.48	-9.1	0	30	Medium dense	12
	-9.1	-9.5				
	-9.5	-10.5	0	>40	Dense	19
	-10.5	-11	>200	0	Hard	19
	-11	-12.1	0	>40	Dense	19

6.3.1.2 Western Banks Island

Tables 13 to 20 summarises the results of the CPT interpretations for the tests undertaken within the Western Banks Island.

In general, the results show a layer of dense to very dense principally gravel material on the sea floor on the eastern side of Western Banks Island, which is underlain by medium dense to very dense sand with variably thick lenses of stiff to hard cohesive material.

On the western side of the Western Banks Island, the interpreted CPT results typically show medium dense to dense principally sand material with lenses of stiff to very stiff cohesive material within the WBI12 and WBI11. Toward the south in WBI09, firm becoming hard predominantly cohesive soils are interpreted.

Table 13 Summary of the CPT interpretation at WBI01

WBI01	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-5.97	-6.6	0	~40	Dense	15
	-6.6	-7.4	0	~30	Medium dense	14
	-7.4	-10.7	0	~40	Dense	16
	-10.7	-12.1	0	30	Medium dense	16
	-12.1	-12.9	50	0	Stiff	16
	-12.9	-14.1	0	30	Medium dense	16
	-14.1	-14.6	50 to 100	100	Very Stiff	18
	-14.6	-14.9	0	35	Medium dense	18

Table 14 Summary of the CPT interpretation at WBI02

WBI02	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-5.98	-7.4	0	>40	Dense to very dense	17
	-7.4	-10	0	40	Dense	17
	-10	-10.5	0	~30	Medium dense	17
	-10.5	-11	50 to 100	0	Stiff	19
	-11	-12.6	100 to 200	0	Very Stiff	19
	-12.6	-13.96	>200	0	Hard	19

Table 15 Summary of the CPT interpretation at WBI04

WBI04	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-10.21	-10	0	>40	Dense to very dense	18
	-10	-11.7	0	~40	Dense	19
	-11.7	-13.07	0	>40	Dense to very dense	19
	-13.07	-13.26	>200	0	Hard	18
	-13.26	-14.16	0	~40	Dense	18
	-14.16	-14.31	>200	0	Hard	18
	-14.31	-14.37	0	~40	Dense	18

Table 16 Summary of the CPT interpretation at WBI05

WBI05	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-6.15	-6.65	0	>40	Dense to very dense	16
	-6.65	-9.4	0	~40	Dense	17
	-9.4	-10.9	0	~35	Medium dense	18
	-10.9	-13.15	>200	0	Hard	19
	-13.15	-13.71	0	~35	Medium dense	18

Table 17 Summary of the CPT interpretation at WBI09

WBI09	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-2.89	-4.34	0	~40	Dense	18
	-4.34	-5.5	50 to 100	0	Firm to stiff	18
	-5.5	-6.2	100 to 200	0	Very stiff	19
	-6.2	-9.89	>200	0	Hard	19
	-9.89	-10.31	0	~35	Medium dense	18

Table 18 Summary of the CPT interpretation at WBI11

WBI11	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-4.22	-5.67	0	~40	Dense	18
	-5.67	-6.3	100	0	Very Stiff	18
	-6.3	-6.9	0	35	Medium dense	18
	-6.9	-8.2	50 to 100	30	Stiff	17
	-8.2	-9.28	0	30	Medium dense	18

Table 19 Summary of the CPT interpretation at WBI12

WBI12	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-3.7	-4.5	0	42	Dense	18
	-4.5	-7.9	0	40	Dense	17
	-7.9	-8.7	50 to 100	0	Stiff	17
	-8.7	-9.5	0	37	Medium dense	17
	-9.5	-10	50 to 100	0	Stiff	17
	-10	-12.21	0	40	Dense	18

Table 20 Summary of the CPT interpretation at WBI17

WBI17	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-4.1	-6	0	>40	Dense to very dense	18
	-6	-6.2	0	30	Medium dense	16
	-6.2	-7.2	0 to 25	0	Very soft to firm	16
	-7.2	-8.2	0	~30	Medium dense	16
	-8.2	-9.9	0	40	Dense to very dense	17
	-9.9	-10	100 to 200	0	Very stiff	18
	-10	-11.1	0	40	Dense to very dense	17
	-11.1	-11.2	100 to 200	0	Very stiff	18
	-11.2	-13	0	40	Dense to very dense	17
	-13	-13.1	100 to 200	0	Very stiff	18
	-13.1	-13.6	0	~35	Medium dense	17
	-13.6	-13.7	100 to 200	0	Very stiff	18
	-13.7	-14.52	0	~35	Medium dense	17

6.3.1.3 Western Basin

Table 21 and Table 22 show the CPT interpretations for WBS01 and WBS02 respectively.

The interpretations from both CPT tests indicate that the cohesive layer encountered in both tests, and within borehole WBS03, is very soft to soft to a depth of between -5.1 m LAT to -6.2 m LAT and then becomes stiff to very stiff and hard and depth. Dense sand was recorded in WBS01 beneath the cohesive material, which is in keeping within the findings from borehole WBS03.

Table 21 Summary of the CPT interpretation at WBS01

WBS01	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	0.1	-5.1	0 to <25	0	Very soft to soft	14
	-5.1	-13.4	100 to >200	0	Stiff to hard	18
	-13.4	-15.2	0	35	Dense	18

Table 22 Summary of the CPT interpretation at WBS02

WBS02	m LAT		Su (kPa)	Phi (deg)	Description	Unit Weight
	(top)	(base)				
	-0.23	-0.7	0	30 to 40	Medium dense	14
	-0.7	-6.2	0 to <25	0	Soft to very soft	14 to 15
	-6.2	-7.2	50 to 100	0	Stiff	18
no reading	-7.2	-8.2				
	-8.2	-8.8	50 to 100	0	Stiff	18
	-8.8	-10.7	100 to 200	0	Very stiff	18
	-10.7	-15.05	150 to >200	0	Very stiff to hard	18

6.3.2 Standard penetration tests

The plots shown in the following sections present the SPT “N” value results with respect to depth (m LAT) for the various the materials encountered during the investigation.

6.3.2.1 Port Central Expansion

Figure 23 shows that the high plasticity clays (CH) range in “N” value from 8 blows to 36 blows in the Port Central Expansion, between -10 m LAT and -13.5 m LAT. This is equivalent to a firm to very stiff material. Intermediate plasticity (CI and CI-CH) material was interpreted as being stiff to very stiff, based on STP “N” values of 19 and 21 blows.

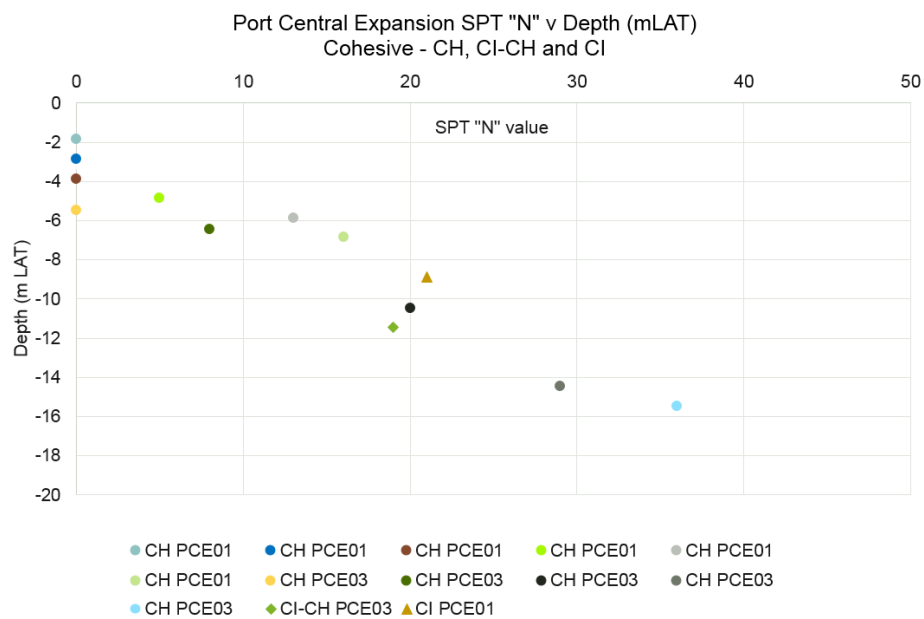


Figure 23 Cohesive Soils SPT "N" v m LAT for the Port Central Expansion

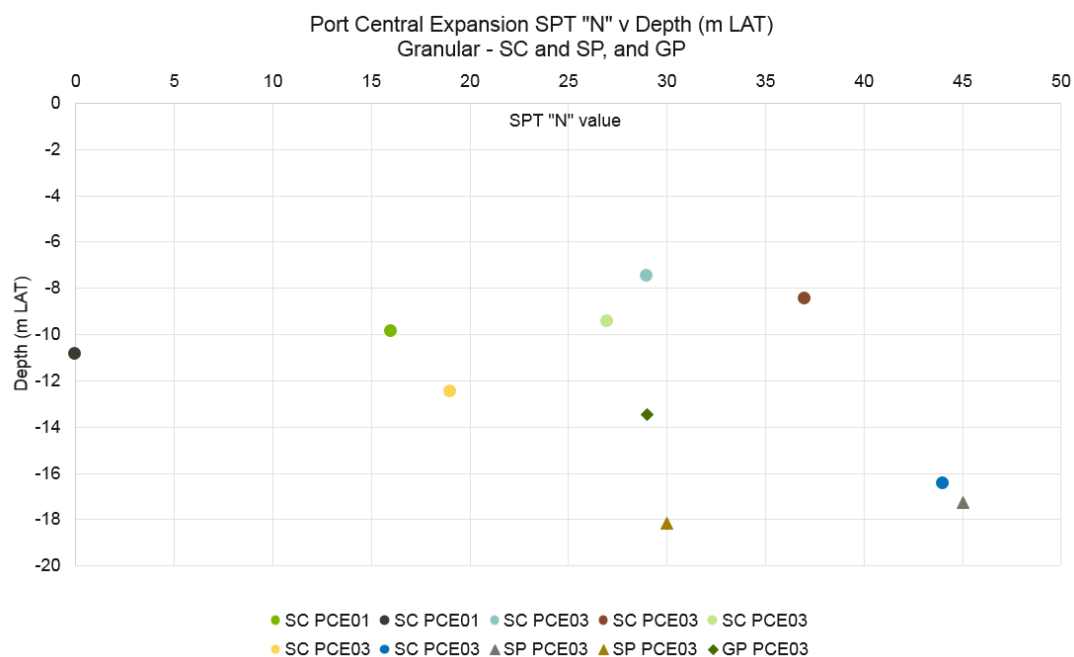


Figure 24 Granular Soils SPT "N" v m LAT for the Port Central Expansion

The majority of the SPT tests undertaken within granular soils within the Port Central Expansion were found to be medium dense (10 to 30 blows). Three tests indicate the granular material to be found to be dense (30 to 50 blows) with the highest completed test being N = 45 blows at -17.26 m LAT.

The majority of the SPT tests undertaken within cohesive soils within the Western Banks Island were found to be generally stiff (10 to 20 blows) (Figure 25).



Figure 26 shows that the SPT “N” values for the granular material generally increase with depth from. From sea floor level to -6.24 m LAT, the granular material can be generally described as very loose to loose (<10 blows), from -6.24 to -19 m LAT the material can be described as medium dense (10 to 30 blows) and from -19 m LAT the material is generally dense to very dense (>30 blows).

6.3.2.3 Western Basin

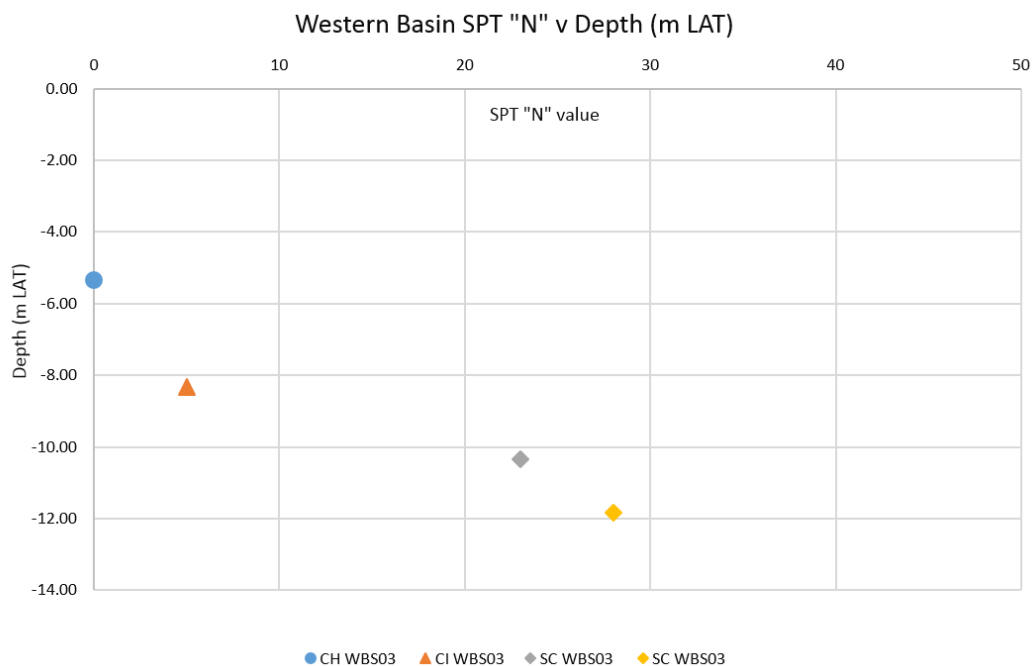


Figure 27 All SPT “N” tests results for the Western Basin v m LAT

Only a single borehole (WBS03) was performed in the Western Basin. Figure 27 shows that the cohesive material (CI and CH) can be described as very soft to firm. Clayey Sand material (SC), which underlie the cohesive material, was found to be medium dense (10 to 30 blows).

6.3.3 Shear Vane Tests

Five (5) hand shear vane tests were performed on cohesive soil core samples retrieved from the Port Central Expansion (Table 23).

The results show wide variability, from very soft (0 to 12 kPa) to very stiff (100 to 200 kPa). In general, the results show that undrained shear strength (S_u) increased with depth in each borehole.

Table 23 Summary of results of hand shear vane tests

Borehole	Depth		Result Peak S_u
	m	m LAT	
PCE01	1.70	-12.17	10
PCE01	3.70	-14.17	70
PCE01	6.00	-16.47	90
PCE03	0.50	-5.96	10
PCE03	1.00	-6.46	115

7 Conclusions

The following conclusion summarises the findings for each of the DMPA and Western Basin.

7.1.1 Port Central Expansion

The Port Central Expansion (PCE) has been identified as a potential DMPA. As the PCE limits encompasses dry land and is partly intertidal, the only area accessible during the fieldwork from a jack up barge was the extreme northern edge of the PCE. Therefore the following summarises only the area of the northern part of the PCE that was investigated during the fieldwork (Figure 7).

The sea floor slopes down from west to east as shown in Figure 8 and three main geotechnical layers exist in a generally horizontal fashion beneath.

Cohesive (clay) material

Present on the sea floor for the majority of the section, the cohesive material is approximately 7 m thick and interdigitates with sand material, becoming absent toward the east as the sea floor surface level reduces.

The clay is typically medium to high plasticity clay (CI and CH) and has a linear shrinkage potential of between 11% and 25%. PSD tests indicate a 55% to 80% fines content with fine and medium sand also present. CPT, SPT and hand shear and tests indicate very soft to soft conditions to around -5.1 m LAT, becoming firm then stiff to very stiff and hard with depth.

Sand material

Present mainly beneath the clay layer in the west and at sea floor level in the west, the sand layer is generally described clayey sand (SC) with some poorly (SP) and well sorted (SW) sand. Toward the west the layer thickness is approximately 2m. In the east sand is recorded at sea floor level.

Typically fine to medium grained, the sand materials contains up to 45% fines content and some fine gravel. CPT tests show the material to be medium dense, becoming dense, with SPT test results also showing medium dense to dense soils.

Bedrock

Recorded as Siltstone or Metasiltstone and considered to be from the Wandilla Formation, bedrock was encountered in the boreholes and interpreted as underlying the sand material at depth.

According to the petrographic description bedrock is a clayey labile siltstone. From UCS and Point Load testing of samples the rock is medium to very high strength to the west and is very low to low strength in the east. The rock is extremely weathered to moderately weathered and generally moderately to closely fractured with iron staining.

7.1.2 Western Banks Island

The Western Banks Island (WBI) has been identified as a potential DMPA. Unlike the PCE, the WBI is located in a completely marine setting which allowed a more thorough geotechnical investigation to take place using a jack up barge (Figure 9).

As per the bathymetric conditions show in Figure 10, the sea floor level varies slightly over the WBI. Five general layers were identified in the WBI.

Sea floor material

This layer is dominated by a ~1m layer of predominantly gravel material in the eastern part of the WBI and by sand dominated and clay material in the west and south. CPT tests within the gravel categorise the material as dense.

Sand material

Predominantly sandy soils, often clayey sand (SC), poorly sorted (SP) or well sorted (WP) sand, underlies the sea floor material throughout the WBI, except for the south western part which comprises principally cohesive material. PSD tests show the sand material mostly comprise medium sized grains, with varying amounts of gravel and clay fines. CPT tests indicate that the sand is generally medium dense with some dense and occasionally very dense zones. SPT tests also indicate the sand to be medium dense.

The sand material is likely to contain lenses of cohesive material which are both vertically and horizontally impersistent.

Cohesive material

Toward the south west of the WBI, the sand and clay layers overlap. The cohesive material can be described as being medium and high plasticity clay (CI to CH). From CPT tests, the clay was firm to stiff becoming very stiff and hard with depth and were generally stiff, between -5 m LAT and -10 m LAT according to SPT test results.

Gravel material

Gravel material was recorded beneath the sand and cohesive layers. This gravel was described as being mainly comprising chert grains which were rounded to sub rounded in angularity, and with cobbles and was recorded to a depth of approximately -25 m LAT. It is likely that the origin of this material is associated with the action of the Boyne River.

Particle size distribution tests show that the samples recovered were typically medium sized gravel with sand and trace clay fines. From SPT tests, the gravel material was generally medium dense to dense, becoming very dense around -20 m LAT.

Bedrock

Bedrock, described on the borehole logs as Metasediments and by the petrographic analysis as clay-cemented quartzose sandstone, underlies gravel and sand within the WBI. The rock is considered to be part of the Wandilla Formation, was found to be highly weatherised and extremely low to very low strength.

Bedrock was encountered on the west side of the section at approximately -14 m LAT, and not encountered at all on the eastern side of the WBI.



7.1.3 Western Basin

Similar to the Port Central Expansion, the Western Basin area is largely above 0 m LAT and comprises intertidal mud flats. Therefore only the geotechnical conditions around the section shown in Figure 12 can be summarised. Sea floor in this area is generally horizontal at around 0 m LAT.

Sea floor

A thin layer of sand dominated material with a significant fines content was observed in the central and southern part of the Western Basin that was investigated. To the north predominantly clay soils were encountered.

Cohesive (clay) material

Predominantly cohesive material in the form of clay was recorded from near sea floor level to at least -11 m LAT.

The clay material is high plasticity (CH) with a soft to very soft consistency from sea floor to between -5.1 m LAT and -6.2 m LAT, becoming stiff to very stiff and hard, from CPT and SPT tests.

Sand material

Sand dominated soils underlie the clay soils at depth. The sand was found to be medium dense from SPT tests, and dense from CPT and contained up to 26% fines.

Bedrock was not encountered in this area.

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Suomi NPP Satellite "Cyclones Lam and Marcia"

<http://earthobservatory.nasa.gov/IOTD/view.php?id=85335>. Licensed under Public Domain via Wikimedia Commons -

http://commons.wikimedia.org/wiki/File:Cyclones_Lam_and_Marcia.jpg#/media/File:Cyclones_Lam_and_Marcia.jpg

Williams, Brian (19 February 2015). "Cyclone Marcia to bring high winds, flooding to southern Queensland". *The Courier Mail*. Retrieved 18 February 2015



9 Limitations

This report has been prepared in accordance with the brief, where provided. The contents of the report are for the sole use of the client (GPC) and no responsibility or liability will be accepted to any third party. Data or opinions contained within this report may not be used in other contexts or for any other purposes without our prior review and agreement.

The findings and conclusions in this report are based on data collected at specific locations and by using suitable investigation techniques. Only a finite amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this draft report does not purport to completely describe all the site characteristics and properties.

Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes. It is strongly recommended that any plans and specifications prepared by others and relating to the content of this report, or any amendments to the original plans and specifications, are reviewed by Aurecon to verify that the intent of our findings and conclusions are properly reflected in the design. During construction we request the opportunity to review our interpretations if the exposed site conditions are significantly different from those inferred in this report.

Subsurface conditions can change over time. This should be borne in mind, particularly if this report is used after a protracted delay.

We recommend that this report not be reproduced either wholly or in part without consulting the author. If the report is reproduced, we recommended that it should be in full.

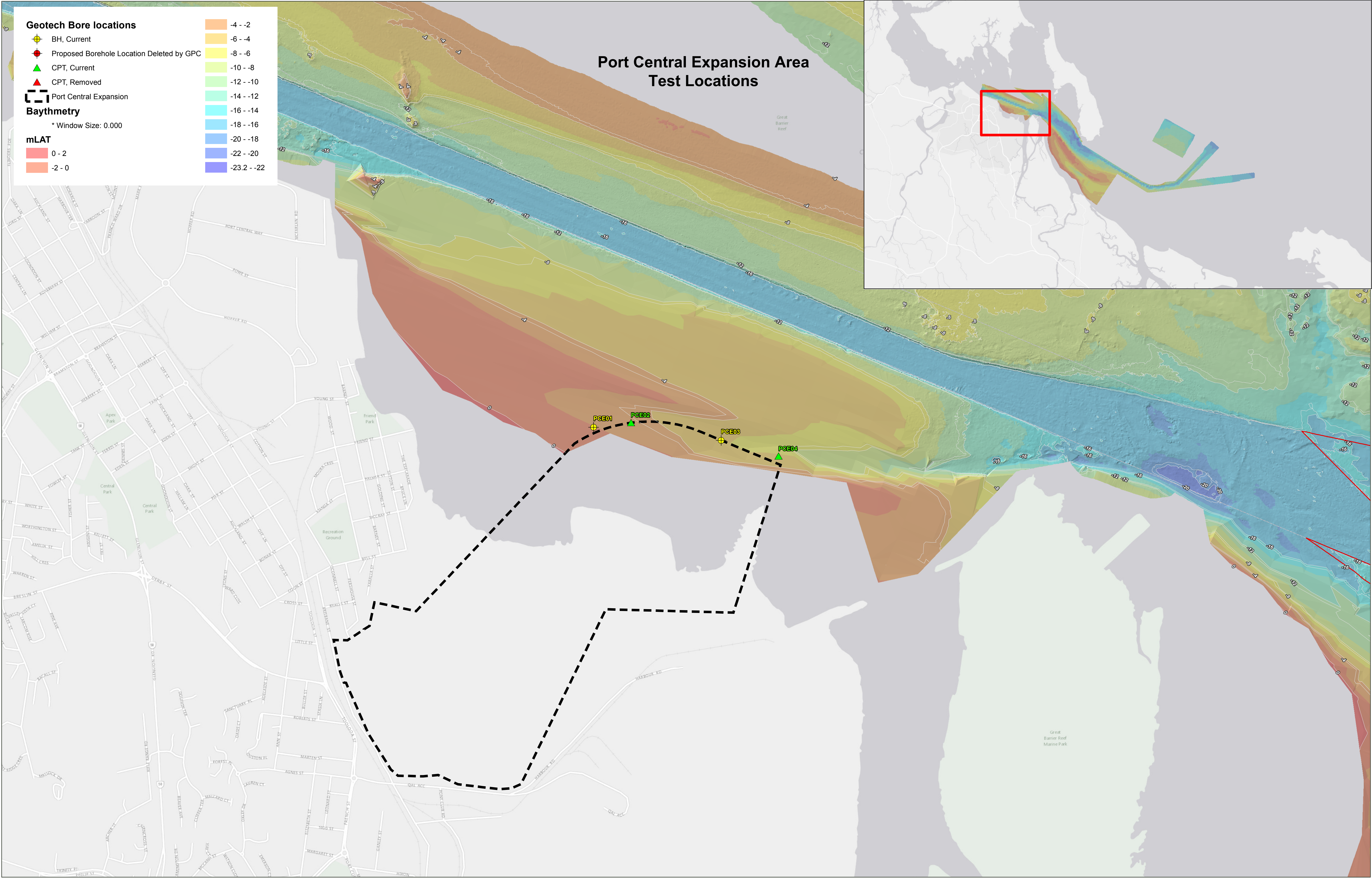
Appendices

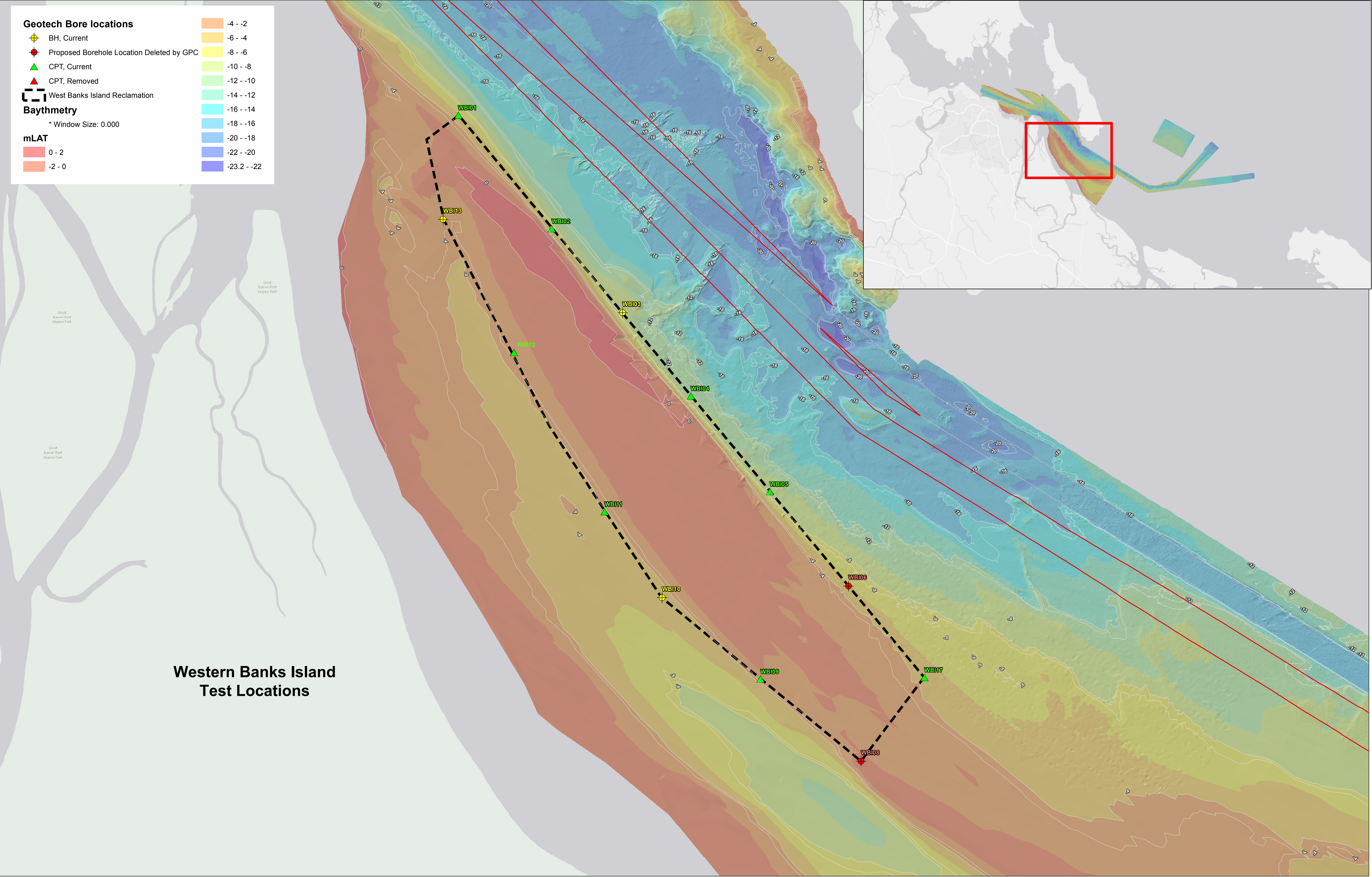


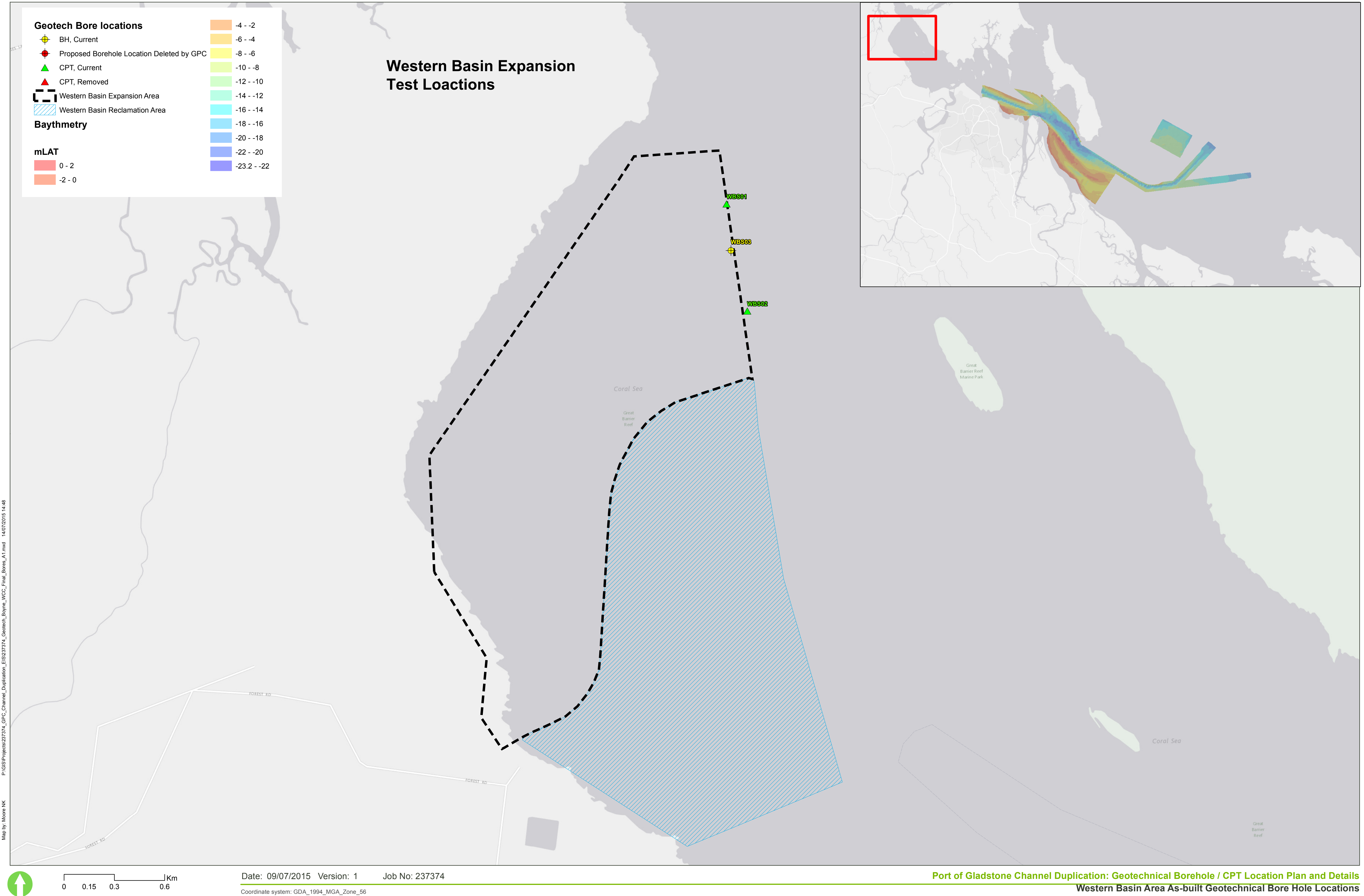


Appendix A

Borehole location plan









Appendix B

Explanatory notes

EXPLANATORY NOTES AND ABBREVIATIONS

The following information provides the terms and abbreviations used in Aurecon geotechnical borelogs and reports. Description of soil and rock are generally in accordance with the Unified Soil Classification System and Australian Standard AS1726-1993, Geotechnical Site Investigations. Soil and rock descriptions using established field techniques have been recorded independent of any laboratory test results. As far as is practicable the data contained on the log sheets is factual. Some interpretation is inevitable in the assessment of conditions between samples and of the origin of the materials. Standard colour charts have not been used.

Assessment of potential site contamination does not form part of this geotechnical report. Any reference to potential contaminants is for information only, and does not necessarily indicate the presence or absence of soil or groundwater contamination.

Soil Description

Soils are generally described in the borelog using the following sequence of terms:

[Drilling Information]; [USC Symbol]; [Soil Type, Colour, Plasticity/Particle Description, Structure]; [Moisture Condition]; [Consistency]

Unified Soil Classification Group Symbols

Typical Names	USC Symbol
Well graded gravels	GW
Poorly graded gravels	GP
Silty gravels	GM
Clayey gravels	GC
Inorganic silts of low plasticity.	ML
Inorganic silts of high plasticity	MH
Organic silts of low plasticity	OL
Organic clays of high plasticity	OH

Typical Names	USC Symbol
Well graded sands	SW
Poorly graded sands	SP
Silty sands	SM
Clayey sands	SC
Inorganic clay of low plasticity	CL
Inorganic clay of medium plasticity	CI
Inorganic clays of high plasticity	CH
Peat and other highly organic soils	PT

Soil Type and Particle Size

Major Divisions		Symbols	Subdivision	Particle Size
Coarse Grained Soils (more than half of material is larger than 0.075mm)	Boulders	G		> 200 mm
	Cobbles			63 mm – 200 mm
	Gravels (more than half of coarse fraction is larger than 2.36mm)		Coarse	20 mm – 63 mm
	Sands (more than half of coarse fraction is smaller than 2.36mm)	S	Medium	6 mm – 20 mm
			Fine	2.36 mm – 6 mm
			Coarse	0.6 mm – 2.36 mm
Fine Grained Soils (more than half of material is smaller than 0.075mm)	Silts	M		< 75 µm
	Clays	C		
	Organic	O		

Soil Plasticity

Term	Symbol	Field Assessment	
Low Plasticity	L	Cannot be rolled into threads when moist	
Medium Plasticity	I ; L / H	Can be rolled into	Shows some shrinkage on drying
High Plasticity	H	threads when moist.	Considerable shrinkage on drying. Greasy to touch. Cracks in dry material

Moisture Content

Term	Symbol	Field Assessment	
		Cohesive Soils	Granular Soils
Dry	D	Hard and friable or powdery	Runs freely through hands.
Moist	M	Feels cool, darkened in colour	
		Can be moulded	Tend to cohere.
Wet	W	Feels cool, darkened in colour	
		Free water forms on hands when handling	Tend to cohere

Consistency of Cohesive Soil

Term	Symbol	Field Assessment	Undrained Shear Strength (kPa)
Very Soft	VS	Exudes between fingers when squeezed.	< 12
Soft	S	Can be moulded by light finger pressure.	12 – 25
Firm	F	Can be moulded by strong finger pressure.	25 – 50
Stiff	St	Cannot be moulded by fingers. Can be indented by thumb pressure.	50 – 100
Very Stiff	VSt	Can be indented by thumb nail.	100 – 200
Hard	H	Difficult to indented by thumb nail.	> 200

Consistency of Non-cohesive Soil

Term	Symbol	Field Assessment	SPT N – Value	Density Index (%)
Very Loose	VL	Foot Imprints easily.	< 4	< 15
Loose	L	Can be excavated with spade. 50mm peg easily driven	4 – 10	15 – 35
Medium Dense	MD	Shovelling difficult	10 – 30	35 – 65
Dense	D	Needs pick for excavation. 50mm peg hard to drive.	30 – 50	65 – 85
Very Dense	VD	Picking difficult	> 50	> 85
Cemented	C	Cemented, indurated or large size particles	> 50	N / A

Rock Description

Rocks are generally described in the borelog using the following sequence of terms:

[Drilling Information]; [Weathering]; [Rock Type, Colour, Structure]; [Rock Quality Designation]; [Strength]; [Defects]

Rock Weathering Classification

Term	Symbol	Field Assessment
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely Weathered	XW	Soil is weathered to such an extend that it has 'soil' properties ie it either disintegrates or can be remoulded, in water.
Distinctly Weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in spores.
Slightly Weathered	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh	FR	Rock shows no sign of decomposition or staining.

Rock Strength

Strength	Symbol	Field Assessment		Point Load Index I _s (50) (MPa)
		By Hand	Hammer with Hand Held Specimen	
Extremely Low	EL	Easily remoulded to a material with soil properties.		< 0.03
Very Low	VL	Easily crumbled in 1 hand.		0.03 – 0.1
Low	L	Broken into pieces in 1 hand.		0.1 – 0.3
Medium	M	Broken with difficulty in 2 hands.		0.3 – 1.0
High	H		1 firm blow to break (rings).	1.0 – 3.0
Very High	VH		> 1 blow to break (rings)	3.0 – 10
Extremely High	EH		Many blows to break (rings).	> 10

Notes on rock strength

- These items refer to the strength of the rock material and not to the strength of the rock mass which may be considerably weaker due to the effect of rock defects.
- Anisotropy of rock material samples may affect the field assessment of strength
- The unconfined compressive strength is typically about 20 x I_s (50), but the multiplier may vary widely for different rock types.

Rock Defects

Defects are generally described using the following sequence of terms: [Defect Spacing]; [Depth (metres from surface), Defect Type, Defect Angle (degrees from horizontal), Surface roughness, Infill, Defect thickness (mm)]

Defect Spacing

Description	Spacing
Extremely closely spaced	< 20mm
Very closely spaced	20mm to 60mm
Closely spaced	60mm to 200mm
Medium spaced	0.2m to 0.6m
Widely spaced	0.6m to 2.0m
Very widely spaced	2.0m to 6.0m
Extremely widely spaced	> 6.0m

Defect Description

Defect Type	Surface Roughness		Coating or Infill
	Macro-surface geometry	Micro-surface geometry	
Bp – Bedding Parting	St – Stepped	Ro – Rough	cn – clean
Fp – Foliation Parting	Cu – Curved	Sm – Smooth	sn – stained
Jo – Joint	Un – Undulating	Sl – Slickensided	vn – veneer
Sh – Sheared Zone	Ir – Irregular		cg – coating
Cs – Crushed Seam	Pl – Planar		
Ds – Decomposed seam			
Is – Infilled Seam			

Water

▼	Measurement standing water level and date
▽	Water Noted
►	Water inflow
◄	Water / drilling fluid loss
Method	
BH	Backhoe bucket (rubber tyred machine)
EX	Excavator bucket (tracked machine)
HA	Hand Auger
AV	Auger drilling with steel "V" bit
AT	Auger drilling with Tungsten Carbide (TC) bit
HOA	Hollow Auger

Support

C	Casing
M	Mud
W	Water
RA	Rotary drilling with flushing of cuttings using
RM	
RC	
NMLC	Coring using an NMLC core barrel
RR	Tricone (Rock Roller) Bit
DB	Drag(Blade) Bit

Field Sampling and Testing

Symbol	Sample or Test
W	Water Sample
D	Disturbed Sample
B	Bulk Disturbed Sample
SPT	Standard Penetration Test
- 7, 11, 12 (eg)	Example of blows per 150mm penetration
- N = 23 (eg)	Penetration Resistance (blows for 300mm penetration following 150mm seating driven, Example of 11 + 12 = 23)
- 25/20mm (eg)	Partial Penetration, example of blow for the measured penetration
- N*	Inferred SPT Value

Symbol	Sample or Test
- RW	Rod Weight only causing penetration (N < I)
- HW	Hammer and rod weight only causing full penetration (N < I)
- HB	Hammer Bouncing (N* > 50)
U (50)	Undisturbed Sample (50mm diameter tube)
PP	Pocket Penetrometer Test (kPa)
FV	Field Shear Vane (kPa)
RQD	Rock Quality Designation expressed as : <u>Sum of lengths of sound core pieces > 100mm</u> Total Length of core section considered
DCP	Dynamic Cone Penetrometer measured in blows / 100mm



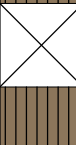
Appendix C

Borehole logs and core photos

Driller: **J & S Drilling**
Rig: **Edson 3000 G**
Easting: **325496.965**
Northing: **7361369.039**
Elevation: **-1.86 mLAT**

Commenced:9/04/2015
Completed: 9/04/2015

Sheet:1 of 3

Drilling Information				Soil Description				Comments and Testing			Strata Information		
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Reults in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)	
													VS VL
PQ3	SPT	20	-2.0	0 m: Silty CLAY Dark grey, high plasticity, trace fine sand, trace fine shell fragments, wet, very soft	CH	W		Preliminary Log Preliminary Log may be subject to alteration (Refer to attached Limitations of Preliminary Logs)	SPT@ -1.86 to -2.31mLAT 0,0,0 N=0		-2.0		
			-2.5	0.45 m: CORE LOSS 0.30m (0.45-0.75)					-2.5		0.5		
	SPT	100	-3.0	0.75 m: Silty CLAY As above.	CH				SPT@ -2.86 to -3.31mLAT 0,0,0 N=0		-3.0	1.0	
			-3.5	1.5 m: Becoming firm, increasing sand content, increasing shell fragments, moist	M		HSV@-3.56mLAT= 10kPA		-3.5		1.5		
	SPT	100	-4.0	1.8 m: Becoming very soft, with fine, sub-angular to sub-rounded gravels, with medium to coarse sand, with white shells, wet	W				SPT@ -3.86 to -4.31mLAT 0,0,0 N=0		-4.0	2.0	
			-4.5	2.6 m: Becoming dark grey, band content reducing, becoming fine to medium, moist, firm	M				-4.5		2.5		
	SPT	85	-5.0	2.8 m: Sand becoming trace, fine					SPT@ -4.86 to -5.31mLAT 1,2,3 N=5		-5.0	3.0	
			-5.5	3 m: Becoming soft to firm					-5.5		3.5		
	SPT	150	-6.0	3.5 m: Becoming brown	M - W		HSV@-5.66mLAT= 70kPa		SPT@ -5.86 to -6.31mLAT 5,6,7 N=13		-6.0	4.0	
			-6.5	3.7 m: Band of fine, sub-angular to sub-rounded gravels and shells, moist to wet (50mm)					-6.5		4.5		
				-6.5	4 m: Becoming stiff								
				-6.5	4.3 m: Becoming lighter brown, increasing fine to medium sand content								
				-6.5	4.8 m: Becoming mottled orange brown								
				-6.5	4.9 m: Sandy CLAY	CH	M						

Logged: **AC**
 Logged Date: **9/04/2015**
 Checked: **BT**
 Checked Date: **21/07/2015**

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Port Central Express
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 325496.965
Northing: 7361369.039
Elevation: -1.86 mLAT

Commenced: 9/04/2015
Completed: 9/04/2015

Sheet: 2 of 3

Drilling Information				Soil Description				Comments and Testing		Strata Information	
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	Depth Below Sea Bed Level (m)
PO3	SPT	100	-7.0	Orange brown, fine sand, high plasticity clays silt, moist, stiff 5 m: Sandy CLAY (Continued)	CH	M			SPT@ -6.86 to -7.31mLAT 4,6,10 N=16		-7.0
			-7.5								-7.5
	SPT	100	-8.0	6 m: Silty CLAY Orange brown, medium plasticity, trace fine sand, moist, very stiff	CI	M		U63@-7.86mLAT to -8.26mLAT HSV@-7.86mLAT= 50kPa			-8.0
			-8.5	6.5 m: Becoming grey, with fine sand							-8.5
	SPT	100	-9.0	7 m: Becoming grey mottled orange brown					SPT@ -8.86 to -9.31mLAT 9,9,12 N=21		-9.0
			-9.5	7.4 m: Clayey SAND Grey mottled orange, fine, high plasticity clay and silt, moist, medium dense 7.6 m: Increasing clay content	SC	M					-9.5
	SPT	100	-10.0						SPT@ -9.86 to -10.31mLAT 9,7,9 N=16		-10.0
			-10.5	8.7 m: Becoming orange mottled grey increasing clay content							-10.5
			-11.0	Continued as Cored Drill Hole							-11.0
			-11.5								-11.5

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC

Logged Date: 9/04/2015

Checked: BT

Checked Date: 21/07/2015

Client: **Gladstone Ports Corporation (GPC)**
Project: **GPC Offshore Geotechnical Investigation**
Location: **Port Central Express**
Project Number: **245852-003**

Driller: **J & S Drilling**
Rig: **Edson 3000 G**
Easting: **325496.965**
Northing: **7361369.039**
Elevation: **-1.86 mLAT**

Sheet:3 of 4

Preliminary Log
Preliminary Log may be subject to alteration
(Refer to attached Limitations of Preliminary Logs)

Remarks:

1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: **AC**

Logged Date: 9/04/2015

Checked: **BT**

Checked Date: 21/07/2015

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Port Central Express
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 325496.965
Northing: 7361369.039
Elevation: -1.86 mLAT

Commenced: 9/04/2015
Completed: 9/04/2015

Sheet: 4 of 4

Drilling Information				Rock Description		Intact Strength		Rock Mass Defects			Strata Information							
Drilling & Casing	LAT (m)	TCR (%)	RQD (%)	MATERIAL DESCRIPTION Rock Type; Colour; Grain Size; Mineralogy Characteristics; Fracture Details; Strength	Weathering	Is ₉₀ Alr/D (MPa) UCS (MPa)	ESTIMATED STRENGTH Is(50)						Defect Spacing (mm)	Defect Description (depth, type, angle, roughness, infill, thickness)	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)	
							● - Axial ○ - Diametral											
							VL	L	M	H	VH	EH						
NMLC	-12.0	100	40	10 m: METASILTSTONE (Continued) Becoming intensely fractured, subhorizontal to horizontal bedding, iron staining and clay infill in joints 10.1 m: Fractured zone, some shells (100mm), highly weathered 10.2 m: Becoming closely fractured highly weathered to moderately weathered	HW HW MW	3.06 MPa Is50 (D) = 0.87 MPa Is50 (A) = 2.29 MPa Is50 (D) = 1.51 MPa Is50 (A) = 3.31 MPa							20	10.15-10.24m - FZ,FE CLAY		-12.0	-12.0	
	-12.5												100	10.4m - FP,5°,CU,RO,CLAY		-10.5	-10.5	
	-13.0			10.9 m: Becoming dark grey with white veins and minor brown banding, closely fractured, subhorizontal to subvertical bedding, white quartz seams, moderately weathered, very high strength	MW	Is50 (D) = 0.40 MPa							300	10.6m - JT,0°,CU,RO,FE CLAY 10.67m - BP,15°,IR,RO,FE CLAY 10.75m - BP,10°,IR,RO,FE CLAY 10.77-10.8m - FP,30°,IR,RO,FE CLAY		-12.5	-12.5	
	-13.5	100	50	11.8 m: Iron staining becoming absent		Is50 (A) = 5.89 MPa Is50 (D) = 1.69 MPa							1000	11.18m - JT,0°,PL,RO,FE 11.36m - JT,0°,PL,RO,FE 11.52-11.54m - DI,* 11.7m - JT,5°,PL,RO,FE 11.8-11.85m - FP,40°,CU,RO,CN		-13.0	-13.5	
	-14.0			PCE01 Terminated at 12.00 m (-13.86mLAT)		Is50 (D) = 5.86 MPa											-12.0	-14.0
	-14.5																-12.5	-14.5
	-15.0																-13.0	-15.0
	-15.5																-13.5	-15.5
	-16.0																-14.0	-16.0
	-16.5																-14.5	-16.5

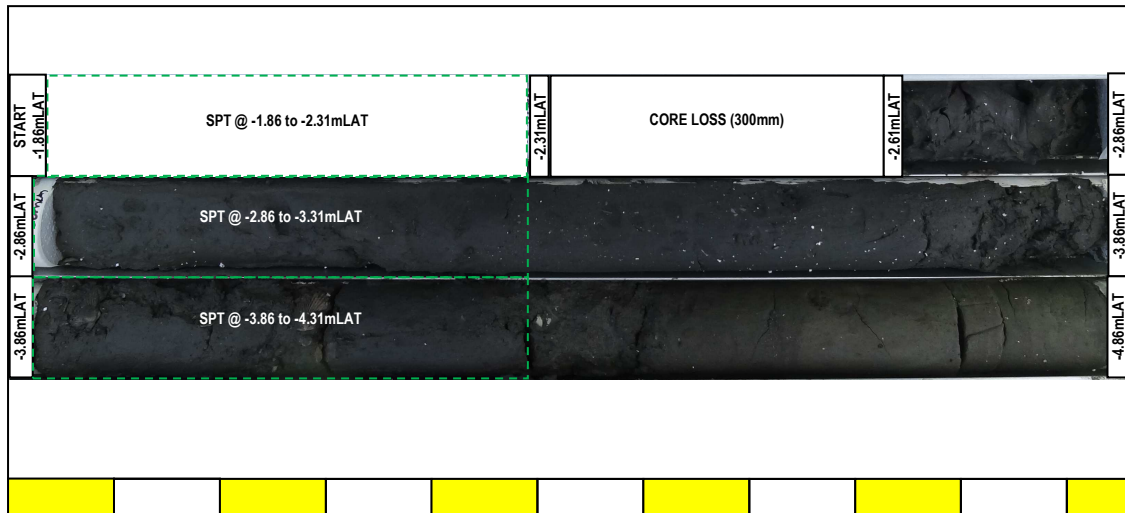
Preliminary Log
Preliminary Log may be subject to alteration
(Refer to attached Limitations of Preliminary Logs)

Remarks:
1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC
Logged Date: 9/04/2015
Checked: BT
Checked Date: 21/07/2015

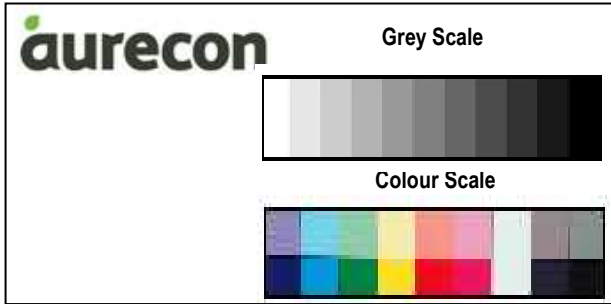


Location		Port Express Central	
Borehole Number		PCE1	
Box	1	of	4
Depth	-1.86	to	-4.86m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

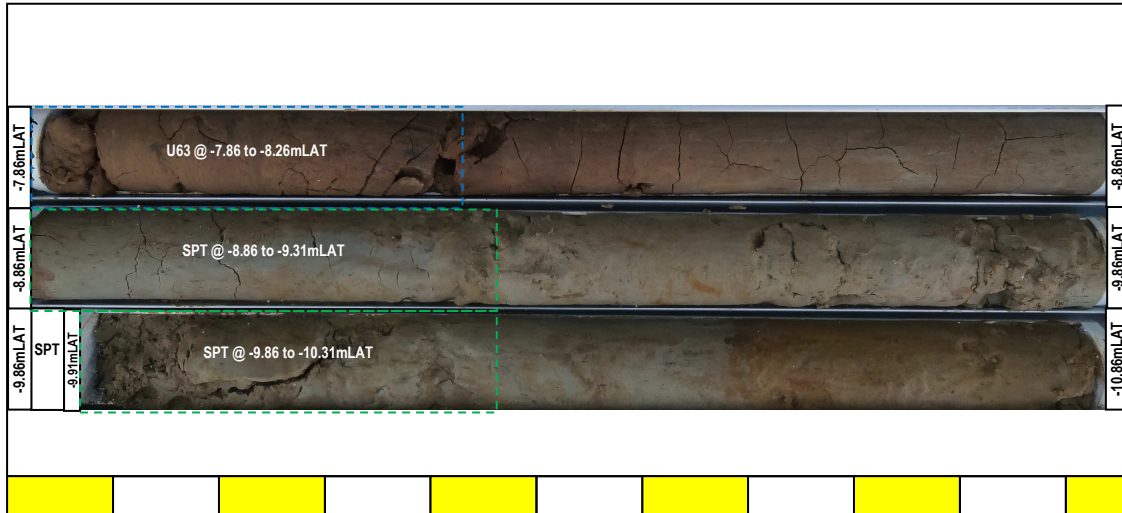


Location		Port Express Central	
Borehole Number		PCE1	
Box	2	of	4
Depth	-4.86	to	-7.86mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

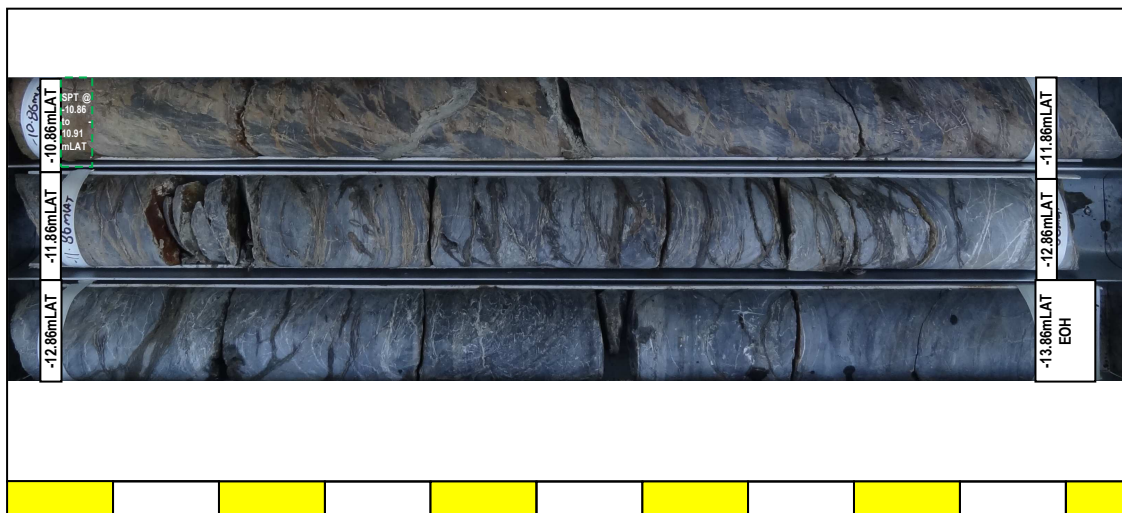




Location		Port Express Central	
Borehole Number		PCE1	
Box	3	of	4
Depth	-7.86	to	-10.86mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Port Express Central	
Borehole Number		PCE1	
Box	4	of	4
Depth	-10.86	to	-13.86mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	1	of	4
Depth	-1.86mLAT	to	-2.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	1	of	4
Depth	-2.86mLAT	to	-3.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		





SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	1	of	4
Depth	-3.86mLAT	to	-4.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

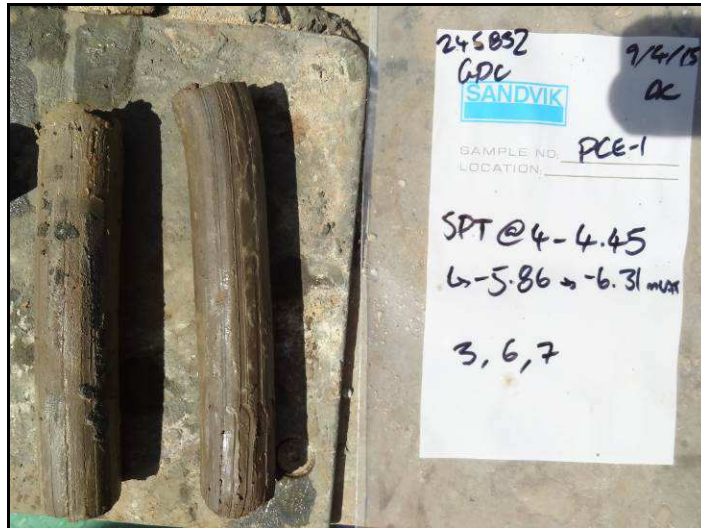
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Borehole Number		PCE-1	
Box	2	of	4
Depth	-4.86mLAT	to	-5.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

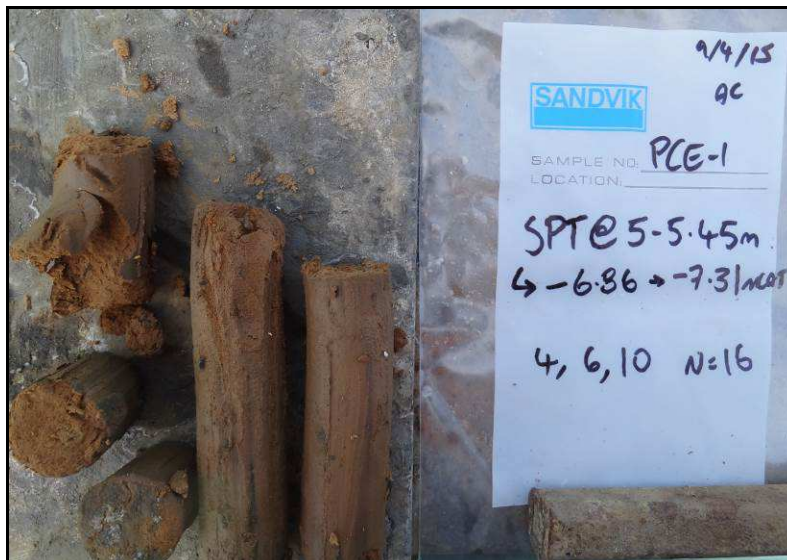
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Borehole Number		PCE-1	
Box	2	of	4
Depth	-5.86mLAT	to	-6.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	2	of	4
Depth	-6.86mLAT	to	-7.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	3	of	4
Depth	-8.86mLAT	to	-9.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	3	of	4
Depth	-9.86mLAT	to	-10.31mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-1	
Box	3	of	4
Depth	-10.86mLAT	to	-10.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Port Central Express
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 326246.392
Northing: 7361292.001
Elevation: -5.46 mLAT

Commenced: 8/04/2015
Completed: 8/04/2015

Sheet: 1 of 4

Drilling Information				Soil Description				Comments and Testing				Strata Information					
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS VL	S L	F MD	St D	VSt VD
PQ3	SPT		-5.5	0 m: Silty CLAY Dark grey green, high plasticity, trace medium to coarse sand, moist to wet, very soft	CH	M - W			SPT@ -5.46 to -5.91mLAT 0,0,0 N=0		-5.5						
		100	-6.0	0.45 m: CORE LOSS 0.05m (0.45-0.50) 0.5 m: Silty CLAY As above 0.7 m: Becoming moist, firm	CH	M		HSV@-6.06mLAT= 10kPa			-6.0	0.5					
	SPT		-6.5	1 m: Becoming increasing brown				HSVC@-6.46mLAT= 115kPa	SPT@ -6.46 to -6.91mLAT 3,3,5 N=8		-6.5	1.0					
		100	-7.0	1.3 m: Becoming with fine, sub-angular to subrounded gravels, trace shell fragments							-7.0	1.5					
			-7.5	1.7 m: Increasing sand content							-7.5	2.0					
	SPT		-8.0	2.2 m: Clayey SAND Grey mottled orange and brown, medium to coarse, with high plasticity clay and silt, trace fine, sub-rounded to sub-angular gravels, moist, medium dense to dense	SC	M			SPT@ -7.46 to -7.91mLAT 5,12,17 N=29		-8.0	2.5					
		100	-8.5	2.7 m: Becoming increasingly orange brown, fine to coarse							-8.5	3.0					
	SPT		-9.0	3 m: Becoming dense					SPT@ -8.46 to -8.91mLAT 11,15,22 N=37		-9.0	3.5					
		100	-9.5	3.6 m: Becoming fine to medium							-9.5	4.0					
	SPT		-10.0	4 m: Becoming fine, increasing clay content, medium dense					SPT@ -9.46 to -9.91mLAT 8,11,16 N=27		-10.0	4.5					
		100	-10.0	4.65 m: Silty CLAY Grey mottled orange with black lenses, high plasticity, with fine sand, moist, very stiff	CH	M					-10.0	4.5					

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC

Logged Date: 8/04/2015

Checked: BT

Checked Date: 21/07/2015

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Port Central Express
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 326246.392
Northing: 7361292.001
Elevation: -5.46 mLAT

Commenced: 8/04/2015
Completed: 8/04/2015

Sheet: 2 of 4

Drilling Information				Soil Description				Comments and Testing		Strata Information	
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	Depth Below Sea Bed Level (m)
PQ3	SPT	100	-10.5	5 m: Silty CLAY (Continued) Becoming stiff to very stiff.	CH	M			SPT@ -10.46 to -10.91mLAT 5,7,13 N=20		-10.5
			-11.0	5.3 m: Trace coarse sand							5.5
	SPT	90	-11.5	6 m: Becoming medium to high plasticity	CI-CH				SPT@ -11.46 to -11.91mLAT 4,7,12 N=19		6.0
			-12.0	6.35 m: Clayey SAND/ Sandy CLAY Orange brown mottled grey, medium to coarse, high plasticity clay and silt, with fine, sub-rounded to sub-angular gravels, trace fine shell fragments, trace red purple iron deposits, moist, medium dense 6.6 m: Gravels becoming trace 6.9 m: Sand becoming fine to coarse	SC	M					6.5
	SPT	100	-12.5						SPT@ -12.46 to -12.91mLAT 4,7,12 N=19		7.0
			-13.0	7.5 m: Becoming with fine to medium, sub-rounded to sub-angular gravels 7.6 m: Clayey GRAVEL Orange brown mottled grey, fine to medium, sub-rounded to angular gravels, with high plasticity clay and silt, with medium to coarse sand, moist to wet, dense	GC	M-W		Band of gravels (350mm)			7.5
	SPT	100	-13.5	7.95 m: Silty CLAY Grey mottled orange brown, high plasticity, with coarse sand, moist, very stiff		M			SPT@ -13.46 to -13.91mLAT 8,12,17 N=29		8.0
			-14.0								8.5
	SPT	100	-14.5	8.9 m: With white fine to coarse, angular gravels, with fine shell fragments				Possible reef remnant?	SPT@ -14.46 to -14.91mLAT 6,13,16 N=29		9.0
			-15.0								9.5

Remarks:
1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC
Logged Date: 8/04/2015
Checked: BT
Checked Date: 21/07/2015

Full File Name: F:\CTV\245852-GPC-GEOTECH AND GEOCHEM-2015\3-PROJECT DELIVERY\BOREHOLE LOGS\GEOCHEM-6-THAILAND-EDIT LOGS\GPC OFFSHORE GEOTECH INVESTIGATION-NBT-NBS-RGT-CB-BF-GF-T

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Port Central Express
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 326246.392
Northing: 7361292.001
Elevation: -5.46 mLAT

Commenced: 8/04/2015
Completed: 8/04/2015

Sheet: 3 of 4

Drilling Information				Soil Description				Comments and Testing		Strata Information											
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density						Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)				
							VS		S		F							St		Vst	
							VL	L	MD	D	VD										
PQ3	SPT	100	-15.5	10 m: Clayey SAND Grey mottled orange and brown, fine to coarse, high plasticity clay with silt, moist, dense 10.1 m: Becoming interbedded bands of orange coarse sand and grey, high plasticity clay lenses	SC	M							SPT@ -15.46 to -15.91mLAT 12,13,23 N=36		-15.5	10.5					
			-16.0	10.7 m: Becoming increasingly grey, fine to coarse																	
	SPT	100	-16.5	10.8 m: SAND Grey, medium to coarse, trace silt and high plasticity clay, trace fine, sub-angular gravels, moist to wet, dense 11 m: Orange brown band (3mm)	SP	M - W							SPT@ -16.46 to -16.91mLAT 10,18,26 N=44		-16.5	11.0					
			-17.0	11.3 m: Returning to grey																	
	SPT	100	-17.5	11.7 m: Becoming fine to coarse, increased silt and clay content 11.8 m: Becoming mottled orange brown	SW								SPT@ -17.26 to -17.71mLAT 5,16,29 N=45		-17.5	12.0					
			-18.0	12 m: Becoming coarse																	
	SPT	100	-18.5	12.6 m: Increasing silt content 12.7 m: Extremely Weathered (XW) SILTSTONE/METASILTSTONE recovered as Gravelly CLAY/SILT Grey with pale orange staining, high plasticity, fine to coarse sub-angular gravels, moist, hard	CH	M							Some rock structure observed, but fractured due to drilling process		-18.5	13.0					
			-19.0	Continued as Cored Drill Hole																	
				-19.5														-19.5	14.0		
				-20.0															-20.0	14.5	

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC
Logged Date: 8/04/2015
Checked: BT
Checked Date: 21/07/2015

Commenced:8/04/2015
Completed: 8/04/2015

Sheet:4 of 5

[illegible]

Logged: **AC**
 Logged Date: **8/04/2015**
 Checked: **BT**
 Checked Date: **21/07/2015**

Client: **Gladstone Ports Corporation (GPC)**
Project: **GPC Offshore Geotechnical Investigation**
Location: **Port Central Express**
Project Number: **245852-003**

Driller: **J & S Drilling**
Rig: **Edson 3000 G**
Easting: **326246.392**
Northing: **7361292.001**
Elevation: **-5.46 mLAT**

Sheet:5 of 5

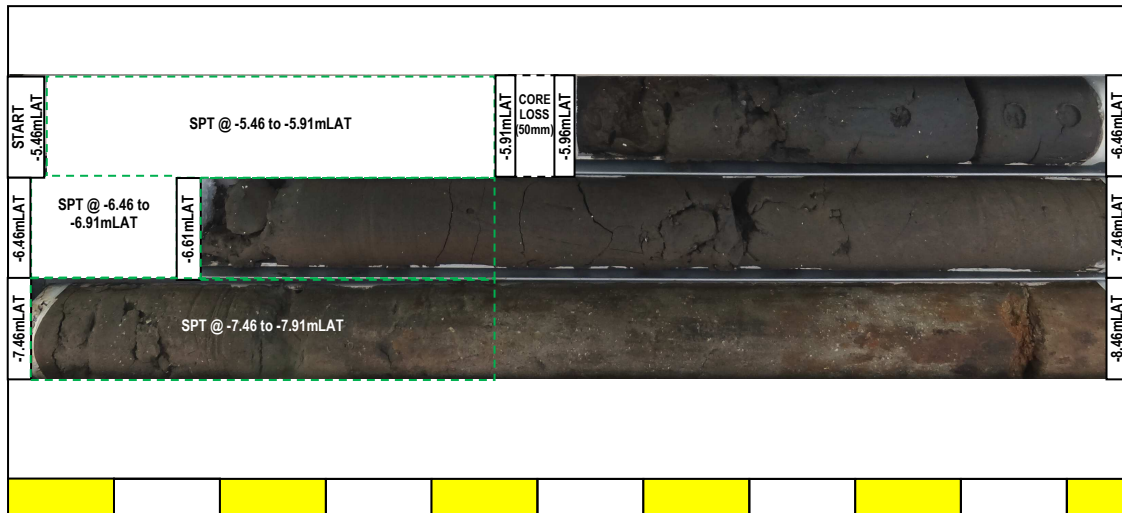
Remarks:

1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: **AC**
 Logged Date: **8/04/2015**
 Checked: **BT**
 Checked Date: **21/07/2015**



Location		Port Express Central	
Borehole Number		PCE3	
Box	1	of	6
Depth	-5.46	to	-8.46m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Port Express Central	
Borehole Number		PCE3	
Box	2	of	6
Depth	-8.46	to	-11.46mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

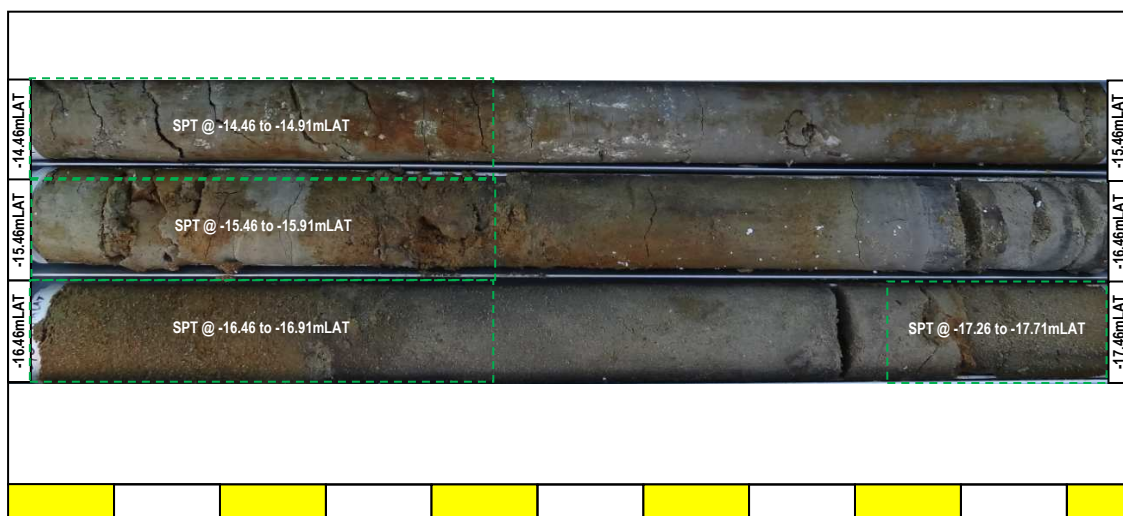




Location		Port Express Central	
Borehole Number		PCE3	
Box	3	of	6
Depth	-11.46	to	-14.46mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Port Express Central	
Borehole Number		PCE3	
Box	4	of	6
Depth	-14.46	to	-17.46mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		





Location		Port Express Central	
Borehole Number		PCE3	
Box	5	of	6
Depth	-17.46	to	-20.46mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Port Express Central	
Borehole Number		PCE3	
Box	6	of	6
Depth	-20.46	to	-21.46mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

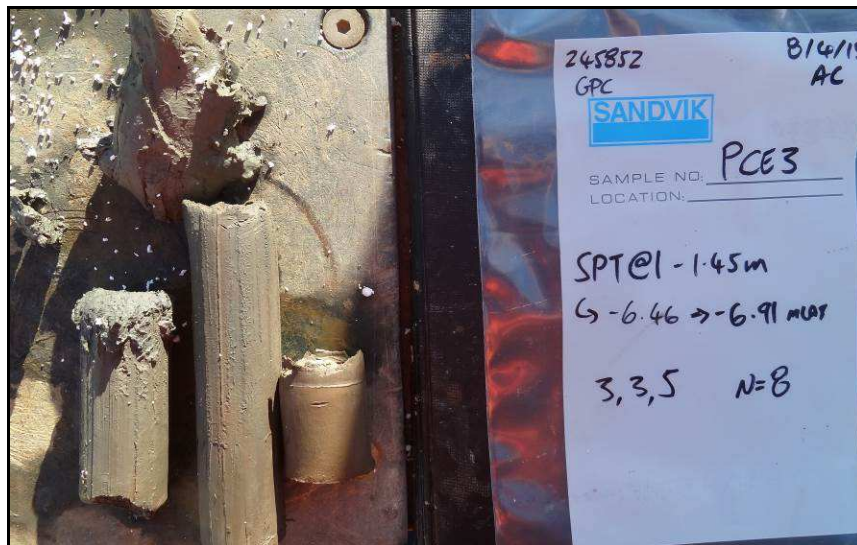
Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	1	of	6
Depth	-5.46mLAT	to	-5.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	1	of	6
Depth	-6.46mLAT	to	-6.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	1	of	6
Depth	-7.46mLAT	to	-7.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	2	of	6
Depth	-8.46mLAT	to	-8.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	2	of	6
Depth	-9.46mLAT	to	-9.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	2	of	6
Depth	-10.46mLAT	to	-10.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	3	of	6
Depth	-11.46mLAT	to	-11.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	3	of	6
Depth	-12.46mLAT	to	-12.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

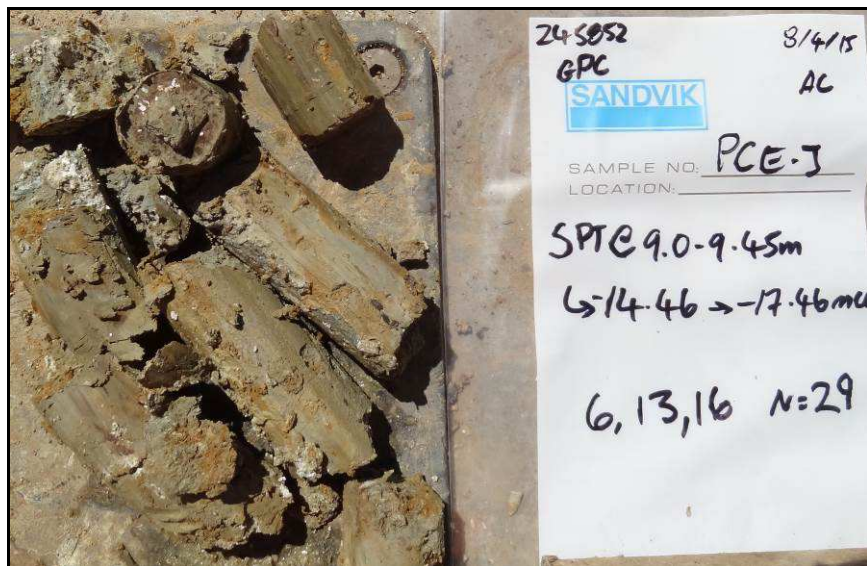
Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	3	of	6
Depth	-13.46mLAT	to	-13.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	4	of	6
Depth	-14.46mLAT	to	-14.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	4	of	6
Depth	-15.46mLAT	to	-15.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	4	of	6
Depth	-16.46mLAT	to	-16.91mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	5	of	6
Depth	-17.26mLAT	to	-17.71mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Port Central Expansion	
Borehole Number		PCE-03	
Box	5	of	6
Depth	-18.16mLAT	to	-18.45mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 331899.27
Northing: 7357856.98
Elevation: -9.05 mLAT

Commenced: 2/04/2015
Completed: 3/04/2015

Sheet: 1 of 4

Drilling Information				Soil Description				Comments and Testing		Strata Information					
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)			
													VS VL	S L	F MD
SPT	0	-9.5	-10.0	0 m: CORE LOSS 1.00m (0.00-1.00) Possibly loose fine sand	SP	W		Casing sunk under own weight for first metre	SPT@ -9.05 to -9.5mLAT 0,0,0 N=0		-9.5	0.5			
	70	-10.5	1 m: Gravelly SAND Brown with white and orange, red, and dark grey inclusions, fine, with medium to coarse sand and fine to medium gravel, typically sub-rounded to rounded with some angular inclusions, medium dense, wet	M					SPT@ -10.05 to -10.5mLAT 13,15,13 N=28				-10.5	1.5	
			1.58 m: Becoming medium to coarse gravel, content increasing												
	ES	-11.0	1.8 m: With fine to medium gravel										-11.0	2.0	
			1.95 m: With trace silt and clay 2 m: Becoming moist												
	90	-11.5	2.5 m: SAND Brown with white and orange, and dark grey inclusions, fine, trace silt, medium dense, wet	SP					W				SPT@ -11.05 to -11.5mLAT 5,10,11 N=21	-11.5	2.5
	ES	-12.0												-12.0	3.0
	79	-12.5	3.45 m: With silt and clay, with intermittent bands of coarse sand, fine to medium, sub-rounded gravel										SPT@ -12.05 to -12.5mLAT 10,12,10 N=22	-12.5	3.5
60	-13.0				SPT@ -12.75 to -13.2mLAT 13,16,12 N=28	-13.0	4.0								
100	-13.5					-13.5	4.5								
100	-14.0	4.6 m: Sandy GRAVEL Brown with white and orange, and dark grey inclusions, fine, trace silt, medium dense, wet	GP	W		-14.0									

Preliminary Log
Preliminary Log may be subject to alteration
(Refer to attached Limitations of Preliminary Logs)

Remarks:
1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: BJA
Logged Date: 2/04/2015
Checked: BT
Checked Date: 21/07/2015

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 331899.27
Northing: 7357856.98
Elevation: -9.05 mLAT

Commenced: 2/04/2015
Completed: 3/04/2015

Sheet: 2 of 4

Drilling Information				Soil Description				Comments and Testing			Strata Information						
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS	S	F	St	VSt
													VL	L	MD	D	VD
SPT	0	14.5	5 m: Sandy GRAVEL Brown with white, red, orange, and dark grey inclusions, fine to medium, sub-rounded to rounded gravel, fine to medium sand, trace coarse gravels and cobbles, dense, wet	GP	W				SPT@ -14.05 to -14.5mLAT 23,20,17 N=37		-14.5	5.5					
			5.45 m: CORE LOSS 0.55m (5.45-6.00) Likely due to increased coarse gravel and cobble content														
	72	15.5	6 m: Sandy GRAVEL Brown with white, red, orange, and dark grey inclusions, fine to medium, sub-rounded to rounded gravel, fine to medium sand, trace coarse gravels and cobbles content increasing, very dense, wet	GP	W				SPT@ -15.05 to -15.33mLAT 26,30/130mm HB N*=69		-15.5	6.5					
	0	16.0	7 m: With fine to coarse sand content increasing, fine to coarse gravels	GP	W				SPT@ -16.05 to -16.33mLAT 16,30/130mm HB N*=69		-16.0	7.0					
			7.28 m: CORE LOSS 0.27m (7.28-7.55)														
	90	17.0	7.55 m: Sandy GRAVEL Brown with white, red, orange, and dark grey inclusions, fine to medium, sub-rounded to rounded gravel, fine to medium sand, trace cobbles, dense, wet	GP	W			Drilling technique likely flushing out fines from core sample			-17.0	8.0					
			8 m: Becoming medium dense														
	55	17.5							SPT@ -17.05 to -17.5mLAT 8,6,10 N=16		-17.5	8.5					
	55	18.0									-18.0	9.0					
			9 m: Coarse gravel content reducing, fine to medium gravels	SPT@ -18.05 to -18.5mLAT 10,12,13 N=25													
55	18.5							Drilling technique likely flushing out fines from core sample			-18.5	9.5					
55	19.0										-19.0						
		9.8 m: Becoming medium coarse gravel, sand content reducing															

Remarks:
1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: BJA
Logged Date: 2/04/2015
Checked: BT
Checked Date: 21/07/2015

Driller: **J & S Drilling**
Rig: **Edson 3000 G**
Easting: **331899.27**
Northing: **7357856.98**
Elevation: **-9.05 mLAT**

Commenced: **2/04/2015**
Completed: **3/04/2015**

Sheet:3 of 4

Drilling Information				Soil Description				Comments and Testing			Strata Information				
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Reults in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)			
													VS VL	S L	F MD
SPT	55	-19.5	10 m: Sandy GRAVEL Brown with white, red, orange, and dark grey inclusions, fine to medium, sub-rounded to rounded gravel, fine to medium sand, trace cobbles, medium dense, wet	GP	W				SPT@ -19.05 to -19.5mLAT 12,12,14 N=26		-19.5	10.5			
			10.6 m: Sand content reducing, coarse gravels increasing, trace cobbles						-20.0				11.0		
			11 m: Becoming very dense												
	65	-20.5	11.6 m: COBBLE Brown, light and dark brown, dark grey inclusions, coarse, sub-rounded to rounded gravels, trace fine to coarse sand, very dense, wet, very high strength cobble stones	GP	W				SPT@ -20.05 to -20.5mLAT 23,30,26 N=56		-20.5	11.5			
			11.74 m: CORE LOSS 0.41m (11.74-12.15)						-21.0				12.0		
			12.15 m: COBBLE Brown, light and dark brown, dark grey inclusions, coarse, sub-rounded to rounded gravels, trace fine to coarse sand, very dense, wet, very high strength cobble stones												
	100	-22.0	13 m: Becoming dense	GP	W						-22.0	13.0			
			13.45 m: CORE LOSS 0.05m (13.45-13.50)										-22.5	13.5	
			13.5 m: COBBLE Brown, light and dark brown, dark grey inclusions, coarse, sub-rounded to rounded gravels, trace fine to coarse sand, very dense, wet, very high strength cobble stones												
	SPT	55	-23.0	13.7 m: Clayey GRAVEL Brown with grey mottling and white, brown and dark grey gravel inclusions, high plasticity, stiff, moist	CH	M						-23.0	14.0		
				14 m: Becoming hard										-23.5	14.5
				14.44 m: CORE LOSS 0.31m (14.44-14.75)											
25	-24.0	14.75 m: GRAVEL Brown, light and dark brown, dark grey inclusions, coarse, sub-rounded to rounded gravels, trace fine to	GW	W						-24.0					

Logged: **BJA**
 Logged Date: **2/04/2015**
 Checked: **BT**
 Checked Date: **21/07/2015**

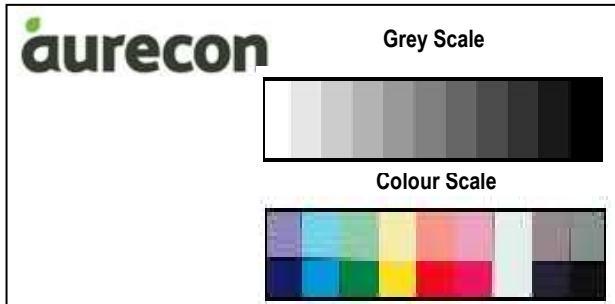
Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 331899.27
Northing: 7357856.98
Elevation: -9.05 mLAT

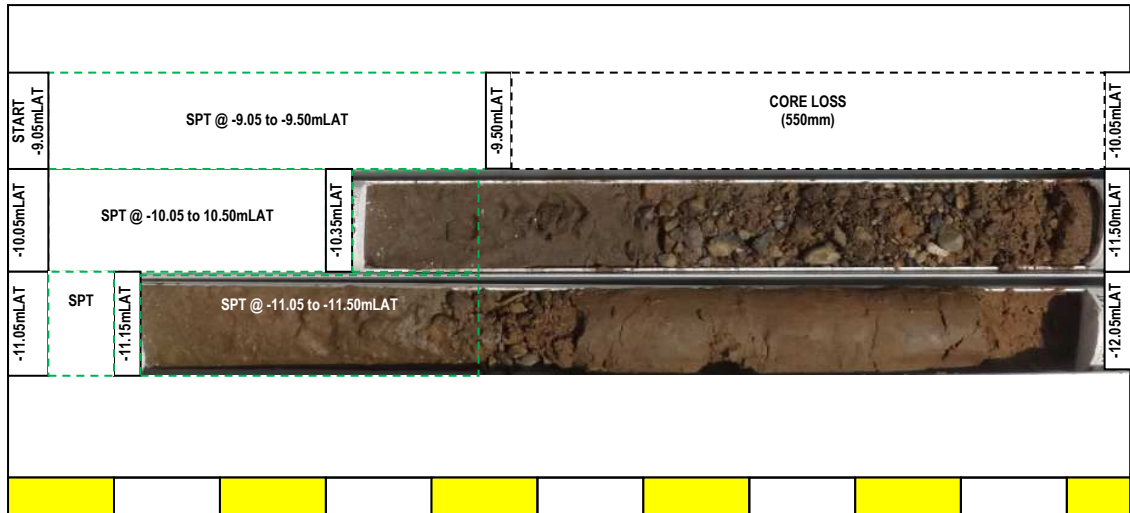
Commenced: 2/04/2015
Completed: 3/04/2015

Sheet: 4 of 4

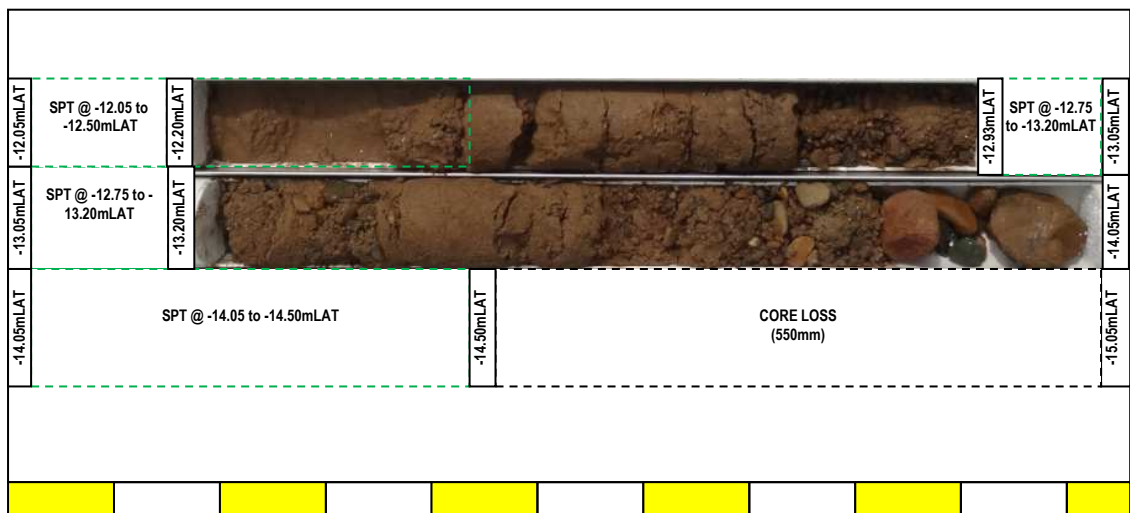
Drilling Information				Soil Description				Comments and Testing		Strata Information							
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS	S	F	St	VSt
													VL	L	MD	D	VD
SPT	55	-24.5	coarse sand, very dense, wet, very high strength cobble stones 15 m: GRAVEL Brown, red, white, dark grey gravel particles, coarse, sub-rounded to rounded gravels, trace cobbles, very dense, wet, possibly with sand	GW	W				SPT@ -24.05 to -24.5mLAT 28,28,29 N=57		-24.5	15.5					
		-25.0							-25.0		16.0						
		-25.5	WBI03 Terminated at 16.00 m (-25.05mLAT)								-25.5	16.5					
		-26.0										-26.0	17.0				
		-26.5										-26.5	17.5				
		-27.0										-27.0	18.0				
		-27.5										-27.5	18.5				
		-28.0										-28.0	19.0				
		-28.5										-28.5	19.5				
		-29.0										-29.0					



Location		Western Banks Island	
Borehole Number		WBI03	
Box	1	of	6
Depth	-9.05	to	-12.05m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

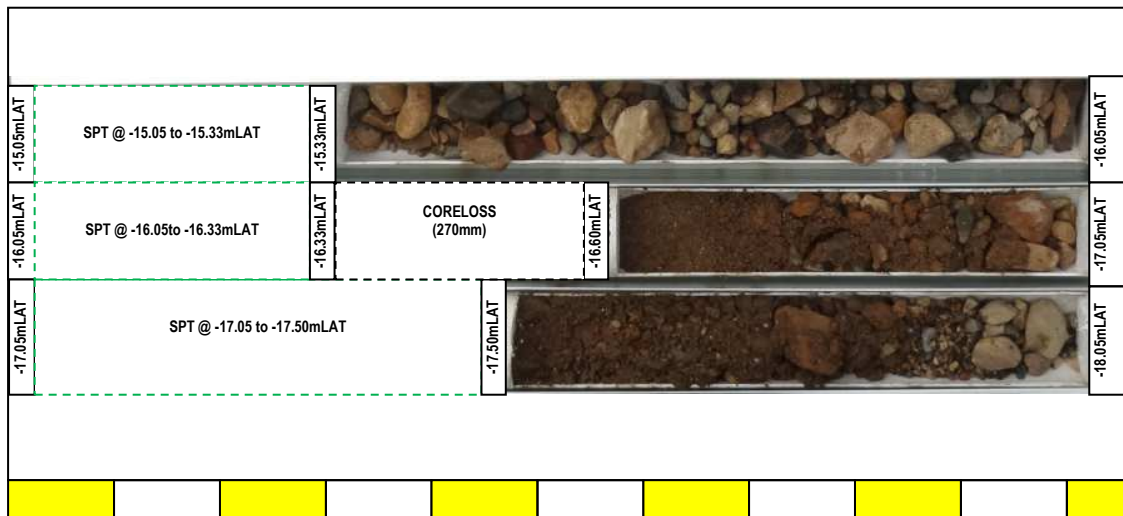


Location		Western Banks Island	
Borehole Number		WBI03	
Box	2	of	6
Depth	-12.05	to	-15.05m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

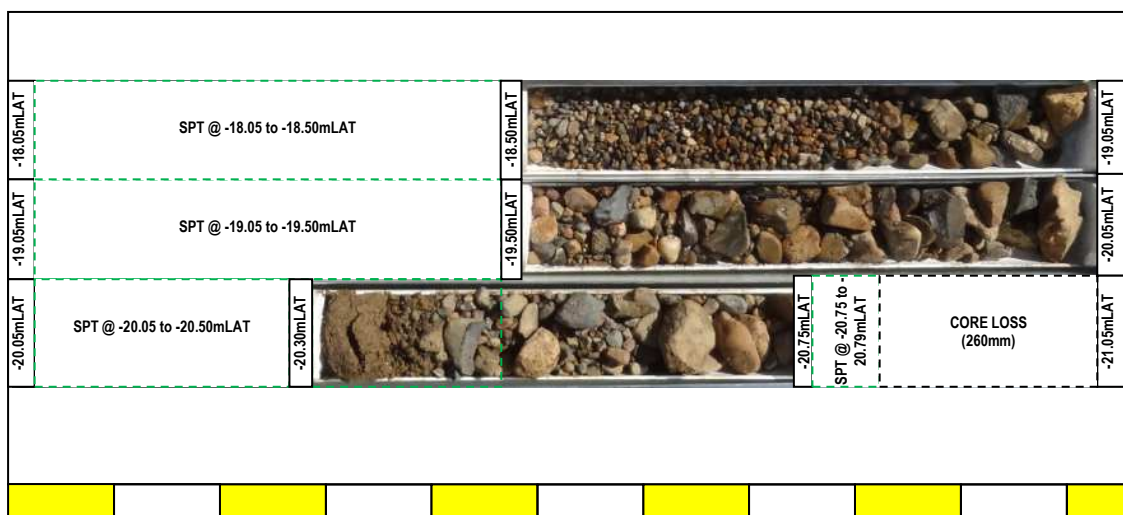




Location		Western Banks Island	
Borehole Number		WBI03	
Box	3	of	6
Depth	-15.05	to	-18.05mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

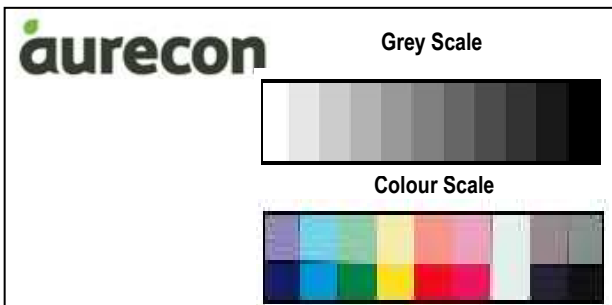
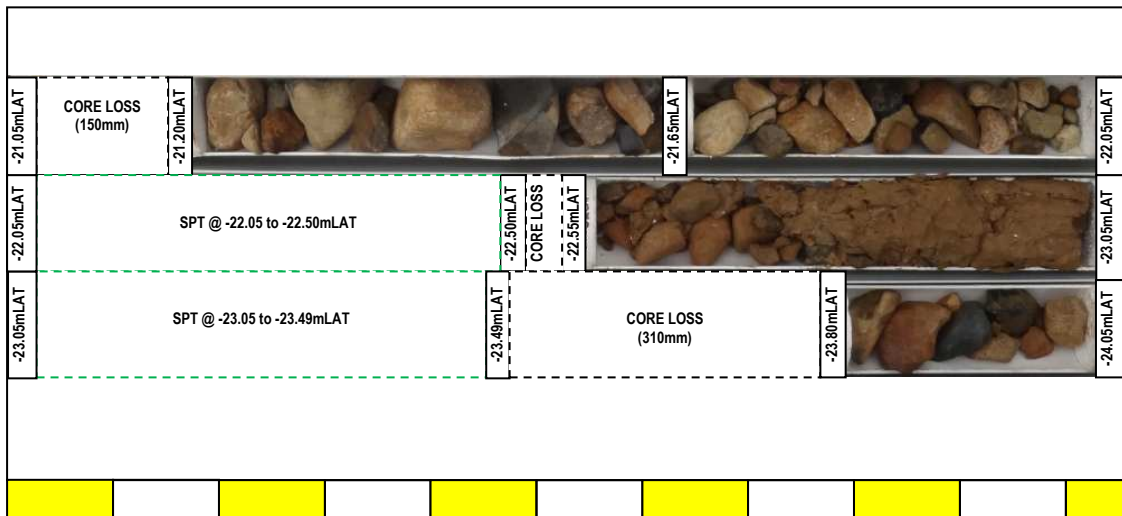


Location		Western Banks Island	
Borehole Number		WBI03	
Box	4	of	6
Depth	-18.05	to	-21.05mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		





Location		Western Banks Island	
Borehole Number		WBI03	
Box	5	of	6
Depth	-21.05	to	-24.05mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Western Banks Island	
Borehole Number		WBI03	
Box	6	of	6
Depth	-24.05	to	-25.05mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		





SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	1	of	6
Depth	-9.05mLAT	to	-9.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	1	of	6
Depth	-10.05mLAT	to	-10.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo

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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

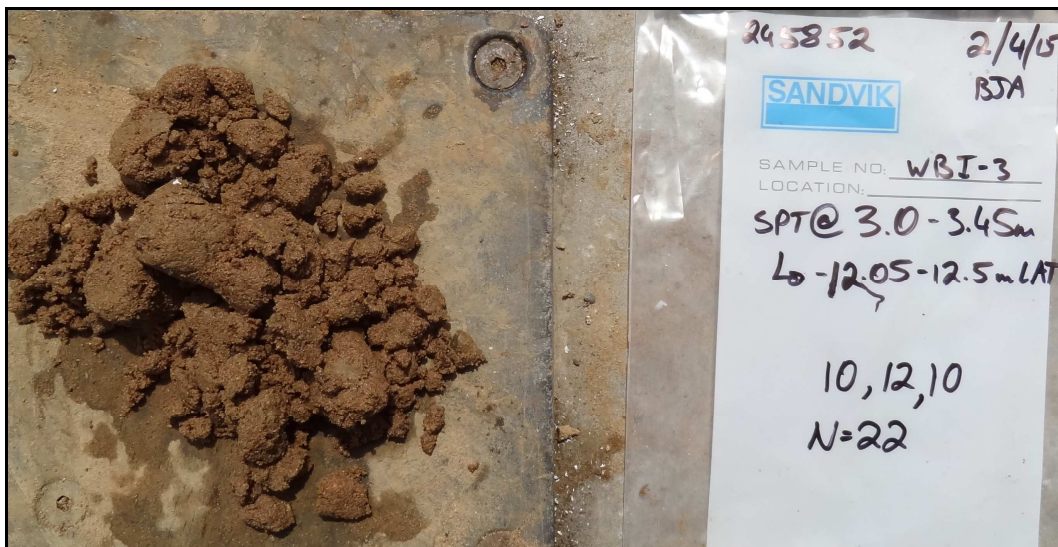
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Borehole Number		WBI-03	
Box	1	of	6
Depth	-11.05mLAT	to	-11.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

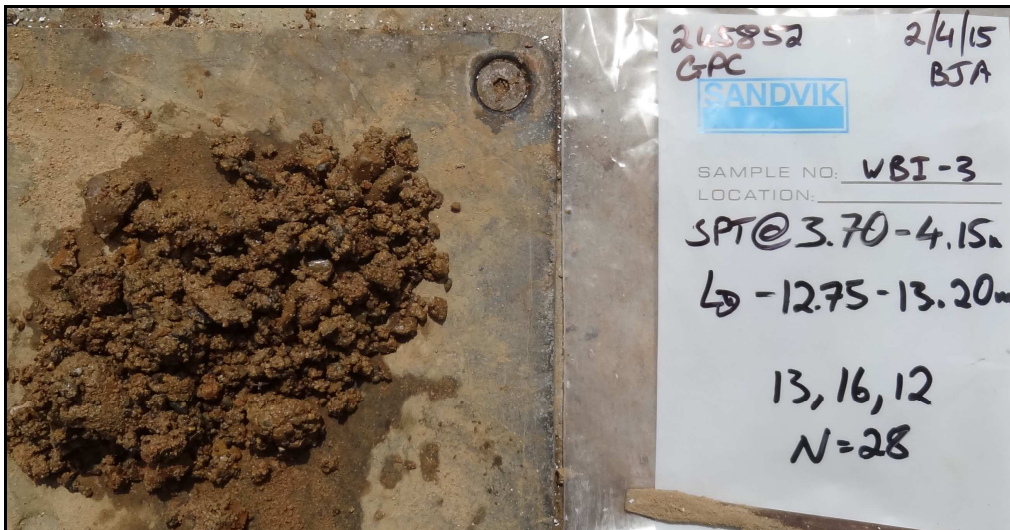
Location		Western Banks Island	
Borehole Number		WBI-03	
Box	2	of	6
Depth	-12.05mLAT	to	-12.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	2	of	6
Depth	-12.75mLAT	to	-13.20mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI03	
Box	2	of	6
Depth	-14.05mLAT	to	-14.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	3	of	6
Depth	-15.05mLAT	to	-15.33mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	3	of	6
Depth	-16.05mLAT	to	-16.33mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo

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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	3	of	6
Depth	-17.05mLAT	to	-17.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	4	of	6
Depth	-18.05mLAT	to	-18.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	4	of	6
Depth	-19.05mLAT	to	-19.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	4	of	6
Depth	-20.05mLAT	to	-20.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

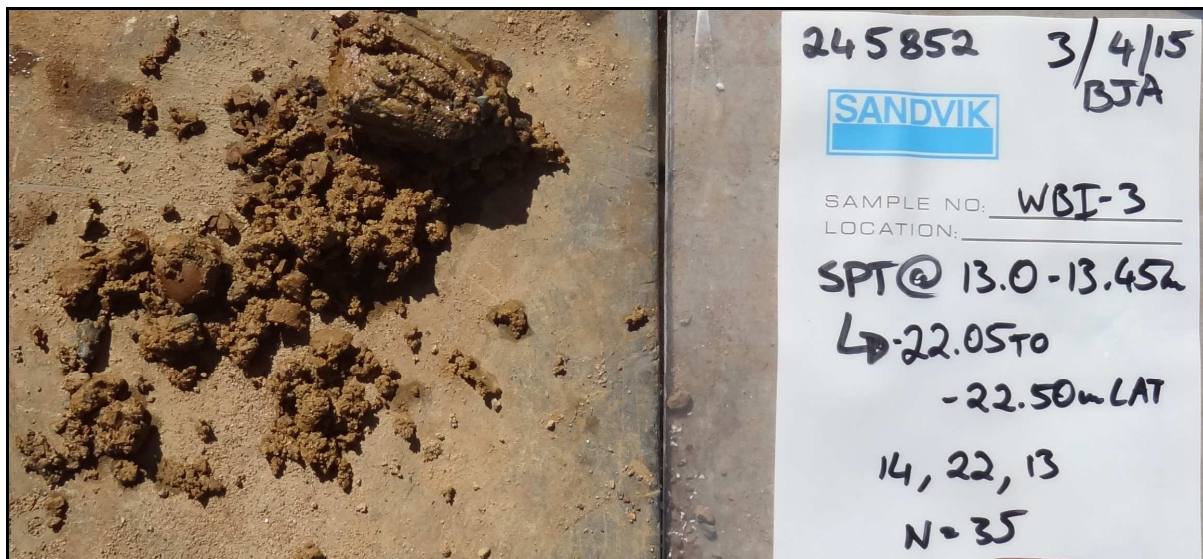
Location		Western Banks Island	
Borehole Number		WBI-03	
Box	5	of	6
Depth	-20.75mLAT	to	-20.79mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	5	of	6
Depth	-22.05mLAT	to	-22.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	5	of	6
Depth	-23.05mLAT	to	-23.49mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	6	of	6
Depth	-24.05mLAT	to	-24.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

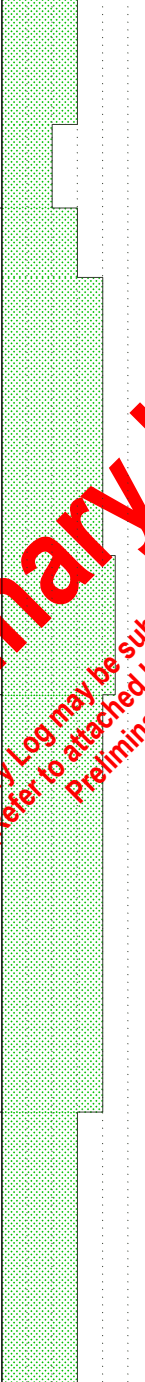


Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 332189.944
Northing: 7355766.614
Elevation: -5.1 mLAT

Commenced: 4/04/2015
Completed: 5/04/2015

Sheet: 1 of 3

Drilling Information				Soil Description				Comments and Testing		Strata Information											
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density						Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)				
							VS	S	F	St	VSt	VL						L	MD	D	VD
	SPT	55	-5.5	0 m: Sandy CLAY Bluish grey with brown, fine sand, medium to high plasticity, firm, moist	CI-CH	M											SPT@ -5.1 to -5.55mLAT 2,3,5 N=8		-5.5	0.5	
			0.45 m: Sand content increasing, becoming soft																		
	ES			0.75 m: CLAY Bluish grey, high plasticity, trace fine sand, firm, moist	CH	M											-6.0	1.0			
	ES		1 m: With brown mottling, trace fine to medium gravels, becoming stiff																		
	SPT	85	-6.5	1.45 m: Becoming brown with grey mottling													-6.5	1.5			
	ES		-7.0	2 m: Becoming black mottling and spots, trace fine sand and gravel, low plasticity, stiff to very stiff	CL												-7.0	2.0			
	SPT	-7.5	2.38 m: Becoming black mottling increasing, with fine sand and gravel																		
		100	-8.0	2.5 m: Sandy CLAY Brown with light orange, dark red and grey mottling, medium plasticity clay fines, fine sand, with silt, stiff, moist	CL	M											-8.0	2.5			
	ES																				
	SPT	100	-8.5	3.8 m: Sand content increasing													-8.5	3.0			
ES	-9.0		4 m: SAND Brown with orange and some grey mottling, fine, trace medium to coarse sand, trace silt, medium dense, moist	SP	M	-9.0	4.0														
SPT	-9.5	4.15 m: With high plasticity clay																			
	55	-9.5	4.7 m: Clay no longer present			-9.5	4.5														
		-10.0				-10.0															

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 332189.944
Northing: 7355766.614
Elevation: -5.1 mLAT

Commenced: 4/04/2015
Completed: 5/04/2015

Sheet: 2 of 3

Drilling Information				Soil Description				Comments and Testing		Strata Information							
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS	S	F	SI	VSt
													VL	L	MD	D	VD
	SPT	100	-10.5	5 m: SAND (Continued) Becoming dense	SP	M			SPT@ -10.1 to -10.55mLAT 9,15,16 N=31		-10.5	5.5					
			-11.0														
	SPT	95	-11.5	6 m: Becoming medium dense				SPT@ -11.1 to -11.55mLAT 5,7,10 N=17		-11.5	6.5						
			-12.0														
	SPT	85	-12.5	7 m: Clayey SAND Light grey with orange mottling and dark grey gravels, fine, trace medium sand, high plasticity clay fines, trace fine, sub-angular to sub-rounded gravel, dense, moist	SC	M			SPT@ -12.1 to -12.525mLAT 7,11,30/125mm HB N*=47		-12.5	7.5					
			-13.0	7.3 m: Clayey gravelly SAND Brown with orange and dark grey mottling and red and grey gravels, fine to medium, fine to coarse, sub-angular to sub-rounded gravel, dense, moist	SC	M											
			-13.5	7.65 m: CORE LOSS 0.15m (7.65-7.80)	SC												
			-14.0	7.8 m: Clayey gravelly SAND Dark brown, fine to medium, fine to coarse, sub-angular to sub-rounded gravel, clay content reduced, dense, moist	SC	M											
	SPT	80	-13.5	8.4 m: Clayey SAND Light grey with orange mottling, fine, high plasticity clay, trace silt, very dense, moist	SC	M			SPT@ -13.1 to -13.3mLAT 21,30/150mm HB N*=180		-13.5	8.5					
			-14.0														
	SPT	95	-14.5	Continued as Cored Drill Hole					SPT@ -14.1 to -14.23mLAT 30/130mm HB N*=69		-14.5	9.5					
			-15.0														

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: BJA

Logged Date: 4/04/2015

Checked: BT

Checked Date: 21/07/2015

Preliminary Log

Preliminary Log may be subject to alteration
(Refer to attached Limitations of
Preliminary Logs)

Remarks:

1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: **BJA**

Logged Date: 4/04/2015

Checked: **BT**

Checked Date: 21/07/2015

Client: **Gladstone Ports Corporation (GPC)**
Project: **GPC Offshore Geotechnical Investigation**
Location: **Western Banks Island**
Project Number: **245852-003**

Driller: **J & S Drilling**
Rig: **Edson 3000 G**
Easting: **332189.944**
Northing: **7355766.614**
Elevation: **-5.1 mLAT**

Sheet:4 of 4

10 m

Is50
(A) =
0.02
MPa
Is50
(D) =
0.03
MPa

Is50
(D) =
0.06
MPa

Preliminary Log

Preliminary Log may be subject to alteration
(Refer to attached Limitations of
Preliminary Logs)

Remarks:

1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: **BJA**

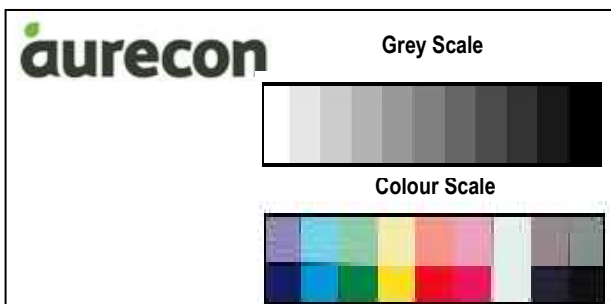
Logged Date: 4/04/2015

Checked: **BT**

Checked Date: 21/07/2015



Location		Western Banks Island	
Borehole Number		WBI10	
Box	1	of	4
Depth	-5.10	to	-8.10m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Western Banks Island	
Borehole Number		WBI10	
Box	2	of	4
Depth	-8.10	to	-11.10mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		





Location		Western Banks Island	
Borehole Number		WBI10	
Box	3	of	4
Depth	-11.10	to	-14.10mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Western Banks Island	
Borehole Number		WBI10	
Box	4	of	4
Depth	-14.10	to	-17.10mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		





SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	1	of	4
Depth	-5.10mLAT	to	-5.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	1	of	4
Depth	-6.10mLAT	to	-6.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		





SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	1	of	4
Depth	-7.10mLAT	to	-7.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

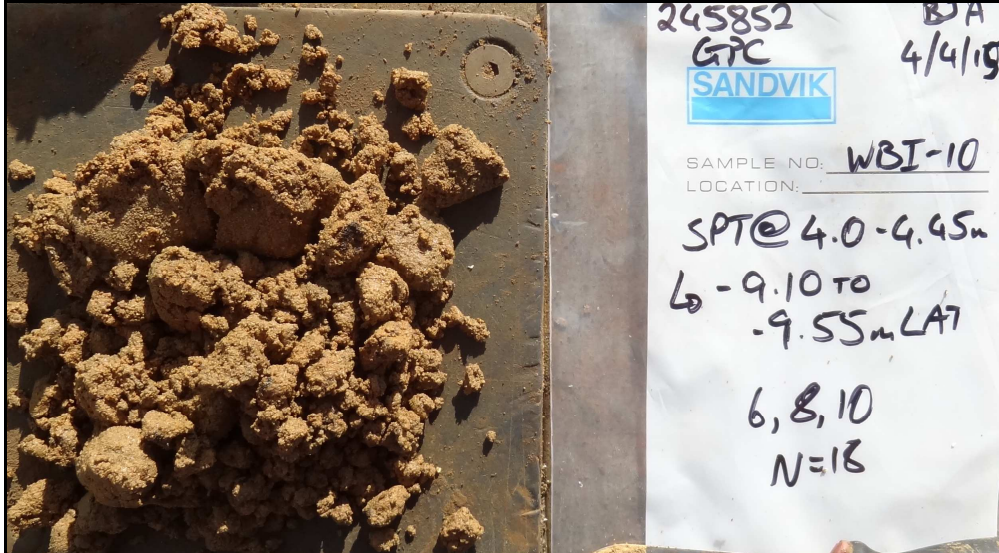
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Borehole Number		WBI-10	
Box	2	of	4
Depth	-8.10mLAT	to	-8.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	2	of	4
Depth	-9.10mLAT	to	-9.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	2	of	4
Depth	-10.10mLAT	to	-10.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		





SPT Sample Photo
GPC Offshore Geotechnical
Investigation

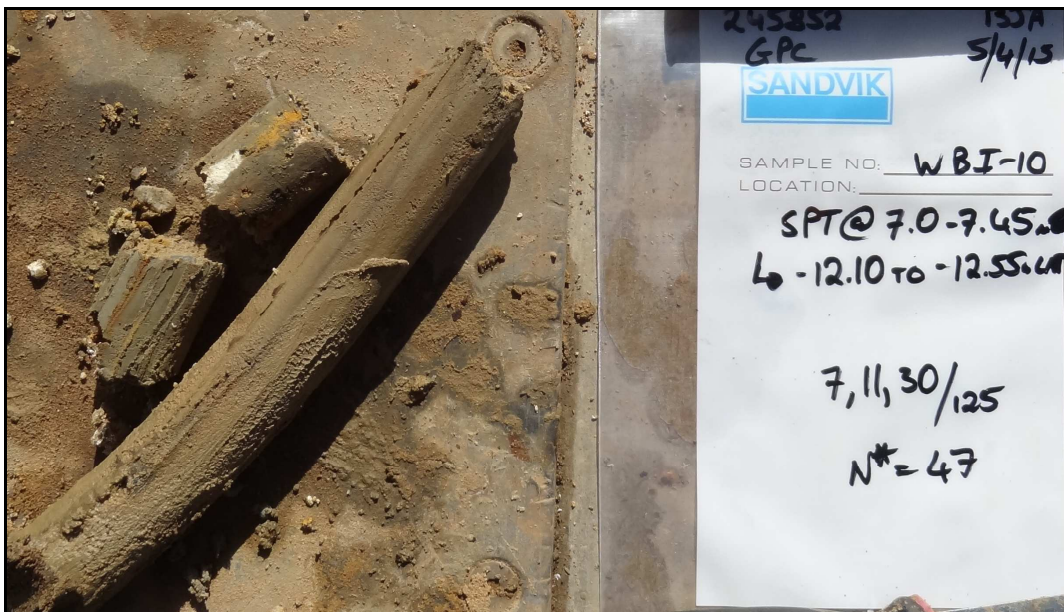
Location		Western Banks Island	
Borehole Number		WBI-10	
Box	3	of	4
Depth	-11.10mLAT	to	-11.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	3	of	4
Depth	-12.10mLAT	to	-12.55mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

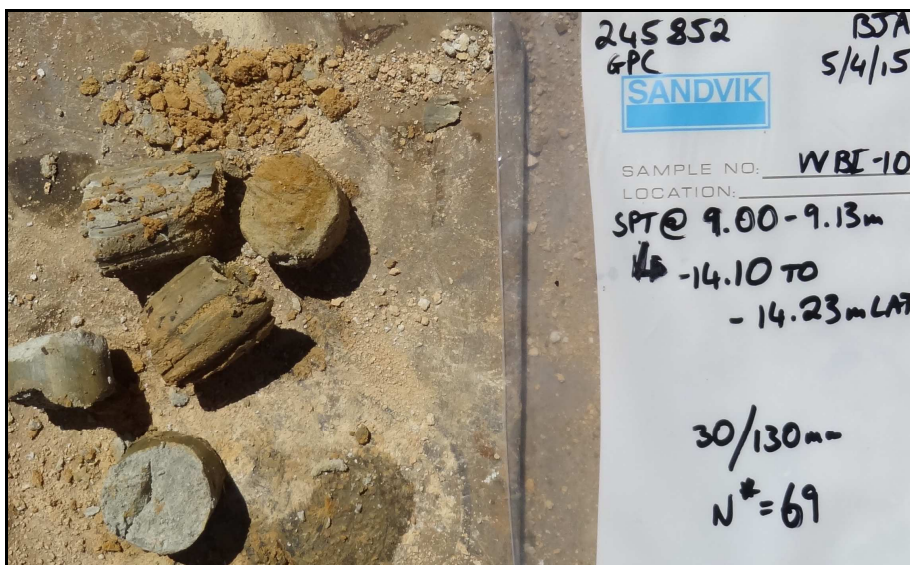
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Borehole Number		WBI-10	
Box	3	of	4
Depth	-13.10mLAT	to	-13.35mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	4	of	4
Depth	-14.10mLAT	to	-14.23mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-10	
Box	4	of	4
Depth	-15.10mLAT	to	-15.30mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	4	of	4
Depth	-16.10mLAT	to	-16.25mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		





SPT Sample Photo
GPC Offshore Geotechnical
Investigation

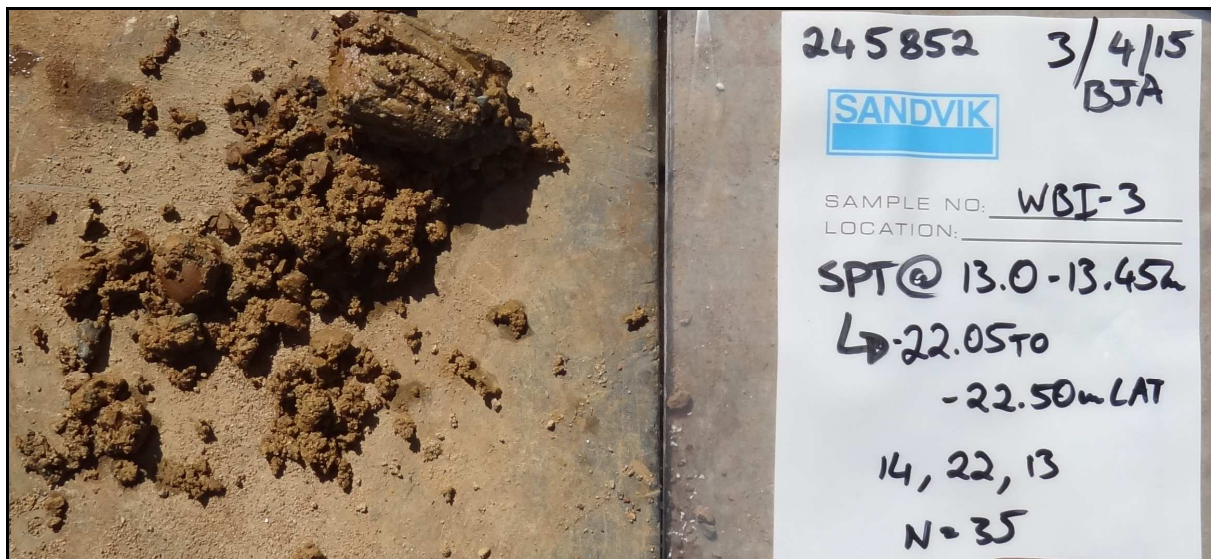
Location		Western Banks Island	
Borehole Number		WBI-03	
Box	5	of	6
Depth	-20.75mLAT	to	-20.79mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	5	of	6
Depth	-22.05mLAT	to	-22.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	5	of	6
Depth	-23.05mLAT	to	-23.49mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-03	
Box	6	of	6
Depth	-24.05mLAT	to	-24.50mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



Sheet:1 of 4

Drilling Information				Soil Description				Comments and Testing				Strata Information					
Drilling & Casing ↑	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS	S	F	SI	VSI
													VL	L	MD	D	VD
PQ3	SPT	0	-3.5	0 m: SAND Grey brown, fine, trace low plasticity silt, wet, very loose	SP	W		Core loss from -3.24mLAT to -4.24mLAT Bulk sample from -3.24mLAT to -4.24mLAT	SPT@ -3.24 to -3.69mLAT 0,0,0 N=0		-3.5						
			-4.0	0.45 m: CORE LOSS 0.55m (0.45-1.00)											0.5		
	SPT	30	-4.5	1 m: Silty SAND Dark grey, with low plasticity silt, with shell fragments, wet, loose	SM	W		Core loss from -4.74mLAT to -5.24mLAT	SPT@ -4.24 to -4.69mLAT 4,3,6 N=9		-4.5						
			-5.0												1.5		
	SPT	60	-5.5					SPT@ -4.94 to -5.39mLAT 1,2,5 N=7		-5.0							
			-6.0					Core loss from -5.74mLAT to -6.24mLAT		-5.5							
	SPT	30	-6.5	3 m: With fine, sub-rounded gravels, becoming loose to medium dense					SPT@ -6.24 to -6.69mLAT 3,2,7 N=9		-6.0						
			-7.0	3.4 m: Becoming with low plasticity silty clay lenses				Core loss from -6.74mLAT to -7.24mLAT		-6.5							
	SPT	0	-7.5	4 m: Silty SAND Dark grey brown, medium to coarse, with fine, sub-rounded to sub-angular gravels, with low plasticity clay with fine shell fragments, wet, dense	SM	W		Core loss from -7.24mLAT to -8.24mLAT	SPT@ -7.24 to -7.69mLAT 4,10,24 N=34		-7.5						
			-8.0	4.8 m: Becoming medium dense										-8.0			

Logged: **AC**
 Logged Date: **1/04/2015**
 Checked: **BT**
 Checked Date: **21/07/2015**

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 330584.14
Northing: 7358541.33
Elevation: -3.24 mLAT

Commenced: 1/04/2015
Completed: 1/04/2015

Sheet: 2 of 4

Drilling Information				Soil Description				Comments and Testing			Strata Information						
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Reults in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS	S	F	St	VSt
													VL	L	MD	D	VD
PQ3	SPT	70		5 m: Silty SAND (Continued)	SM	W			SPT@ -8.14 to -8.59mLAT 3,7,8 N=15								
	SPT		-8.5														
		70		5.35 m: Silty CLAY Dark brown mottled grey, high plasticity, trace fine sand, moist, stiff	CH	M											
			-9.0														
			-9.5														
	SPT			6 m: Becoming brown mottled grey					SPT@ -9.24 to -9.69mLAT 3,7,9 N=16								
		75															
			-10.0														
			-10.5														
	SPT			7 m: Becoming medium to high plasticity	CI-CH				SPT@ -10.24 to -10.69mLAT 3,5,9 N=14								
		55															
			-11.0														
		-11.5															
SPT			8.2 m: Clayey GRAVEL/Gravelly CLAY Brown, fine to coarse, sub-angular to sub-rounded gravel, high plasticity, with silt, trace coarse sand, moist, dense	GC	M			U63 @-11.24mLAT to -11.54mLAT									
	90		8.5 m: Clay reducing becoming low plasticity														
		-12.0															
		-12.5															
SPT			8.6 m: Sandy GRAVEL/Gravelly SAND Orange brown, medium to coarse, fine to coarse, sub-rounded to sub-angular gravels, with high plasticity silt, moist to wet, dense	GW	M - W			Core loss from -11.94mLAT to -12.04mLAT (TCR in gravels estimate only due to likely loss of material)	SPT@ -12.04 to -12.49mLAT 12,18,18 N=36								
	10																
		-13.0															
SPT			9.75 m: Becoming wet		W			Core loss from -12.49mLAT to -12.89mLAT									
	50								SPT@ -12.99 to -13.44mLAT 8,15,16 N=31								

Preliminary Log
Preliminary Log may be subject to alteration
(Refer to attached Limitations of Preliminary Logs)

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC

Logged Date: 1/04/2015

Checked: BT

Checked Date: 21/07/2015

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Banks Island
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 330584.14
Northing: 7358541.33
Elevation: -3.24 mLAT

Commenced: 1/04/2015
Completed: 1/04/2015

Sheet: 3 of 4

Drilling Information				Soil Description				Comments and Testing				Strata Information					
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS	S	F	St	VSt
													VL	L	MD	D	VD
PQ3	SPT	50	-13.5	10 m: Sandy GRAVEL/Gravelly SAND (Continued)	GW	W											
				10.5 m: Becoming gravel content, becoming coarse, moist, very dense		M						10.5					
			-14.0	10.75 m: Becoming dense								11.0					
	SPT	50	-14.5	11 m: Trace high plasticity clay lenses with cobbles (up to 90mm)					SPT@ -13.99 to -14.33mLAT 9,25,5/40 HB N*=44			11.5					
				11.5 m: Increasing clay content becoming with medium to high plasticity clay lenses								12.0					
			-15.0	11.75 m: Increasing fine to medium gravels, becoming very dense					SPT@ -14.99 to -15.44mLAT 10,18,26 N=60			12.5					
	SPT	0	-15.5									13.0					
												13.5					
			-16.0	13 m: Returning to predominantly medium to coarse gravels					SPT@ -16.24 to -16.64mLAT 23,27,30/100 HB N*=72			14.0					
			-16.5									14.5					
			-17.0									15.0					
			-17.5	14 m: Becoming dense					SPT@ -17.24 to -17.69mLAT 19,20,18 N=38			15.5					
	SPT	0	-18.0									16.0					
												16.5					

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC

Logged Date: 1/04/2015

Checked: BT

Checked Date: 21/07/2015

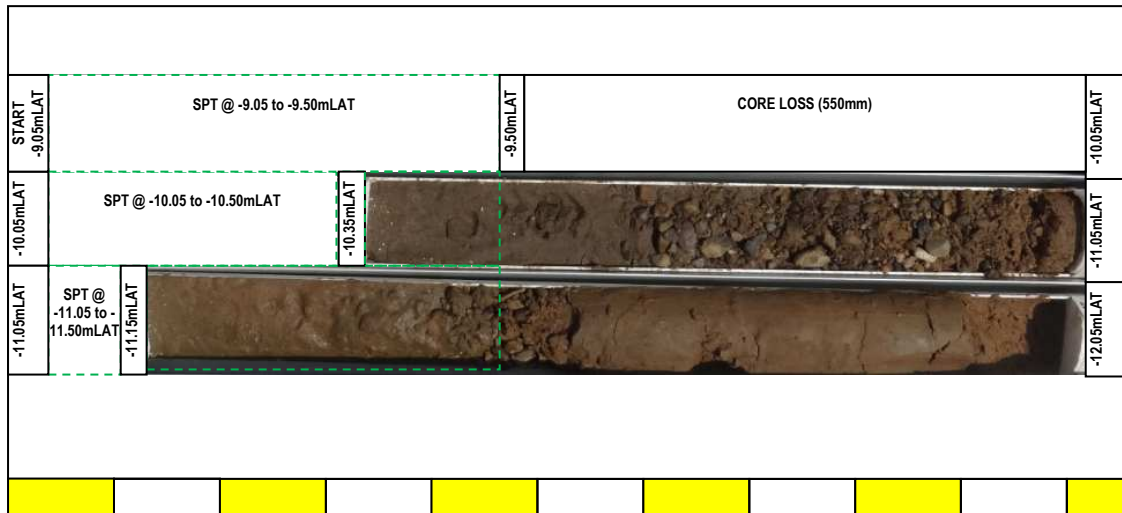
Sheet:4 of 4

Drilling Information				Soil Description					Comments and Testing			Strata Information					
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density					Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)	
							VS VL	S L	F MD	SI D	VSt VD						
PQ3	SPT	70	-18.5	15 m: Sandy GRAVEL/Gravelly SAND (Continued) Becoming very dense	GW	M							SPT@ -18.24 to -18.69mLAT 14,24,26 N=52		-18.5		
			-19.0														
	SPT	90	-19.5	15.8 m: Increasing silt content, medium to coarse sand, becoming dense								SPT@ -19.04 to -19.49mLAT 24,19,27 N=46		-19.0			
			-19.5														
	SPT	90	-20.0	16.8 m: With cobbles (up to 100mm), and high plasticity clay between gravels, wet		W						Cobble caught in drill bit 100mm rock fragment returned		SPT@ -20.24 to -20.69mLAT 8,6,28 N=34		-20.0	
			-20.5														
	SPT	0	-21.0	17.45 m: CORE LOSS 0.40m (17.45-17.85)											-21.0		
			-21.0														
SPT	-	-	17.85 m: Sandy GRAVEL/Gravelly SAND As above. Clay content reducing leaving predominantly low plasticity silt, moist to wet, very dense	GW	M						SPT@ -21.09 to -21.38mLAT 30,30/140 HB N*=64		-21.0				
			WB113 Terminated at 18.15 m (-21.39mLAT)											-21.5			
			-22.0												-22.0		
			-22.5												-22.5		
			-23.0												-23.0		

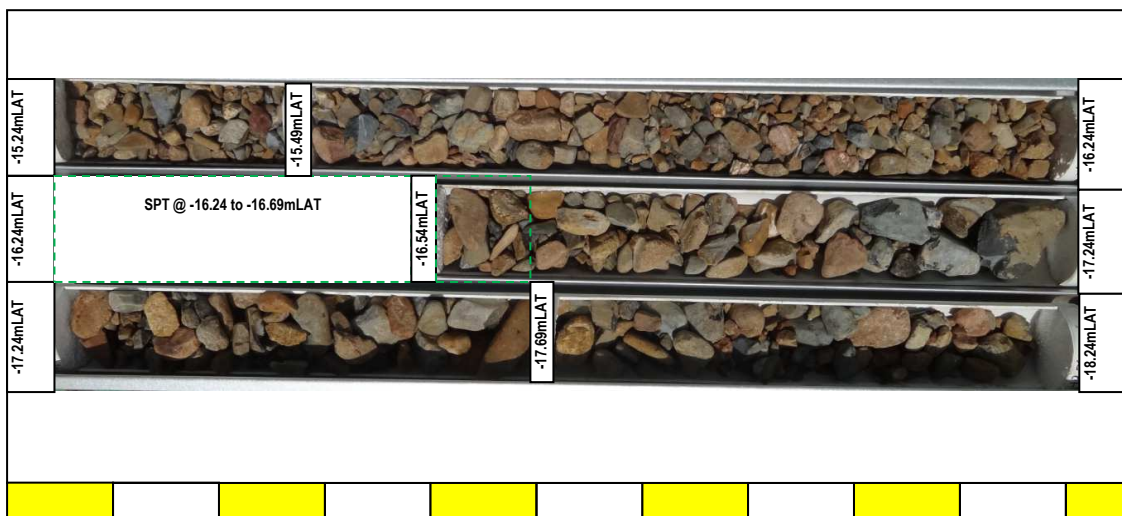
Logged: **AC**
 Logged Date: **1/04/2015**
 Checked: **BT**
 Checked Date: **21/07/2015**



Location		Western Banks Island	
Borehole Number		WBI13	
Box	1	of	4
Depth	-9.05	to	-12.05m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

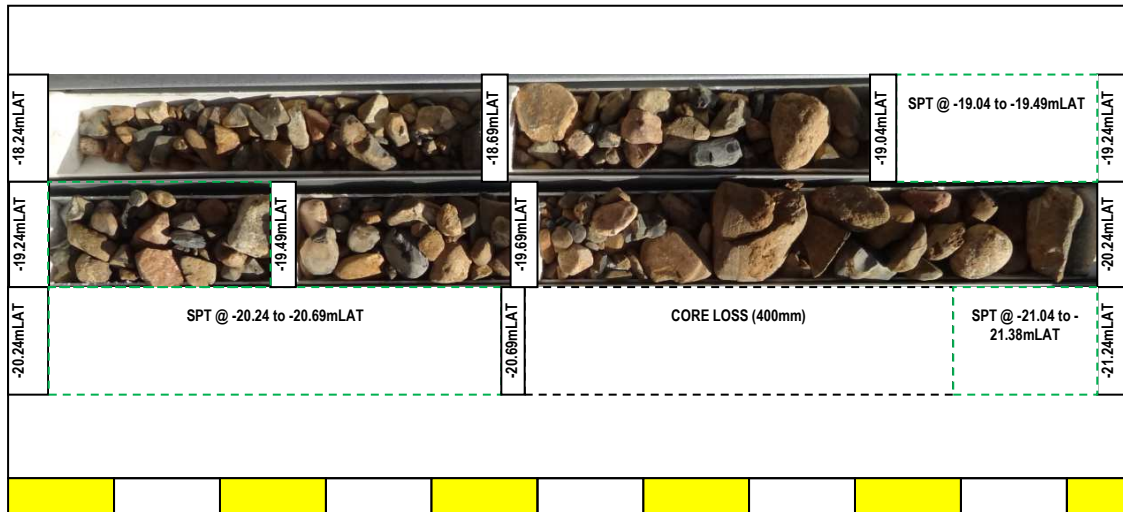


Location		Western Banks Island	
Borehole Number		WBI13	
Box	2	of	4
Depth	-12.24	to	-15.24mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		

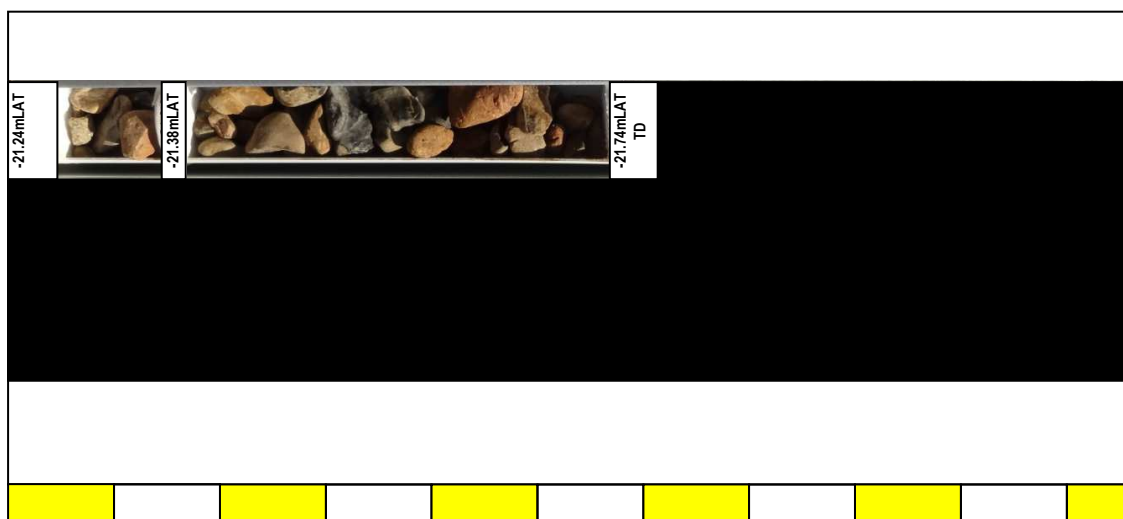




Location		Western Banks Island	
Borehole Number		WBI13	
Box	3	of	4
Depth	-18.24	to	-21.24mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Western Banks Island	
Borehole Number		WBI13	
Box	4	of	4
Depth	-21.24	to	-21.74mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	1	of	4
Depth	-3.24mLAT	to	-3.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

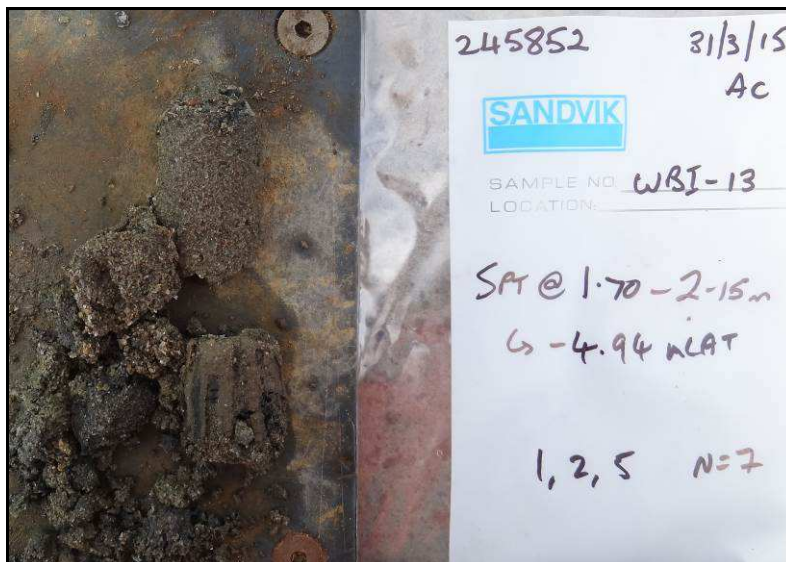
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Borehole Number		WBI-13	
Box	1	of	4
Depth	-4.24mLAT	to	-4.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	1	of	4
Depth	-4.94mLAT	to	-5.39mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	2	of	4
Depth	-6.24mLAT	to	-6.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	2	of	4
Depth	-7.24mLAT	to	-7.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	2	of	4
Depth	-8.14mLAT	to	-8.59mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	3	of	4
Depth	-9.24mLAT	to	-9.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	3	of	4
Depth	-10.24mLAT	to	-10.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location

**Western Banks
Island**

Borehole Number

WBI-13

Box

3

of

4

Depth

-12.04mLAT

to

-12.49mLAT

Project

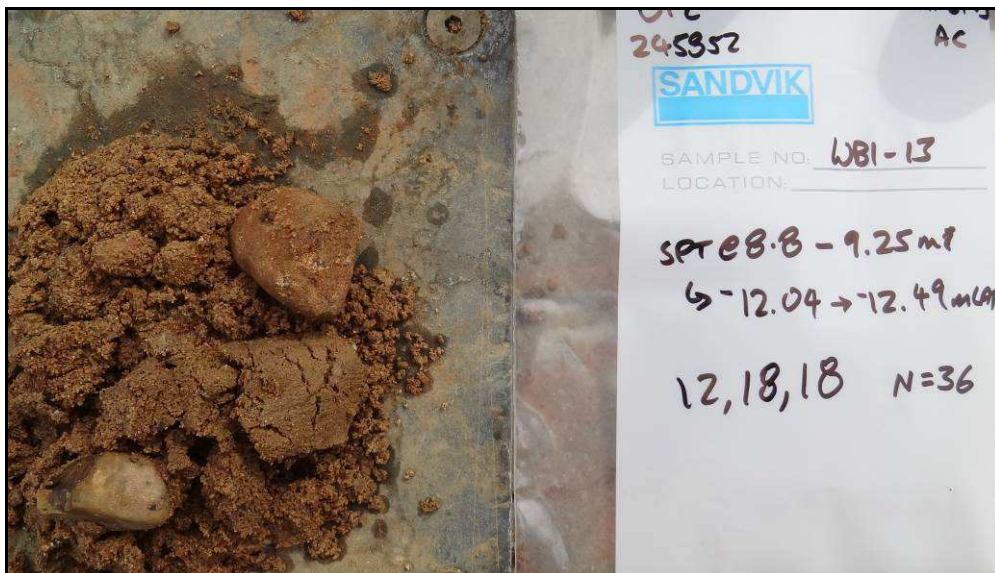
GPC Offshore Geotechnical Investigation

Number

245852

Client

Gladstone Ports Corporation



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location

**Western Banks
Island**

Borehole Number

WBI-13

Box

4

of

4

Depth

-12.99mLAT

to

-13.44mLAT

Project

GPC Offshore Geotechnical Investigation

Number

245852

Client

Gladstone Ports Corporation



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	4	of	4
Depth	-13.99mLAT	to	-14.33mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	4	of	4
Depth	-14.99mLAT	to	-15.99mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	5	of	6
Depth	-16.24mLAT	to	-16.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	5	of	6
Depth	-17.24mLAT	to	-17.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	5	of	6
Depth	-18.24mLAT	to	-18.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	6	of	6
Depth	-19.04mLAT	to	-19.49mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	6	of	6
Depth	-20.24mLAT	to	-20.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	6	of	6
Depth	-21.09mLAT	to	-21.38mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

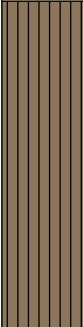


Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Basin Expansion
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 312835.2
Northing: 7371459.9
Elevation: 0.16 mLAT

Commenced: 4/03/2015
Completed: 4/03/2015

Sheet: 1 of 3

Drilling Information				Soil Description				Comments and Testing		Strata Information											
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density						Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)				
							VS	S	F	St	VSt	VL						L	MD	D	VD
PQ3	D		0.0	0 m: Silty SAND/Sandy SILT Dark grey, fine, low plasticity, trace clay, with shells and shell fragments, very loose to loose, wet	SM	W											0.00M to 2.80 depth: Recovered as bulk samples and piston tubes			0.0	
	P		-0.5														PP @ 0.4 - 0.8m= 0 kPa (too soft to complete test)			0.5	
	D		-1.0	0.8 m: Sandy SILT Dark grey, low plasticity, fine, trace clay, trace fine shell fragments, very soft to soft, wet	ML	W														1.0	
	D	0	-1.5	1.5 m: Increasing clay content																1.5	
	D		-2.0														PP @ 2.0 - 2.4m= 0 kPa (too soft to complete test)			2.0	
	P		-2.5																	2.5	
	D		-3.0																	3.0	
			-3.5	3 m: Becoming moist to wet	M - W															3.5	
			-4.0	3.2 m: Silty CLAY Dark grey, low plasticity, with fine sand, trace shell fragments, moist to wet, very soft to soft	CL															4.0	
			-4.5	3.8 m: Becoming high plasticity	CH												PP @ 4.0 - 4.4m= 0 kPa (too soft to complete test)			4.5	

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC

Logged Date: 4/03/2015

Checked: BT

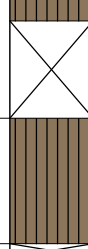
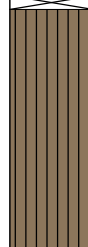
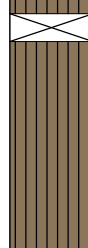
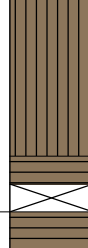
Checked Date: 21/07/2015

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Basin Expansion
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 312835.2
Northing: 7371459.9
Elevation: 0.16 mLAT

Commenced: 4/03/2015
Completed: 4/03/2015

Sheet: 2 of 3

Drilling Information				Soil Description				Comments and Testing			Strata Information						
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS VL	S L	F MD	SI D	VSI VD
PQ3	SPT	20	-5.0	5 m: Silty CLAY (Continued)	CH	M		Core loss (350mm)	SPT@ -5.34 to -5.79mLAT 0,0,0 N=0		-5.0	5.5					
			-5.5	5.15 m: CORE LOSS 0.35m (5.15-5.50)							-5.5						
			-6.0	5.5 m: Silty CLAY As above. Shell fragments becoming absent, very soft							-6.0						
			-6.5	5.95 m: CORE LOSS 0.05m (5.95-6.00)							-6.5						
	U63	85	-7.0	6 m: Silty CLAY As above	CH			Core loss (100mm) PP @ 745-800 kPa too soft to complete test			-7.0	7.5					
			-7.5	6.9 m: CORE LOSS 0.10m (6.90-7.00)							-7.5						
			-8.0	7 m: Silty CLAY As above	CH						-8.0						
			-8.5	7.8 m: Trace shell fragments							-8.5						
	SPT	45	-9.0	8.3 m: Becoming low plasticity	CL			Core loss (100mm)	SPT@ -8.34 to -8.79mLAT 0,0,5 N=5		-9.0	9.5					
			-9.5	8.4 m: CORE LOSS 0.10m (8.40-8.50)							-9.5						
			-10.0	8.5 m: Silty CLAY As above. With medium to coarse sand, fine, angular gravels, becoming soft to firm	CL						-10.0						
			-10.5	8.95 m: CORE LOSS 0.25m (8.95-9.20)							-10.5						
	80		-11.0	9.2 m: Sandy CLAY Grey with trace orange mottling, with medium to coarse sand, high plasticity, trace fine shell fragments, moist, firm	CH	M		Core loss (200mm)			-11.0	11.5					
			-11.5	9.7 m: Increasing orange mottling, becoming medium plasticity, increasing fine to coarse sand							-11.5						

Remarks:

- Borehole position determined from DGPS
- Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

Logged: AC

Logged Date: 4/03/2015

Checked: BT

Checked Date: 21/07/2015

Client: Gladstone Ports Corporation (GPC)
Project: GPC Offshore Geotechnical Investigation
Location: Western Basin Expansion
Project Number: 245852-003

Driller: J & S Drilling
Rig: Edson 3000 G
Easting: 312835.2
Northing: 7371459.9
Elevation: 0.16 mLAT

Commenced: 4/03/2015
Completed: 4/03/2015

Sheet: 3 of 3

Drilling Information				Soil Description				Comments and Testing		Strata Information							
Drilling & Casing	Sample Type	TCR (%)	LAT (m)	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components	USC	Moisture Content	Consistency / Relative Density	Comments / Test Results / Origin (Pocket Penetrometer Results in kg/cm ²)	SPT Values	Graphic Log	LAT (m)	Depth Below Sea Bed Level (m)					
													VS VL	S L	F MD	SI D	VSI VD
PQ3	SPT	55	-10.0	10 m: Clayey SAND Grey with orange mottling fine to coarse, with low plasticity silt and clay, moist, medium dense	SC	M					-10.0						
			-10.5	10.4 m: Becoming coarse sand, trace fine black, angular gravels, decreasing clay content							-10.5	10.5					
			-11.0	10.95 m: CORE LOSS 0.05m (10.95-11.00)							-11.0	11.0					
	SPT	0	-11.0	11 m: Clayey SAND As above, Becoming pale orange and grey with fine, angular to sub-angular gravels	SC					-11.0							
			-11.5							-11.5	11.5						
			-12.0	12 m: Becoming grey, increasing strength						-12.0	12.0						
			-12.5	WBS03 Terminated at 12.45 m (-12.29mLAT)						-12.5	12.5						
			-13.0								-13.0	13.0					
			-13.5								-13.5	13.5					
			-14.0								-14.0	14.0					
			-14.5								-14.5	14.5					

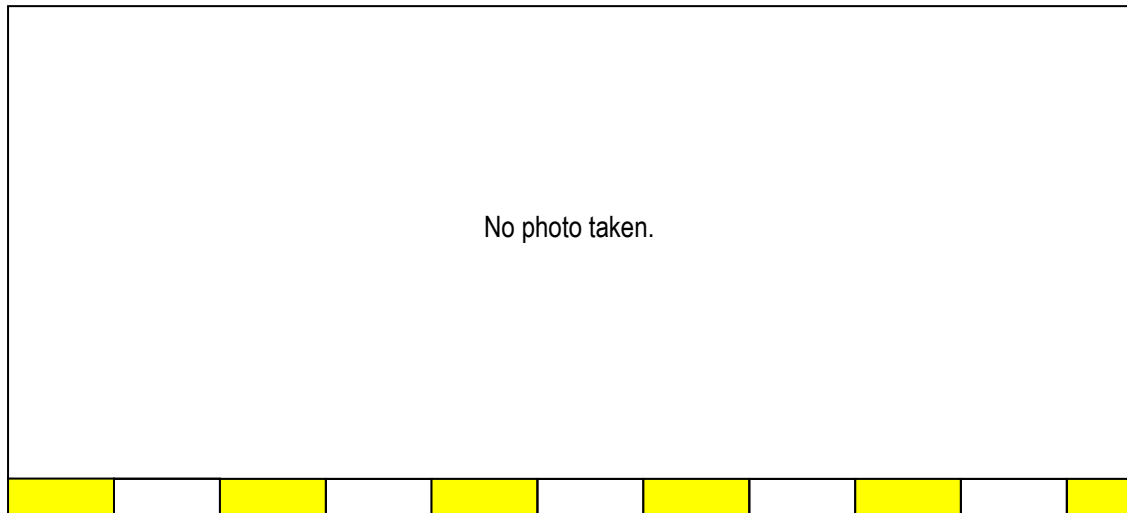
Preliminary Log
Preliminary Log may be subject to alteration
(Refer to attached Limitations of Preliminary Logs)

Remarks:
1. Borehole position determined from DGPS
2. Boreholes drilled from a jack-up barge and left to naturally collapse on retrieval of drilling equipment

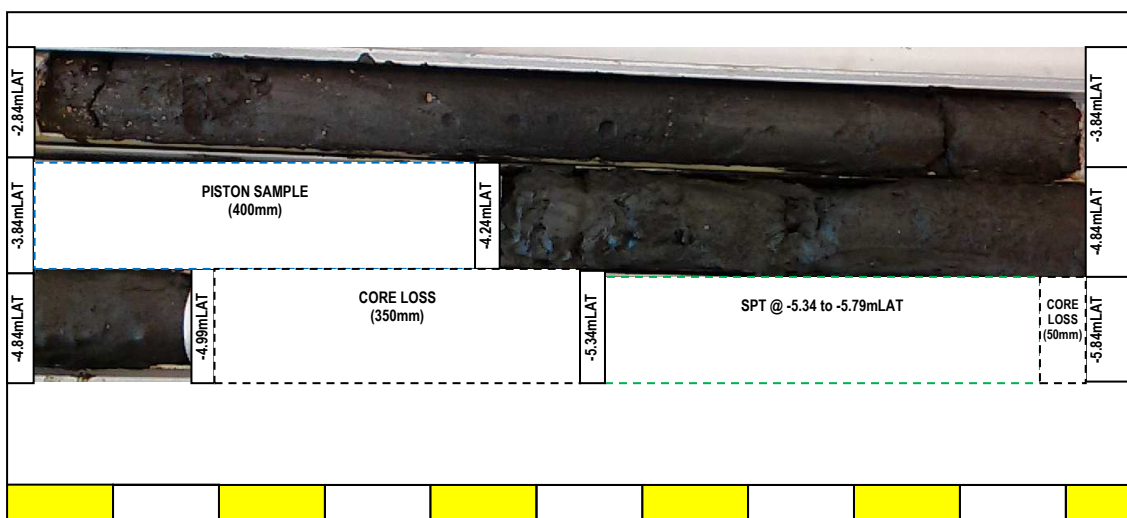
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Checked: BT
Checked Date: 21/07/2015

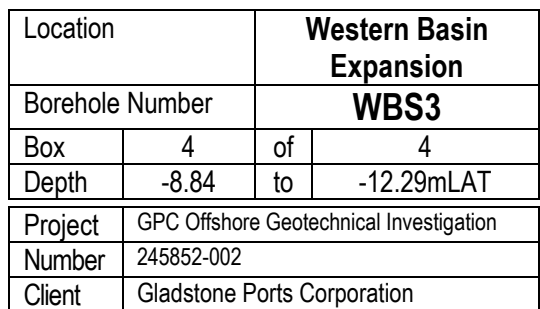
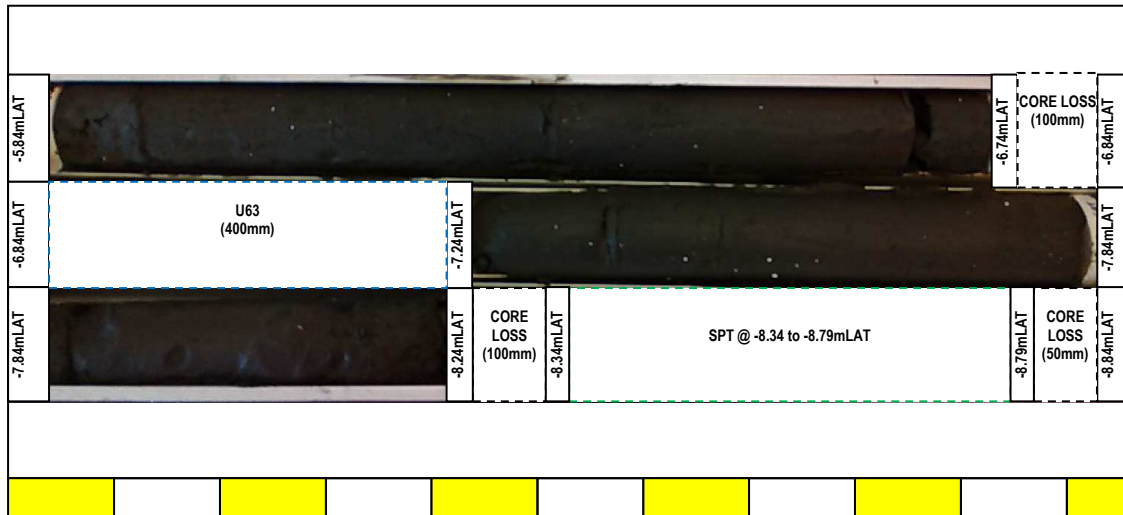
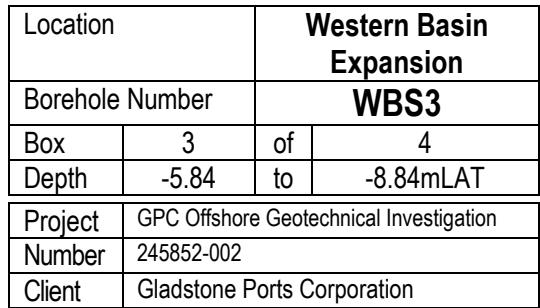


Location		Western Basin Expansion	
Borehole Number		WBS3	
Box	1	of	4
Depth	0.16	to	-2.84m LAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		



Location		Western Basin Expansion	
Borehole Number		WBS3	
Box	2	of	4
Depth	-2.84	to	-5.84mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852-002		
Client	Gladstone Ports Corporation		





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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	1	of	4
Depth	-3.24mLAT	to	-3.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

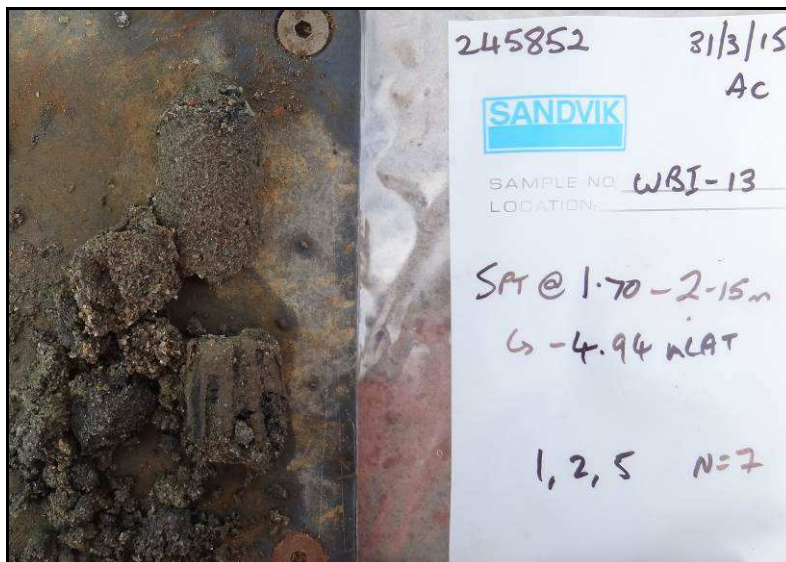
Location		Western Banks Island	
Borehole Number		WBI-13	
Box	1	of	4
Depth	-4.24mLAT	to	-4.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

No SPT Photo

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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	1	of	4
Depth	-4.94mLAT	to	-5.39mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	2	of	4
Depth	-6.24mLAT	to	-6.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	2	of	4
Depth	-7.24mLAT	to	-7.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	2	of	4
Depth	-8.14mLAT	to	-8.59mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	3	of	4
Depth	-9.24mLAT	to	-9.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	3	of	4
Depth	-10.24mLAT	to	-10.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location

**Western Banks
Island**

Borehole Number

WBI-13

Box

3

of

4

Depth

-12.04mLAT

to

-12.49mLAT

Project

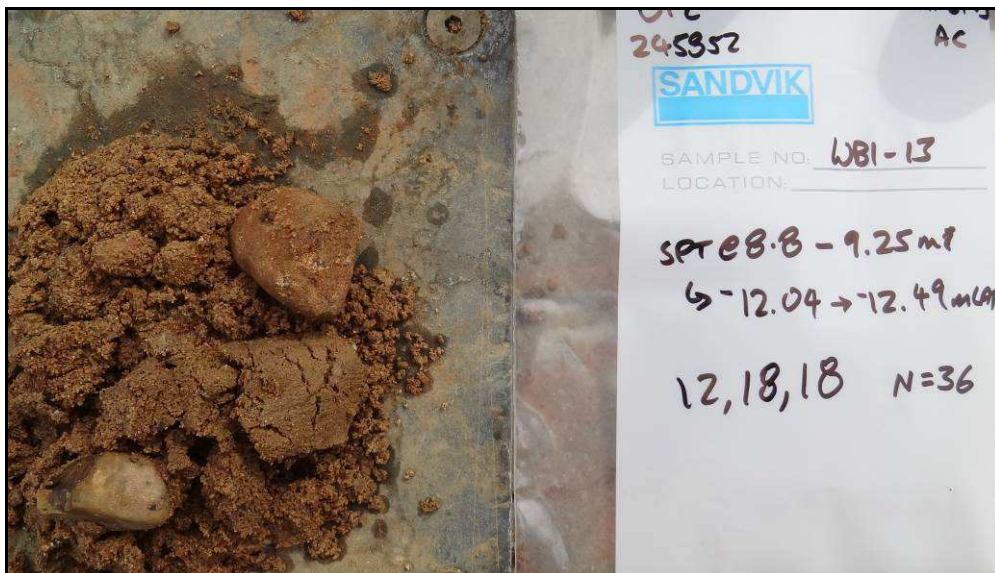
GPC Offshore Geotechnical Investigation

Number

245852

Client

Gladstone Ports Corporation



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location

**Western Banks
Island**

Borehole Number

WBI-13

Box

4

of

4

Depth

-12.99mLAT

to

-13.44mLAT

Project

GPC Offshore Geotechnical Investigation

Number

245852

Client

Gladstone Ports Corporation



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	4	of	4
Depth	-13.99mLAT	to	-14.33mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	4	of	4
Depth	-14.99mLAT	to	-15.99mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	5	of	6
Depth	-16.24mLAT	to	-16.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	5	of	6
Depth	-17.24mLAT	to	-17.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	5	of	6
Depth	-18.24mLAT	to	-18.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	6	of	6
Depth	-19.04mLAT	to	-19.49mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		



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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	6	of	6
Depth	-20.24mLAT	to	-20.69mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		

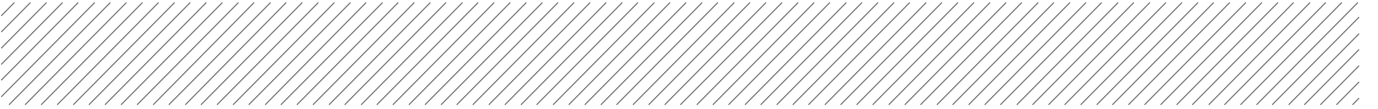


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SPT Sample Photo
GPC Offshore Geotechnical
Investigation

Location		Western Banks Island	
Borehole Number		WBI-13	
Box	6	of	6
Depth	-21.09mLAT	to	-21.38mLAT
Project	GPC Offshore Geotechnical Investigation		
Number	245852		
Client	Gladstone Ports Corporation		





Appendix D

Geotechnical laboratory test certificates

POINT LOAD TEST REPORT

Test Method: AS 4133.4.1

Client	Aurecon Australasia Pty Ltd	Report No.	15050589-PL
Project	GPC Offshore Investigation	Test Date	20/05/2015
		Report Date	20/05/2015

Sample No.	15050589	15050590	15050592	15050593	15050594	15050595	15050596
Client ID	BP-01	BP-01	BP-01	BP-01	BP-01	BP-01	BP-01
Depth (m)	2.70	3.05	3.68	4.30	5.10	5.85	6.60
Is (MPa)	0.30	2.19	1.02	2.03	0.06	1.48	1.01
Is(50) (MPa)	0.35	2.52	1.13	2.44	0.07	1.68	1.08
Load Direction	Axial	Axial	Axial	Axial	Axial	Axial	Axial
*Descriptive Term	M	H	H	H	VL	H	H

Sample No.	15050597	15050598	15050599	15050601	15050602	15050604	15050605
Client ID	BP-01	PCE-03	PCE-03	PCE-03	PCE-03	PCE-03	PCE-01
Depth (m)	7.15	13.45	13.95	14.66	15.13	15.90	9.45
Is (MPa)	0.38	0.23	0.23	0.03	0.29	0.25	0.75
Is(50) (MPa)	0.44	0.28	0.28	0.04	0.33	0.28	0.84
Load Direction	Axial	Axial	Axial	Axial	Axial	Axial	Axial
*Descriptive Term	M	L	L	VL	M	L	M

NOTES/REMARKS: Tested as received + Irregular Lump * AS 1726: Table A8
 EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High

Sample/s supplied by the client

Page 1 of 1 REP02102

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Authorised Signatory



C. Channon



Laboratory No. 9926

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

POINT LOAD TEST REPORT

Test Method: AS 4133.4.1

Client	Aurecon Australasia Pty Ltd	Report No.	15050590-PL
Project	GPC Offshore Investigation	Test Date	20/05/2015
		Report Date	20/05/2015

Sample No.	15050590	15050592	15050593	15050594	15050595	15050596	15050598
Client ID	BP-01	BP-01	BP-01	BP-01	BP-01	BP-01	PCE-03
Depth (m)	3.05	3.68	4.30	5.10	5.85	6.60	13.45
Is (MPa)	2.47	1.63	0.82	0.21	0.49	0.90	0.20
Is(50) (MPa)	2.87	2.02	1.01	0.26	0.61	1.11	0.25
Load Direction	Diametral	Diametral	Diametral	Diametral	Diametral	Diametral	Diametral
*Descriptive Term	H	H	H	L	M	H	L

Sample No.	15050599	15050601	15050602	15050604	15050605	15050607	15050608
Client ID	PCE-03	PCE-03	PCE-03	PCE-03	PCE-01	PCE-01	PCE-01
Depth (m)	13.95	14.66	15.13	15.90	9.45	9.90	10.30
Is (MPa)	0.17	0.24	0.19	0.23	1.18	0.70	1.21
Is(50) (MPa)	0.22	0.30	0.24	0.29	1.48	0.87	1.51
Load Direction	Diametral	Diametral	Diametral	Diametral	Diametral	Diametral	Diametral
*Descriptive Term	L	L	L	L	H	M	H

NOTES/REMARKS: Tested as received + Irregular Lump * AS 1726: Table A8
 EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High

Sample/s supplied by the client

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

POINT LOAD TEST REPORT

Test Method: AS 4133.4.1

Client	Aurecon Australasia Pty Ltd	Report No.	15050607-PL
Project	GPC Offshore Investigation	Test Date	20/05/2015
		Report Date	20/05/2015

Sample No.	15050607	15050608	15050610	15050611	15050612	15050613	15050614
Client ID	PCE-01	PCE-01	PCE-01	PCE-01	PCE-01	WBI-10	WBI-10
Depth (m)	9.90	10.30	10.64	11.30	11.77	9.40	9.79
Is (MPa)	2.65	1.92	2.89	5.05	8.72	0.02	0.05
Is(50) (MPa)	3.06	2.29	3.31	5.89	9.20	0.03	0.06
Load Direction	Axial	Axial	Axial	Axial	Axial	Axial	Axial
*Descriptive Term	VH	H	VH	VH	VH	EL	VL

Sample No.	15050615	15050616	15050617	-	-	-	-
Client ID	WBI-10	WBI-10	WBI-10	-	-	-	-
Depth (m)	10.33	11.95	11.40	-	-	-	-
Is (MPa)	0.01	0.05	0.02	-	-	-	-
Is(50) (MPa)	0.01	0.06	0.02	-	-	-	-
Load Direction	Axial	Axial	Axial	-	-	-	-
*Descriptive Term	EL	VL	EL	-	-	-	-

NOTES/REMARKS: Tested as received + Irregular Lump * AS 1726: Table A8
 EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High

Sample/s supplied by the client

Page 1 of 1 REP02102

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

POINT LOAD TEST REPORT

Test Method: AS 4133.4.1

Client	Aurecon Australasia Pty Ltd	Report No.	15050610-PL
Project	GPC Offshore Investigation	Test Date	20/05/2015
		Report Date	20/05/2015

Sample No.	15050610	15050611	15050612	15050613	15050614	15050616	15050617
Client ID	PCE-01	PCE-01	PCE-01	WBI-10	WBI-10	WBI-10	WBI-10
Depth (m)	10.64	11.30	11.77	9.40	9.79	11.95	11.40
Is (MPa)	0.32	1.35	4.72	0.03	0.04	0.02	0.03
Is(50) (MPa)	0.40	1.69	5.86	0.03	0.05	0.02	0.03
Load Direction	Diametral	Diametral	Diametral	Diametral	Diametral	Diametral	Diametral
*Descriptive Term	M	H	VH	VL	VL	EL	VL

Sample No.	-	-	-	-	-	-	-
Client ID	-	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-	-
Is (MPa)	-	-	-	-	-	-	-
Is(50) (MPa)	-	-	-	-	-	-	-
Load Direction	-	-	-	-	-	-	-
*Descriptive Term	-	-	-	-	-	-	-

NOTES/REMARKS: Tested as received + Irregular Lump * AS 1726: Table A8
 EL: Extremely Low, VL: Very Low, L: Low, M: Medium, H: High, VH: Very High, EH: Extremely High

Sample/s supplied by the client

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Trilab Pty Ltd ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.1

Client Aurecon Australasia Pty Ltd

Report No. 15050591-UCS

Project GPC Offshore Investigation

Test Date 20/05/2015

Report Date 22/05/2015

Sample No.	15050591														
Client ID	BP-01														
Depth (m)	3.10-3.40														
Description	Meta Sedimentary														
Wet Density (t/m ³)	2.60														
Moisture Content (%)	3.1														
Specimen Length (mm)	233.4														
Specimen Diameter (mm)	82.6														
Mode of Failure	Conical														
Test Duration (Min:Sec)	6:36														
<table border="1"> <tr> <td>CLIENT:</td><td>Aurecon Australasia Pty Ltd</td></tr> <tr> <td>PROJECT:</td><td>GPC Offshore Investigation</td></tr> <tr> <td>LAB SAMPLE No.</td><td>15050591</td></tr> <tr> <td>BOREHOLE:</td><td>BP-01</td></tr> <tr> <td colspan="2">AFTER TEST</td></tr> <tr> <td>DATE:</td><td>20/05/15</td></tr> <tr> <td>DEPTH:</td><td>3.10-3.40</td></tr> </table> 		CLIENT:	Aurecon Australasia Pty Ltd	PROJECT:	GPC Offshore Investigation	LAB SAMPLE No.	15050591	BOREHOLE:	BP-01	AFTER TEST		DATE:	20/05/15	DEPTH:	3.10-3.40
CLIENT:	Aurecon Australasia Pty Ltd														
PROJECT:	GPC Offshore Investigation														
LAB SAMPLE No.	15050591														
BOREHOLE:	BP-01														
AFTER TEST															
DATE:	20/05/15														
DEPTH:	3.10-3.40														
UCS (MPa)	11.2														

NOTES/REMARKS:

Stored and tested as received

Sample/s supplied by the client

Test Apparatus - Kelba 1000 kN Load Cell

Photo not to scale

Page: 1 of 1 REP02701

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ABN 25 065 630 506

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.2

Client Aurecon Australasia Pty Ltd

Report No. 15050600-UCS

Project GPC Offshore Investigation

Test Date 20/05/2015

Report Date 22/05/2015

Sample No.	15050600
Client ID	PCE-03
Depth (m)	14.00-14.60
Description	Meta Sedimentary
Wet Density (t/m ³)	2.38
Moisture Content (%)	8.7
Specimen Length (mm)	226.8
Specimen Diameter (mm)	81.8
Mode of Failure	Shear and Defect
Rate of Displacement (mm/min)	0.1
Test Duration (Min:Sec)	15:09
	
UCS (MPa)	0.714

NOTES/REMARKS: Pre-existing defect

Stored and tested as received

Photo not to scale

Sample/s supplied by the client

Test Apparatus - 50kN Load Cell in Compression Machine

Page: 1 of 1 REP13301

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Trilab Pty Ltd

ABN 25 065 630 506

ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.1

Client Aurecon Australasia Pty Ltd

Report No. 15050603-UCS

Project GPC Offshore Investigation

Test Date 20/05/2015

Report Date 22/05/2015

Sample No.	15050603
Client ID	PCE-03
Depth (m)	15.23-15.55
Description	Meta Sedimentary
Wet Density (t/m ³)	2.40
Moisture Content (%)	7.9
Specimen Length (mm)	233.7
Specimen Diameter (mm)	82.5
Mode of Failure	Conical
Test Duration (Min:Sec)	4:01
	
UCS (MPa)	1.16

NOTES/REMARKS: Pre-existing defect

Stored and tested as received

Sample/s supplied by the client

Test Apparatus - Kelba 1000 kN Load Cell

Photo not to scale

Page: 1 of 1 REP02701

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Trilab Pty Ltd

ABN 25 065 630 506

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.1

Client Aurecon Australasia Pty Ltd

Report No. 15050606-UCS

Project GPC Offshore Investigation

Test Date 20/05/2015

Report Date 22/05/2015

Sample No.	15050606
Client ID	PCE-01
Depth (m)	9.56-9.74
Description	Meta Sedimentary
Wet Density (t/m ³)	2.65
Moisture Content (%)	1.5
Specimen Length (mm)	221.6
Specimen Diameter (mm)	82.6
Mode of Failure	Shear
Test Duration (Min:Sec)	6:14



UCS (MPa)	11.5
-----------	------

NOTES/REMARKS:

Stored and tested as received

Sample/s supplied by the client

Test Apparatus - Kelba 1000 kN Load Cell

Photo not to scale

Page: 1 of 1 REP02701

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ABN 25 065 630 506

UNIAXIAL COMPRESSIVE STRENGTH TEST REPORT

Test Method: AS 4133.4.2.1

Client Aurecon Australasia Pty Ltd

Report No. 15050609-UCS

Project GPC Offshore Investigation

Test Date 20/05/2015

Report Date 22/05/2015

Sample No.	15050609														
Client ID	PCE-01														
Depth (m)	10.37-10.58														
Description	Meta Sedimentary														
Wet Density (t/m ³)	2.65														
Moisture Content (%)	1.1														
Specimen Length (mm)	175.9 *														
Specimen Diameter (mm)	82.6														
Mode of Failure	Shear and Defect														
Test Duration (Min:Sec)	6:04														
<table border="1"> <tr> <td>CLIENT:</td><td>Aurecon Australasia Pty Ltd</td></tr> <tr> <td>PROJECT:</td><td>GPC Offshore Investigation</td></tr> <tr> <td>LAB SAMPLE No.</td><td>15050609</td></tr> <tr> <td>BOREHOLE:</td><td>PCE-01</td></tr> <tr> <td colspan="2">AFTER TEST</td></tr> <tr> <td>DATE:</td><td>20/5/15</td></tr> <tr> <td>DEPTH:</td><td>10.37-10.58</td></tr> </table> 		CLIENT:	Aurecon Australasia Pty Ltd	PROJECT:	GPC Offshore Investigation	LAB SAMPLE No.	15050609	BOREHOLE:	PCE-01	AFTER TEST		DATE:	20/5/15	DEPTH:	10.37-10.58
CLIENT:	Aurecon Australasia Pty Ltd														
PROJECT:	GPC Offshore Investigation														
LAB SAMPLE No.	15050609														
BOREHOLE:	PCE-01														
AFTER TEST															
DATE:	20/5/15														
DEPTH:	10.37-10.58														
UCS (MPa)	22.3														

NOTES/REMARKS: Pre-existing defect

Stored and tested as received

* Length to diameter ratio less than 2.5:1

Photo not to scale

Sample/s supplied by the client

Test Apparatus - Kelba 1000 kN Load Cell

Page: 1 of 1 REP02701

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	Aurecon Australia Pty Ltd	Report No.	15040307-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	10/4/15-27/4/15
		Report Date	28/04/2015

Sample No.	15040307	15040309	15040310	15040311	15040314	15040317	15040318
Client ID	Sample 21 - GG15	Sample 23 - GG15	Sample 24 - GG15	Sample 25 - WBS3	Sample 28 - WBS3	Sample 31 - WBS3	Sample 32 - GG04
Depth (m)	1.00-1.45	5.00-5.45	7.00-7.45	0.00-0.40	2.00-2.40	10.50-10.95	0.00-0.45
Moisture (%)	12.1	18.5	10.9	44.0	66.2	18.8	14.9
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5							
26.5			100				
19	100		96	100			100
9.5	74	100	82	99			98
4.75	60	97	62	97		100	94
2.36	48	95	46	96		97	87
1.18	36	91	38	94		82	74
0.600	28	83	28	93	100	51	51
0.425	26	73	23	92	99	41	40
0.300	24	60	19	90	99	36	30
0.150	21	40	14	73	96	29	21
0.075	19	29	11	40	79	26	16

NOTES/REMARKS:

Sample/s supplied by the client

Page 1 of 1 REP01102

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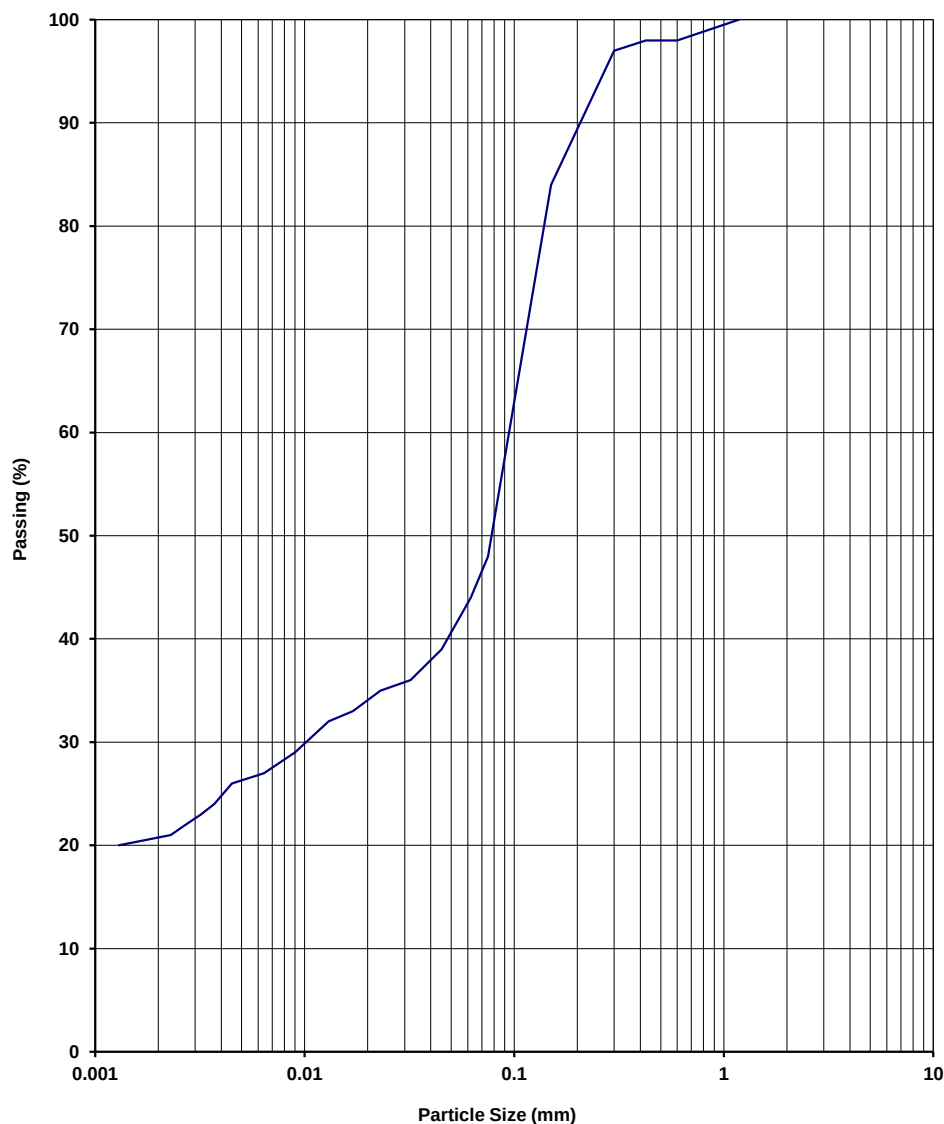
ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040312-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	9/4/15-21/4/15
		Report Date	24/4/2015
Client ID	Sample 26 - WBS3	Depth (m)	0.40-0.80

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	
1.18	100
0.600	98
0.425	98
0.300	97
0.150	84
0.075	48
0.062	44
0.045	39
0.032	36
0.023	35
0.017	33
0.013	32
0.009	29
0.0064	27
0.0045	26
0.0037	24
0.0032	23
0.0027	22
0.0023	21
0.0013	20



NOTES/REMARKS:

-
Moisture Content 43.2% -2.36mm Soil Particle Density(t/m³) 2.64
Sample/s supplied by the client

Page 1 of 1 REP03902

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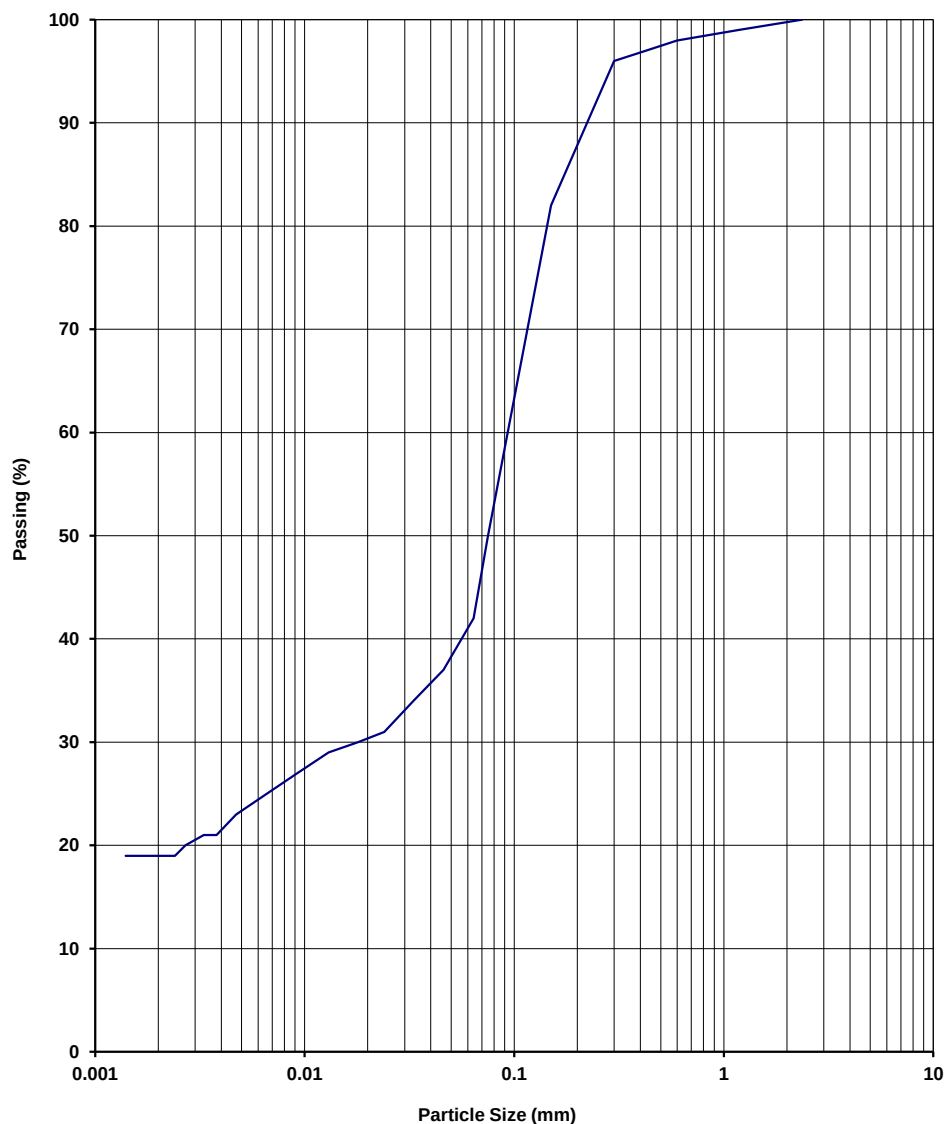
ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040313-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	9/4/15-21/4/15
		Report Date	24/4/2015
Client ID	Sample 27 - WBS3	Depth (m)	1.20-1.60

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	99
0.600	98
0.425	97
0.300	96
0.150	82
0.075	50
0.064	42
0.046	37
0.033	34
0.024	31
0.018	30
0.013	29
0.0092	27
0.0066	25
0.0047	23
0.0038	21
0.0033	21
0.0027	20
0.0024	19
0.0014	19



NOTES/REMARKS:

-
Moisture Content 48.8% -2.36mm Soil Particle Density(t/m³) 2.61
Sample/s supplied by the client

Page 1 of 1 REP03902

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Aurecon Australia Pty Ltd	Report No.	15040305-AL
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	10/4/15-21/4/15
		Report Date	29/04/2015

Sample No.	15040305	15040315	15040316	15040329	15040333	15040334
Client ID	Sample 19 - GG14	Sample 29 - WBS3	Sample 30 - WBS3	Sample 43 - GG16	Sample 47 - GG18	Sample 48 - GG18
Depth (m)	3.00-3.45	4.00-4.40	7.00-7.40	5.00-5.40	4.00-4.45	6.00-6.45
Liquid Limit (%)	61	71	75	42	69	65
Plastic Limit (%)	23	23	26	15	23	21
Plasticity Index (%)	38	48	49	27	46	44
Linear Shrinkage (%)	17.5	16.5	19.5	11.0	19.5 +	20.0 +
Moisture Content (%)	14.5	96.0	62.5	36.5	23.7	24.0

Sample No.	-	-	-	-	-	-
Client ID	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-
Liquid Limit (%)	-	-	-	-	-	-
Plastic Limit (%)	-	-	-	-	-	-
Plasticity Index (%)	-	-	-	-	-	-
Linear Shrinkage (%)	-	-	-	-	-	-
Moisture Content (%)	-	-	-	-	-	-

NOTES/REMARKS:

The samples were tested in a natural state, wet sieved and in a 125-250mm mould.

Sample/s supplied by the client

* Cracking occurred

+ Curling occurred

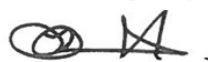
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REP00102

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	Aurecon Australia Pty Ltd	Report No.	15040699-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	4/5/15-11/5/15
		Report Date	12/05/2015

Sample No.	15040699	15040700	15040701	15040702	15040703	15040709	15040715
Client ID	WBI-3	WBI-3	WBI-3	WBI-3	WBI-3	WBI-10	GG-17
Depth (m)	2.00-2.45	3.00-3.45	5.00-5.45	8.00-8.45	10.00-10.45	5.00-5.45	5.00-5.45
Moisture (%)	18.5	19.5	8.5	12.2	11.7	23.0	24.3
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5							
26.5							
19	100	100	100	100	100		100
9.5	95	98	61	80	63		96
4.75	87	94	49	60	57		95
2.36	79	90	40	46	52		94
1.18	76	88	33	36	49	100	92
0.600	72	85	25	25	31	99	69
0.425	56	77	19	15	20	98	46
0.300	29	53	14	10	13	87	31
0.150	13	21	9	7	9	21	22
0.075	9	14	7	5	6	15	19

NOTES/REMARKS:

Sample/s supplied by the client

Page 1 of 1 REP01102

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	Aurecon Australia Pty Ltd	Report No.	15040716-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	5/5/15-11/5/15
		Report Date	12/05/2015

Sample No.	15040716	15040717	15040718	15040721	15040724	15040725	15040727
Client ID	GG-17	GG06	GG06	PCE1	PCE1	PCE3	PCE3
Depth (m)	7.90-8.35	1.50-1.95	3.00-3.45	5.00-5.45	8.00-8.45	0.00-0.45	4.00-4.45
Moisture (%)	13.4	16.6	8.3	18.1	22.0	54.9	15.8
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5							
26.5							
19	100	100	100				
9.5	86	93	58			100	100
4.75	76	88	42			98	99
2.36	70	85	33			96	96
1.18	62	83	27			94	92
0.600	49	79	22			92	86
0.425	40	76	20	100		91	83
0.300	31	71	17	98	100	90	78
0.150	21	51	14	80	91	87	54
0.075	17	41	11	58	41	68	44

NOTES/REMARKS:

Sample/s supplied by the client

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1, 2.1.1

Client	Aurecon Australia Pty Ltd	Report No.	15040729-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	5/5/15-11/5/15
		Report Date	12/05/2015

Sample No.	15040729	15040731	15040732	15040735	15040736	15040737	15040738
Client ID	PCE3	PCE3	WBI-13	WBI-13	WBI-13	WBI-13	WBI-13
Depth (m)	7.00-7.45	11.00-11.45	1.00-1.45	9.75-10.20	11.75-12.2	14.00-14.45	17.00-17.45
Moisture (%)	20.8	16.8	22.9	10.5	9.4	8.9	10.1
AS SIEVE SIZE (mm)	PERCENT PASSING						
150							
75							
53							
37.5							
26.5							
19				100	100	100	100
9.5			100	60	67	68	73
4.75	100		96	52	52	51	60
2.36	98	100	92	48	42	40	52
1.18	95	98	87	44	35	31	46
0.600	90	72	82	34	28	22	37
0.425	86	47	79	25	23	18	29
0.300	82	33	74	17	17	15	23
0.150	73	21	25	9	10	11	19
0.075	61	16	11	6	7	8	16

NOTES/REMARKS:

Sample/s supplied by the client

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Aurecon Australia Pty Ltd	Report No.	15040705-AL
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	4/5/15-12/5/15
		Report Date	13/05/2015

Sample No.	15040705	15040706	15040707	15040708	15040712	15040713
Client ID	WBI-10	WBI-10	WBI-10	WBI-10	GG-17	GG-17
Depth (m)	0.00-0.45	1.00-1.45	2.00-2.45	3.00-3.45	1.00-1.45	2.00-2.45
Liquid Limit (%)	50	55	37	43	60	63
Plastic Limit (%)	19	19	12	16	20	20
Plasticity Index (%)	31	36	25	27	40	43
Linear Shrinkage (%)	14.0 +	16.0 +	12.5 +	12.5 +	17.5	18.5 +
Moisture Content (%)	26.5	23.0	16.8	16.9	22.2	21.6

Sample No.	15040714	15040717	15040720	15040723	15040725	15040728
Client ID	GG-17	GG06	PCE1	PCE1	PCE3	PCE3
Depth (m)	3.00-3.45	1.50-1.95	3.00-3.45	7.00-7.45	0.00-0.45	6.00-6.45
Liquid Limit (%)	42	38	82	42	68	49
Plastic Limit (%)	16	15	24	17	24	17
Plasticity Index (%)	26	23	58	25	44	32
Linear Shrinkage (%)	13.0	10.5	25.0 +	11.0	17.5	15.5 +
Moisture Content (%)	15.5	16.6	31.9	19.0	54.9	19.2

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Cracking occurred + Curling occurred Page 1 of 1 REP00102

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

ATTERBERG LIMITS TEST REPORT

Test Method: AS 1289 2.1.1, 3.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Aurecon Australia Pty Ltd	Report No.	15040734-AL
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	5/5/15-12/5/15
		Report Date	13/05/2015

Sample No.	15040734	15040745	15040748	15040752	-	-
Client ID	WBI-13	GG09	BW02	BW02	-	-
Depth (m)	7.00-7.45	2.00-2.45	2.00-2.45	10.00-10.45	-	-
Liquid Limit (%)	49	36	61	73	-	-
Plastic Limit (%)	19	16	19	24	-	-
Plasticity Index (%)	30	20	42	49	-	-
Linear Shrinkage (%)	14.5 +	9.5	18.0 +	20.5 +	-	-
Moisture Content (%)	23.8	14.7	21.1	22.8	-	-

Sample No.	-	-	-	-	-	-
Client ID	-	-	-	-	-	-
Depth (m)	-	-	-	-	-	-
Liquid Limit (%)	-	-	-	-	-	-
Plastic Limit (%)	-	-	-	-	-	-
Plasticity Index (%)	-	-	-	-	-	-
Linear Shrinkage (%)	-	-	-	-	-	-
Moisture Content (%)	-	-	-	-	-	-

NOTES/REMARKS: The samples were tested oven dried, dry sieved and in a 125-250mm mould.

Sample/s supplied by the client * Cracking occurred + Curling occurred Page 1 of 1 REP00102

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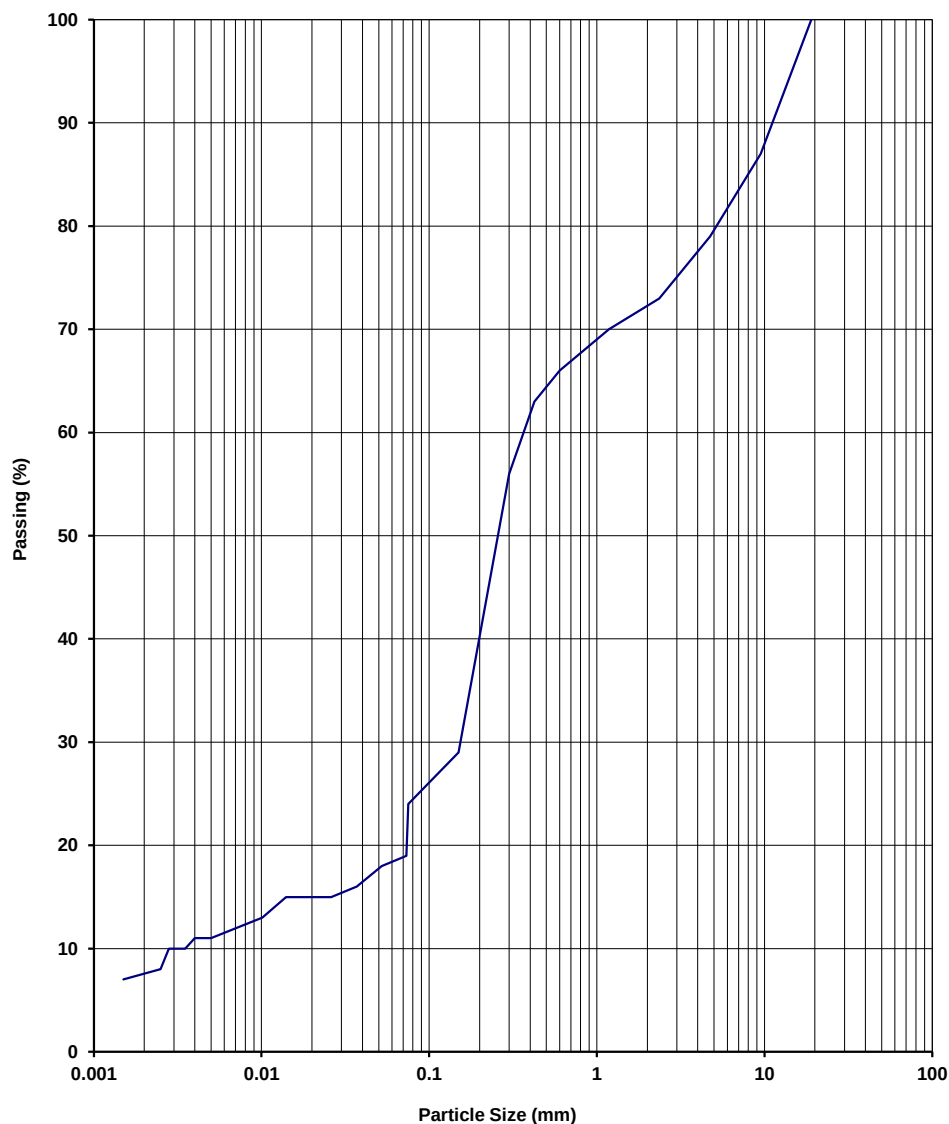
Trilab Pty Ltd ABN 25 065 630 506

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040710-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	4/5/15-11/5/15
		Report Date	12/5/2015
Client ID	WBI-10	Depth (m)	7.00-7.45

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
9.5	87
4.75	79
2.36	73
1.18	70
0.600	66
0.425	63
0.300	56
0.150	29
0.075	24
0.073	19
0.052	18
0.037	16
0.026	15
0.019	15
0.014	15
0.0101	13
0.0071	12
0.005	11
0.004	11
0.0035	10
0.0028	10
0.0025	8
0.0015	7



NOTES/REMARKS:

-
Moisture Content 14.1% -2.36mm Soil Particle Density(t/m³) 2.58
Sample/s supplied by the client

Page 1 of 1 REP03902

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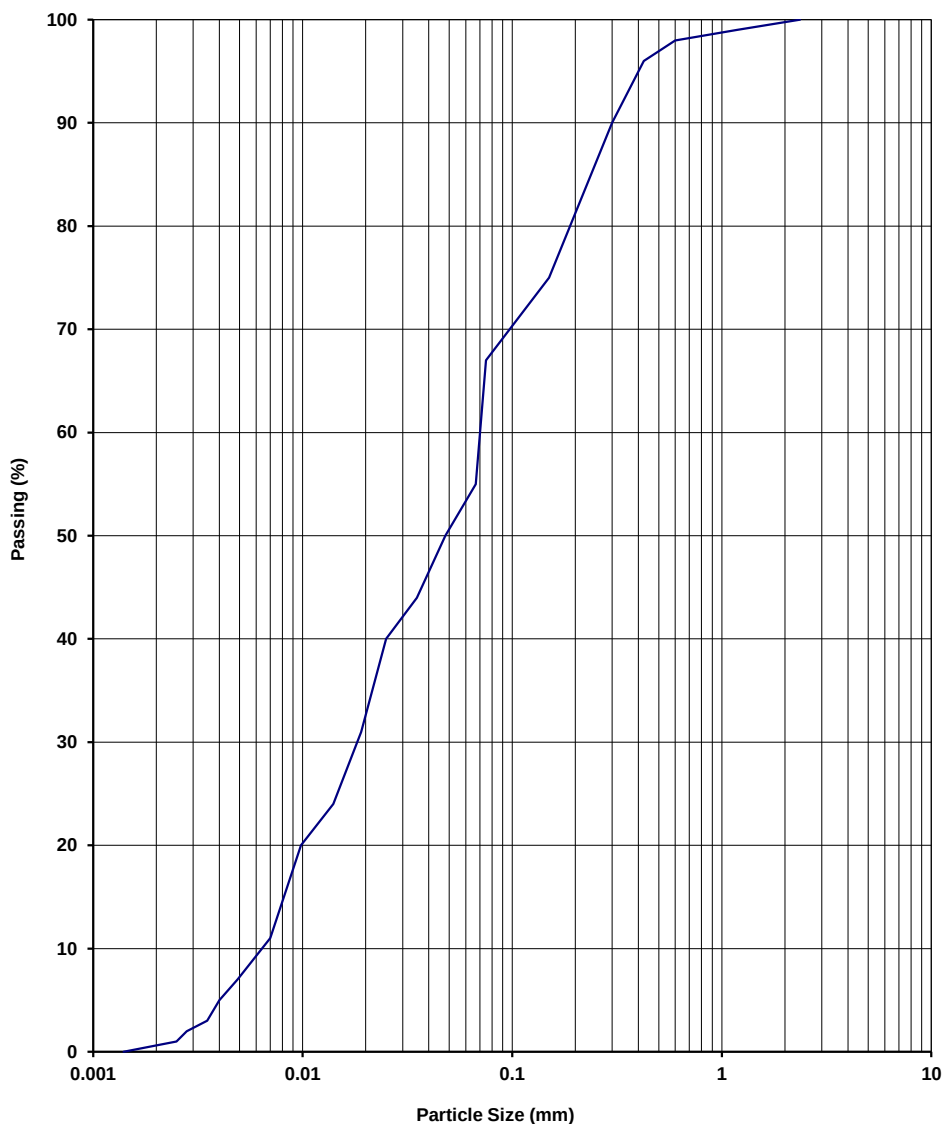
ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040711-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	4/5/15-11/5/15
		Report Date	12/5/2015
Client ID	WBI-10	Depth (m)	9.00-9.15

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	
2.36	100
1.18	99
0.600	98
0.425	96
0.300	90
0.150	75
0.075	67
0.067	55
0.048	50
0.035	44
0.025	40
0.019	31
0.014	24
0.0098	20
0.007	11
0.0049	7
0.004	5
0.0035	3
0.0028	2
0.0025	1
0.0014	0.0001



NOTES/REMARKS:

-
Moisture Content 14.6% -2.36mm Soil Particle Density(t/m³) 2.68
Sample/s supplied by the client

Page 1 of 1 REP03902

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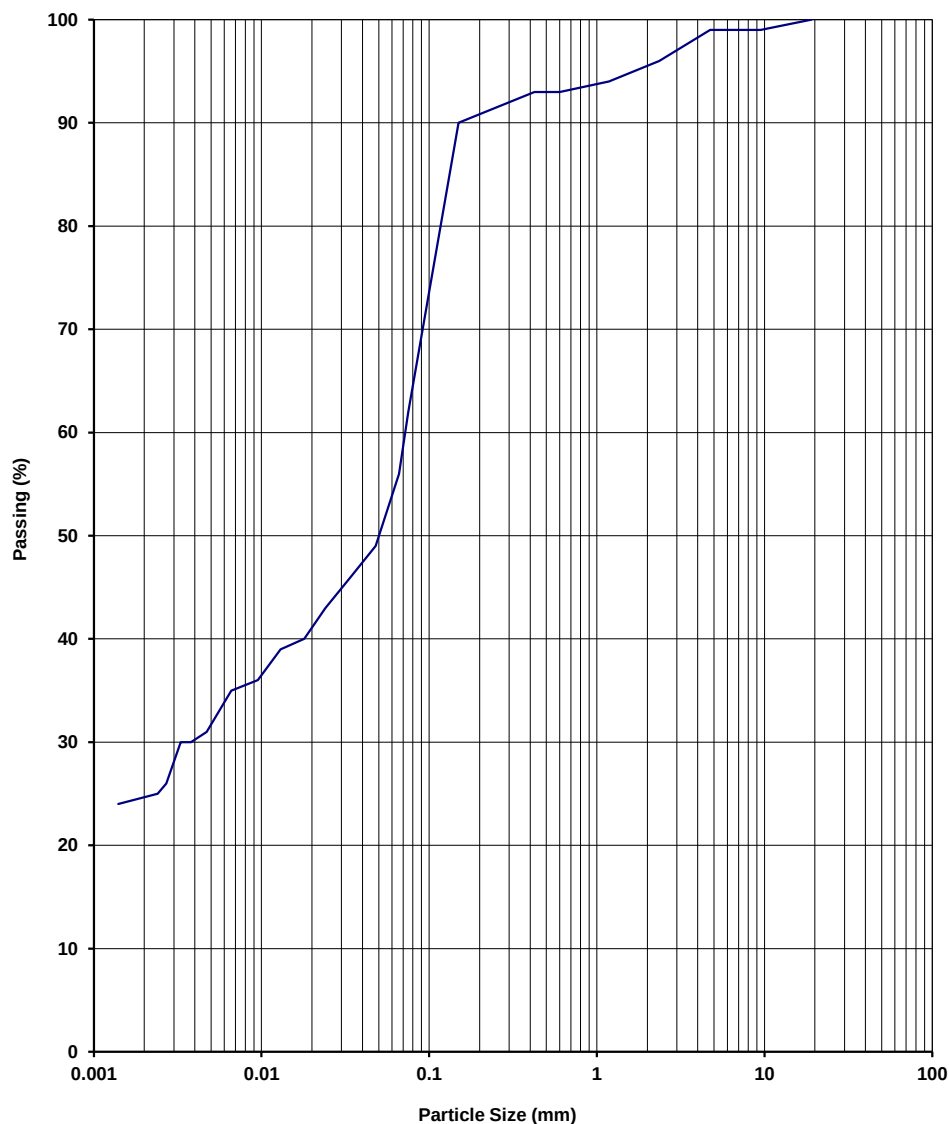
ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040719-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	5/5/15-11/5/15
		Report Date	12/5/2015
Client ID	PCE1	Depth (m)	1.00-1.45

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
9.5	99
4.75	99
2.36	96
1.18	94
0.600	93
0.425	93
0.300	92
0.150	90
0.075	62
0.066	56
0.048	49
0.034	46
0.024	43
0.018	40
0.013	39
0.0095	36
0.0066	35
0.0047	31
0.0038	30
0.0033	30
0.0027	26
0.0024	25
0.0014	24



NOTES/REMARKS:

-
Moisture Content 50.9% -2.36mm Soil Particle Density(t/m³) 2.63
Sample/s supplied by the client

Page 1 of 1 REP03902

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

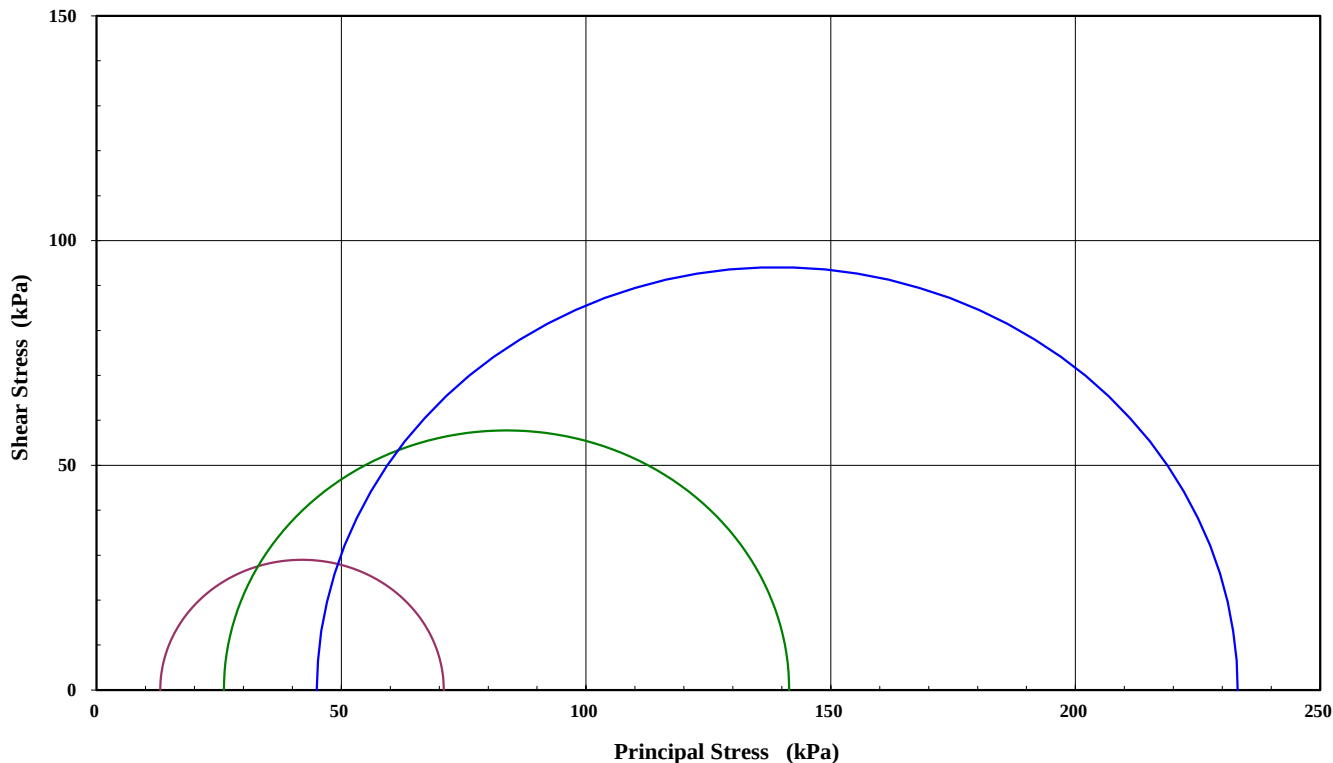
Client: Aurecon Australia Pty Ltd	Report No.: 15040722 - CU
Project: 245852 - GPC Offshore Geotechnical Sampling	Test Date: 5/05/2015 Report Date: 13/05/2015
Client Id.: PCE1	Depth (m): 6.00-6.40

Description: SANDY SILTY CLAY- yellow brown

SAMPLE & TEST DETAILS

Initial Height: 128.1 mm	Initial Moisture Content: 19.3 %	Rate of Strain: 0.005 %/min
Initial Diameter: 59.8 mm	Final Moisture Content: 22.5 %	B Response: 98 %
L/D Ratio: 2.1 : 1	Wet Density: 2.07 t/m ³	
	Dry Density: 1.74 t/m ³	

Mohr Circle Diagram



Interpretation between stages :	1 to 2	2 to 3	1 to 3
Cohesion C' (kPa) :	0.1	3.7	1.5
Angle of Shear Resistance Φ' (Degrees) :	43.5	41.0	42.0
Failure Criteria:	Peak Principal Stress Ratio		
Sample Type: Single Individual Undisturbed Specimen	Remarks: Tested as Received		
Sample/s supplied by the client	Note: Graph not to scale		

Page 1

REP03001

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Laboratory Number
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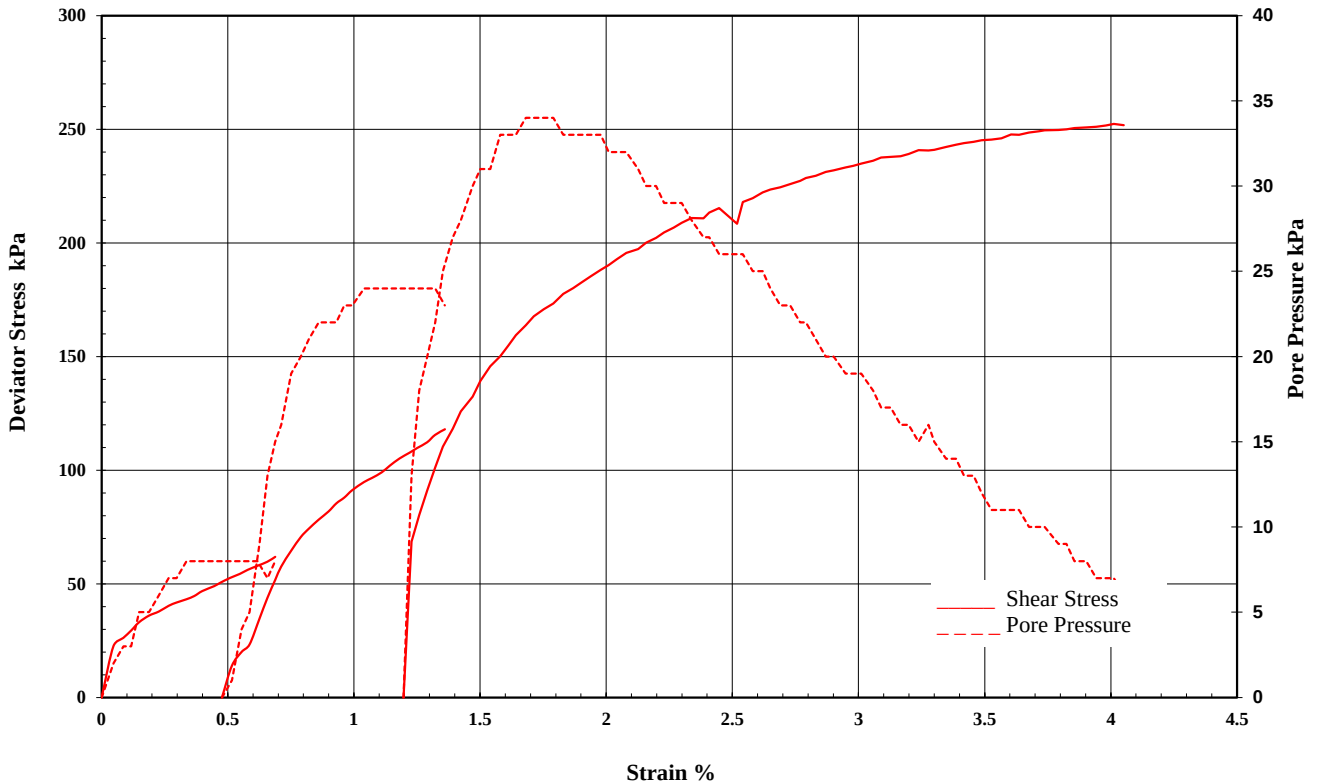
TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: Aurecon Australia Pty Ltd	Report No.: 15040722 - CU
Project: 245852 - GPC Offshore Geotechnical Sampling	Test Date: 5/05/2015 Report Date: 13/05/2015
Client Id.: PCE1	Depth (m): 6.00-6.40

Description: SANDY SILTY CLAY- yellow brown

Stress/Strain & Pore Pressure/Strain Diagram



FAILURE DETAILS

Effective Pressure	Confining Pressure	Back Pressure	Initial Pore	Failure Pore	Principal Effective Stresses			Deviator Stress	Strain
					σ'_1	σ'_3	σ'_1 / σ'_3		
21 kPa	523 kPa	502 kPa	502 kPa	510 kPa	71 kPa	13 kPa	5.456	58 kPa	0.62 %
50 kPa	552 kPa	502 kPa	502 kPa	526 kPa	142 kPa	26 kPa	5.443	116 kPa	1.32 %
78 kPa	580 kPa	502 kPa	502 kPa	535 kPa	233 kPa	45 kPa	5.181	188 kPa	1.98 %

Sample Type: Single Individual Undisturbed Specimen

Remarks: Tested as Received

Sample/s supplied by the client

Note: Graph not to scale

Page 2

REP03001

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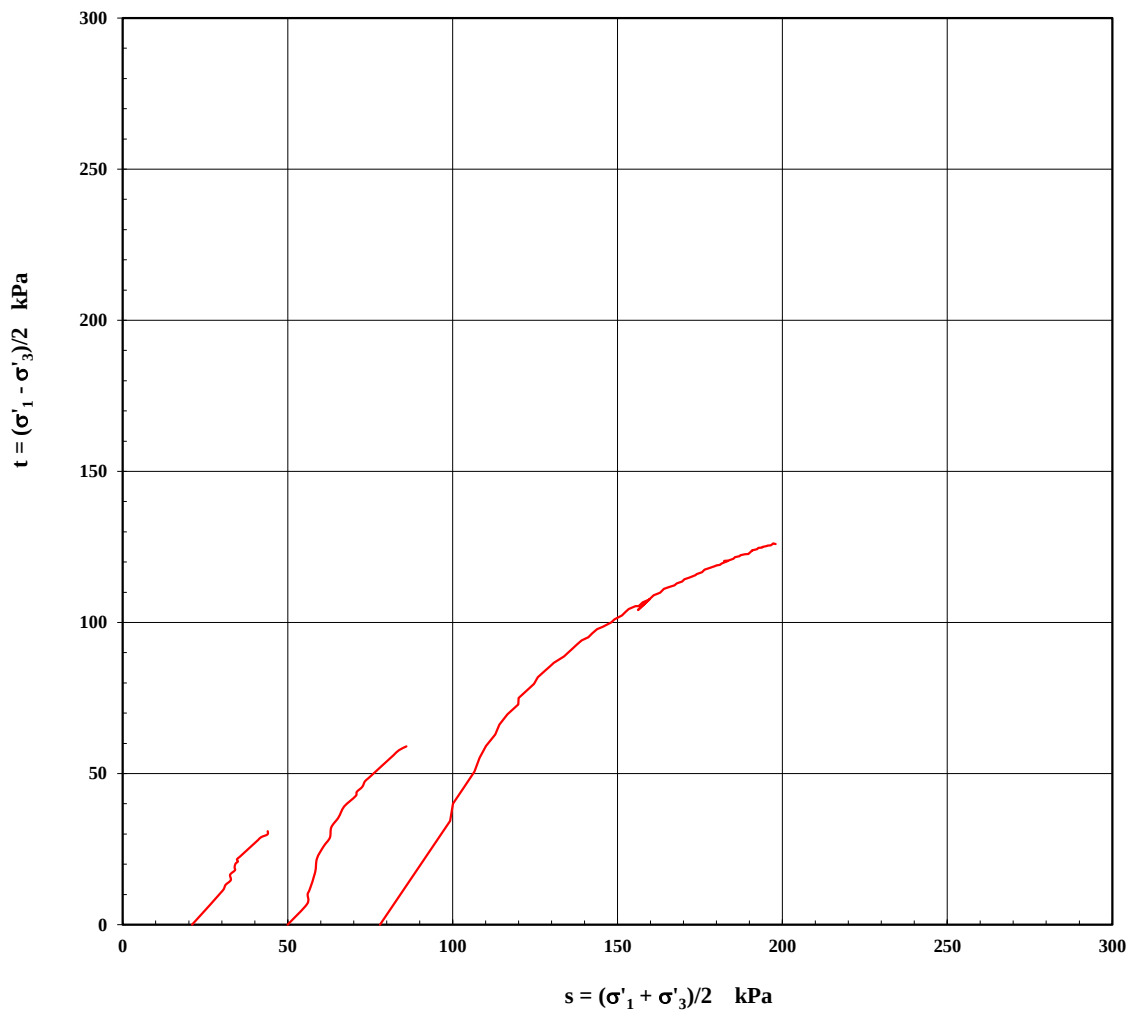
Trilab Pty Ltd
ABN 25 065 630 506

TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: Aurecon Australia Pty Ltd	Report No.: 15040722 - CU
Project: 245852 - GPC Offshore Geotechnical Sampling	Test Date: 5/05/2015 Report Date: 13/05/2015
Client Id.: PCE1	Depth (m): 6.00-6.40
Description: SANDY SILTY CLAY- yellow brown	

MIT Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Undisturbed Specimen	Remarks: Tested as Received
Sample/s supplied by the client	Note: Graph not to scale

Page 3

REP03001

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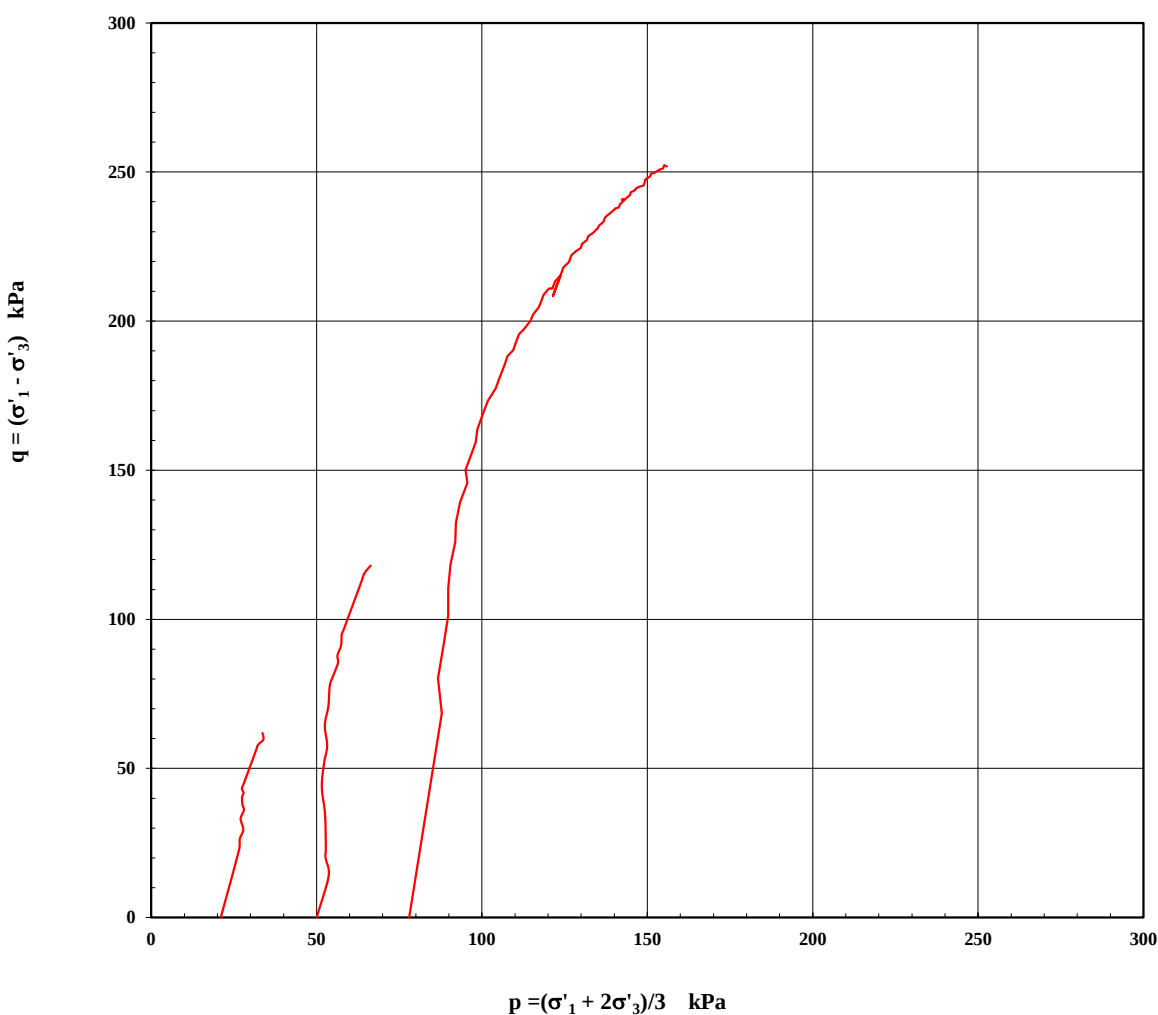
Laboratory Number
9926

TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: Aurecon Australia Pty Ltd	Report No.: 15040722 - CU
Project: 245852 - GPC Offshore Geotechnical Sampling	Test Date: 5/05/2015 Report Date: 13/05/2015
Client Id.: PCE1	Depth (m): 6.00-6.40
Description: SANDY SILTY CLAY- yellow brown	

Cambridge Method - Effective Stress Path



Note: Graph not to scale.

Sample Type: Single Individual Undisturbed Specimen	Remarks: Tested as Received
Sample/s supplied by the client	Note: Graph not to scale

Page 4

REP03001

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Laboratory Number
9926

TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: Aurecon Australia Pty Ltd	Report No.: 15040722 - CU
Project: 245852 - GPC Offshore Geotechnical Sampling	Test Date: 5/05/2015 Report Date: 13/05/2015
Client Id.: PCE1	Depth (m): 6.00-6.40
Description: SANDY SILTY CLAY- yellow brown	



Sample Type: Single Individual Undisturbed Specimen	Remarks: Tested as Received
Sample/s supplied by the client	Note: Graph not to scale

Page 5

REP03001

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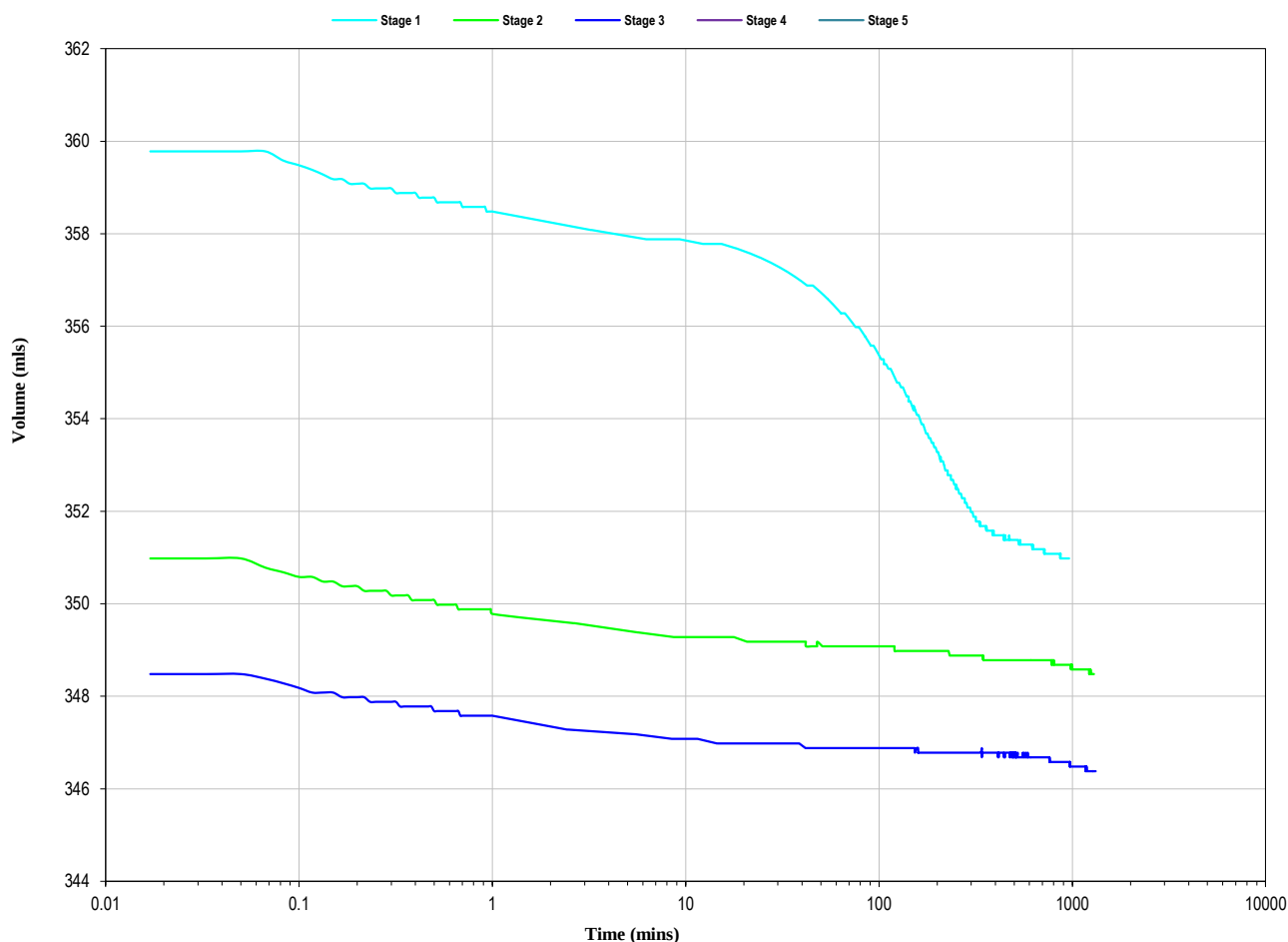
TRIAXIAL TEST REPORT

Test Method: AS1289.6.4.2

Client: Aurecon Australia Pty Ltd	Report No.: 15040722 - CU
Project: 245852 - GPC Offshore Geotechnical Sampling	Test Date: 5/05/2015 Report Date: 13/05/2015
Client Id.: PCE1	Depth (m): 6.00-6.40

Description: SANDY SILTY CLAY- yellow brown

Volume v's Time (Log Scale)



	Stage 1	Stage 2	Stage 3
Cv (m ² /year) :	281.63	42.52	22.73
Mv (m ² /MN) :	0.118	0.578	0.708
k (m/s) :	1.03E-08	7.61E-09	4.99E-09

Sample Type: Single Individual Undisturbed Specimen Remarks: Tested as Received

Sample/s supplied by the client Note: Graph not to scale

Page 6

REP03001

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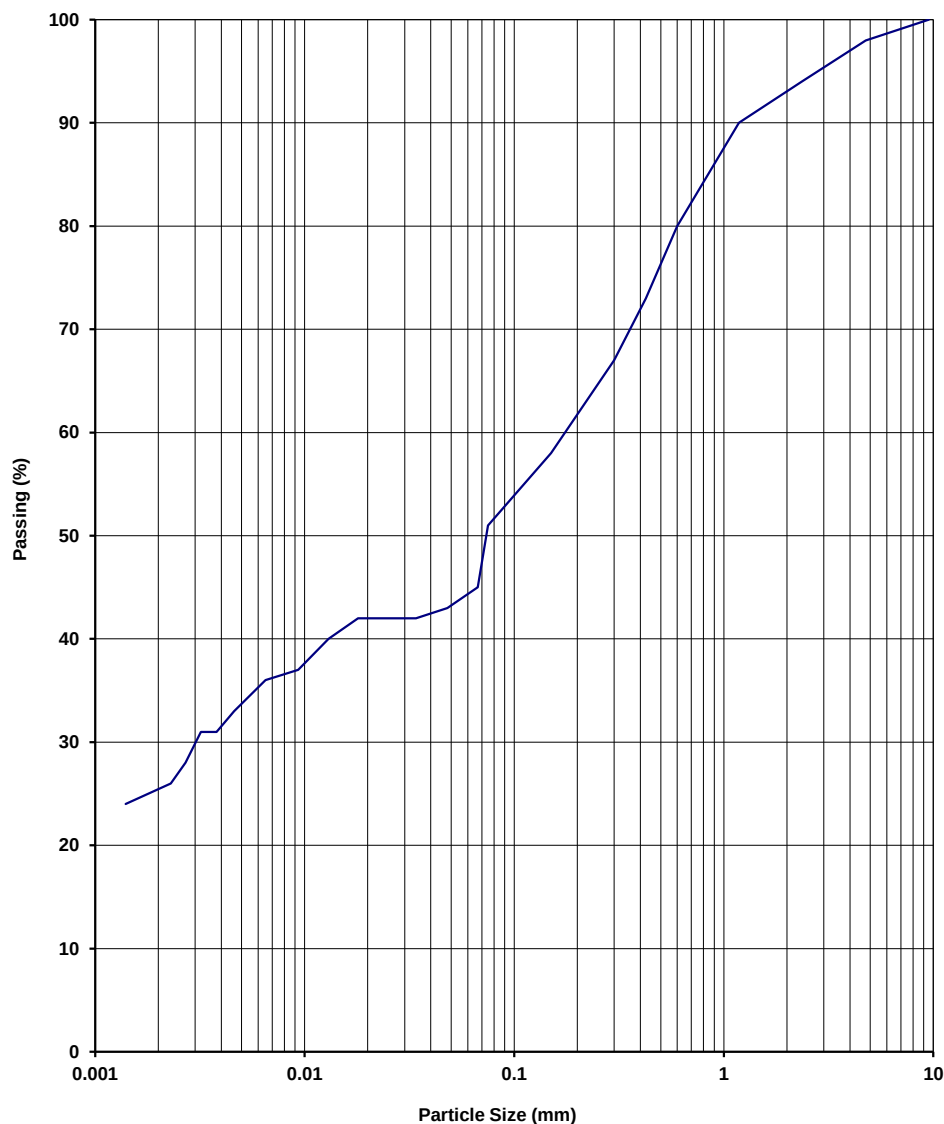
Trilab Pty Ltd
ABN 25 065 630 506

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040726-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	6/5/15-11/5/15
		Report Date	12/5/2015
Client ID	PCE3	Depth (m)	2.00-2.45

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
9.5	100
4.75	98
2.36	94
1.18	90
0.600	80
0.425	73
0.300	67
0.150	58
0.075	51
0.067	45
0.048	43
0.034	42
0.024	42
0.018	42
0.013	40
0.0093	37
0.0065	36
0.0046	33
0.0038	31
0.0032	31
0.0027	28
0.0023	26
0.0014	24



NOTES/REMARKS:

-
Moisture Content 15.4% -2.36mm Soil Particle Density(t/m³) 2.67
Sample/s supplied by the client

Page 1 of 1 REP03902

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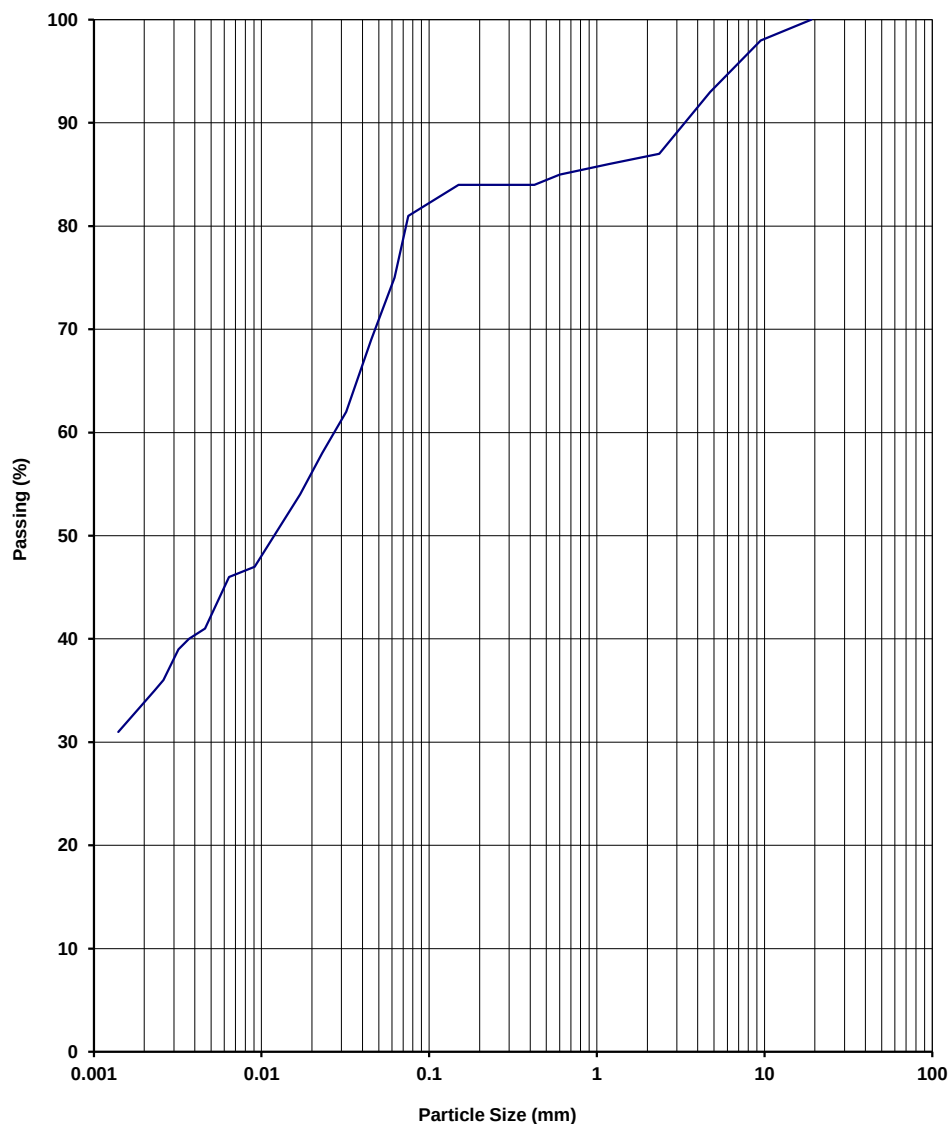
ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040730-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	5/5/15-11/5/15
		Report Date	12/5/2015
Client ID	PCE3	Depth (m)	9.00-9.45

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
9.5	98
4.75	93
2.36	87
1.18	86
0.600	85
0.425	84
0.300	84
0.150	84
0.075	81
0.062	75
0.045	69
0.032	62
0.023	58
0.017	54
0.013	51
0.0091	47
0.0064	46
0.0046	41
0.0037	40
0.0032	39
0.0026	36
0.0023	35
0.0014	31



NOTES/REMARKS:

-
Moisture Content 22.6% -2.36mm Soil Particle Density(t/m³) 2.66
Sample/s supplied by the client

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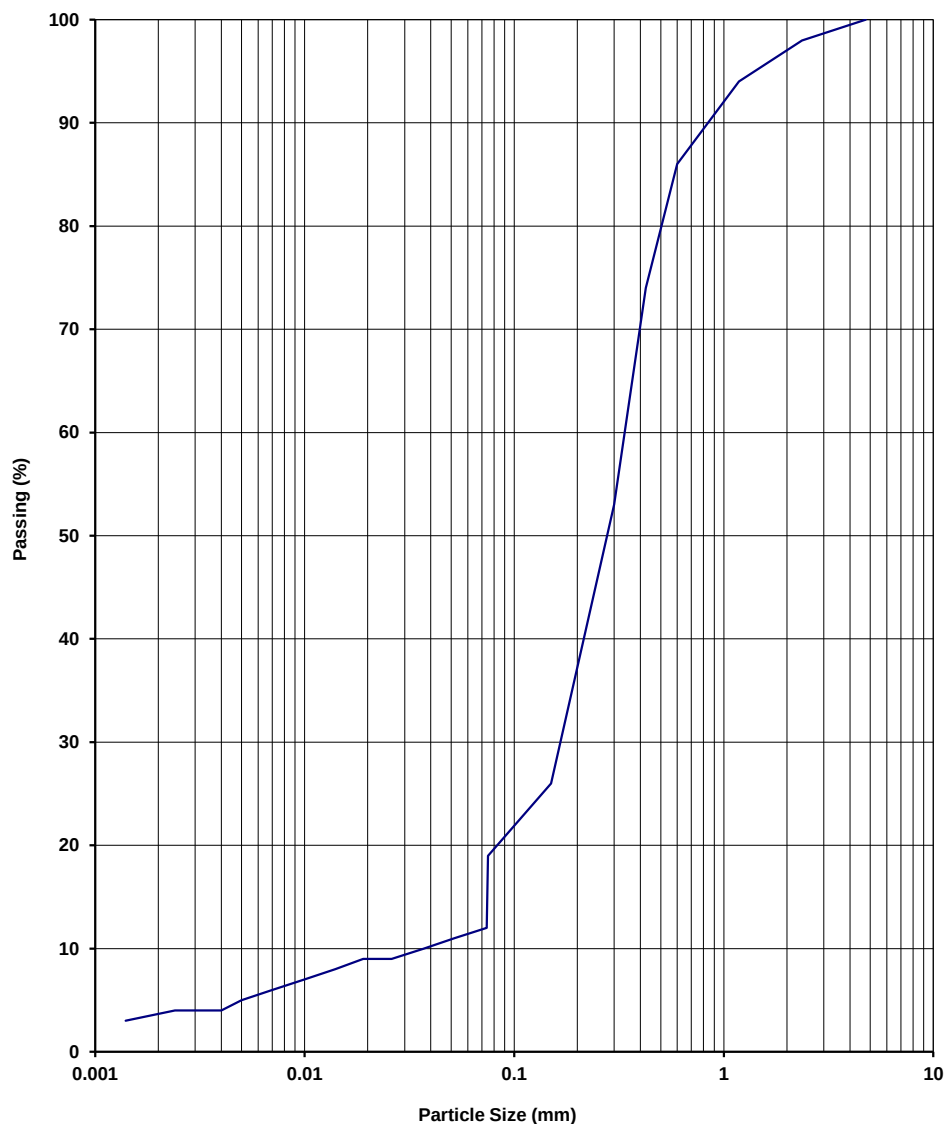
ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1

Client	Aurecon Australia Pty Ltd	Report No.	15040733-G
Project	245852 - GPC Offshore Geotechnical Sampling	Test Date	5/5/15-11/5/15
		Report Date	12/5/2015
Client ID	WBI-13	Depth (m)	3.00-3.45

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
9.5	
4.75	100
2.36	98
1.18	94
0.600	86
0.425	74
0.300	53
0.150	26
0.075	19
0.074	12
0.052	11
0.037	10
0.026	9
0.019	9
0.014	8
0.01	7
0.007	6
0.005	5
0.004	4
0.0035	4
0.0028	4
0.0024	4
0.0014	3



NOTES/REMARKS:

-
Moisture Content 21.2% -2.36mm Soil Particle Density(t/m³) 2.68
Sample/s supplied by the client

Page 1 of 1 REP03902

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ACCURATE QUALITY RESULTS FOR TOMORROW'S ENGINEERING

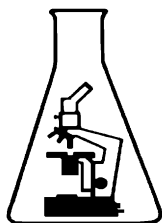
GEOCHEMPET SERVICES BRISBANE

Geochempet Services

ABN 980 6945 3445

PETROLOGICAL and GEOCHEMICAL CONSULTANTS

Principals: K.E. Spring B.Sc.(Hons), MAppSc and H.M. Spring B.Sc.



5/14 Redcliffe Gardens Drive
Clontarf, QLD 4019

Telephone: (07) 3284 0020

Fax: (07) 3284 0018

Email: info@geochempet.com
www.geochempet.com

PETROGRAPHIC REPORT ON A ROCK SAMPLE (PCE-03) PORT OF GLADSTONE OFFSHORE

prepared for

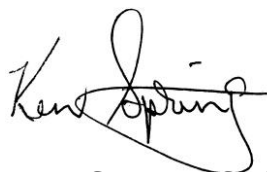
**AURECON
BRISBANE**

Purchase Order:

Invoice Number: 00006625

Client Ref: Graham Irvine

Issued by



K. E. Spring B.Sc.(Hons), MAppSc
14 July 2015

JULY, 2015

Ar150705

Page 1 of 4

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GEOCHEMPET SERVICES BRISBANE

Sample Number: PCE-03 **Date Sampled:** 21/05/15

Sample Type: Hand specimen **Date Received:** 19/06/15

Sample Location: -19.46 m LAT

Sample Source: Port of Gladstone offshore

Work Requested Petrographic analysis

Methods Adapted from ASTM C295 *Standard Guide for Petrographic Assessment of Aggregates for Concrete* and the AS2758.1 – 1998 *Aggregates and rock for engineering purposes part 1; Concrete aggregates (Appendix B)*

Identification Clayey labile siltstone

Description

The supplied hand specimen consists of pale greyish orange to light brown, variably weathered, clayey siltstone, which is seen to be moderately ferruginized, massive, sedimentary rock. The rock is soft and friable, and can be carved by a fingernail. When soaked in water, the rock is water absorbent.

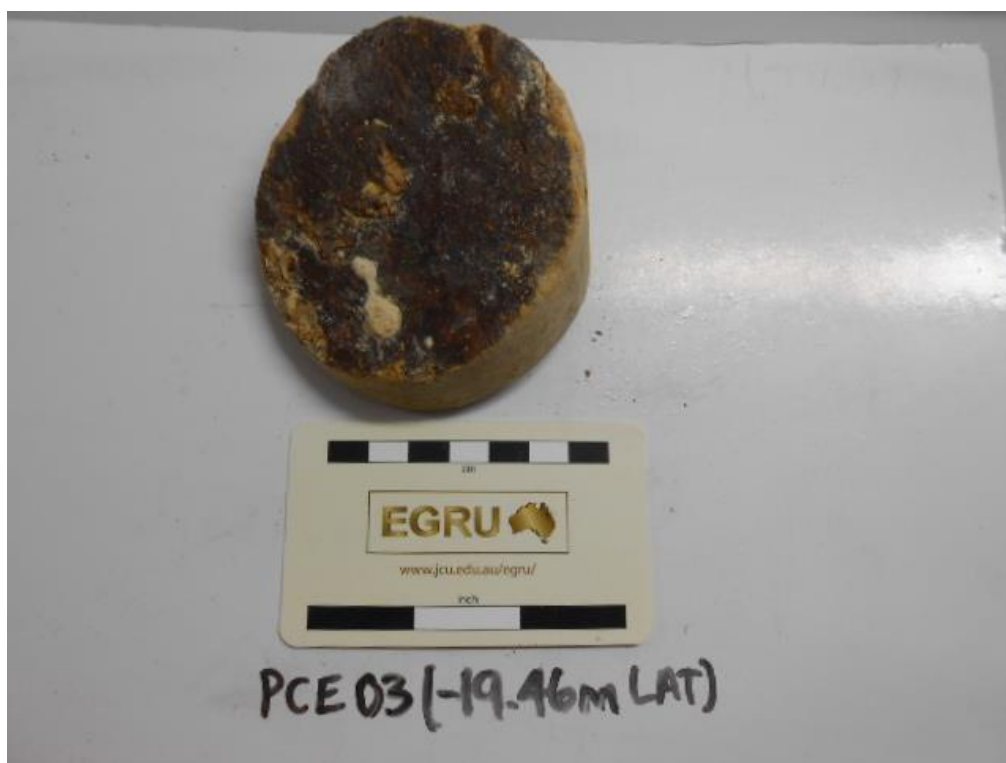


Plate 1. Photograph of supplied rock sample showing a ferruginized joint surface.

GEOCHEMPET SERVICES BRISBANE

In order to permit detailed microscopic examination in transmitted polarised light a thin section was prepared from the specimen. An approximate mineralogical composition of the siltstone, expressed in volume percent and based on a brief count of 100 widely spaced points in thin section, is:

Hard, Durable Minerals

- 17% quartz
- 3% leucoxene
- <1% accessory minerals (zircon and leucoxenized opaque oxides)

Soft, Weak / Deleterious Minerals

- 71% interstitial clay cement (mixture of sericite/illite/chlorite)
- 8% interstitial earthy limonite
- <1% carbonaceous material

Porosity

- 1% pores

In thin section, the clayey siltstone appears to be a slightly porous and massive. As a whole the rock is loosely packed with angular to rounded quartz chips up to about 0.1 mm in size in a sericitic/illitic/chloritic matrix.

The silt grains are dominantly simple grains of quartz. There are scattered specks of leucoxene and limonite in the matrix. Trace amounts of heavy detrital minerals include leucoxenized opaque oxide and zircon is observed.

The grains are cemented by an argillized matrix consists of clay of a low to moderately birefringent type consistent with chlorite-illite-sericite mixed layer clay along with some patchy iron-staining particularly around common limonitic fractures and specks of carbonaceous matter. The rock has a few residual interstitial pores (about 4 mm long) filled or lined by secondary iron oxides within the clay matrix.

A few fractures are filled by earthy limonite and is associated with limited porosity.

Comments and Interpretations

The supplied hand specimen (labelled PCE-03) from offshore at Port of Gladstone is interpreted to have originated as clayey siltstone. Its composition and textures appear to be consistent with a fluvial or perhaps marine depositional environment.

For engineering purposes the supplied sample may be summarised as;

- **labile siltstone**, a sedimentary rock type
- clay-cemented
- massive
- slightly porous (about 1% pores)

JULY, 2015

Ar150705

Page 3 of 4

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GEOCHEMPET SERVICES BRISBANE

- water absorbent
- tightly cemented by an interstitial network of illitic/sericitic clays along with minor limonite
- containing about 20% of robust, durable components (mainly quartz grains and leucoxene)
- containing about 79% of weak, soft or otherwise non-durable components (illite/sericite/chlorite clay and earthy limonite)
- variably weathered
- **soft**
- **apparently of low dry strength**

The siltstone is predicted to be **non-durable**.

Free Silica Content

About 17%.

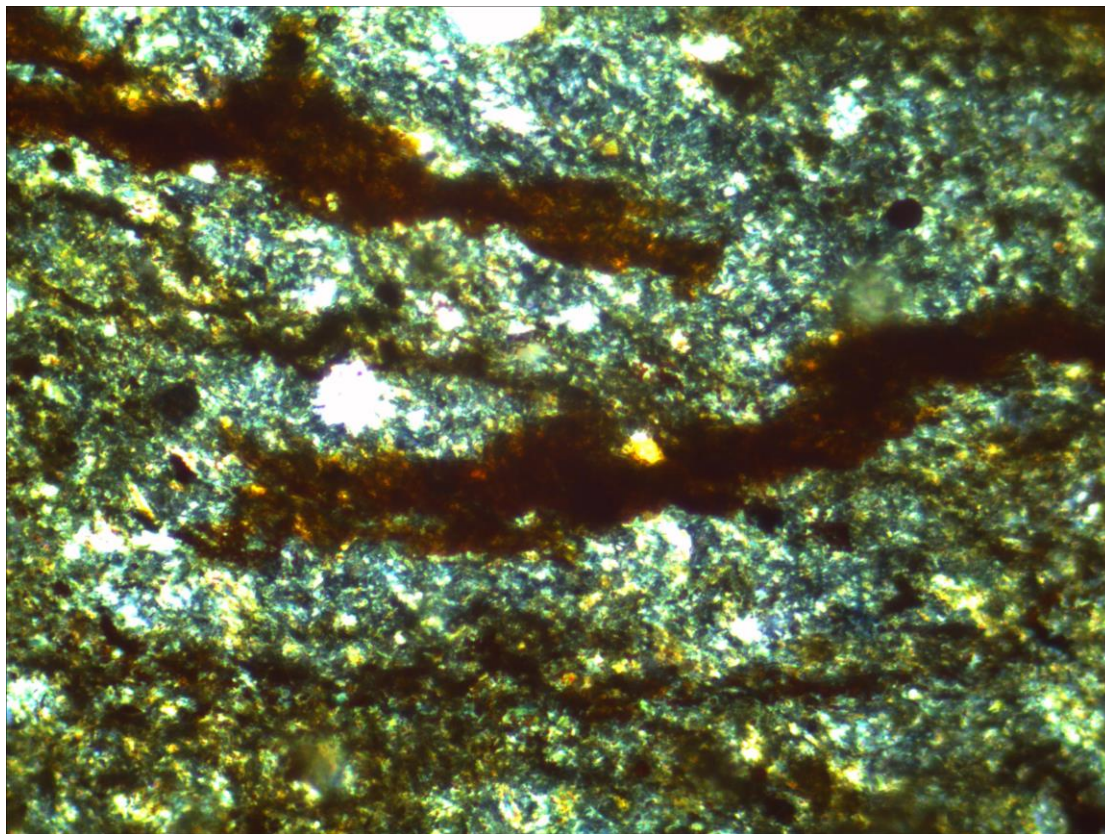
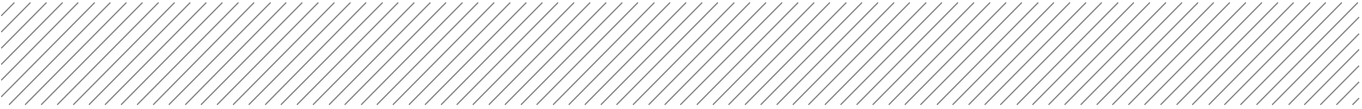
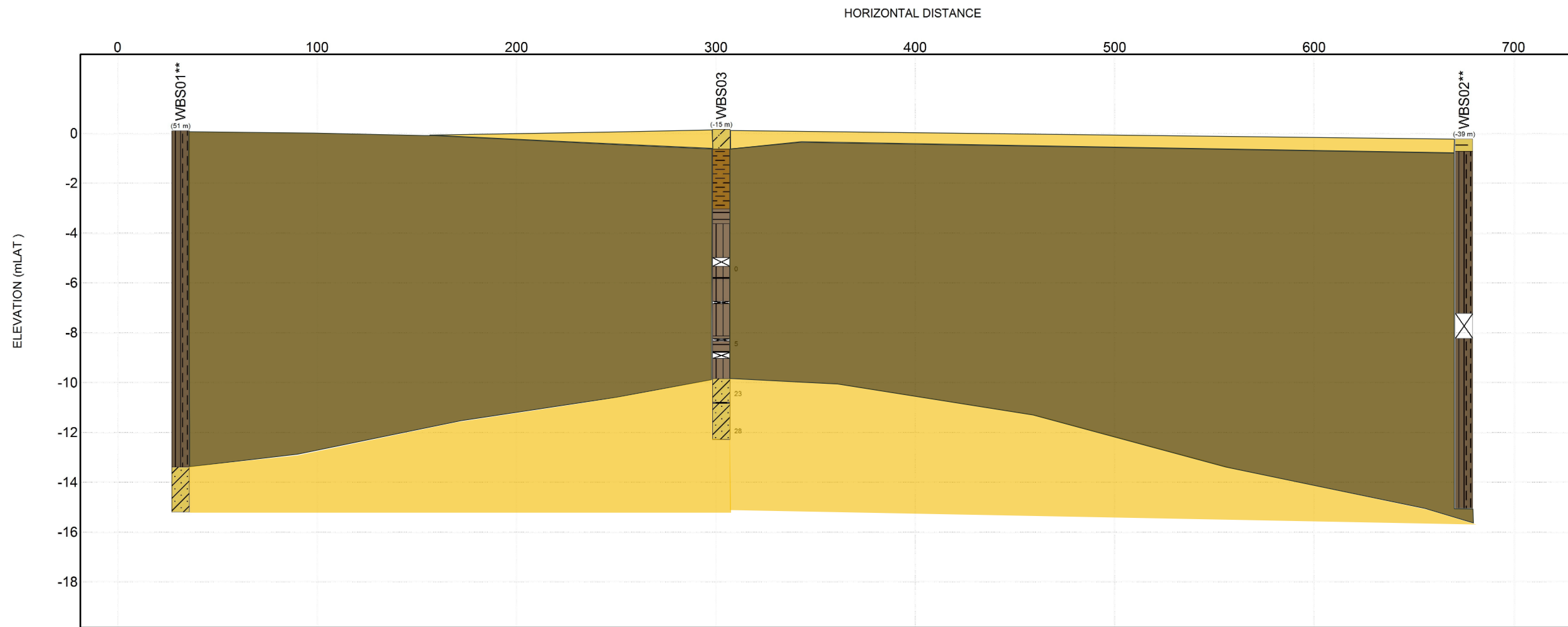


Plate 2. Medium magnification, crossed polarised transmitted light image of part of siltstone. It shows common limonite fractures in the clay matrix along with scattered quartz silt grains. Image width is 0.59 mm.



Appendix E

Long sections



WBS01
⊕

WBS03
⊕

WBS02
⊕



⊗ CORE LOSS

⊗ CH

⊗ CH-MH

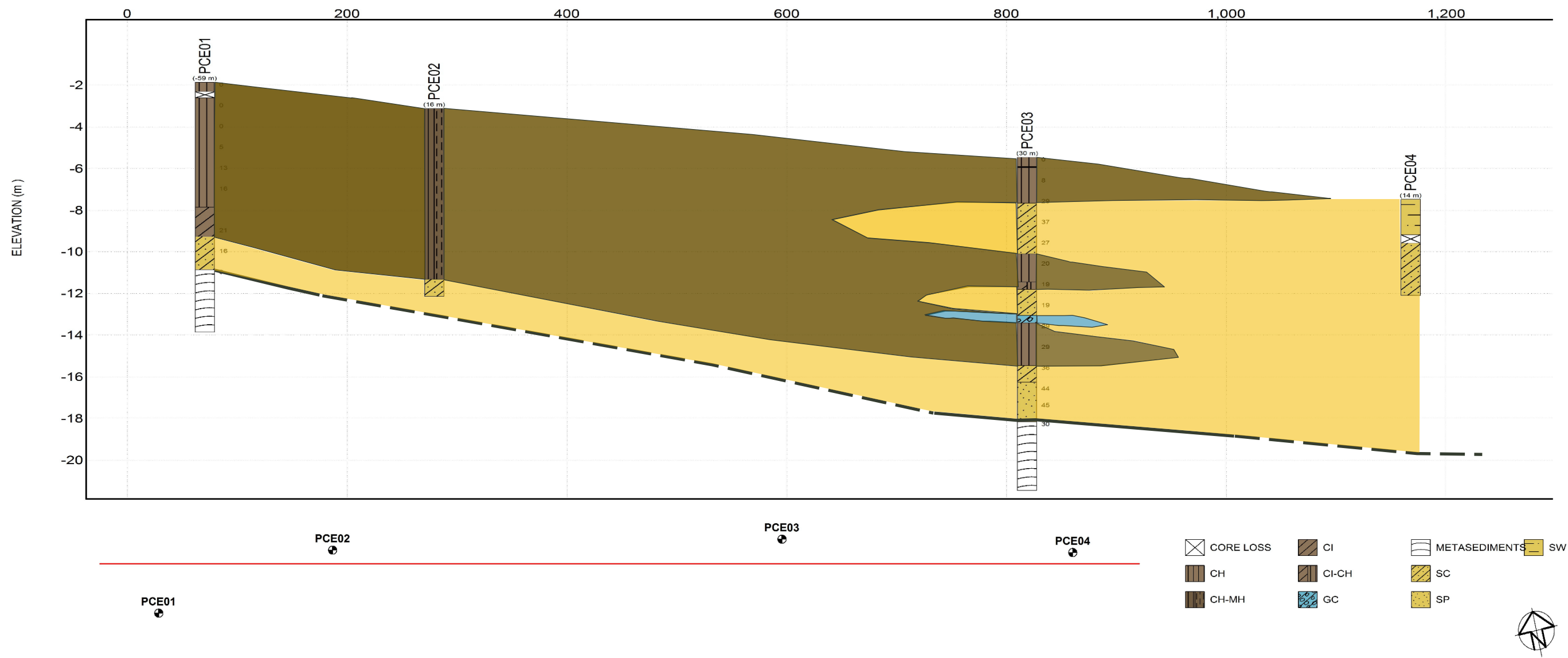
⊗ CL

⊗ ML

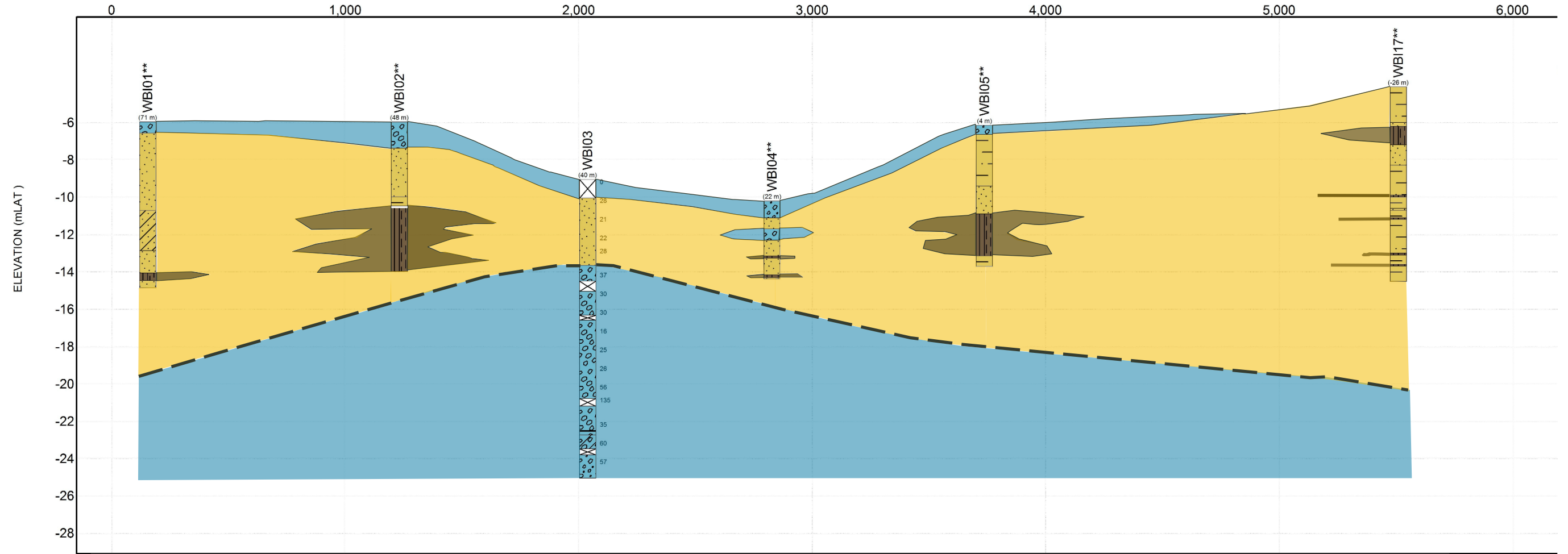
⊗ SC

⊗ SM

⊗ SW



HORIZONTAL DISTANCE (m)



WBI01

WBI02

WBI03

WBI04

WBI05

WBI17

WBI13

CORE LOSS

CH-MH

GC

GP

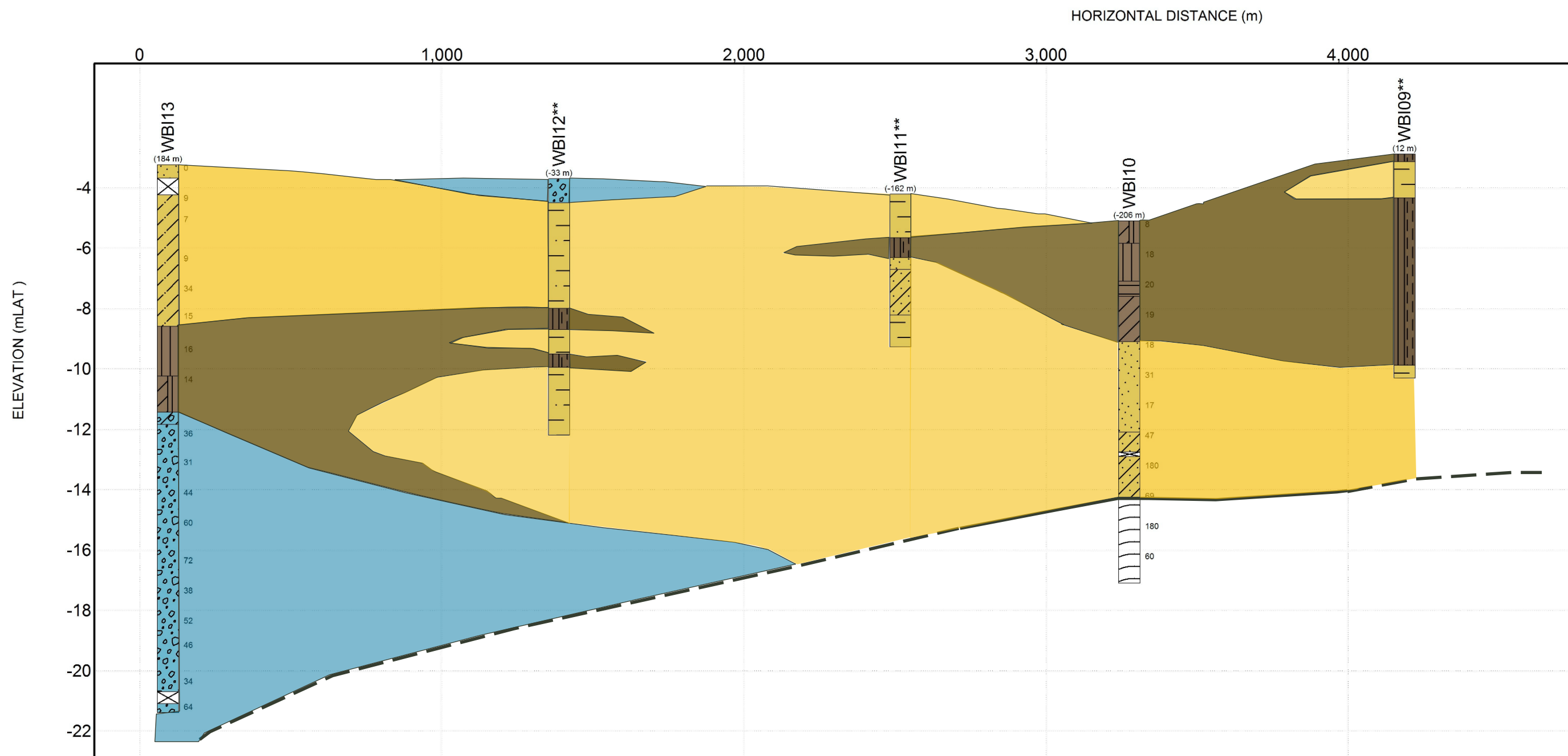
GW

SC

SP

SW





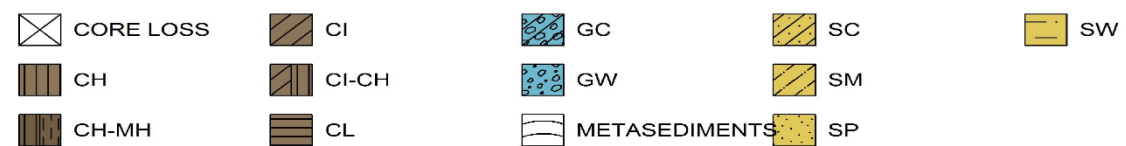
WBI13

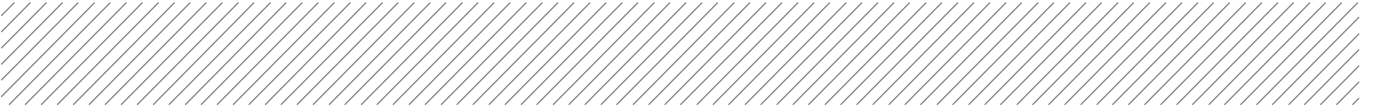
WBI12

WBI11

WBI10

WBI09





Appendix F

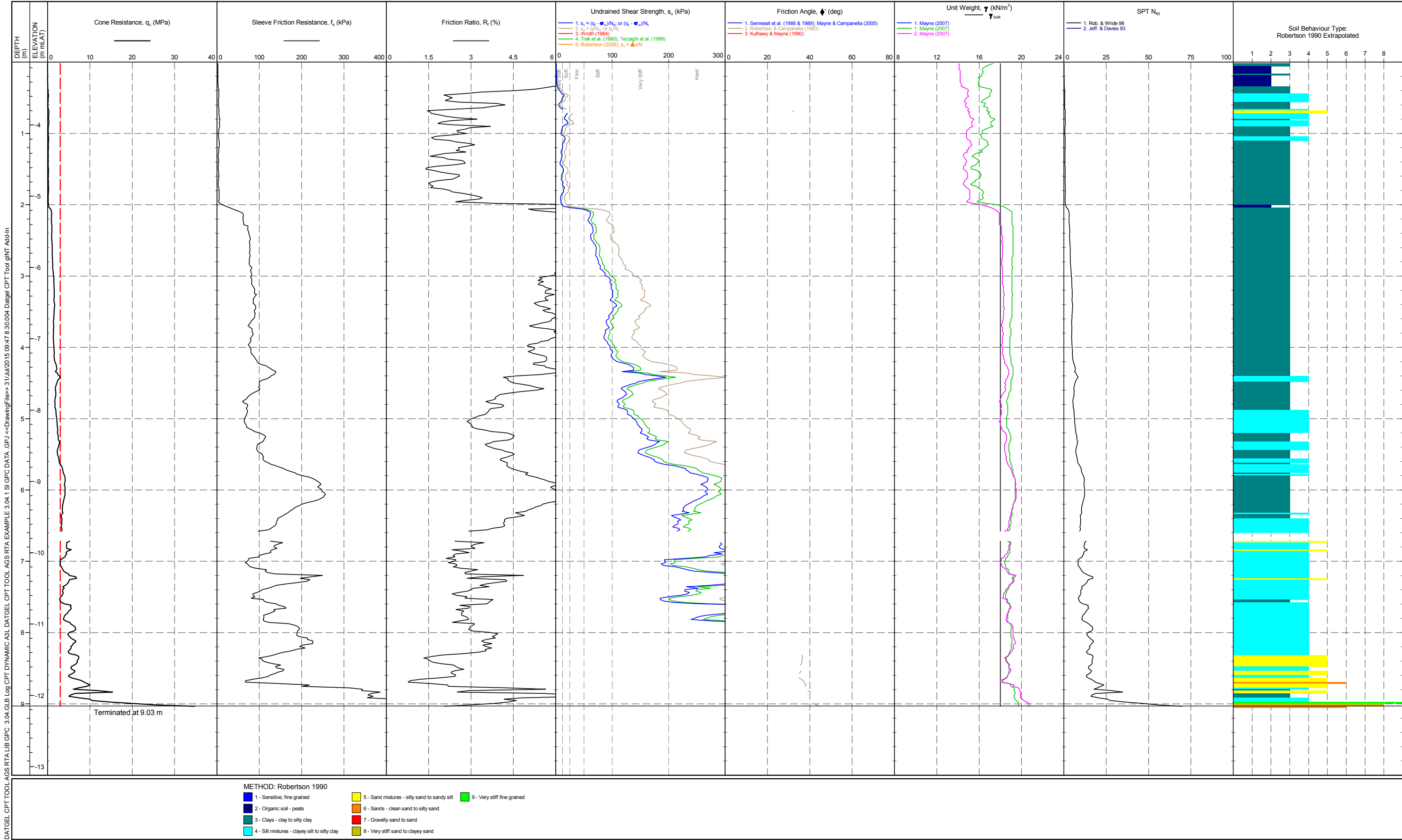
Cone Penetration Tests



PointID

PCE-2

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 325717.1 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7361397.2 m	CONE ID : EC40	APPROVED BY :		DATE : 13/02/2015 - 14/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -3.12 m mLAT				

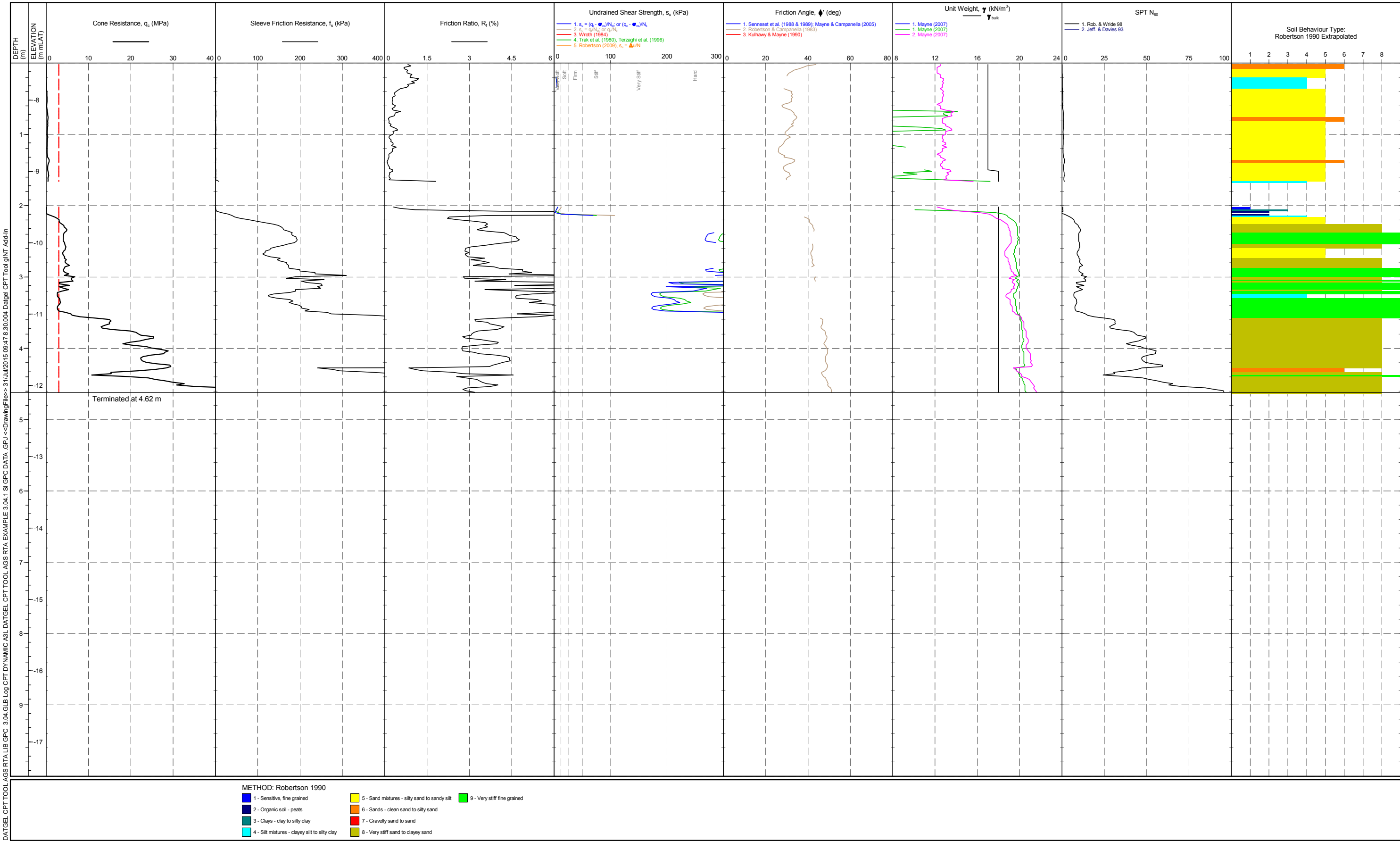




PointID

PCE-4

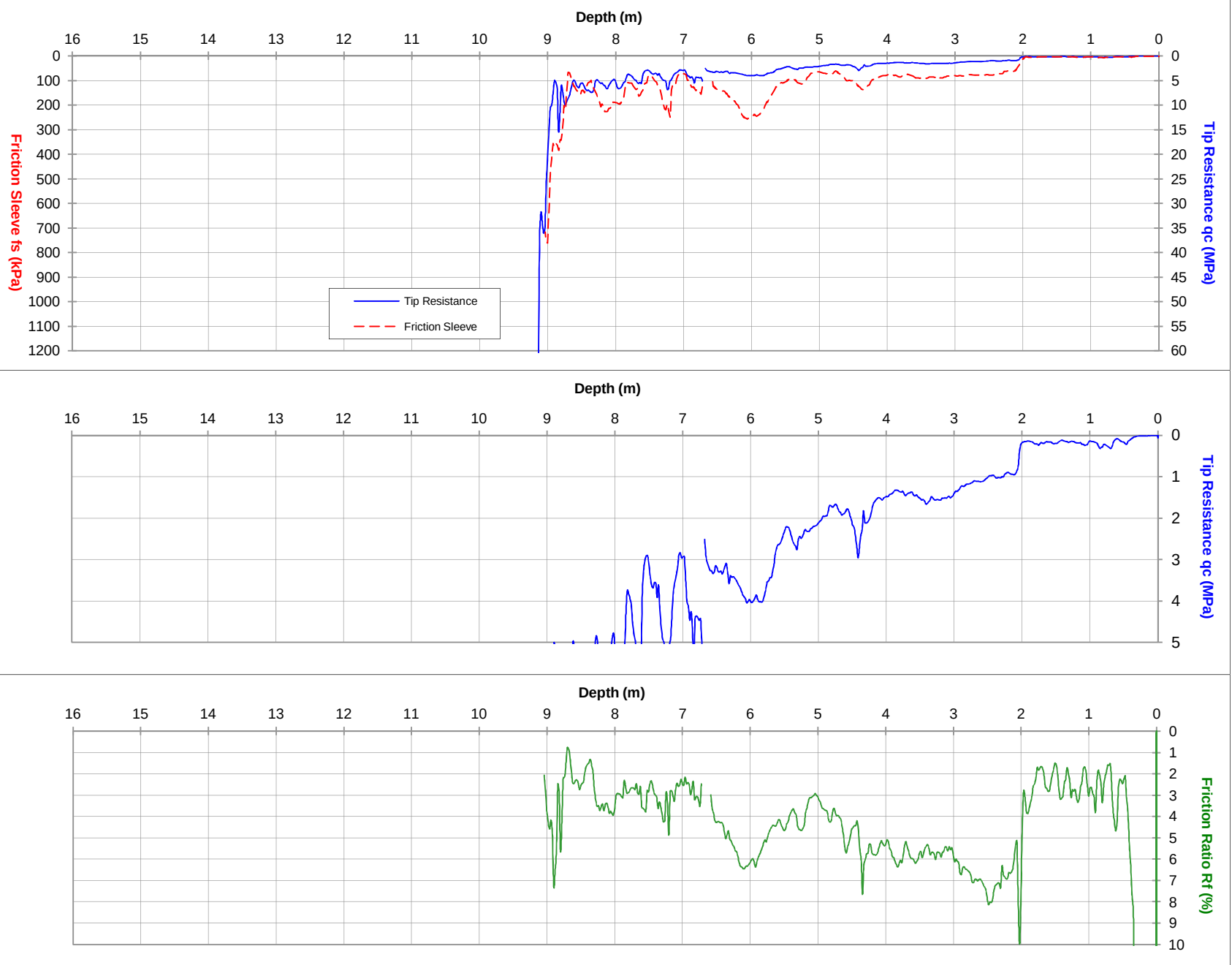
CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 326583.4 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7361200.1 m	CONE ID :	APPROVED BY :		DATE : 15/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -7.48 m LAT				



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Friday, 13 February 2015
Probe No.: PCE 2 & 2A
Job Number: Q15005M
Co-ordinates:



File: AU0001&2P5

Cone I.D.: EC40

Casing to (m): 0.4 / 6.7

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 5.385 / 5.1
Refusal: 76MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Friday, 13 February 2015

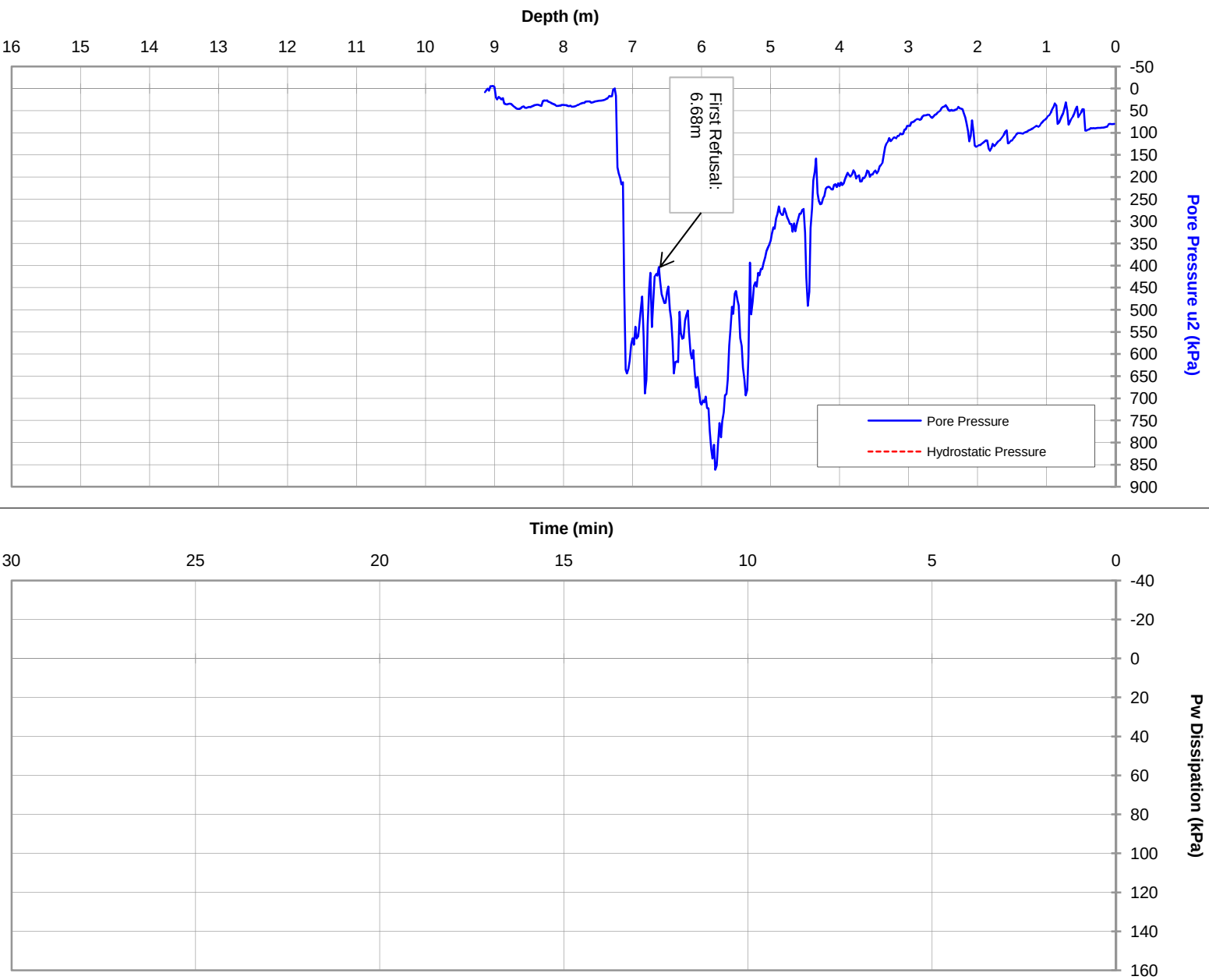
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 2

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

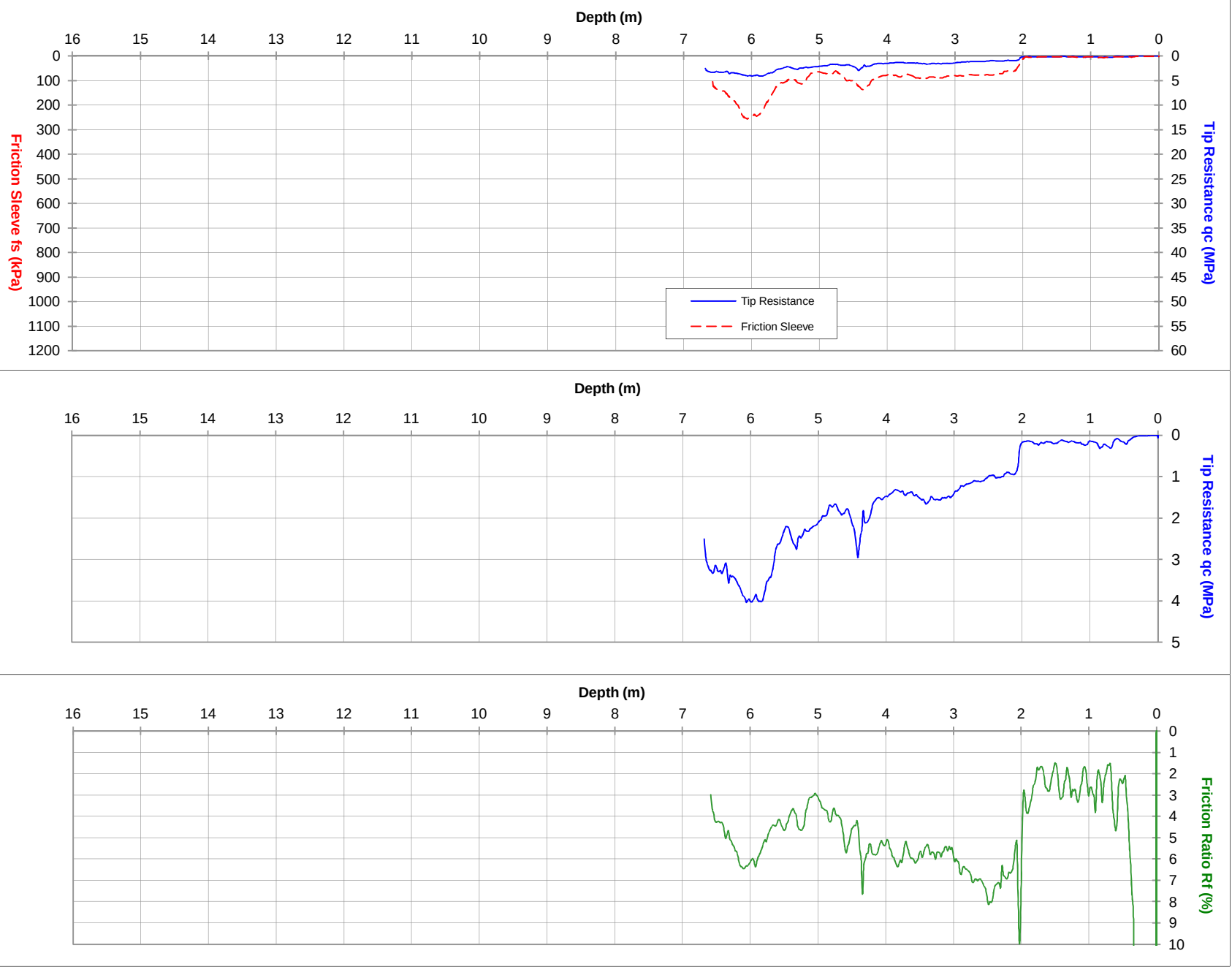
RL (m):

Date: Friday, 13 February 2015

Probe No.: PCE 2

Job Number: Q15005M

Co-ordinates:



File: AU0001P5

Cone I.D. : EC40

Casing to (m): 0.4

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 5.385
Refusal: Rod break at approx. 1m

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Friday, 13 February 2015

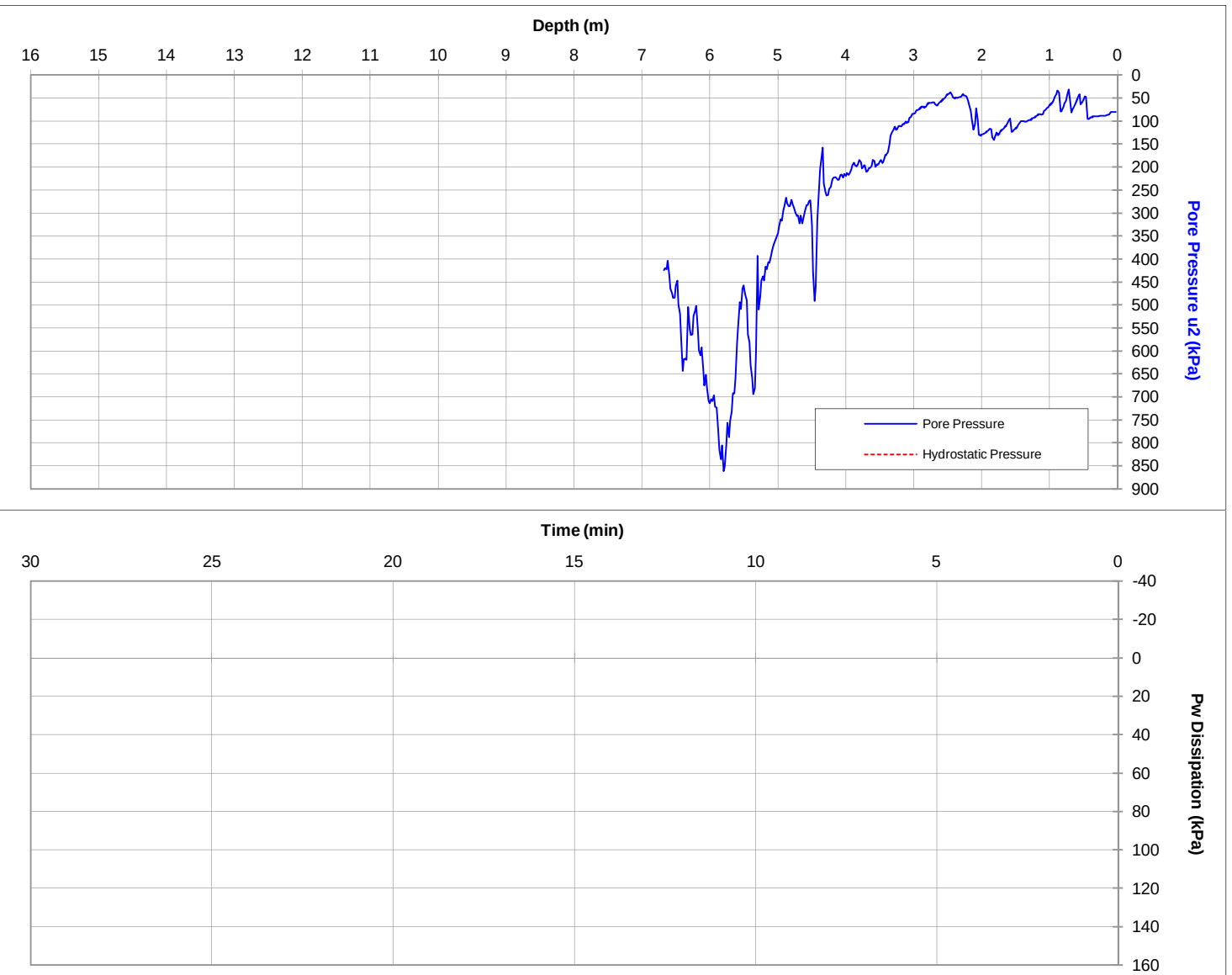
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 2

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

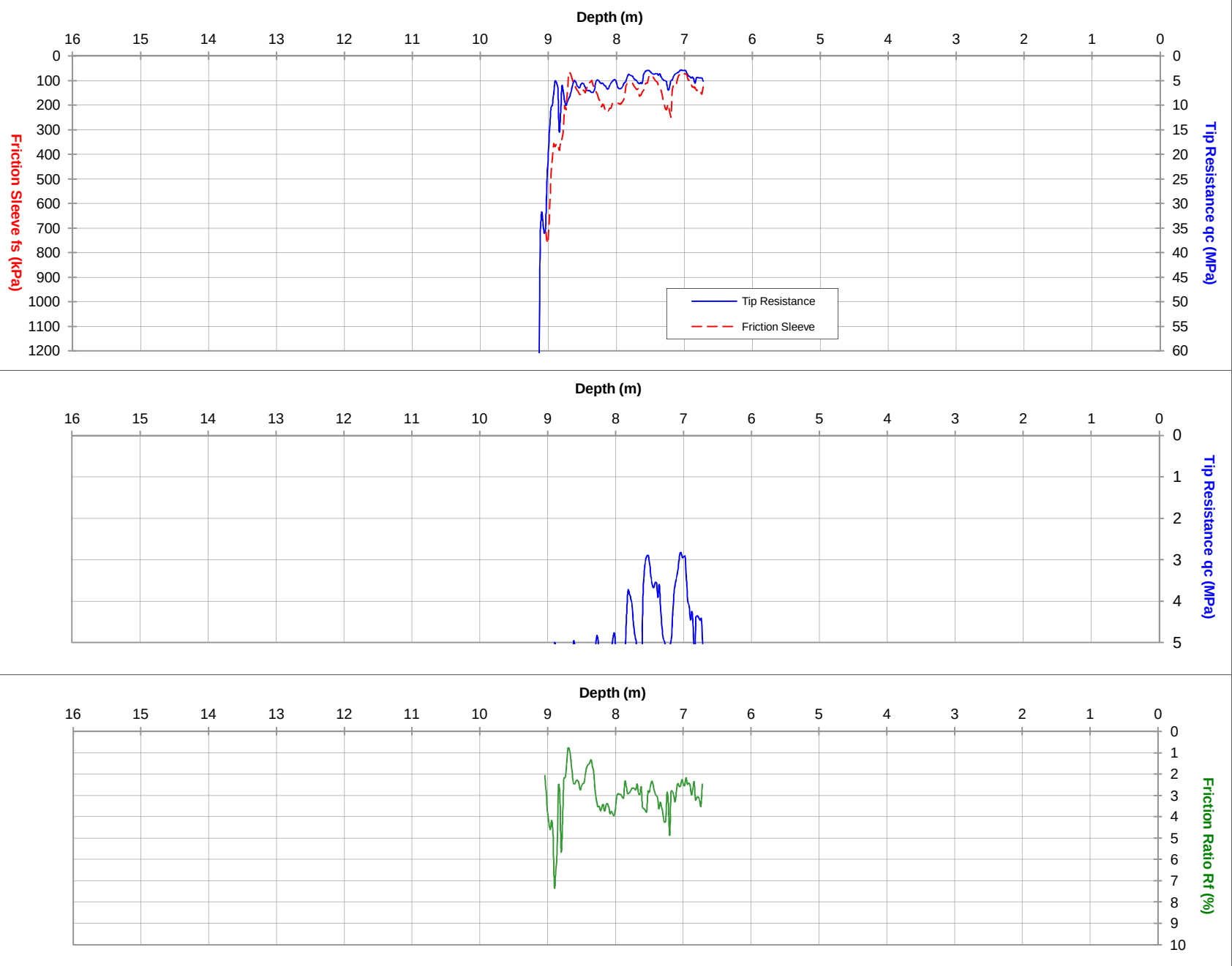
RL (m):

Date: Saturday, 14 February 2015

Probe No.: PCE 2A

Job Number: Q15005M

Co-ordinates:



File: AU0002P5

Cone I.D. : EC39

Casing to (m): 6.7

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 5.1
Refusal: 76MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Saturday, 14 February 2015

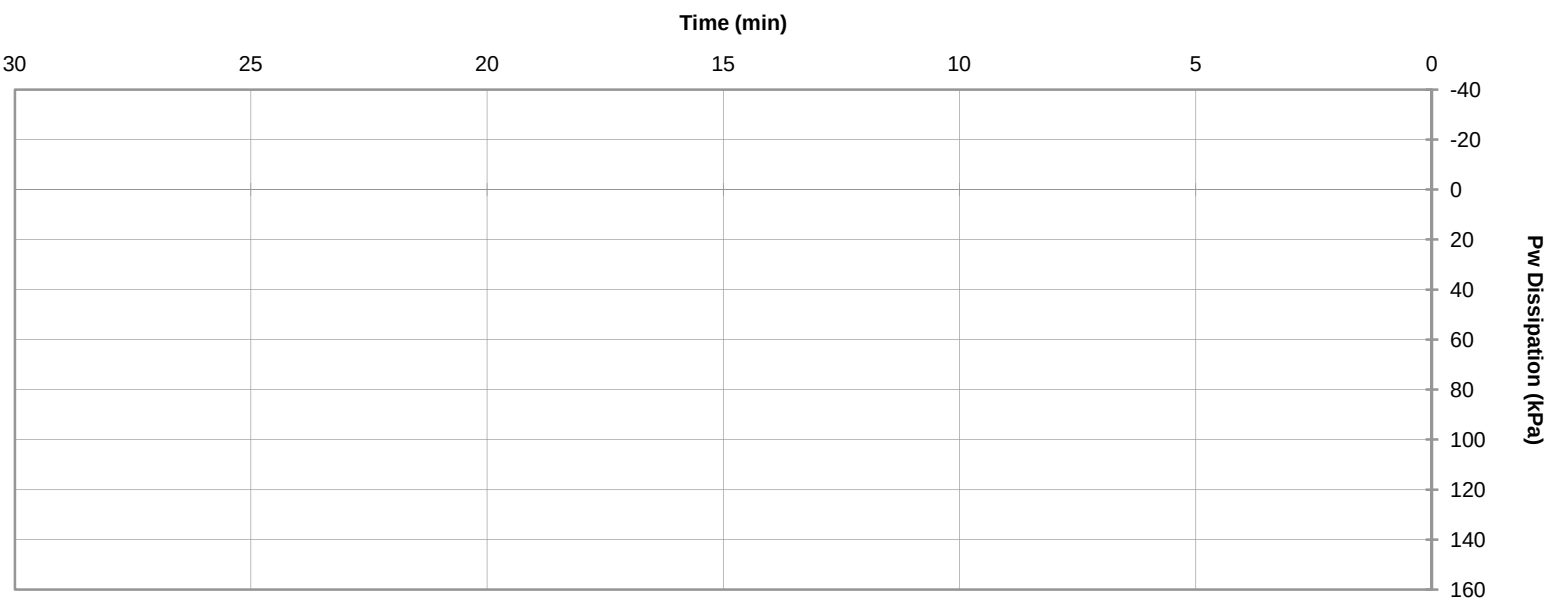
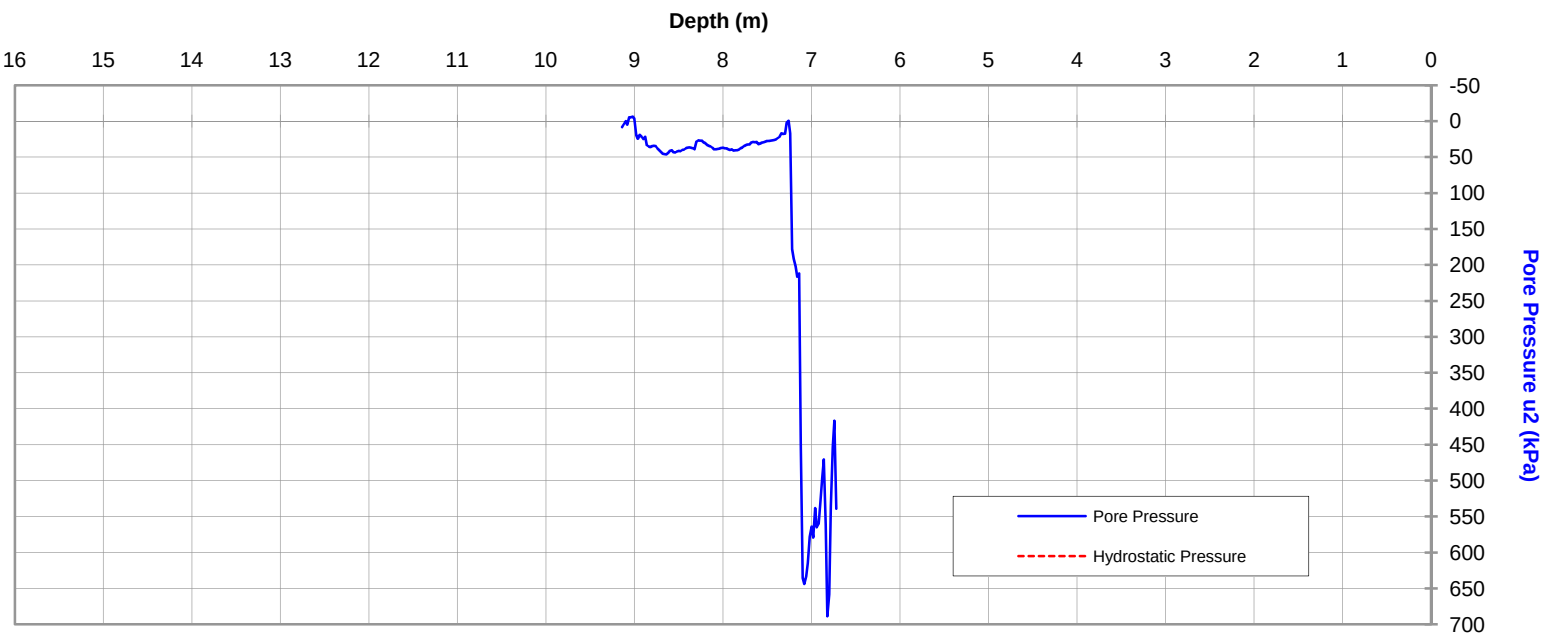
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 2A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

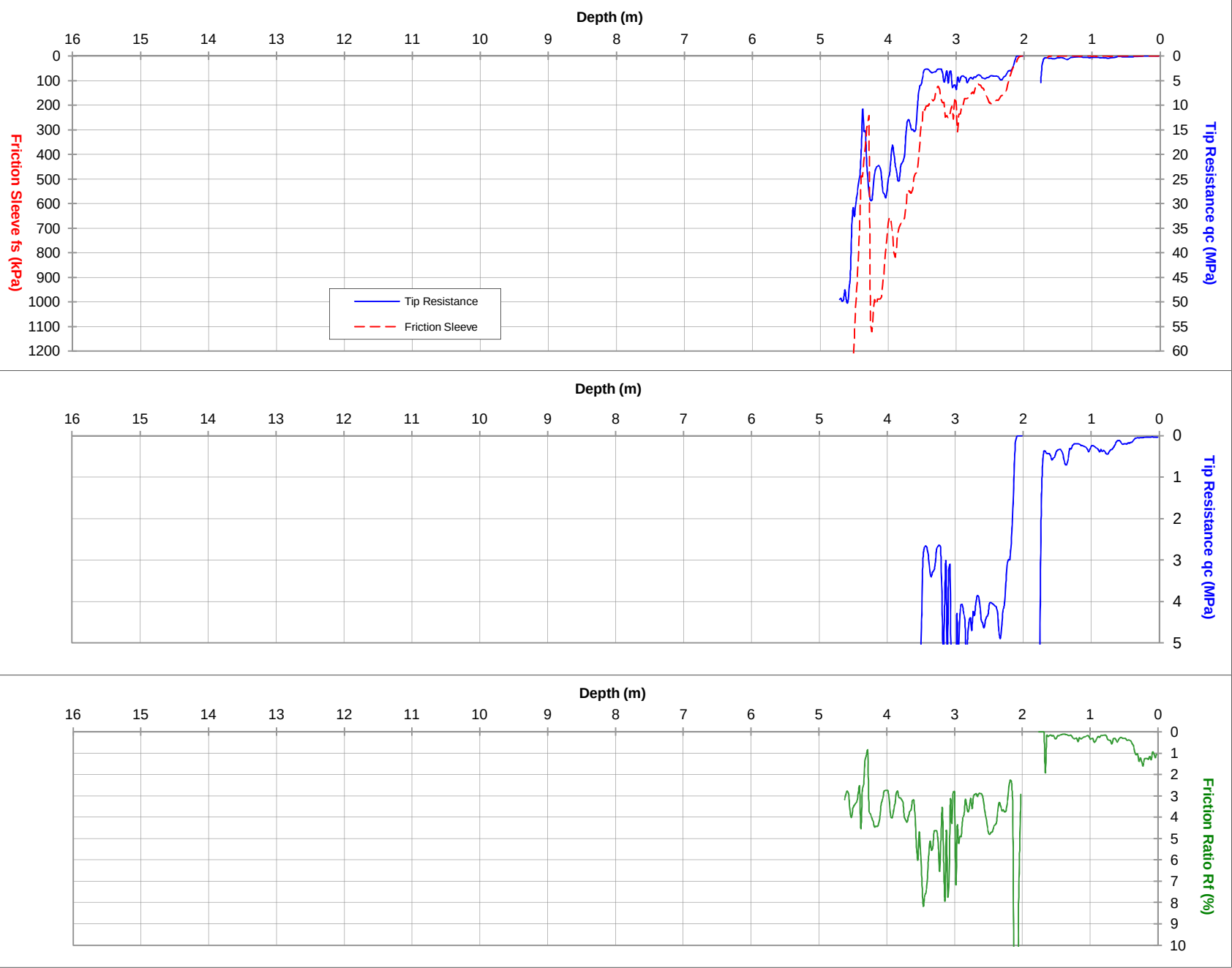
RL (m):

Date: Sunday, 15 February 2015

Probe No.: PCE 4

Job Number: Q15005M

Co-ordinates:



File: AU0003P5

Cone I.D. : EC39

Casing to (m): 0.3 / 2.0

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 9.8
Refusal: Lateral Rod support + 50MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 15 February 2015

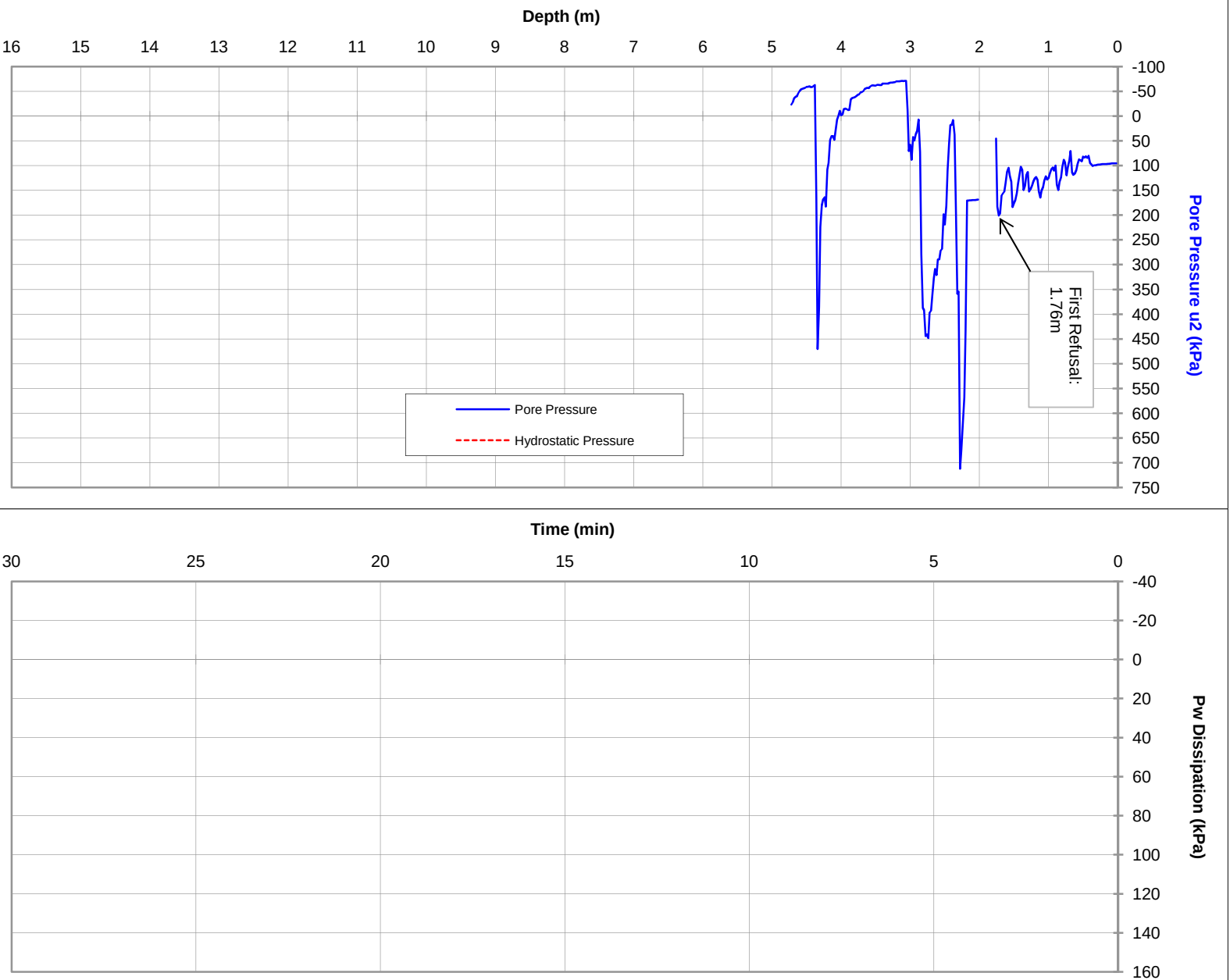
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 4 & 4A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

Date: Sunday, 15 February 2015

PROJECT: Geotechnical Investigation for the Port of Gladstone

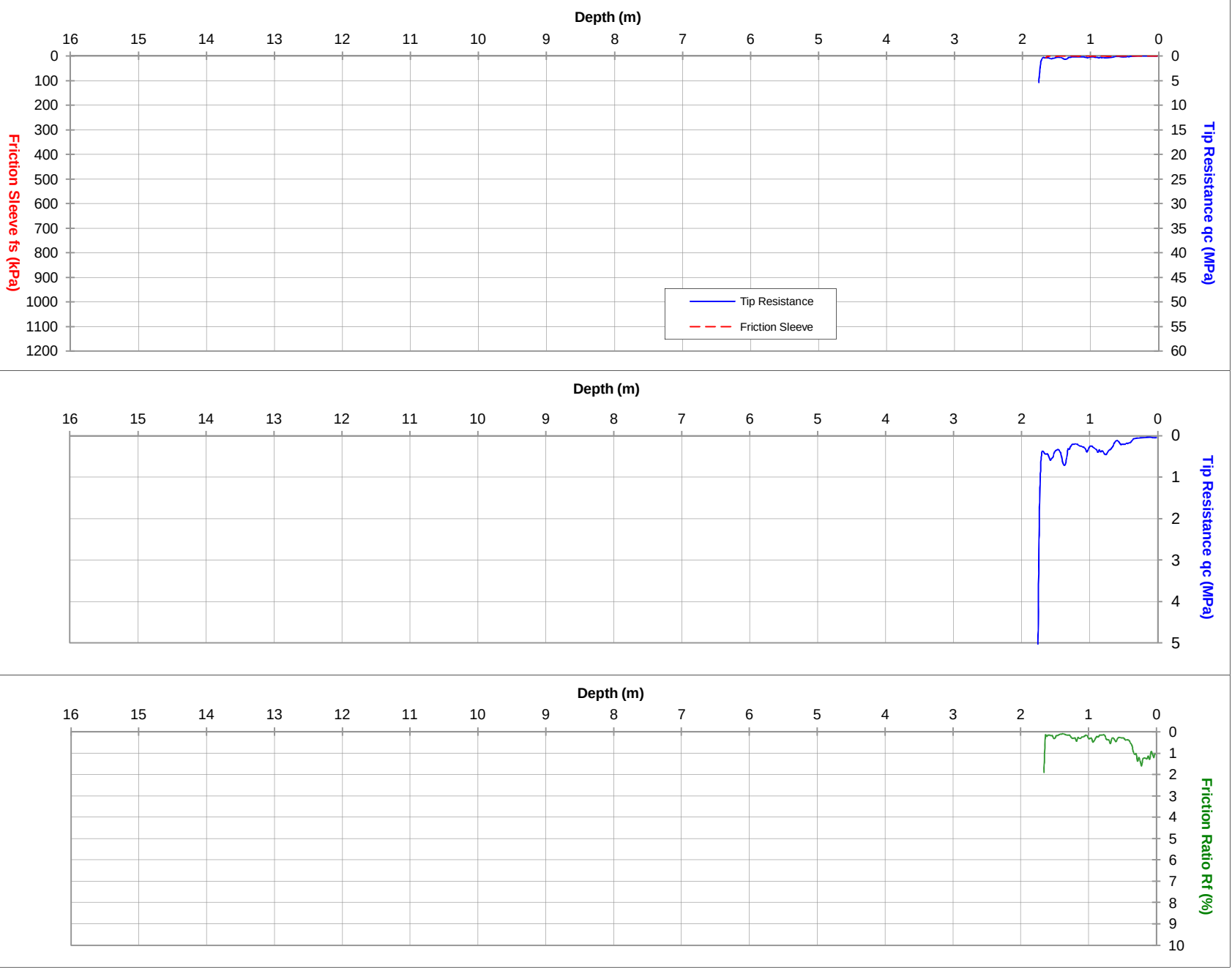
Probe No.: PCE 4

LOCATION: Gladstone Harbour & Channel

Job Number: Q15005M

RL (m):

Co-ordinates:



File: AU0003P5

Cone I.D. : EC39

Casing to (m): 0.3

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 9.8
Refusal: Casing movement

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 15 February 2015

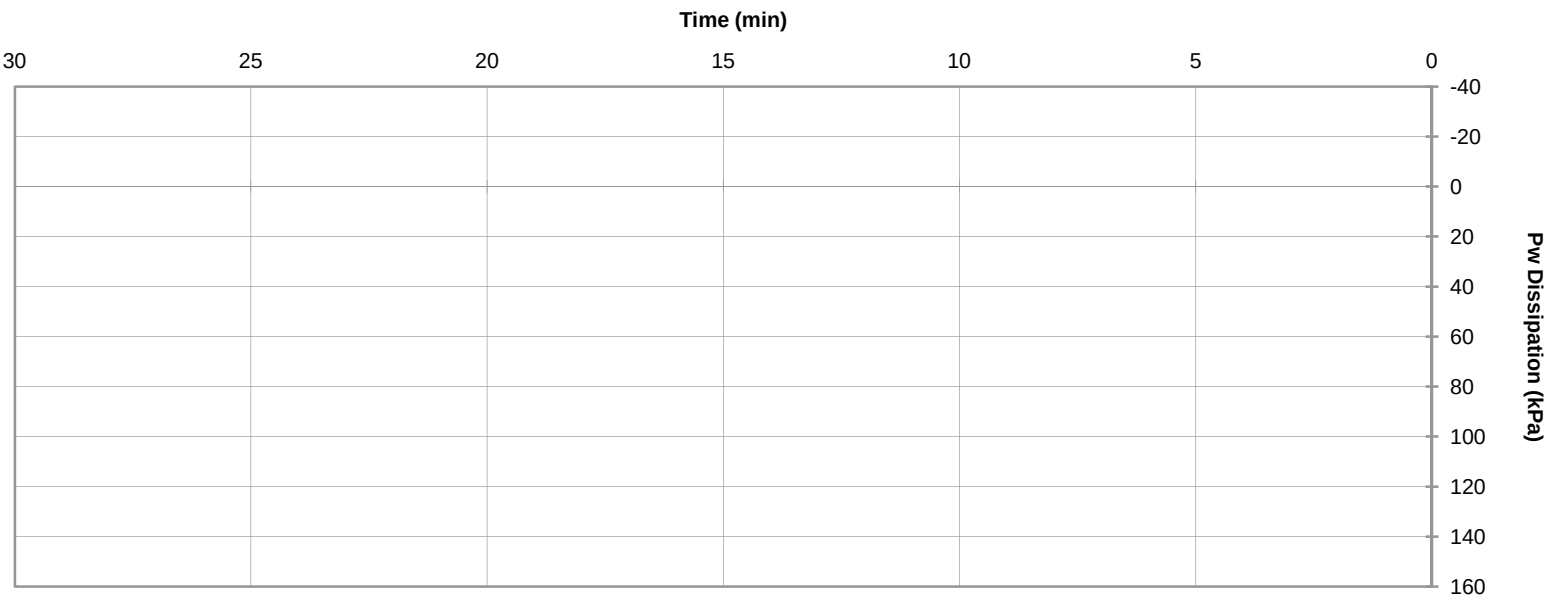
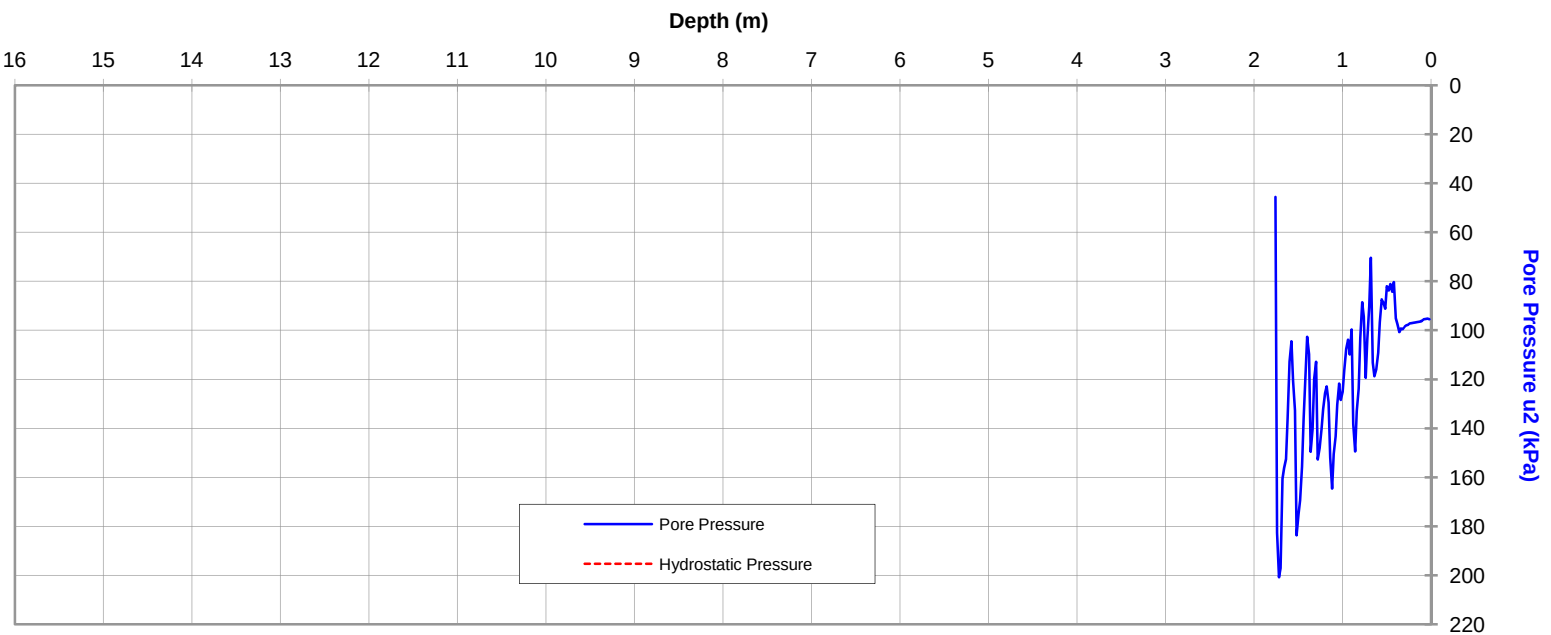
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 4

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

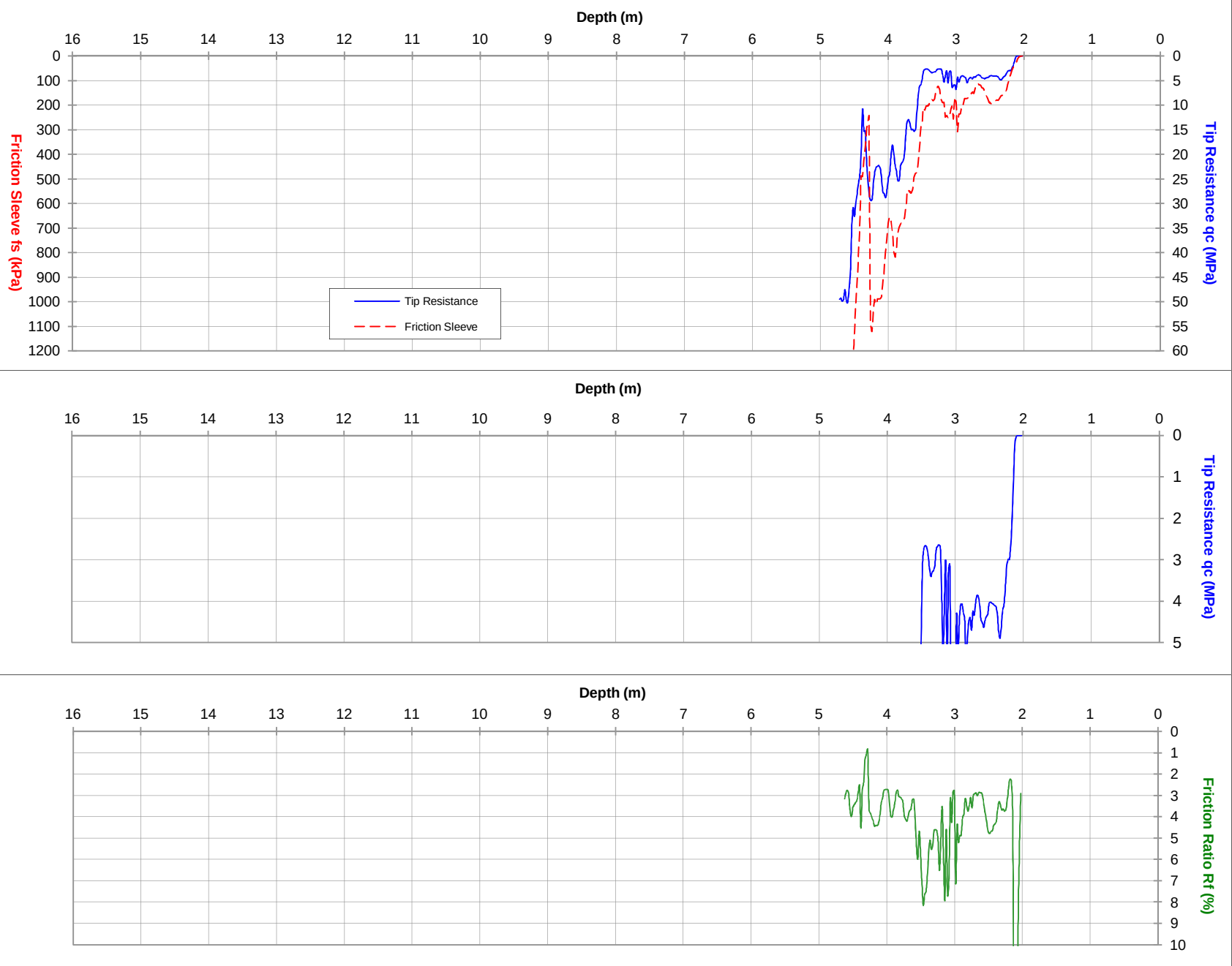
RL (m):

Date: Sunday, 15 February 2015

Probe No.: PCE 4A

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 15 February 2015

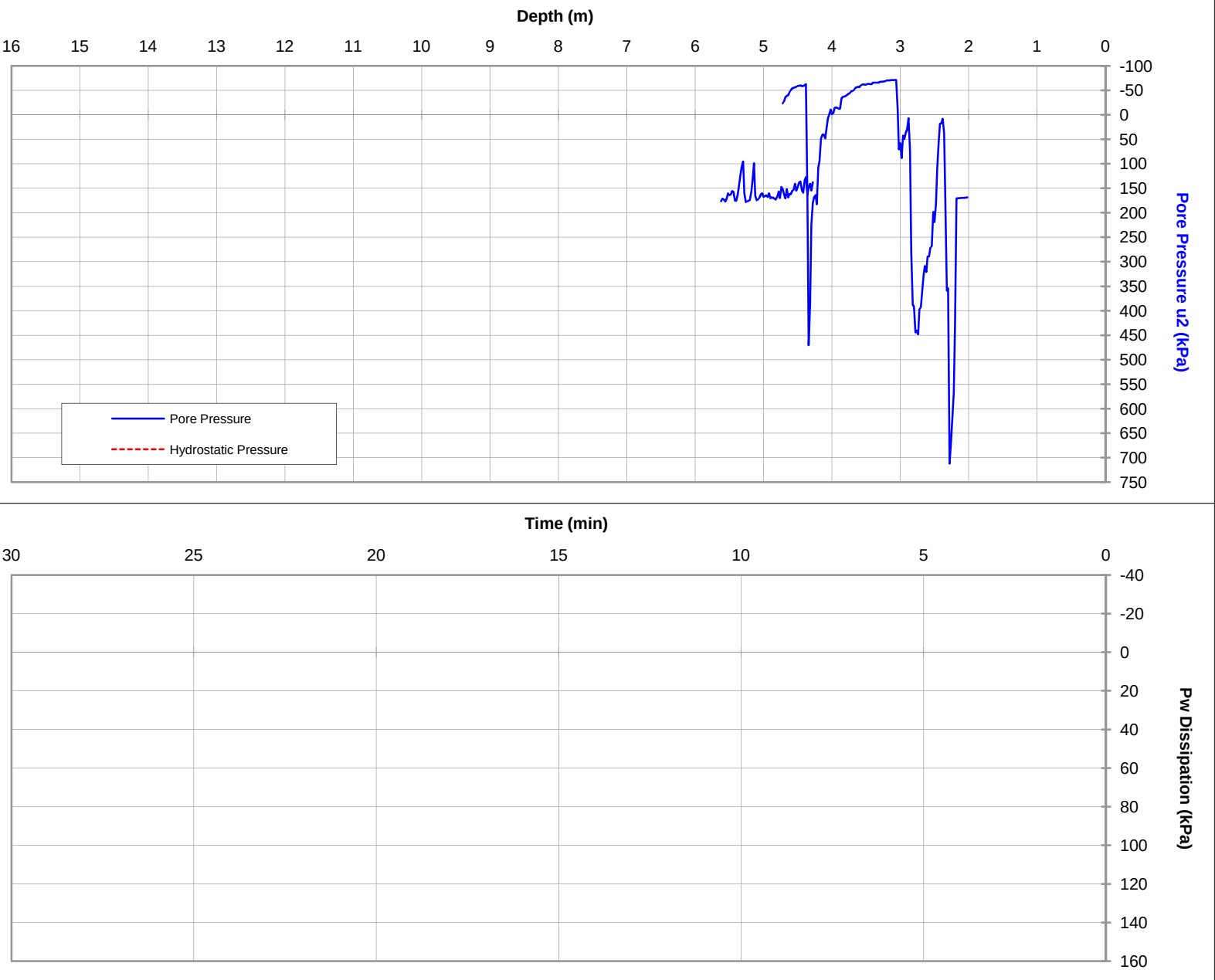
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 4A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

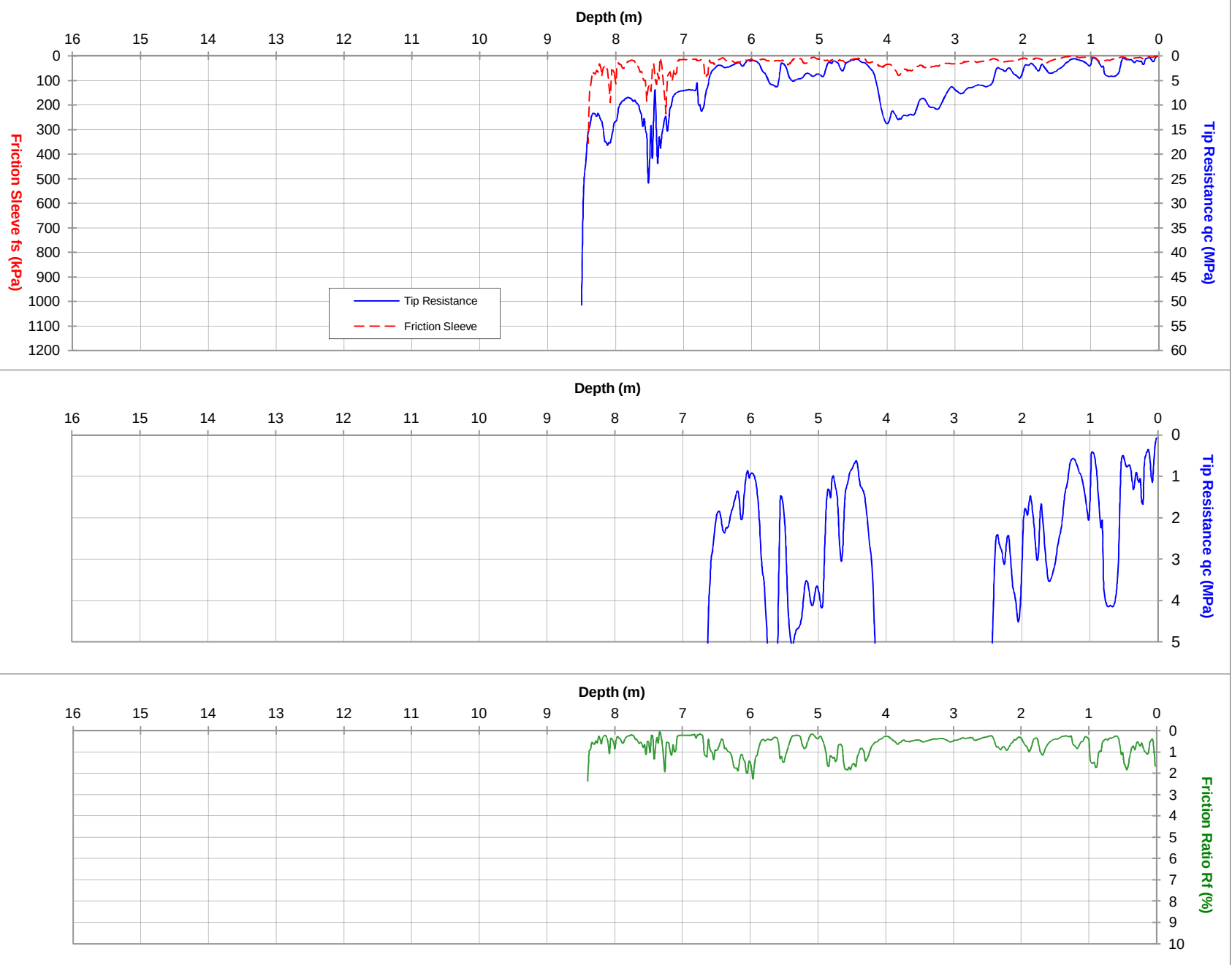
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Monday, 16 February 2015
Probe No.: WB112
Job Number: Q15005M
Co-ordinates:



File: AU0005P5

Cone I.D. : EC39

Casing to (m): 0.4

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 6.6
Refusal: Lateral Rod support + 50MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Monday, 16 February 2015

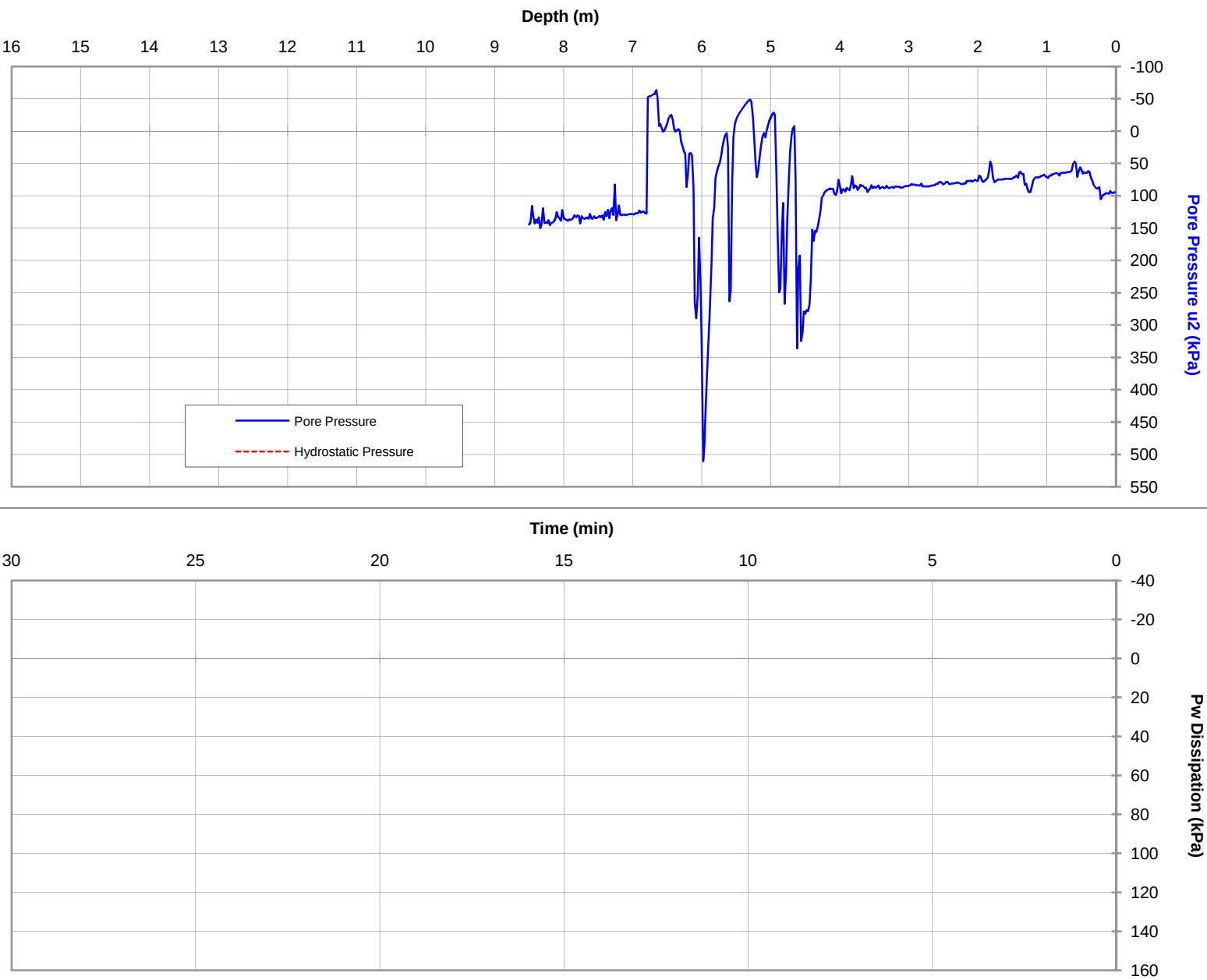
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WB112

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

Date: Sunday, 22 February 2015

PROJECT: Geotechnical Investigation for the Port of Gladstone

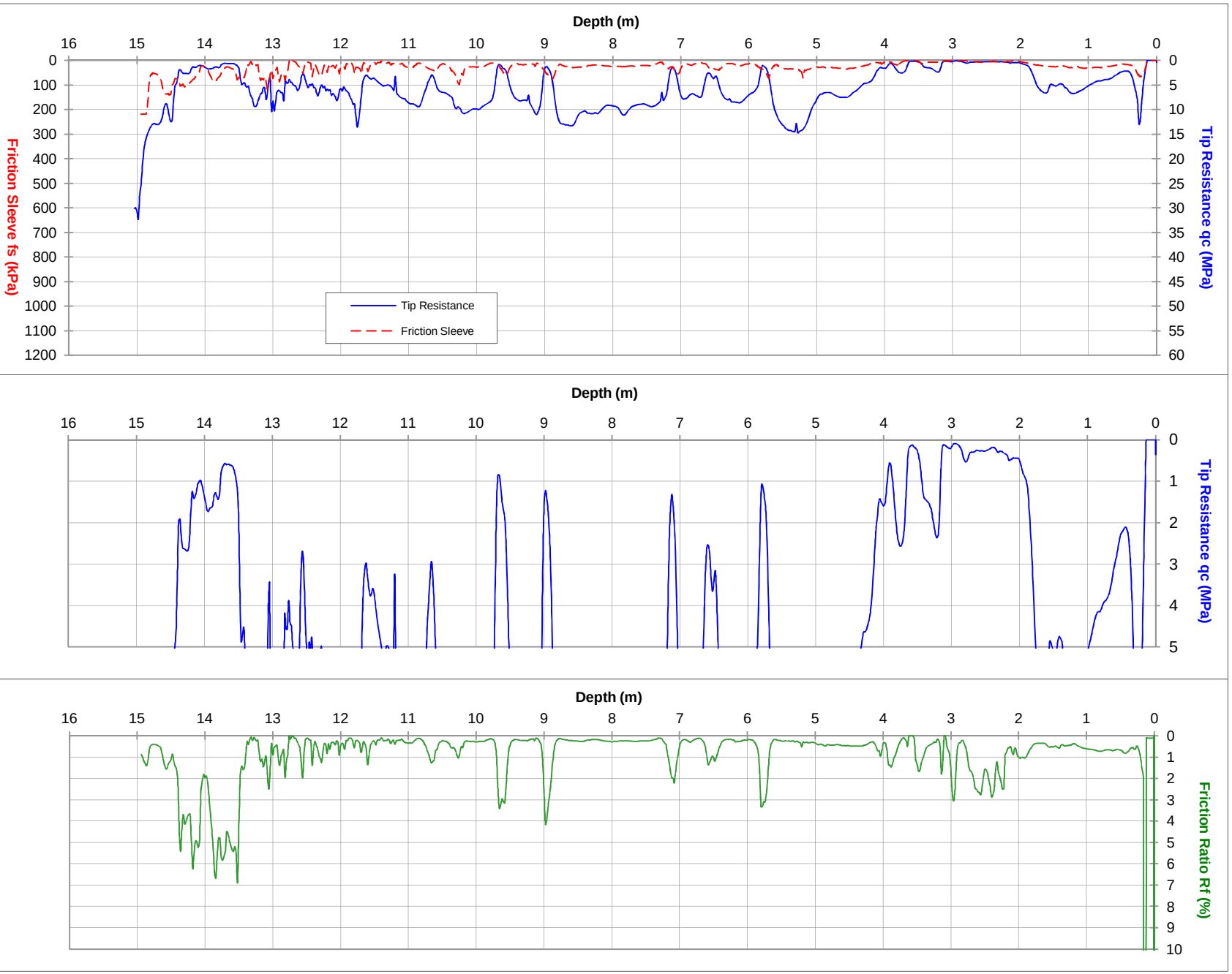
Probe No.: WBI 7

LOCATION: Gladstone Harbour & Channel

Job Number: Q15005M

RL (m):

Co-ordinates:



File: AU0006P5

Cone I.D. : EC39

Casing to (m): 0.35

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 8.0
Refusal: Lateral Rod Support + 35MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 22 February 2015

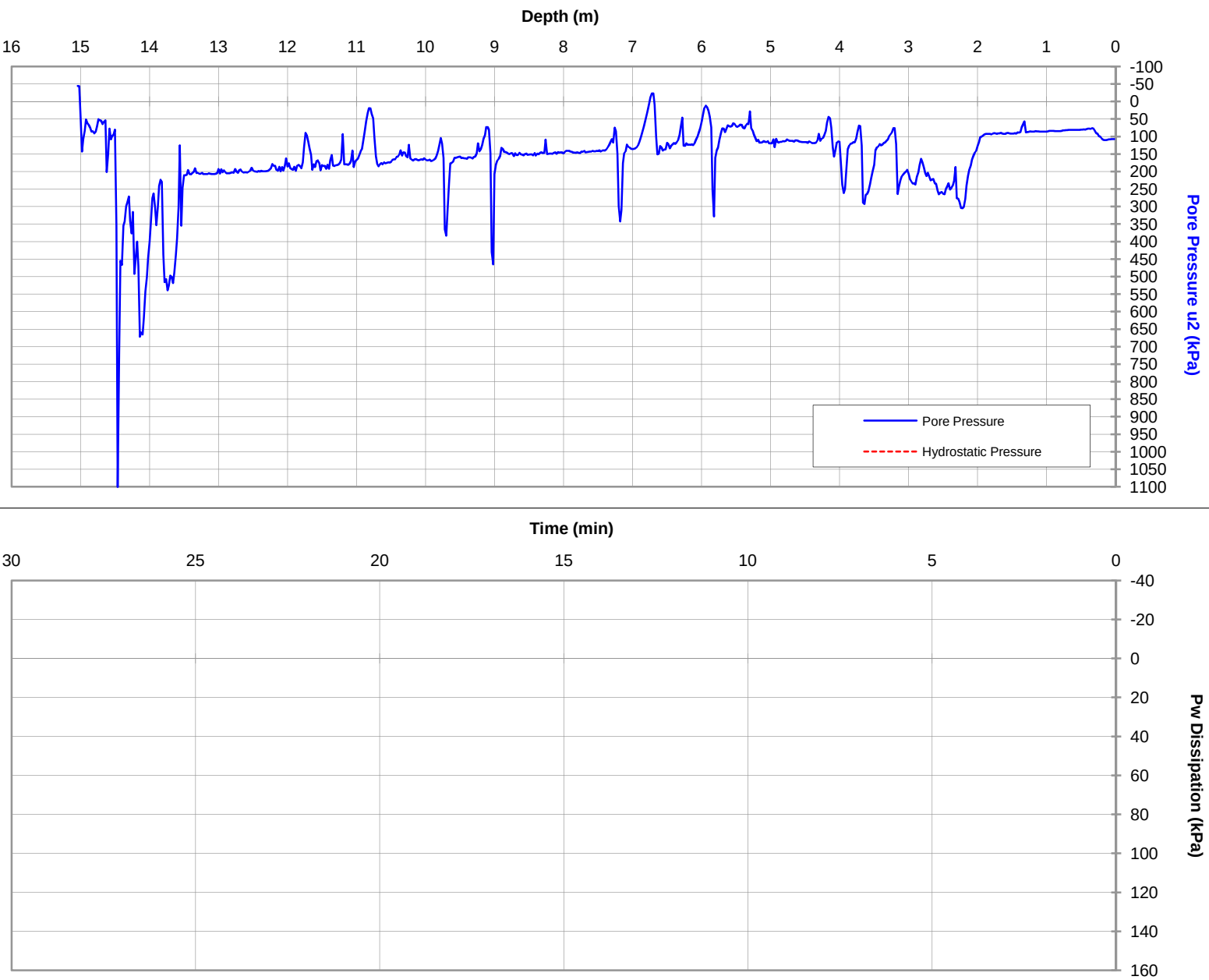
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 7

Location: Gladstone Harbour & Channel

Job Number: Q15005M

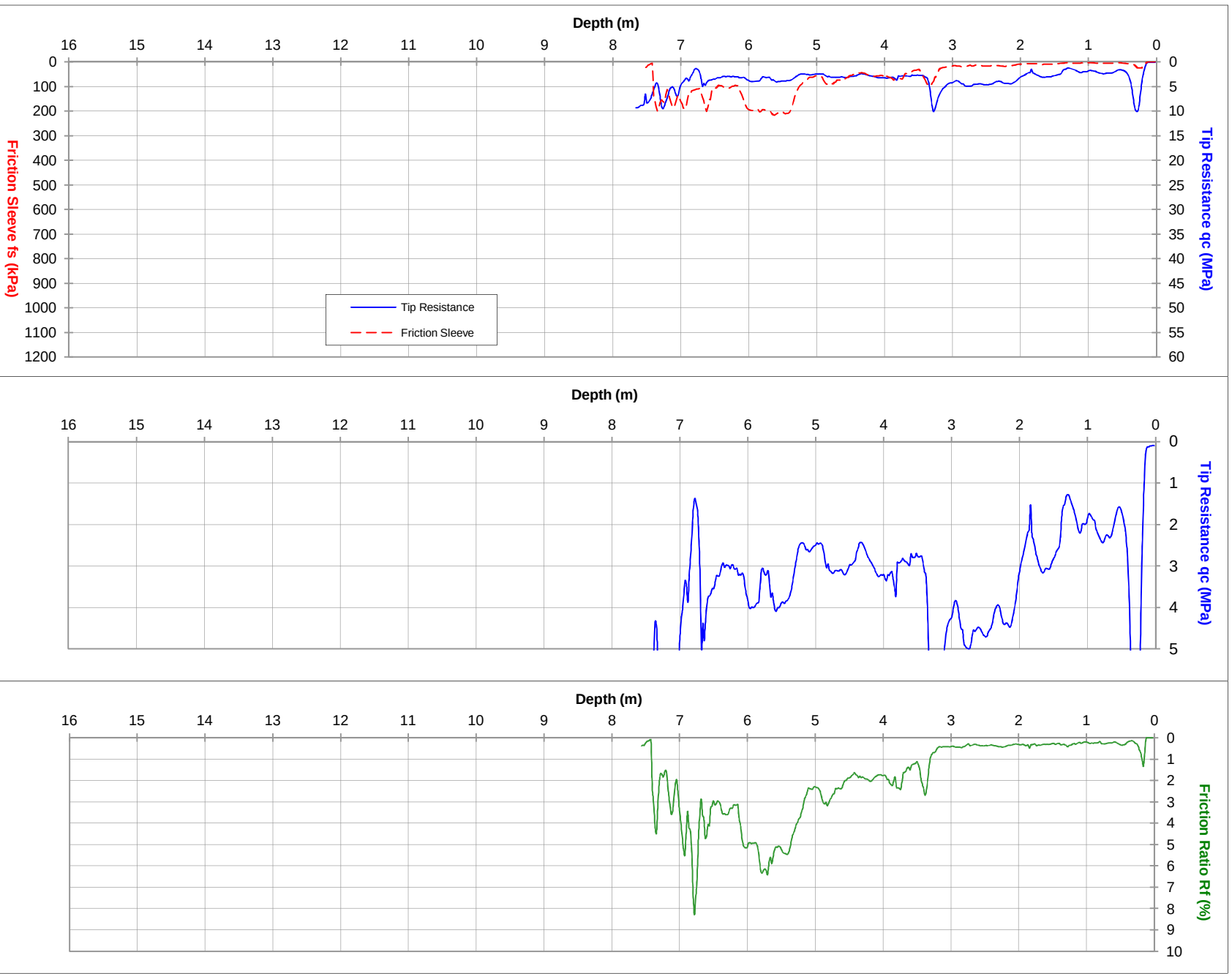
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Monday, 23 February 2015
Probe No.: WBI 5
Job Number: Q15005M
Co-ordinates:



File: AU0007P5

Cone I.D. : EC148

Casing to (m): 0.35

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m):
Refusal: Rod break at approx. 0.5m

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Monday, 23 February 2015

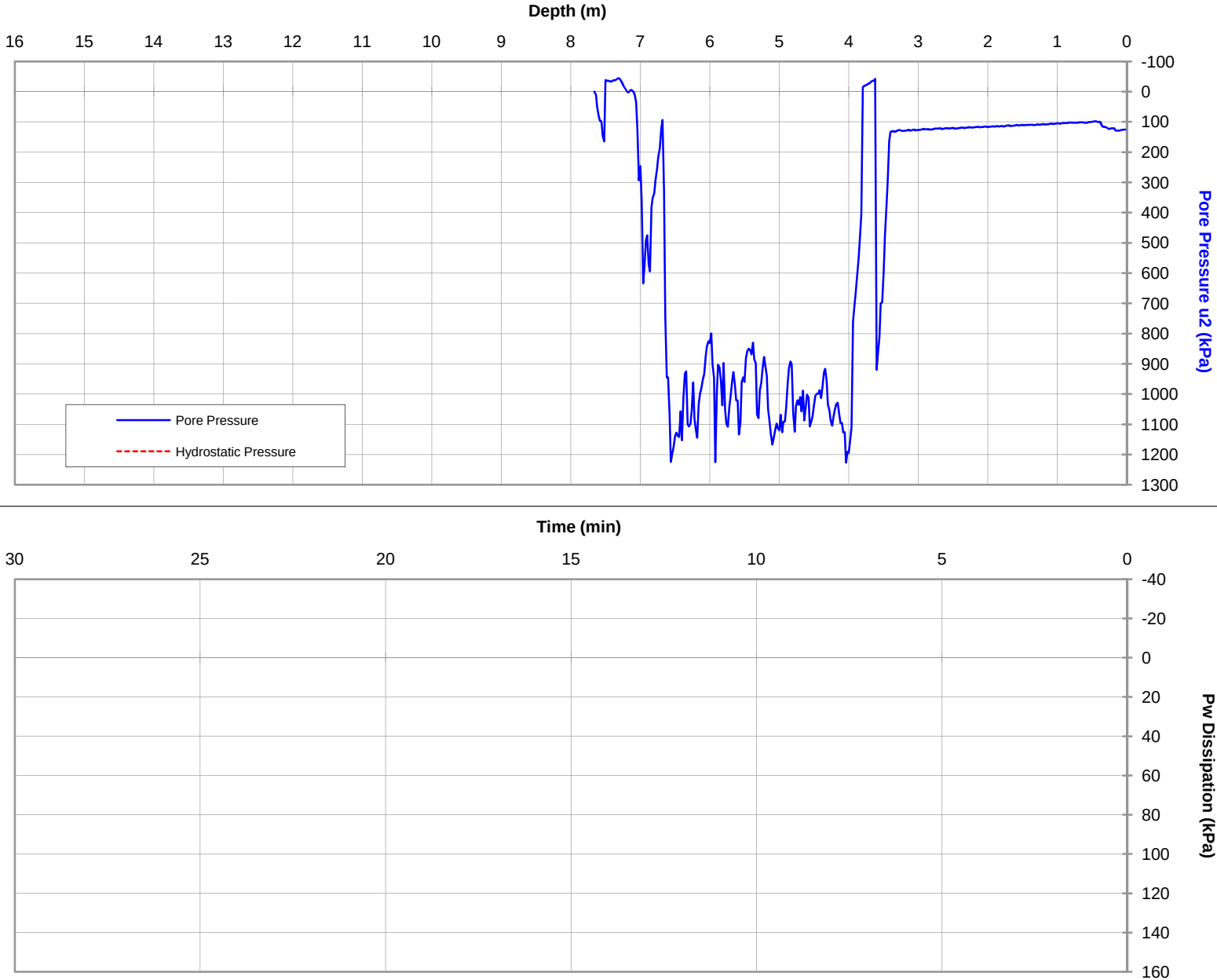
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 5

Location: Gladstone Harbour & Channel

Job Number: Q15005M

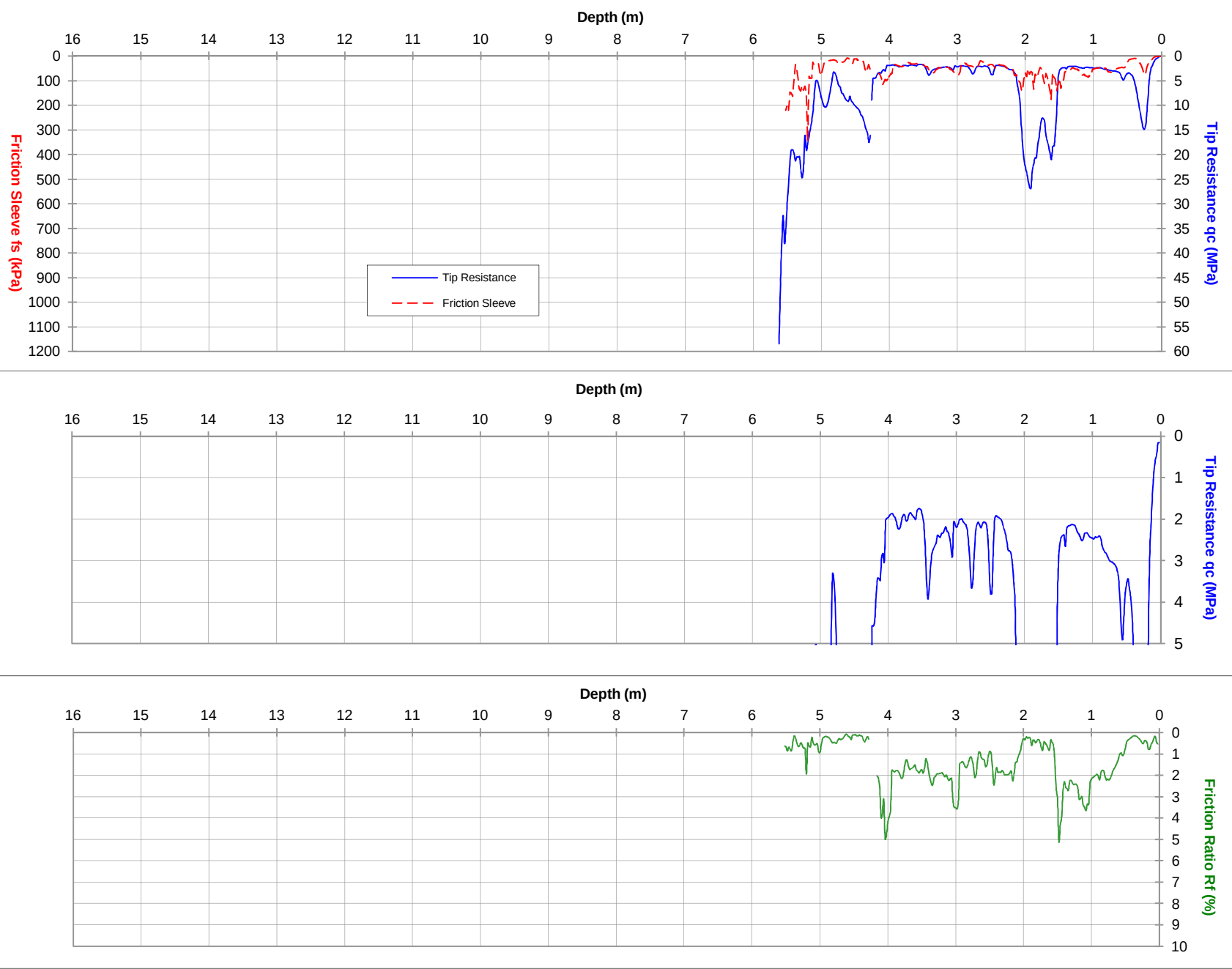
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Tuesday, 24 February 2015
Probe No.: WBI 4 & 4A
Job Number: Q15005M
Co-ordinates:



File: AU0008&9P5

Cone I.D.: EC20

Casing to (m): 0.4 / 4.0

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 13.65 / 12.05
Refusal: Lat. Rod Support + 56MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Tuesday, 24 February 2015

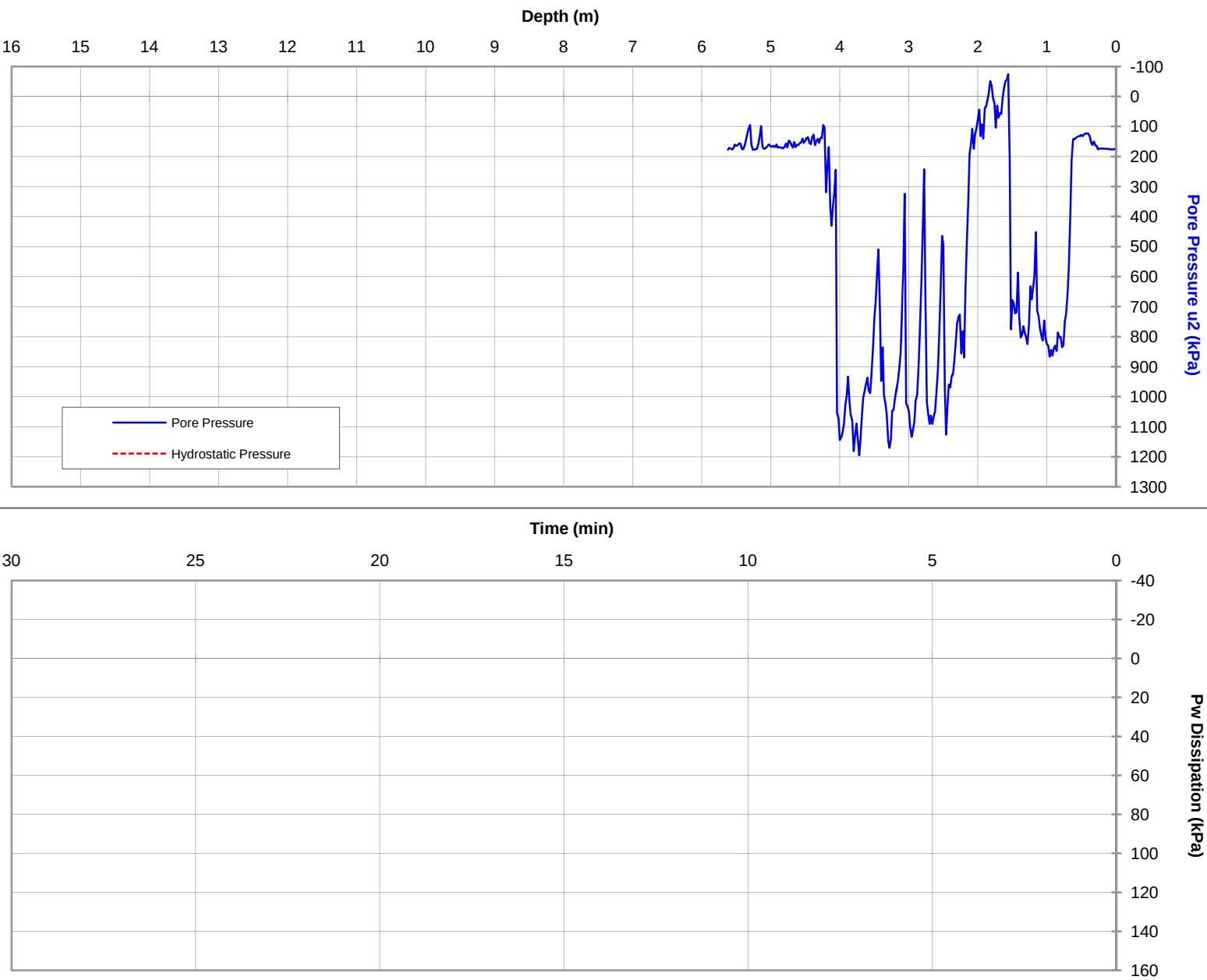
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 4 & 4A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

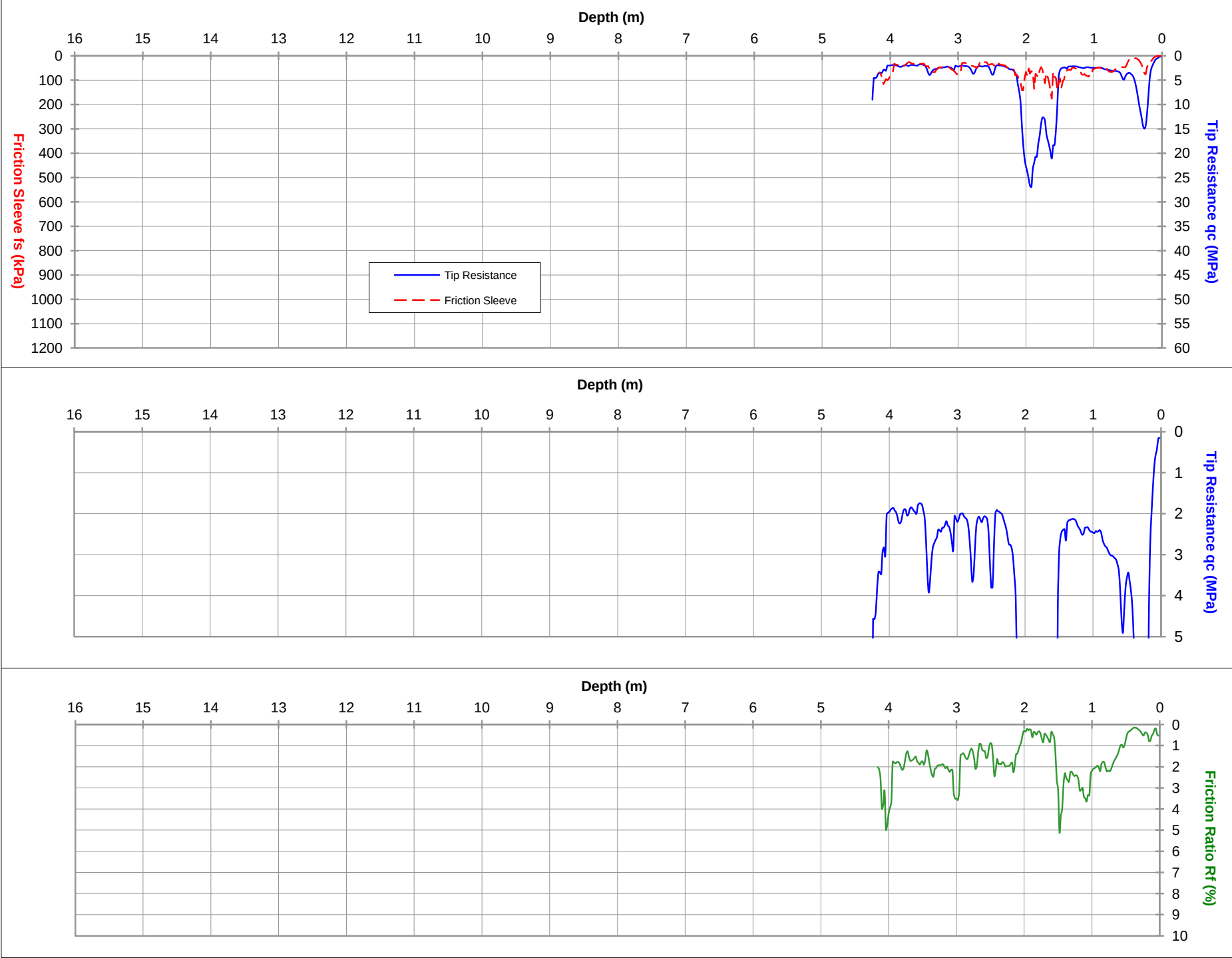
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Tuesday, 24 February 2015
Probe No.: WBI 4
Job Number: Q15005M
Co-ordinates:



File: AU0008P5 Cone I.D. : EC20 Casing to (m): 0.4 300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 13.65 / 13.0
Refusal: Lat. Rod Support
Tested in accordance with AS 1289, 6.5.1 - 1999 and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Tuesday, 24 February 2015

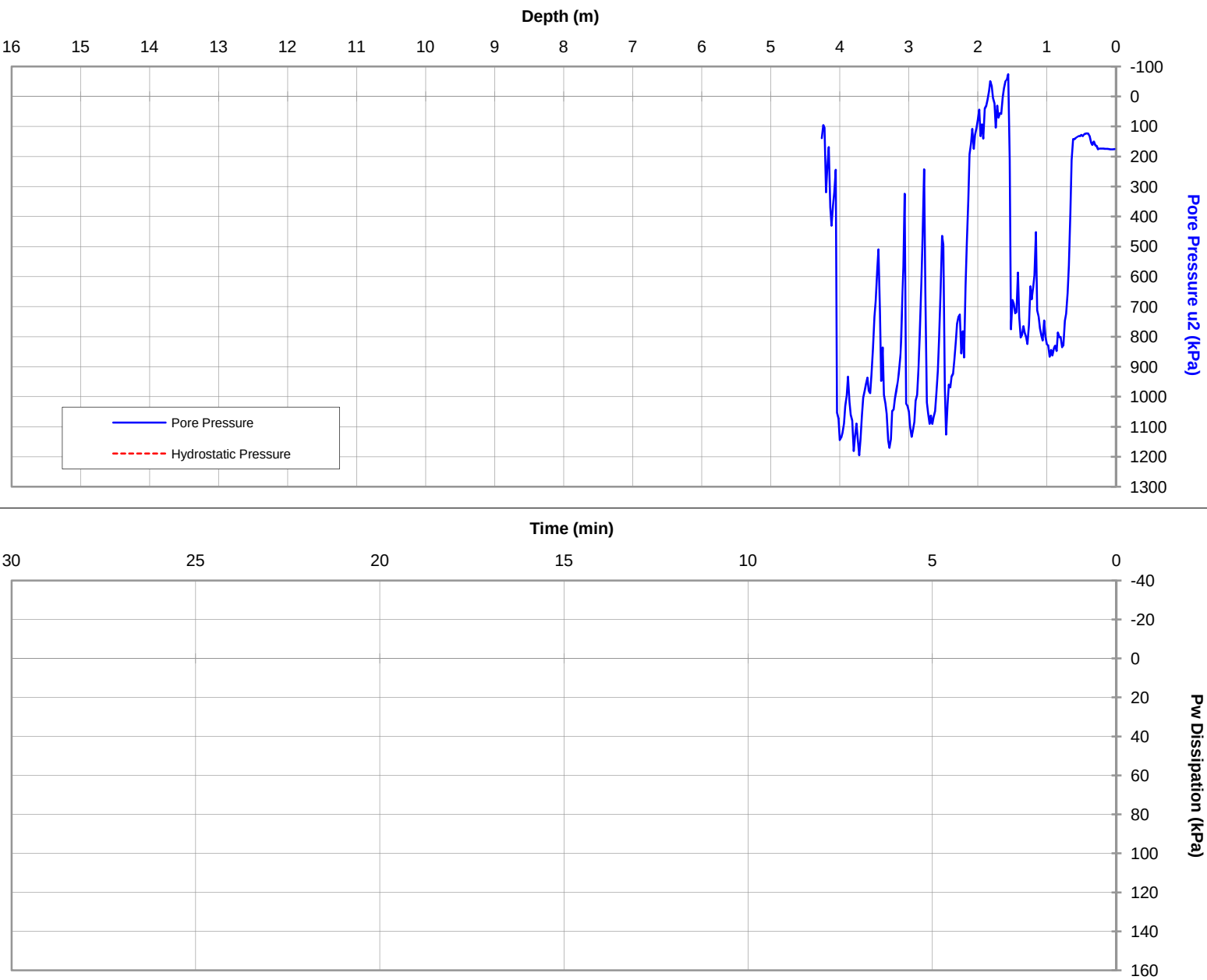
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 4

Location: Gladstone Harbour & Channel

Job Number: Q15005M

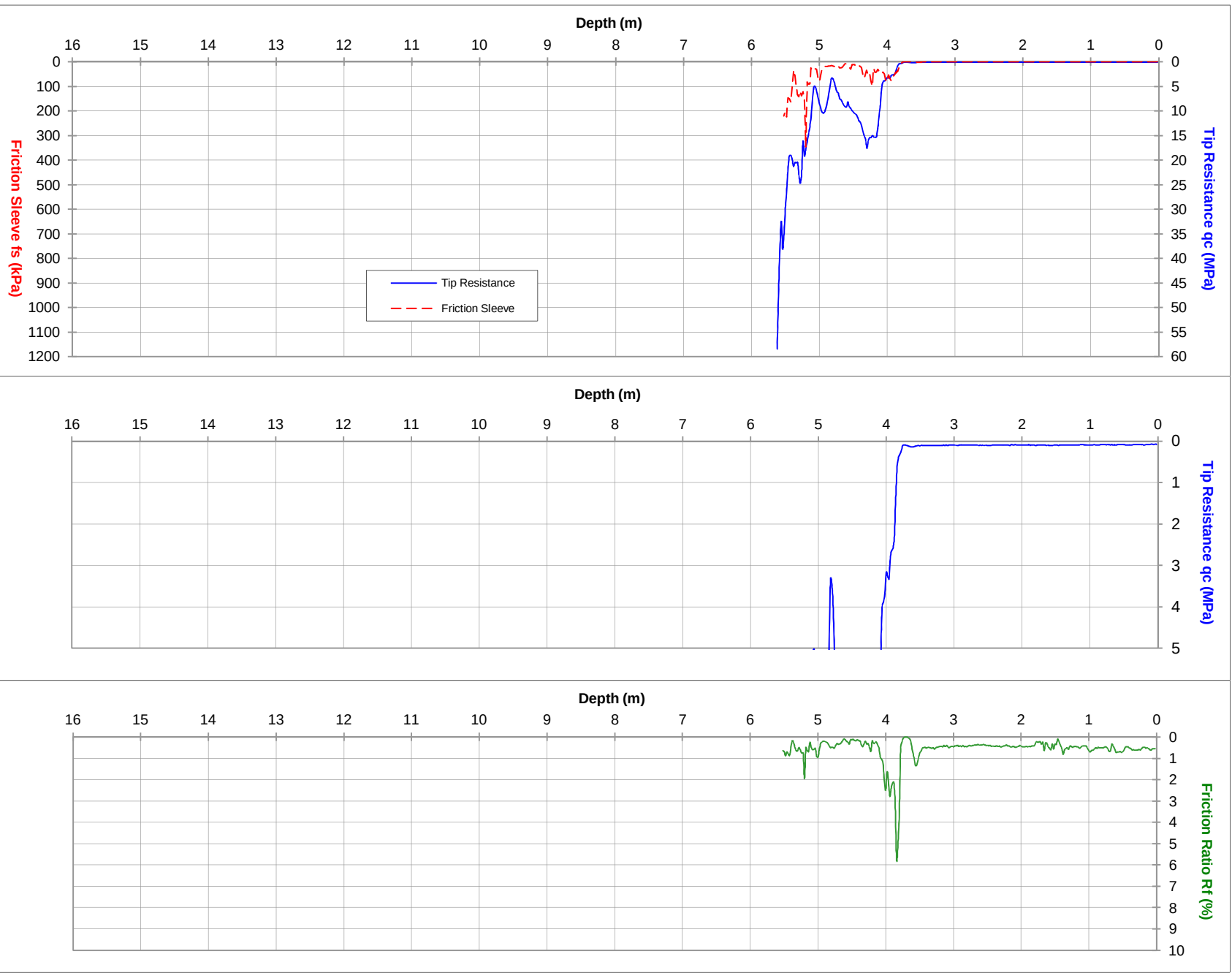
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Wednesday, 25 February 2015
Probe No.: WBI 4A
Job Number: Q15005M
Co-ordinates:



File: AU0009P5

Cone I.D. : EC20

Casing to (m): 4.0

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 12.0 / 12.05
Refusal: Lat. Rod Support + 56MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Wednesday, 25 February 2015

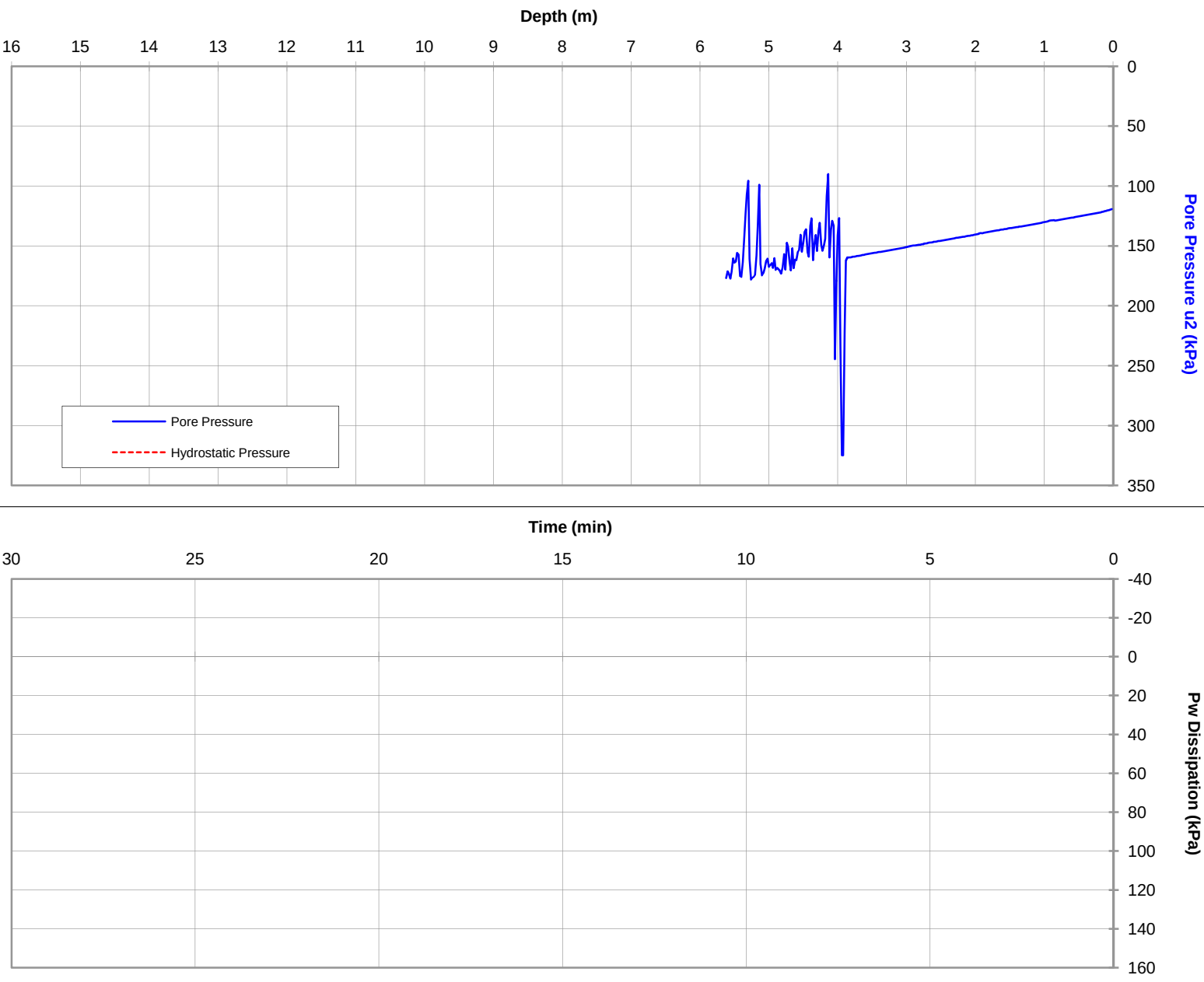
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 4A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

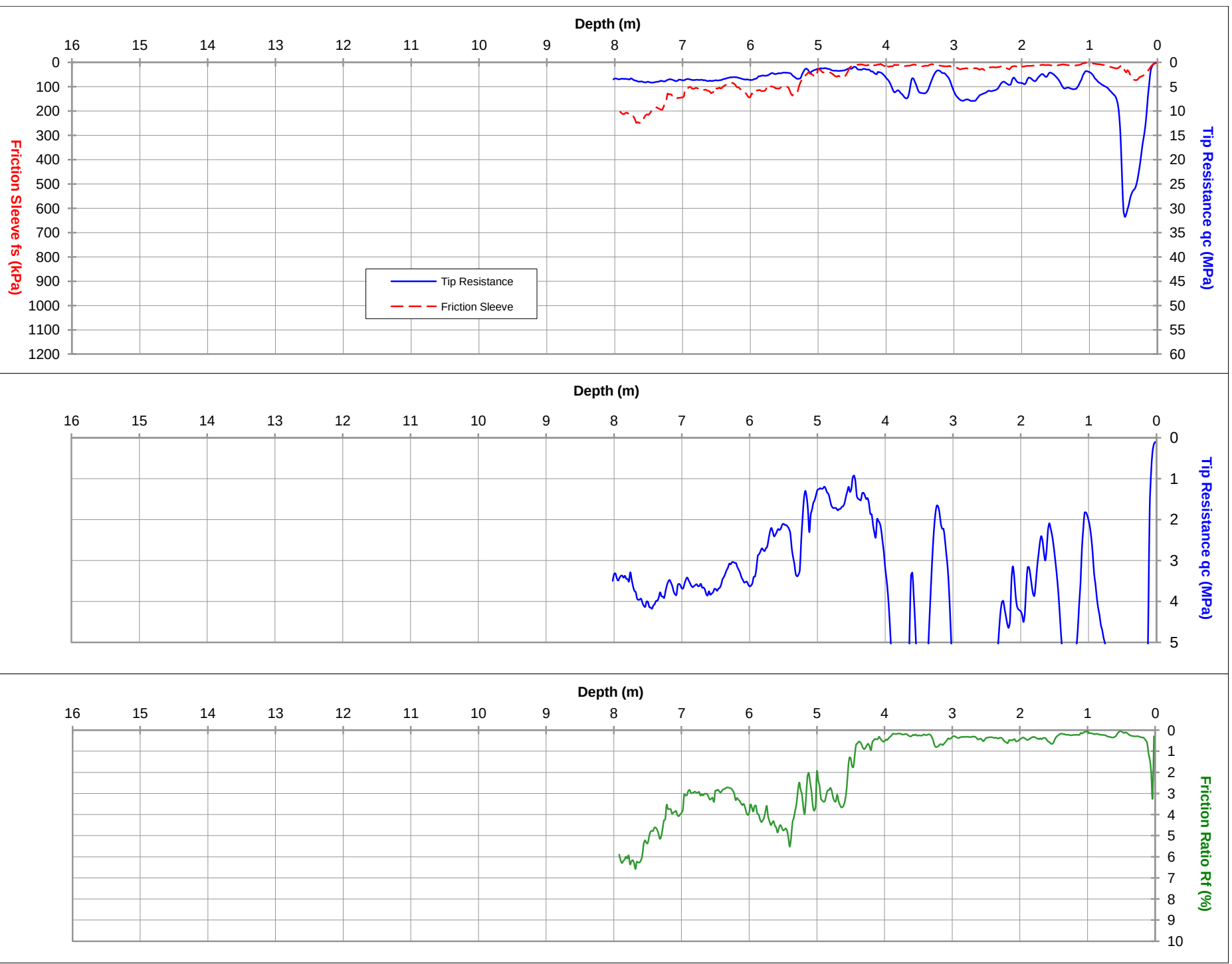
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Thursday, 26 February 2015
Probe No.: WBI 2
Job Number: Q15005M
Co-ordinates:



File: AU0010P5

Cone I.D. : EC20

Casing to (m): 0.5

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 8.0 / 7.0
Refusal: Lat. Rod Support

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Thursday, 26 February 2015

Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 2

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Thursday, 26 February 2015
Probe No.: WBI 1
Job Number: Q15005M
Co-ordinates:



File: AU0011P5

Cone I.D. : EC20

Casing to (m): 0.4

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 7.8 / 8.3
Refusal: Lat. Rod Support + 30MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Thursday, 26 February 2015

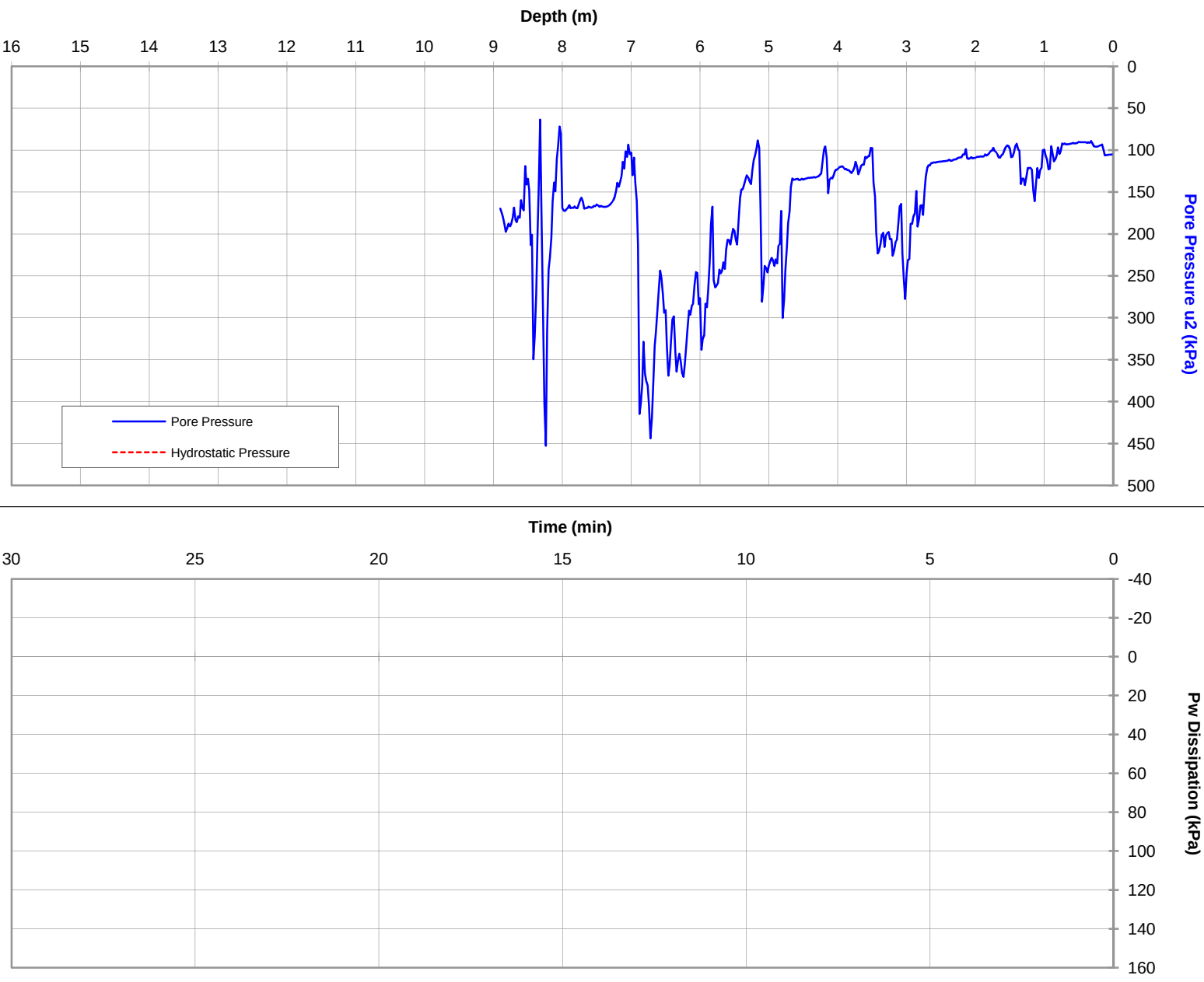
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBI 1

Location: Gladstone Harbour & Channel

Job Number: Q15005M

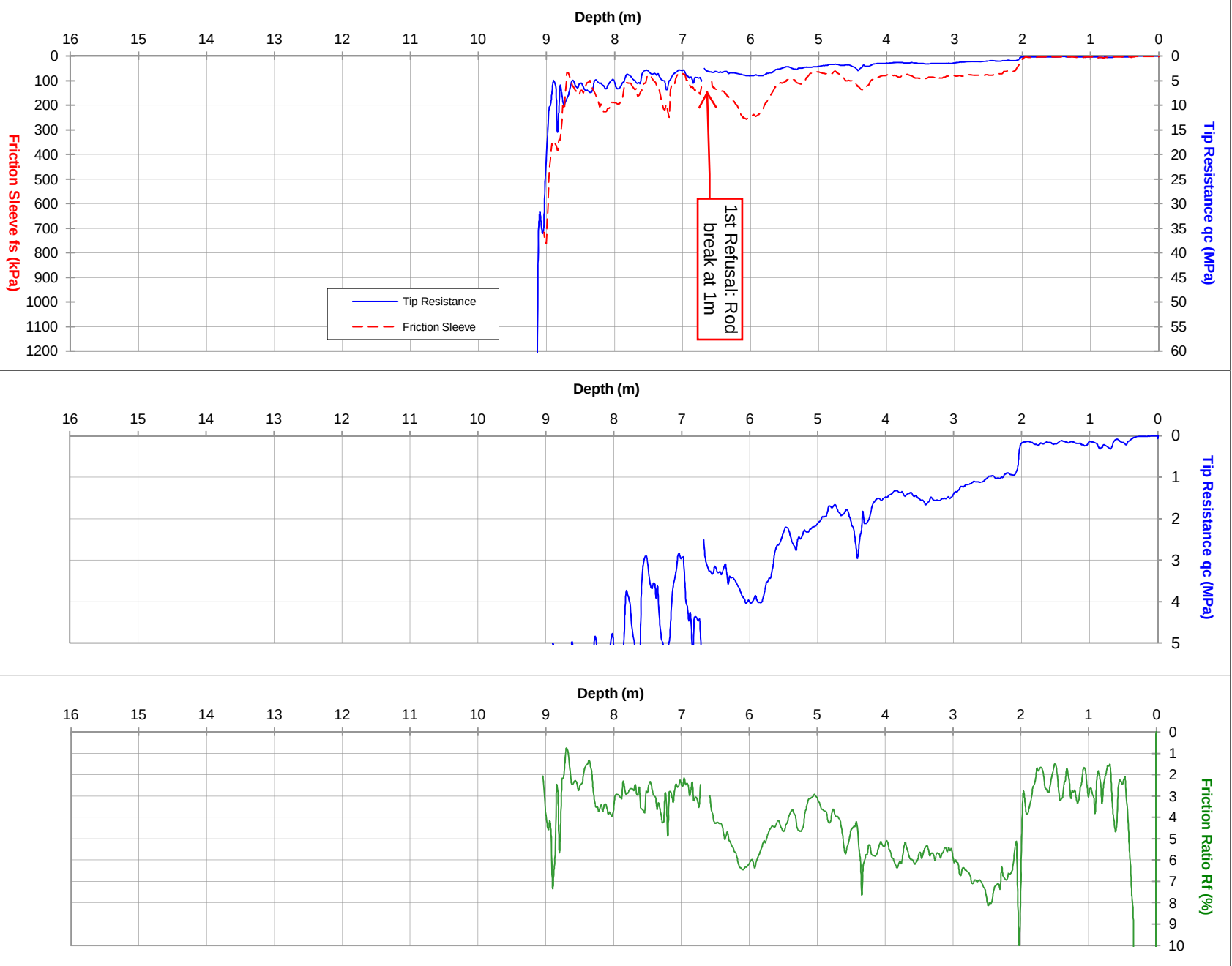
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Friday, 13 February 2015
Probe No.: PCE 2 & 2A
Job Number: Q15005M
Co-ordinates:



File: AU0001&2P5

Cone I.D.: EC40

Casing to (m): 0.4 / 6.7

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 5.385 / 5.1
Refusal: 76MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Friday, 13 February 2015

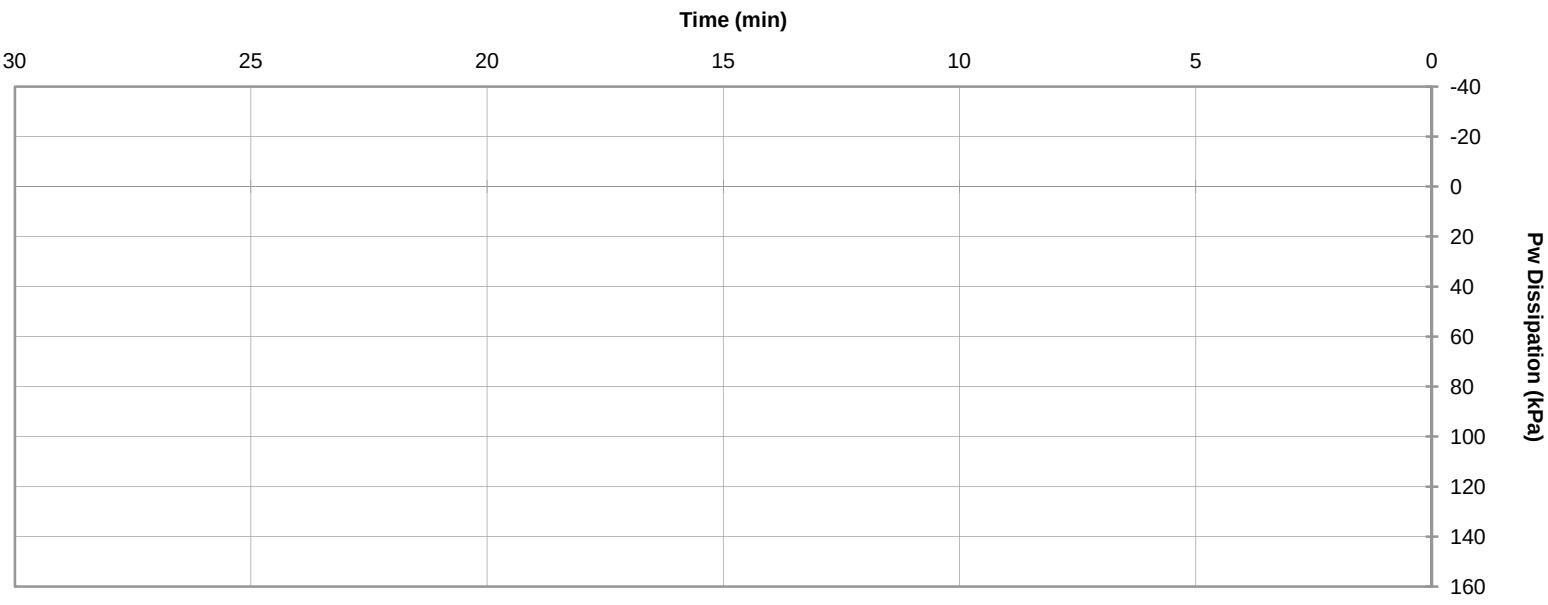
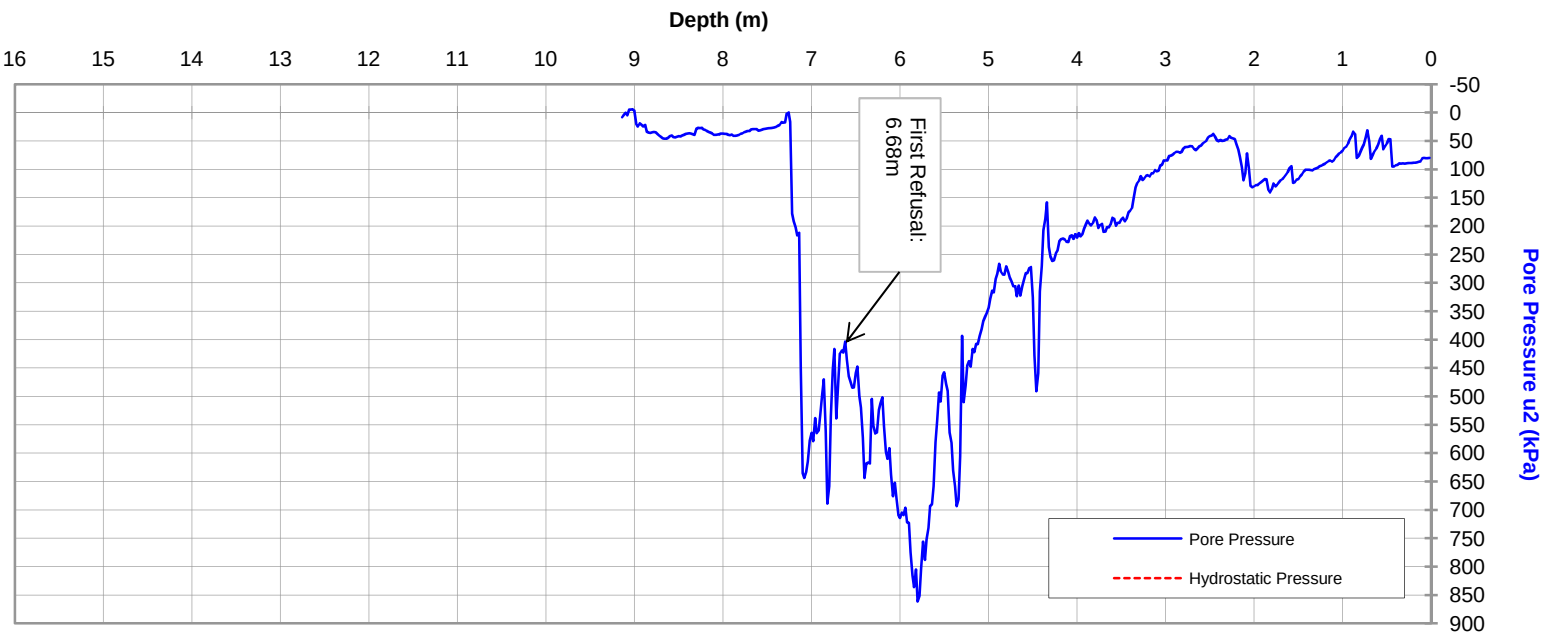
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 2

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

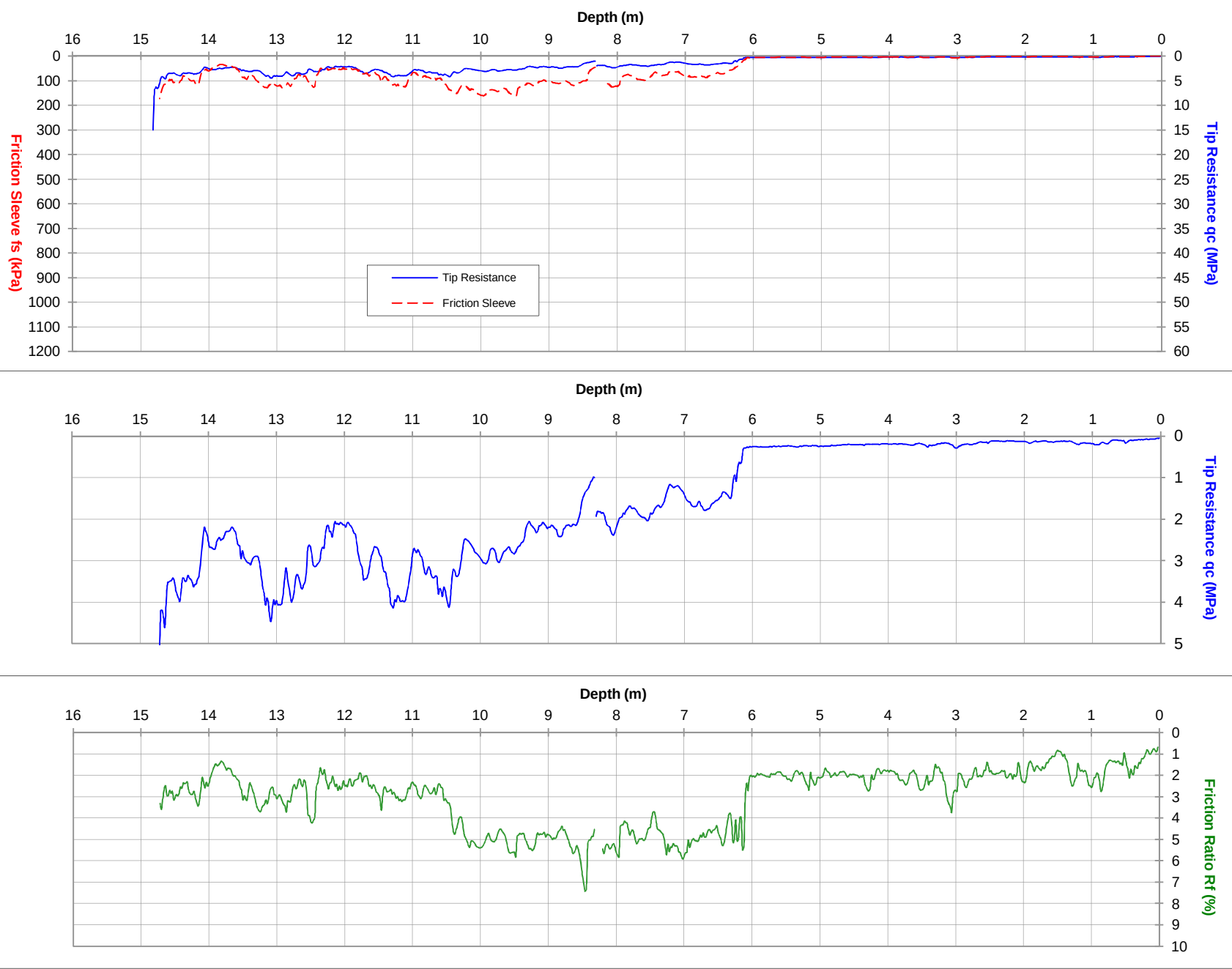
RL (m):

Date: Sunday, 1 March 2015

Probe No.: WBS 2 & 2A

Job Number: Q15005M

Co-ordinates:



File: AU0014P5

Cone I.D. : EC20

Casing to (m): 1.72 / 7.8

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 3.95 / 2.65
Refusal: 15MPa + Lat. Rod support

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 1 March 2015

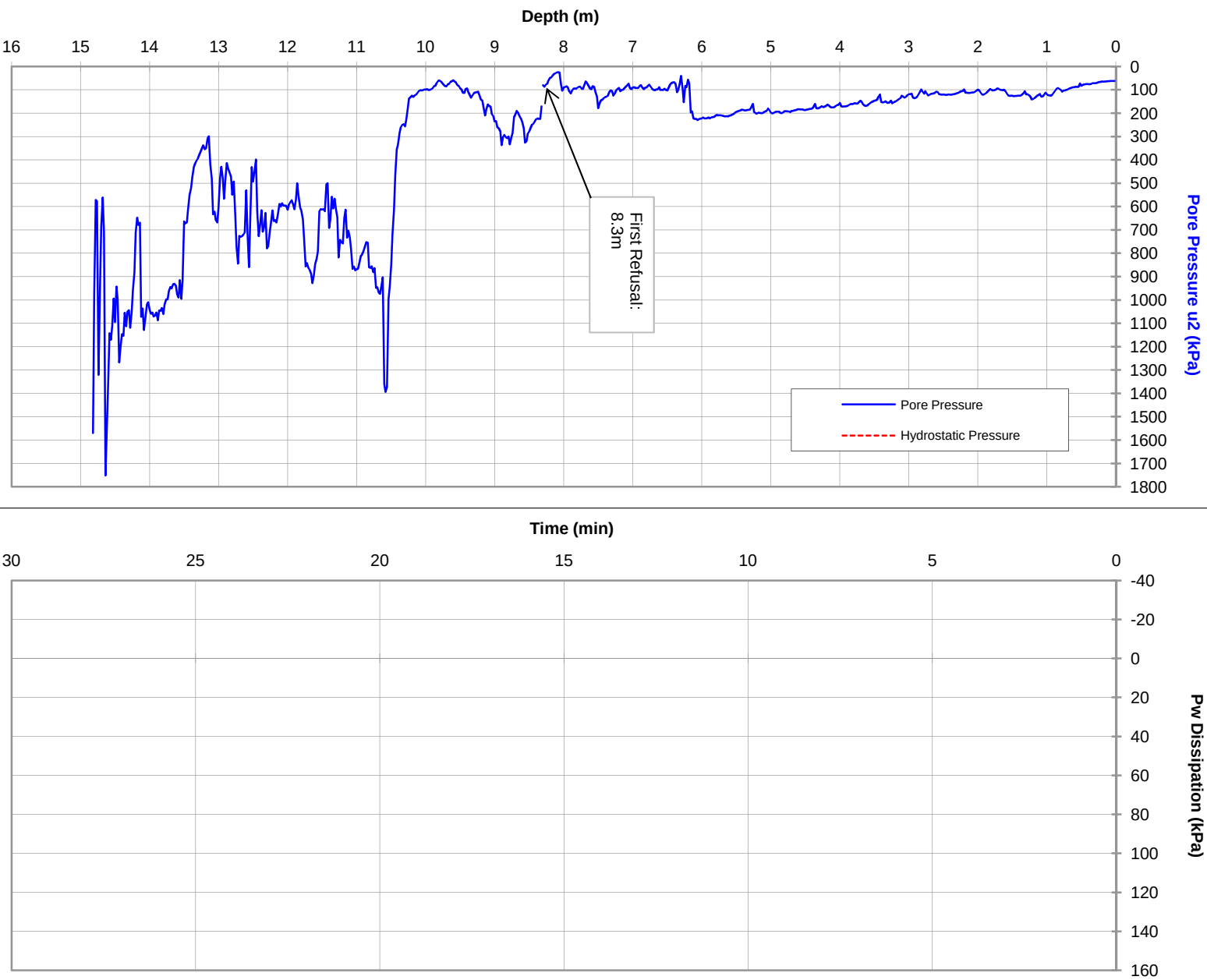
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBS 2 & 2A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

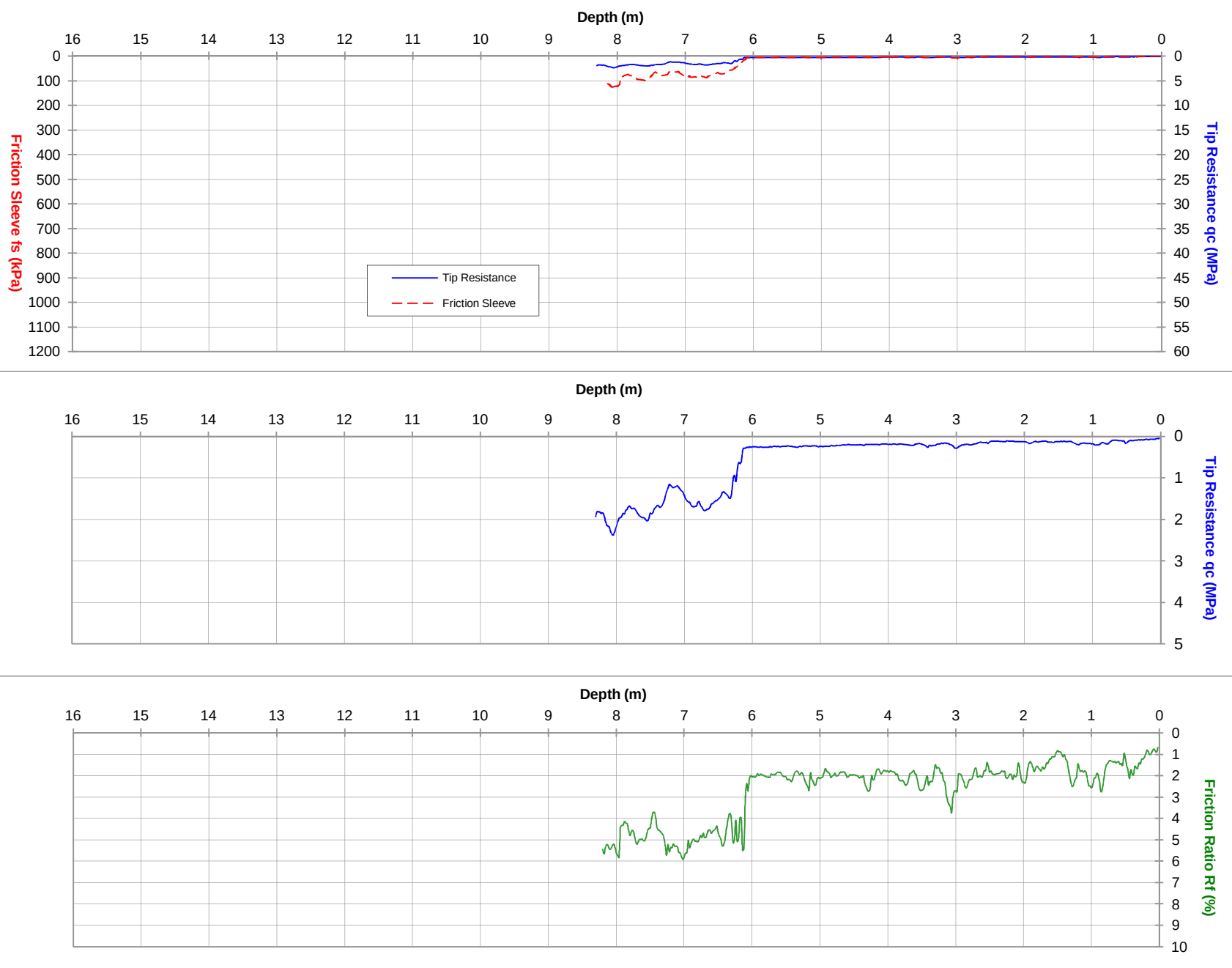
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Sunday, 1 March 2015
Probe No.: WBS 2
Job Number: Q15005M
Co-ordinates:



File: AU0014P5

Cone I.D. : EC20

Casing to (m): 1.72

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 3.95 / 3.95
Refusal: Lat. Rod support

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 1 March 2015

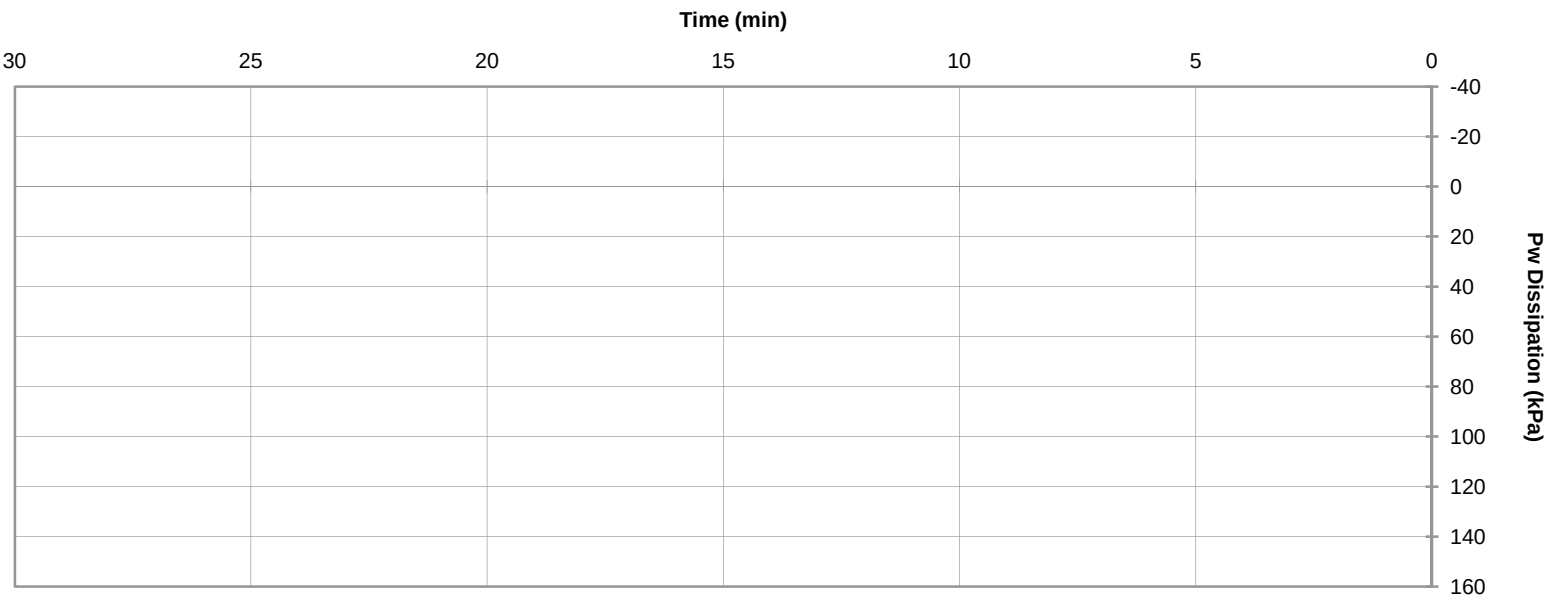
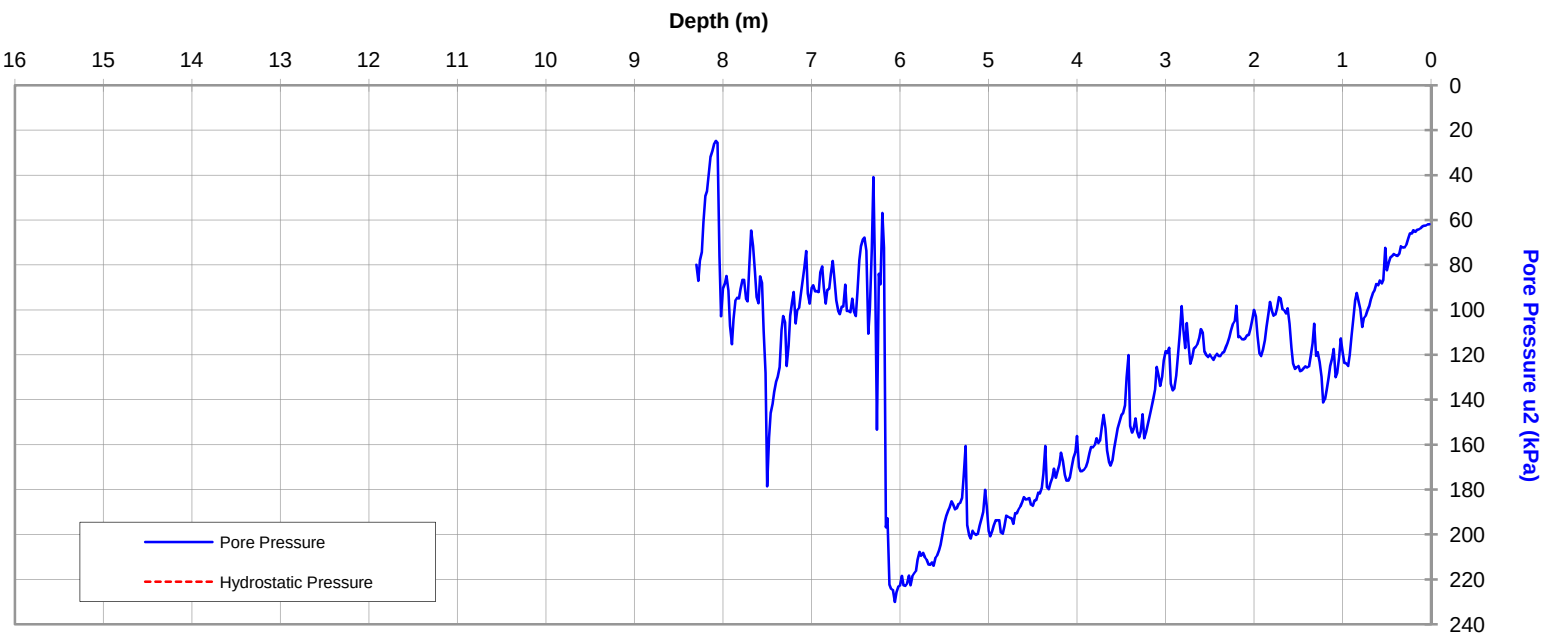
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBS 2

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

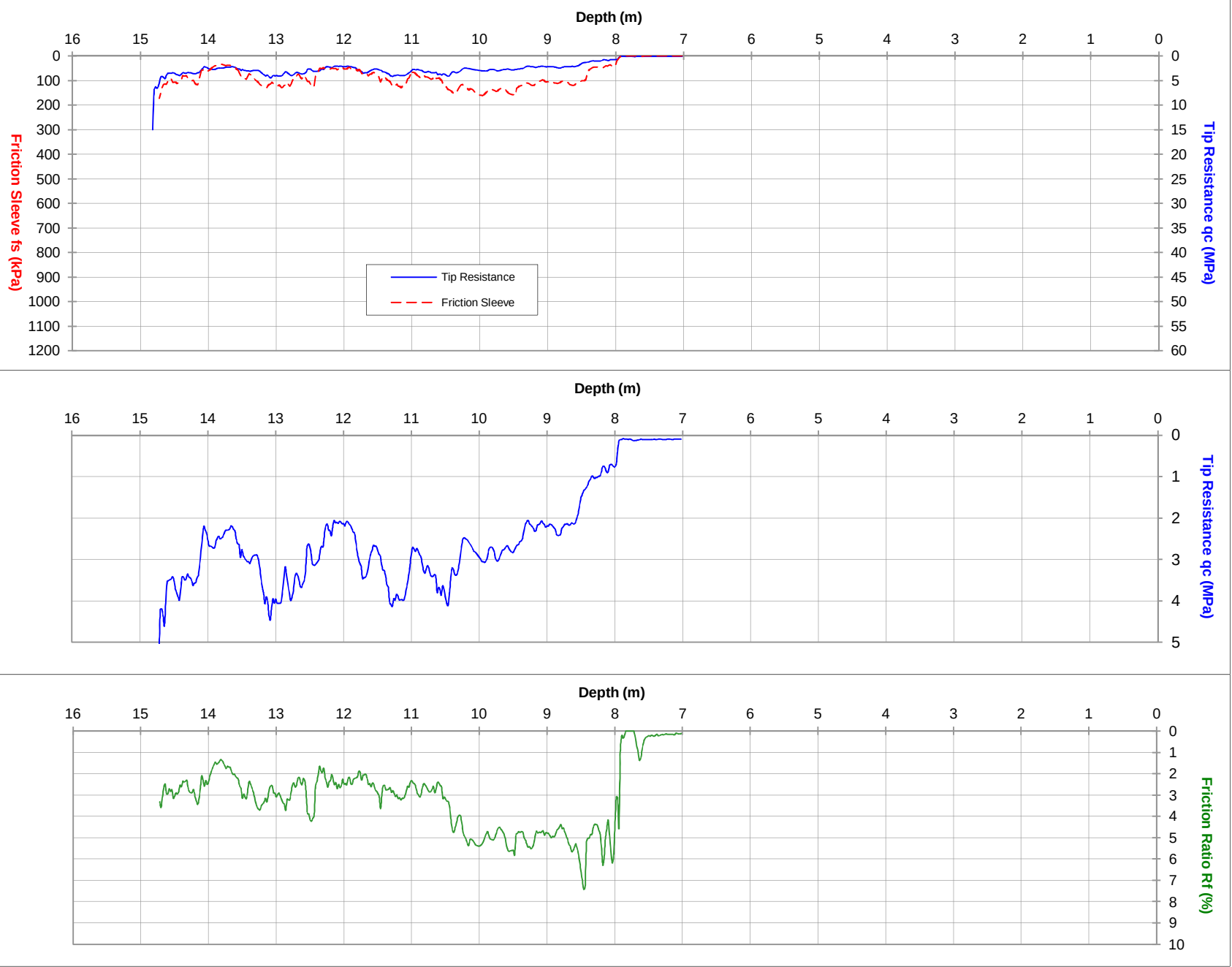
RL (m):

Date: Sunday, 1 March 2015

Probe No.: WBS 2A

Job Number: Q15005M

Co-ordinates:



File: AU0015P5

Cone I.D. : EC20

Casing to (m): 7.8

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 3.45 / 2.65
Refusal: 15MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 1 March 2015

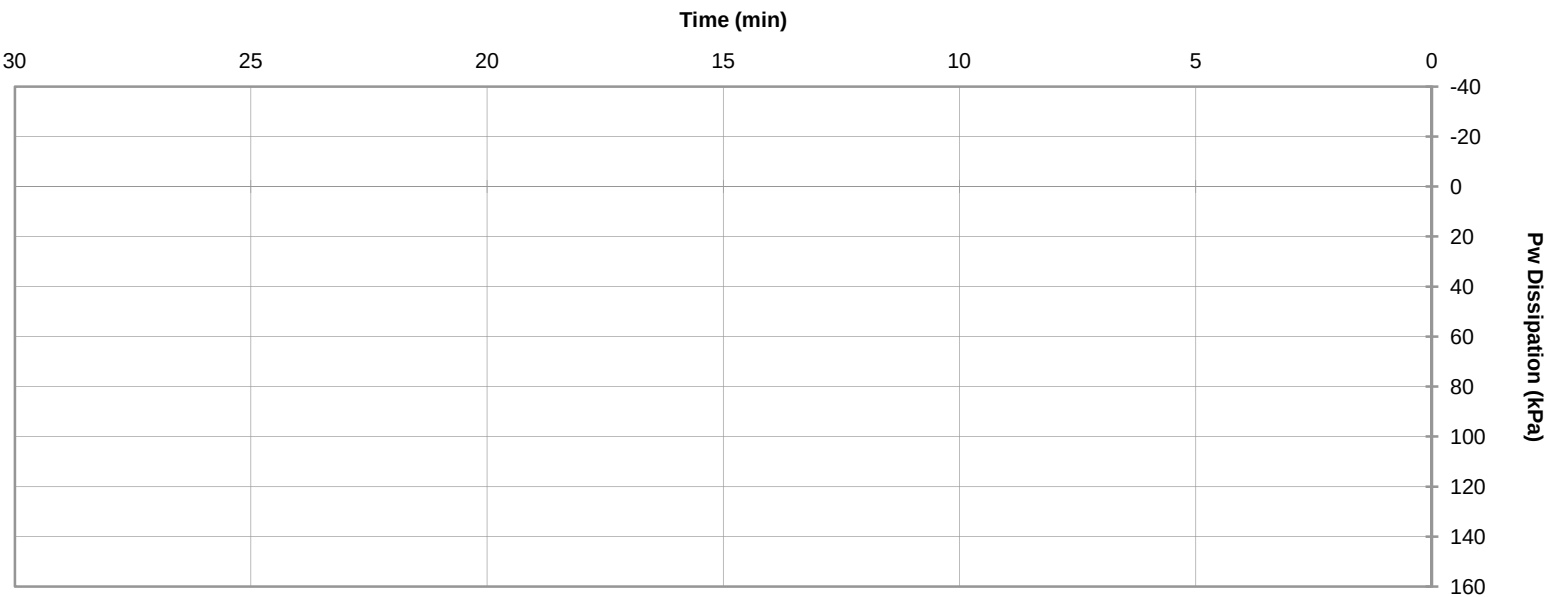
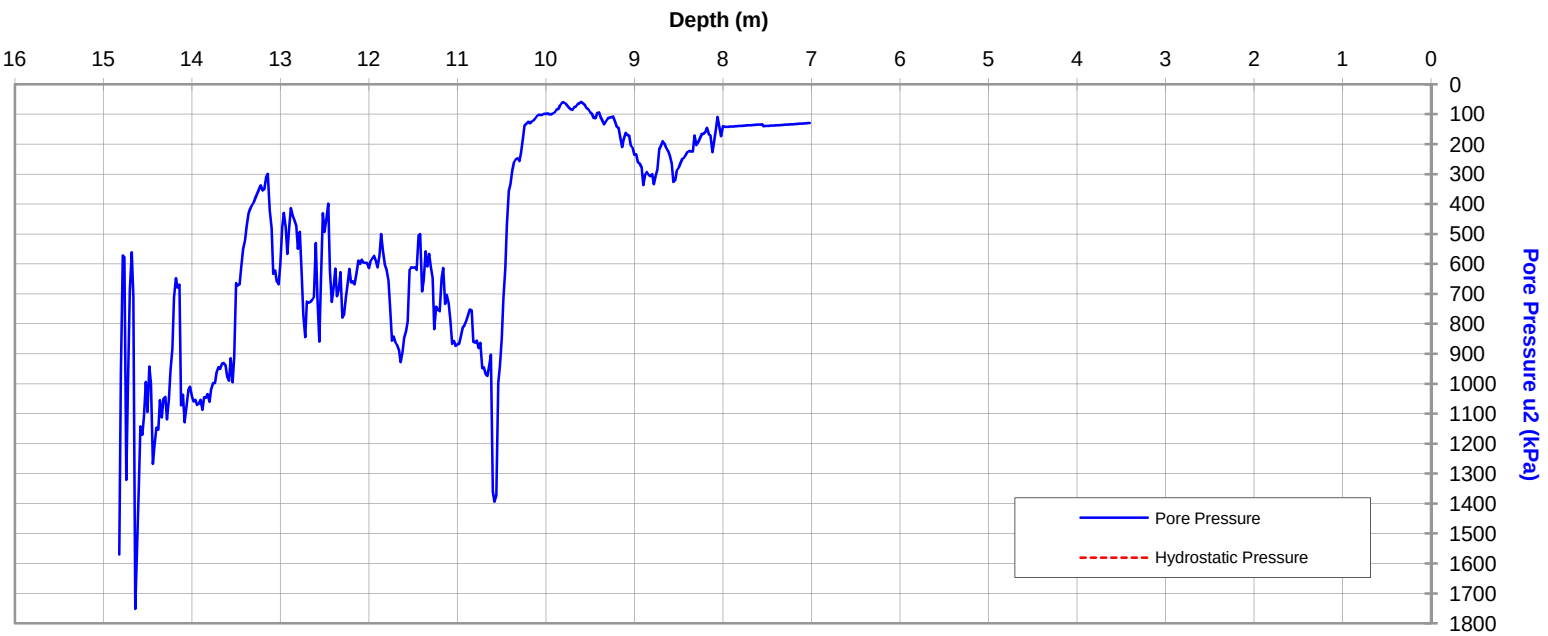
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBS 2A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

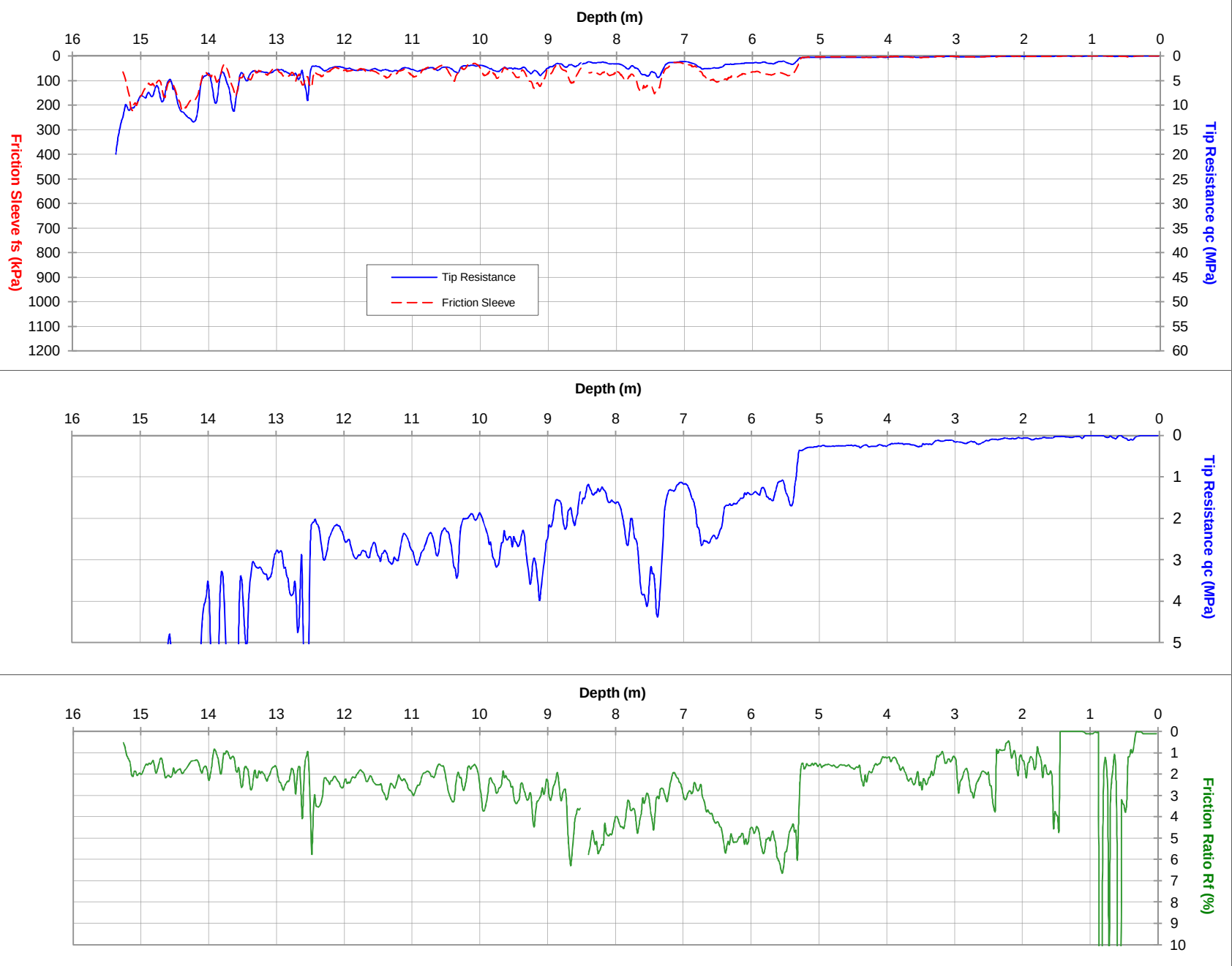
RL (m):

Date: Sunday, 1 March 2015

Probe No.: WBS 1 & 1A

Job Number: Q15005M

Co-ordinates:



File: AU0016P5

Cone I.D. : EC20

Casing to (m): 1.7 / 7.8

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 0.85 / 1.75
Refusal: 1at. Rod support + 20MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 1 March 2015

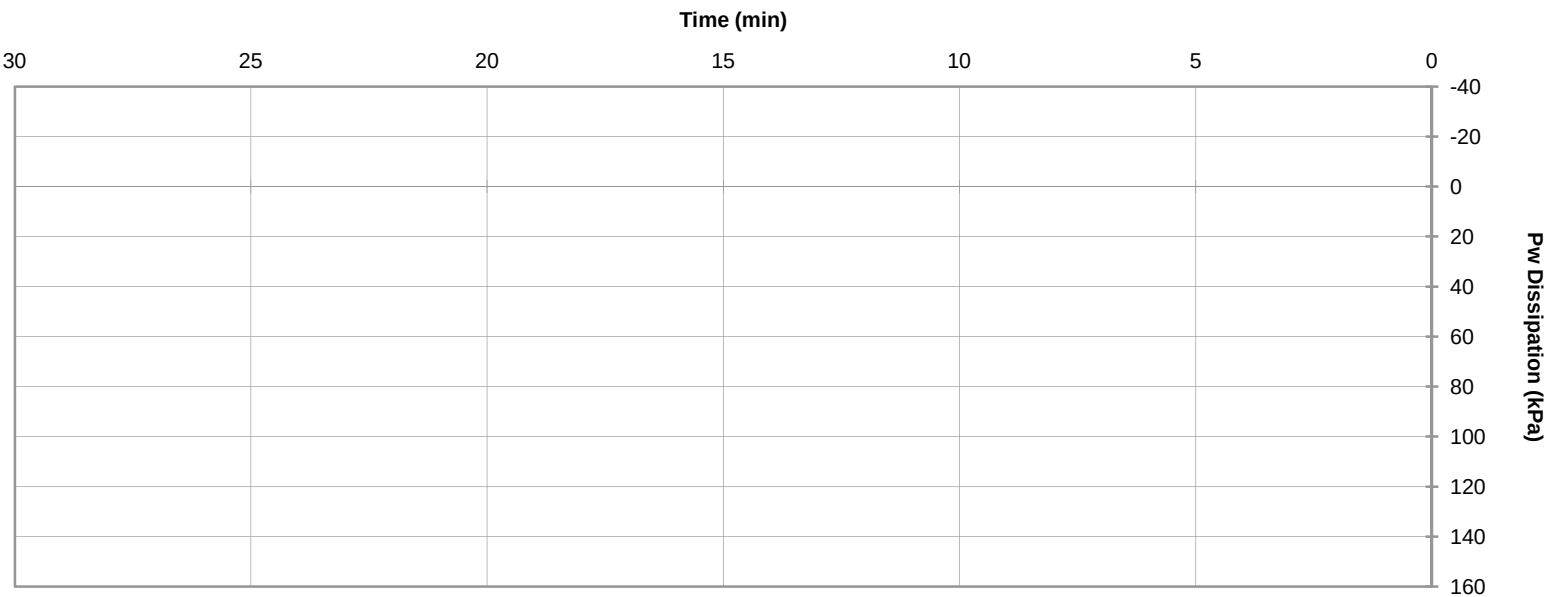
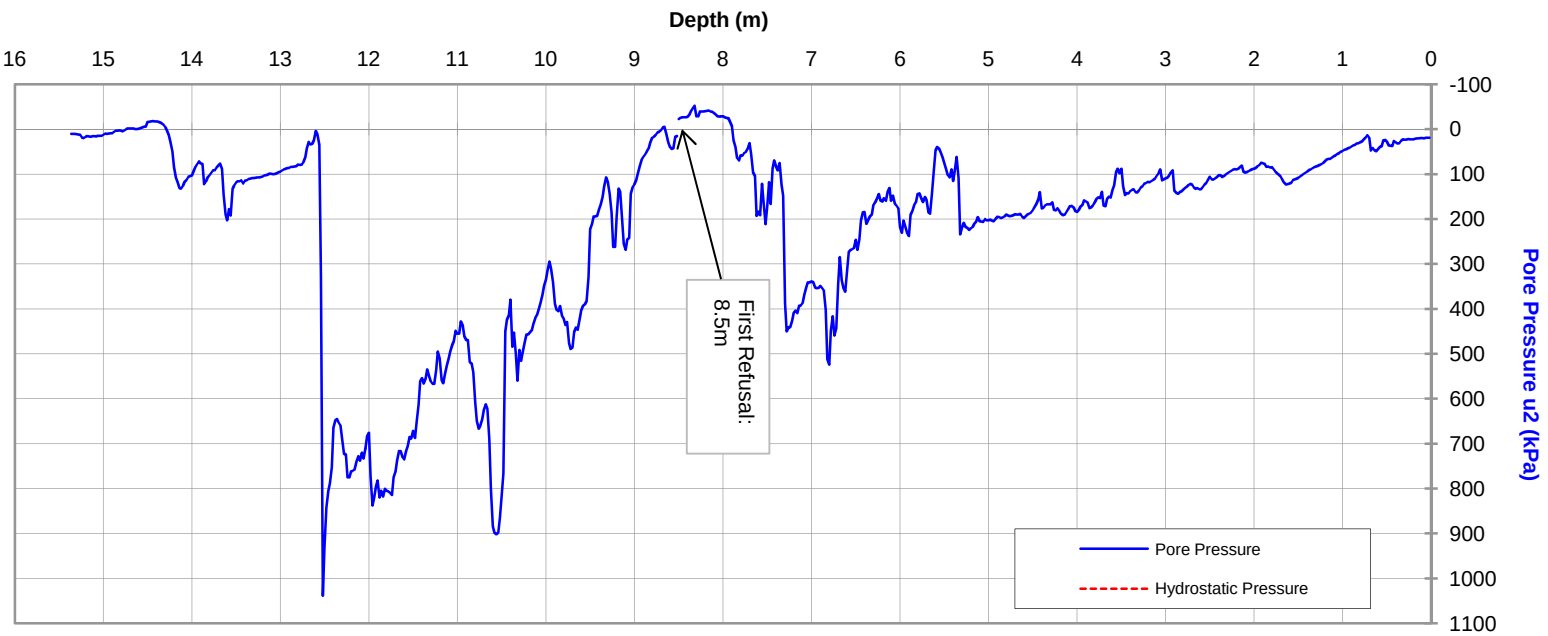
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBS 1 & 1A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

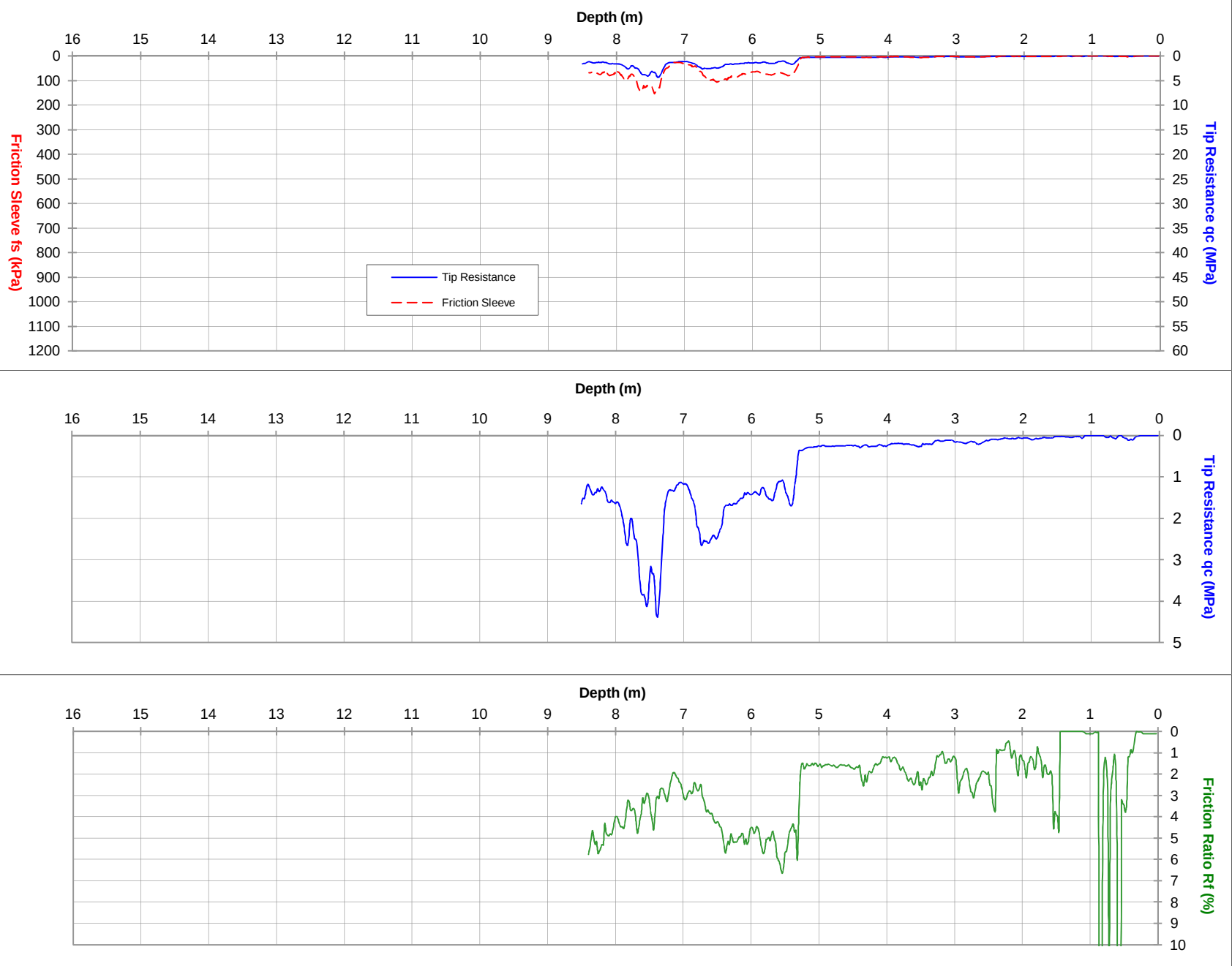
RL (m):

Date: Sunday, 1 March 2015

Probe No.: WBS 1

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 1 March 2015

Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBS 1

Location: Gladstone Harbour & Channel

Job Number: Q15005M

Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon

PROJECT: Geotechnical Investigation for the Port of Gladstone

LOCATION: Gladstone Harbour & Channel

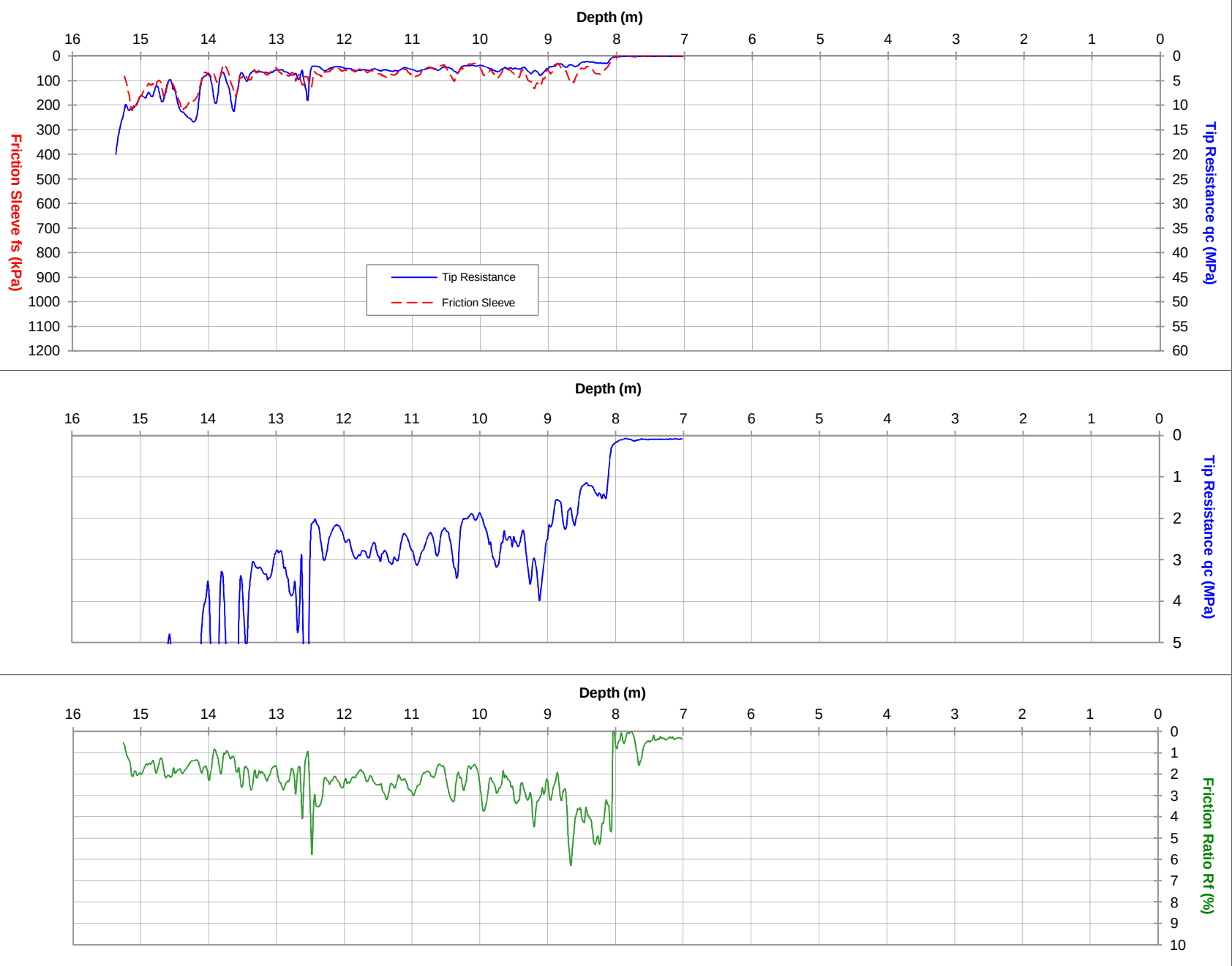
RL (m):

Date: Sunday, 1 March 2015

Probe No.: WBS 1A

Job Number: Q15005M

Co-ordinates:



File: AU0017P5

Cone I.D. : EC20

Casing to (m): 7.8

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 1.05 / 1.75
Refusal: 1st. Rod support + 20MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 1 March 2015

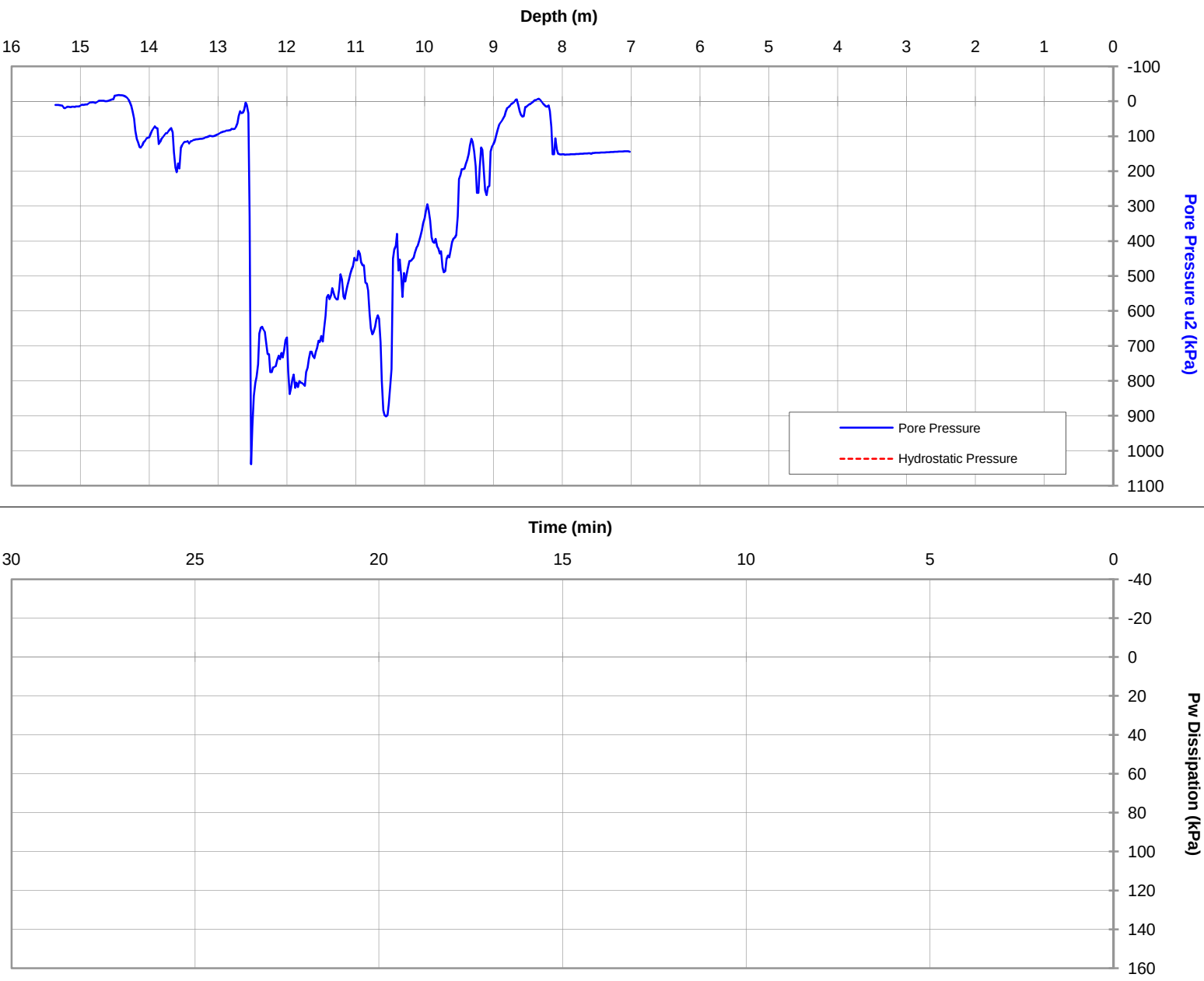
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: WBS 1A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

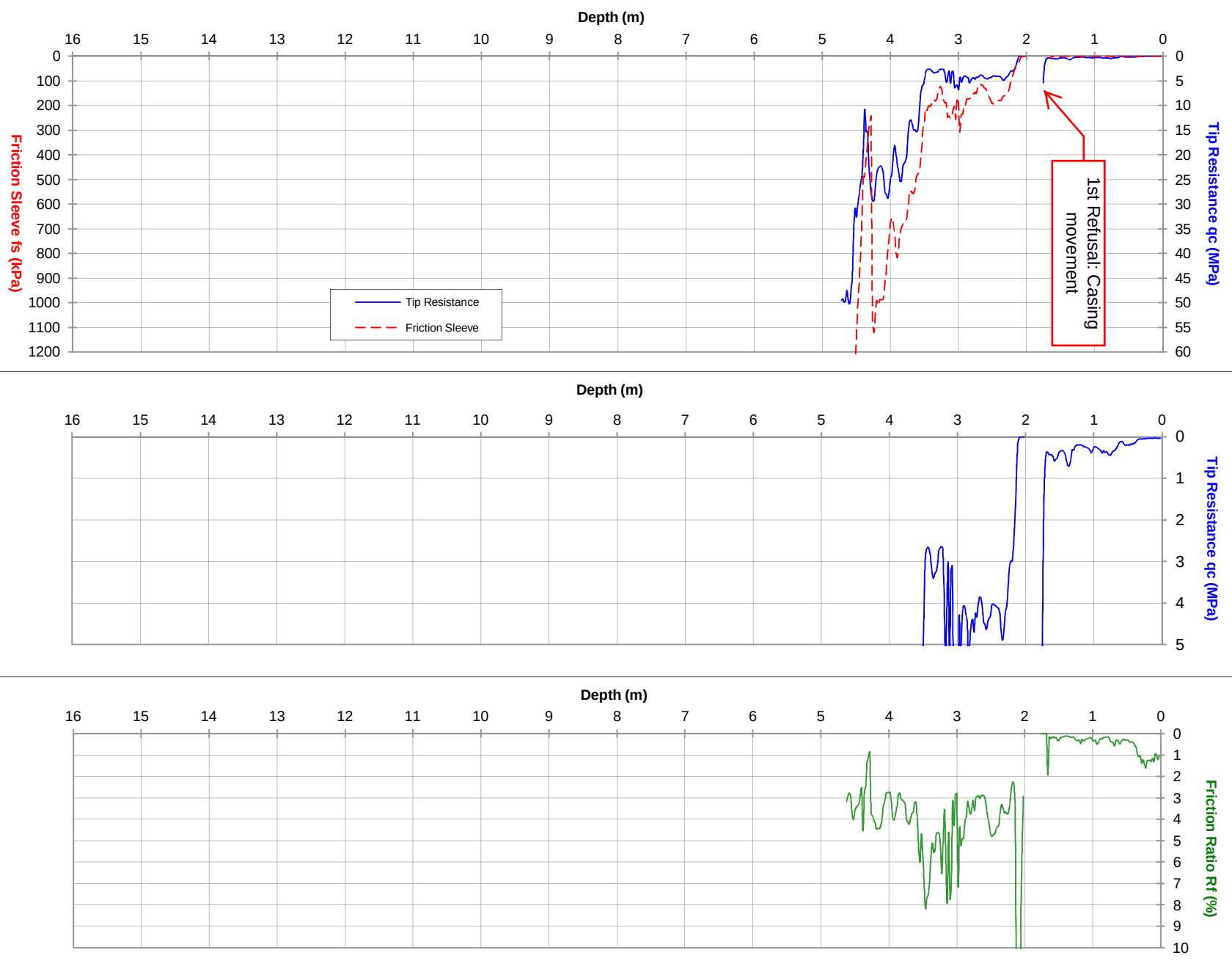
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Sunday, 15 February 2015
Probe No.: PCE 4
Job Number: Q15005M
Co-ordinates:



File: AU0003P5

Cone I.D. : EC39

Casing to (m): 0.3 / 2.0

300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 9.8
Refusal: Lateral Rod support + 50MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

ELECTRIC FRICTION-CONE PENETROMETER

Client: Aurecon

Date: Sunday, 15 February 2015

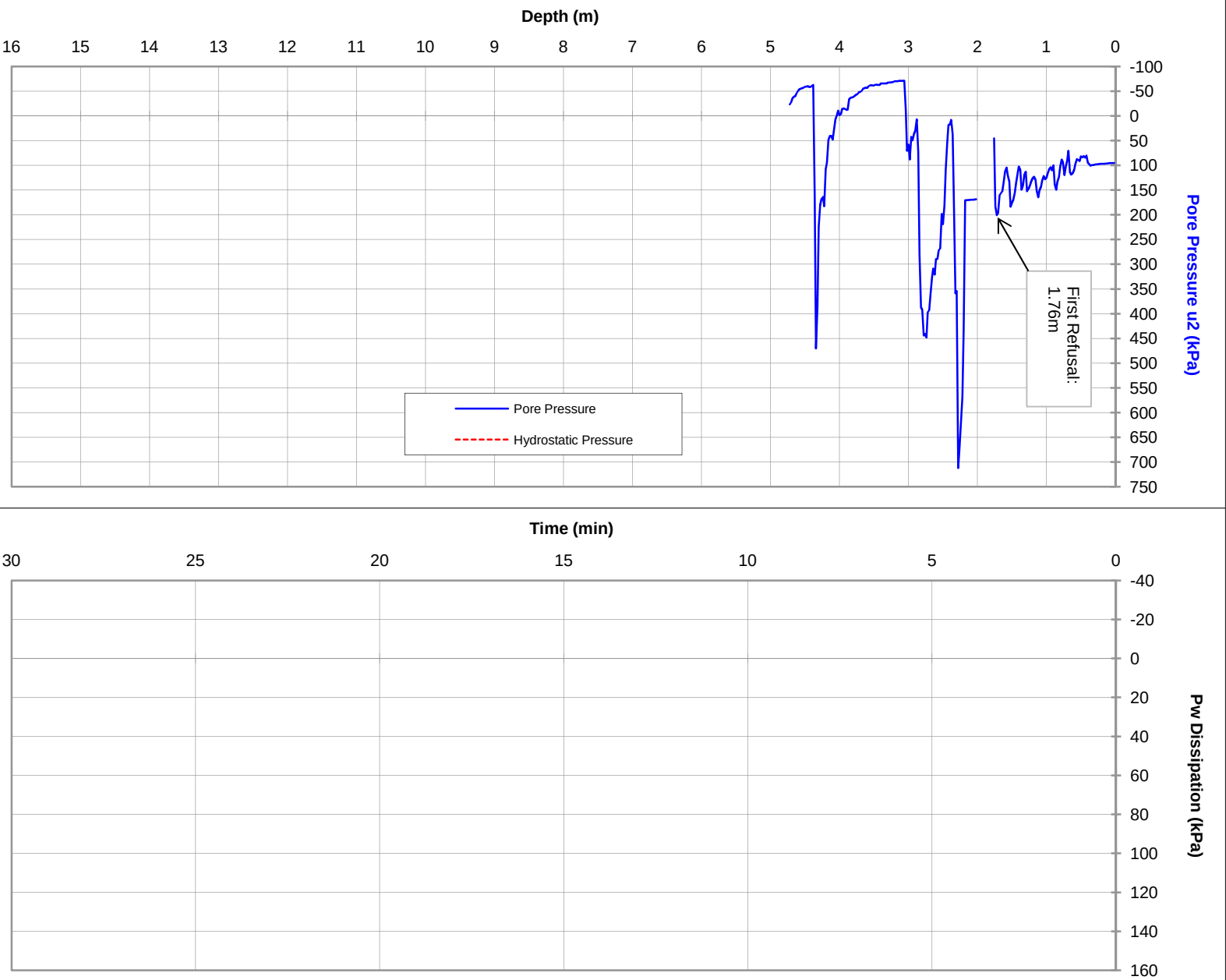
Project: Geotechnical Investigation for the Port of Gladstone

Probe No.: PCE 4 & 4A

Location: Gladstone Harbour & Channel

Job Number: Q15005M

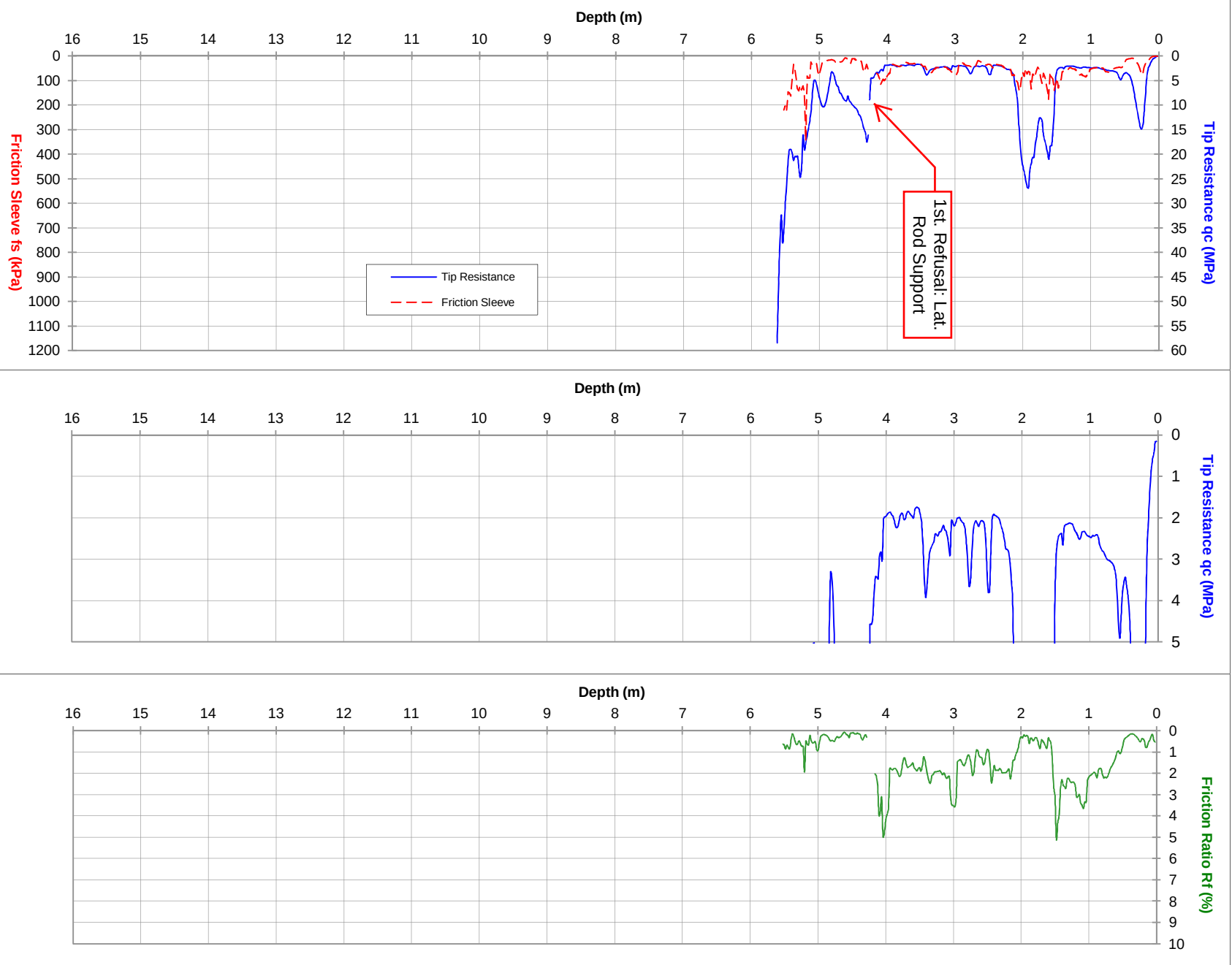
Co-ordinates:



ELECTRIC FRICTION-CONE PENETROMETER

CLIENT: Aurecon
PROJECT: Geotechnical Investigation for the Port of Gladstone
LOCATION: Gladstone Harbour & Channel
RL (m):

Date: Tuesday, 24 February 2015
Probe No.: WBI 4 & 4A
Job Number: Q15005M
Co-ordinates:



File: AU0008&9P5

Cone I.D.: EC20

Casing to (m): 0.4 / 4.0

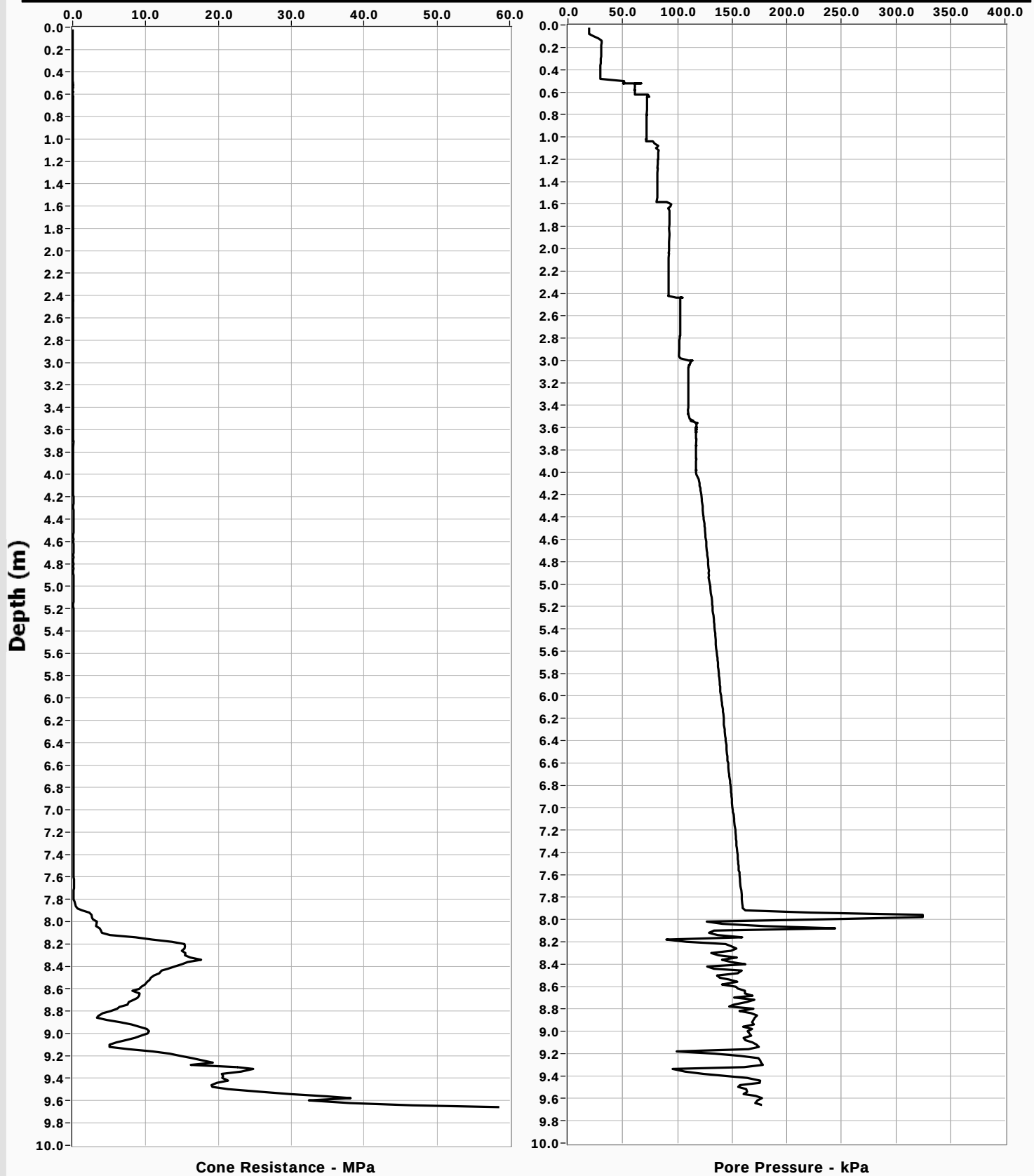
300kN Portable Pushing frame on JUB

Sea-level Start/Finish (m): 13.65 / 12.05
Refusal: Lat. Rod Support + 56MPa

Tested in accordance with AS 1289.6.5.1 - 1999
and IRTF 2001 for friction reducer

Probedrill, Western Australia

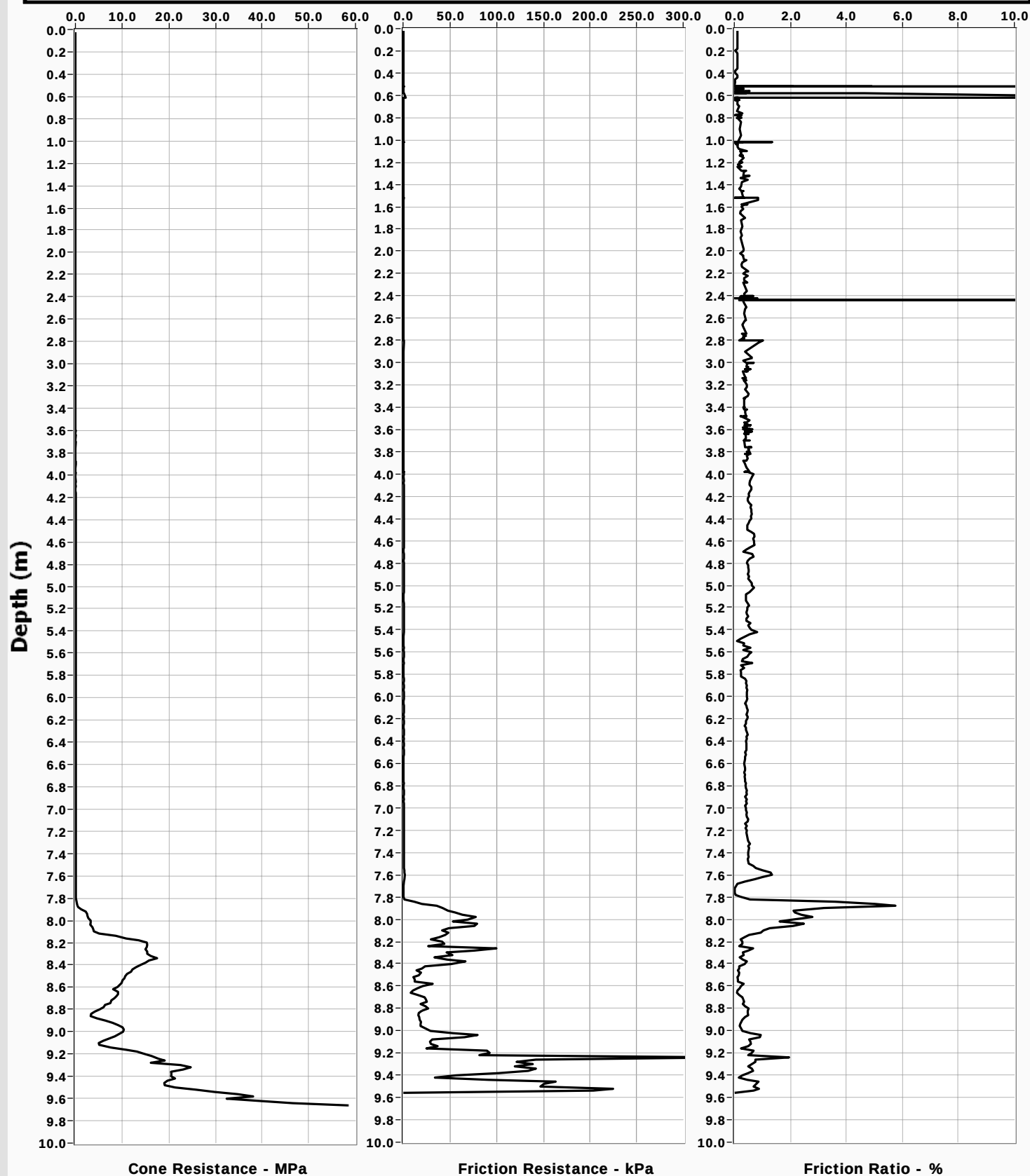
6:05:17 AM
Wednesday, 25 February 2015



Client: Aurecon Group				Cone Id: EC20			
Location: GLADSTONE 13-2-15				File No: AU0009P5.txt			
Probe No: WBI 4A				Start Depth: 0.020 meters			
Water Table: -				Rig: PORTABLE JUB			
Base Line Start: Qc 6.189 Fs -40.275 PP 56.317 Inc 2.198				Logging Incr: 0.020			
Base Line Finish: Qc 6.204 Fs -39.741 PP 53.353 Inc 18.781				Friction Delay: -			
				Operator: TERRY			
				Average Feed Rate: 4.0 mm/sec			

Probedrill, Western Australia

6:05:17 AM
Wednesday, 25 February 2015



Client: Aurecon Group
Location: GLADSTONE 13-2-15
Probe No: WBI 4A
Water Table: -

Base Line Start: Qc 6.189 Fs -40.275 PP 56.317 Inc 2.198
Base Line Finish: Qc 6.204 Fs -39.741 PP 53.353 Inc 18.781

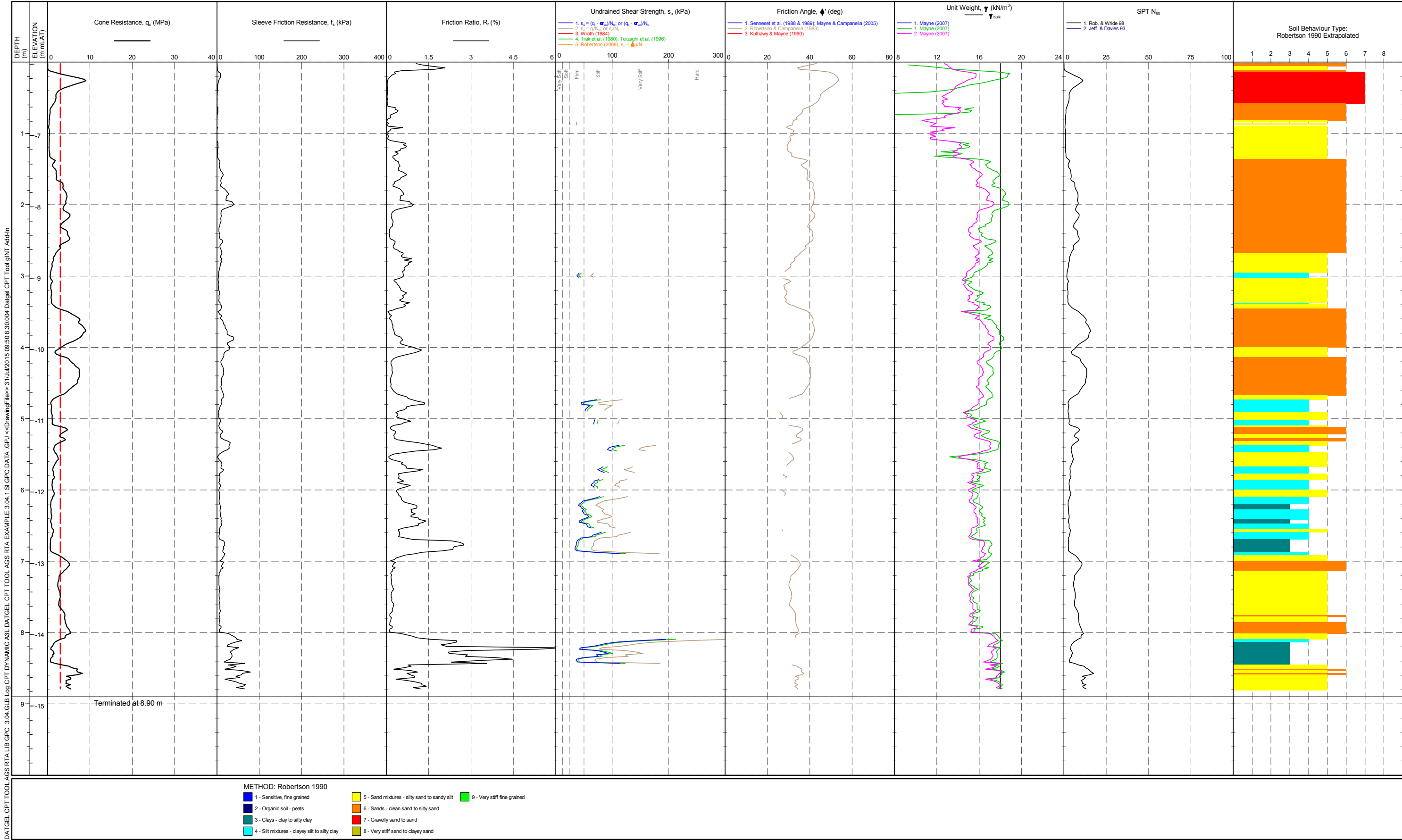
Cone Id: EC20
File No: AU0009P5.txt
Start Depth: 0.020 meters
Rig: PORTABLE JUB
Logging Incr: 0.020
Friction Delay: -
Operator: TERRY
Average Feed Rate: 4.0 mm/sec



PointID

WBI-1

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 330694.9 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7359306.1 m	CONE ID : EC40	APPROVED BY :		DATE : 26/02/2015
LOCATION : Gladstone, QLD	COORD. SYS.: WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -5.97 m mLAT				

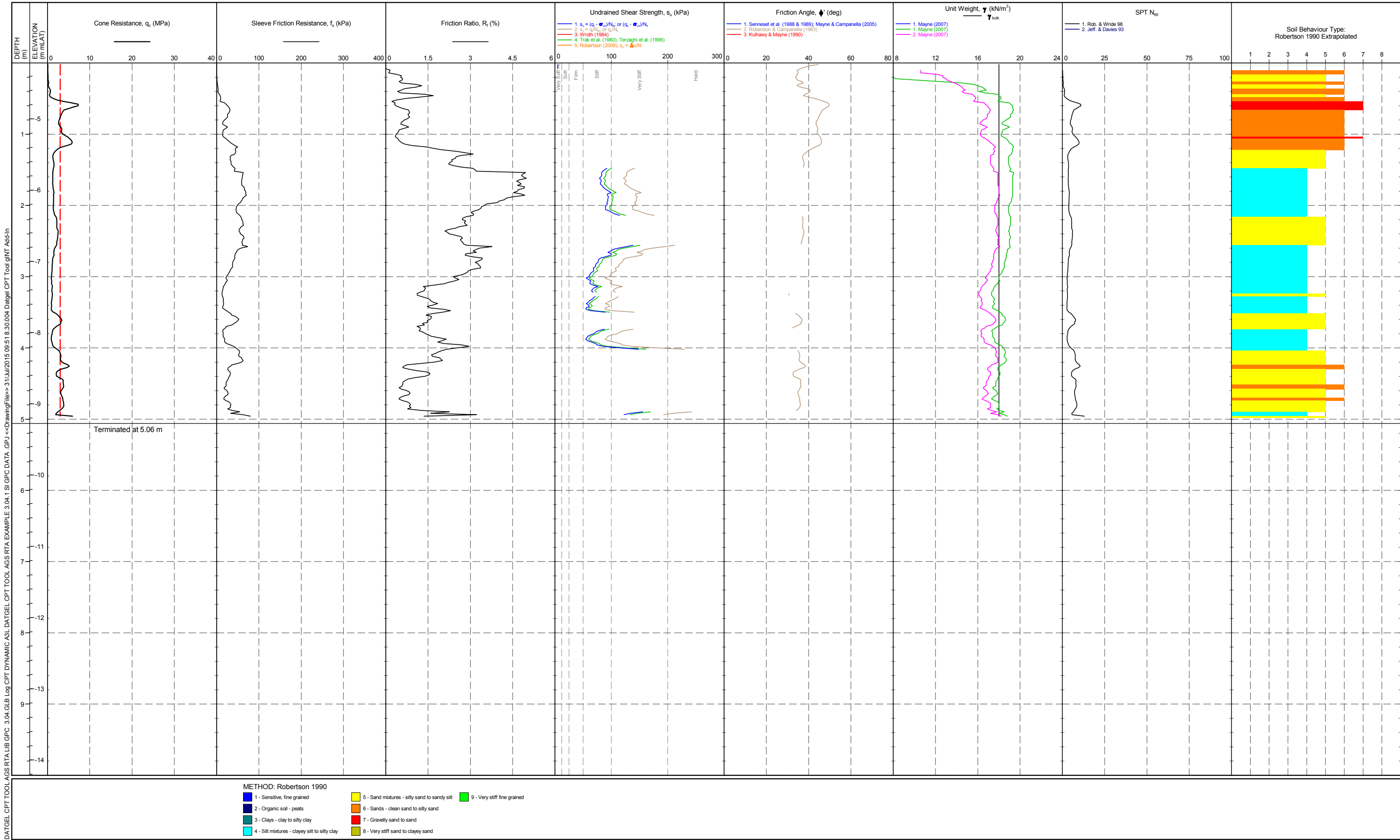




PointID

WBI-11

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 331768.8 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7356397.8 m	CONE ID : EC40	APPROVED BY :		DATE : 27/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -4.22 m mLAT				

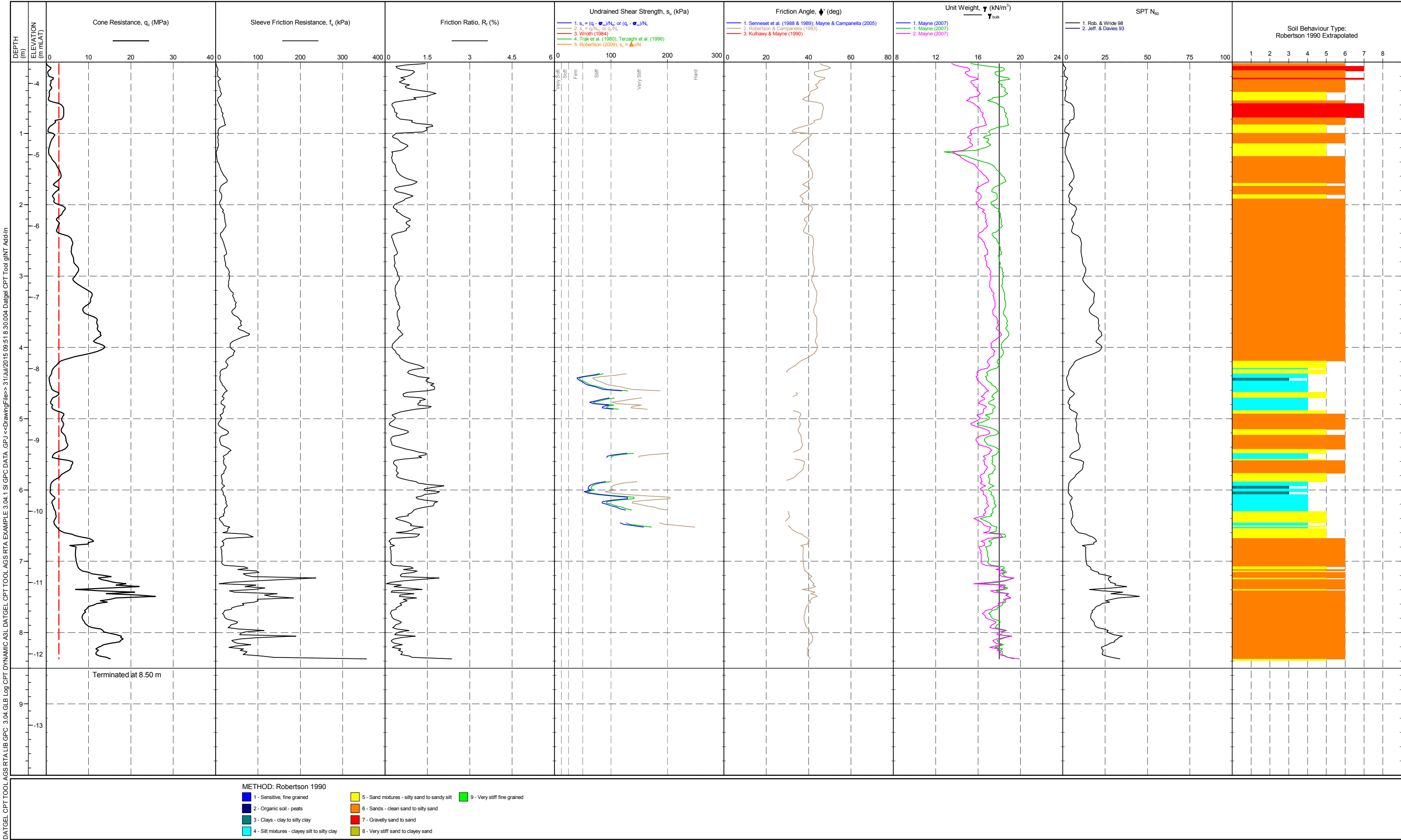




PointID

WBI-12

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 331190.6 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7357377.1 m	CONE ID : EC40	APPROVED BY :		DATE : 17/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -3.70 m LAT				

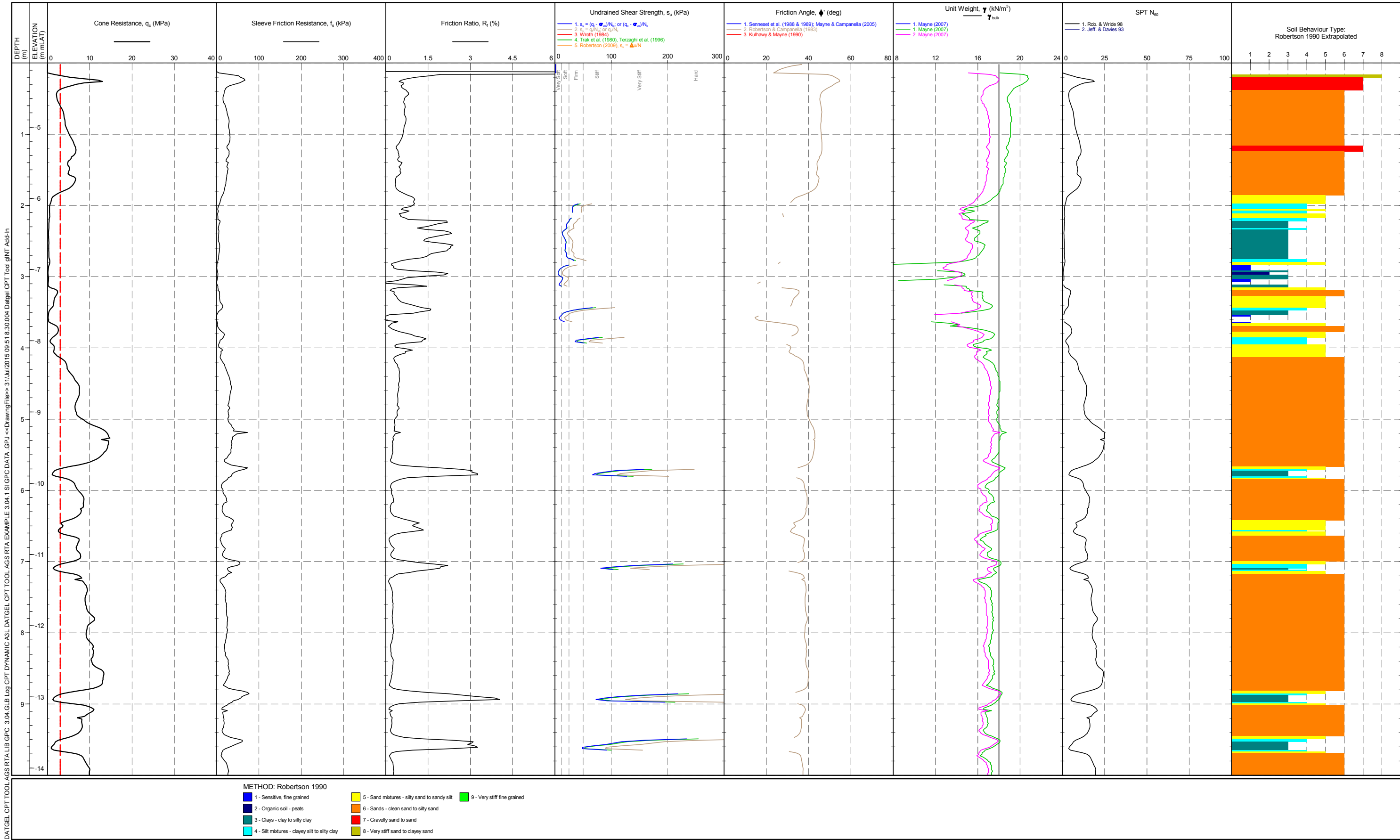




PointID

WBI-17

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 2
ENGINEER : GEI/KAP/AC/BT	EASTING : 334113.7 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7355181.1 m	CONE ID : EC40	APPROVED BY :		DATE : 22/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -4.10 m mLAT				





PointID

WBI-17

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 2 OF 2
ENGINEER : GEI/KAP/AC/BT	EASTING : 334113.7 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7355181.1 m	CONE ID : EC40	APPROVED BY :		DATE : 22/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -4.10 m LAT				

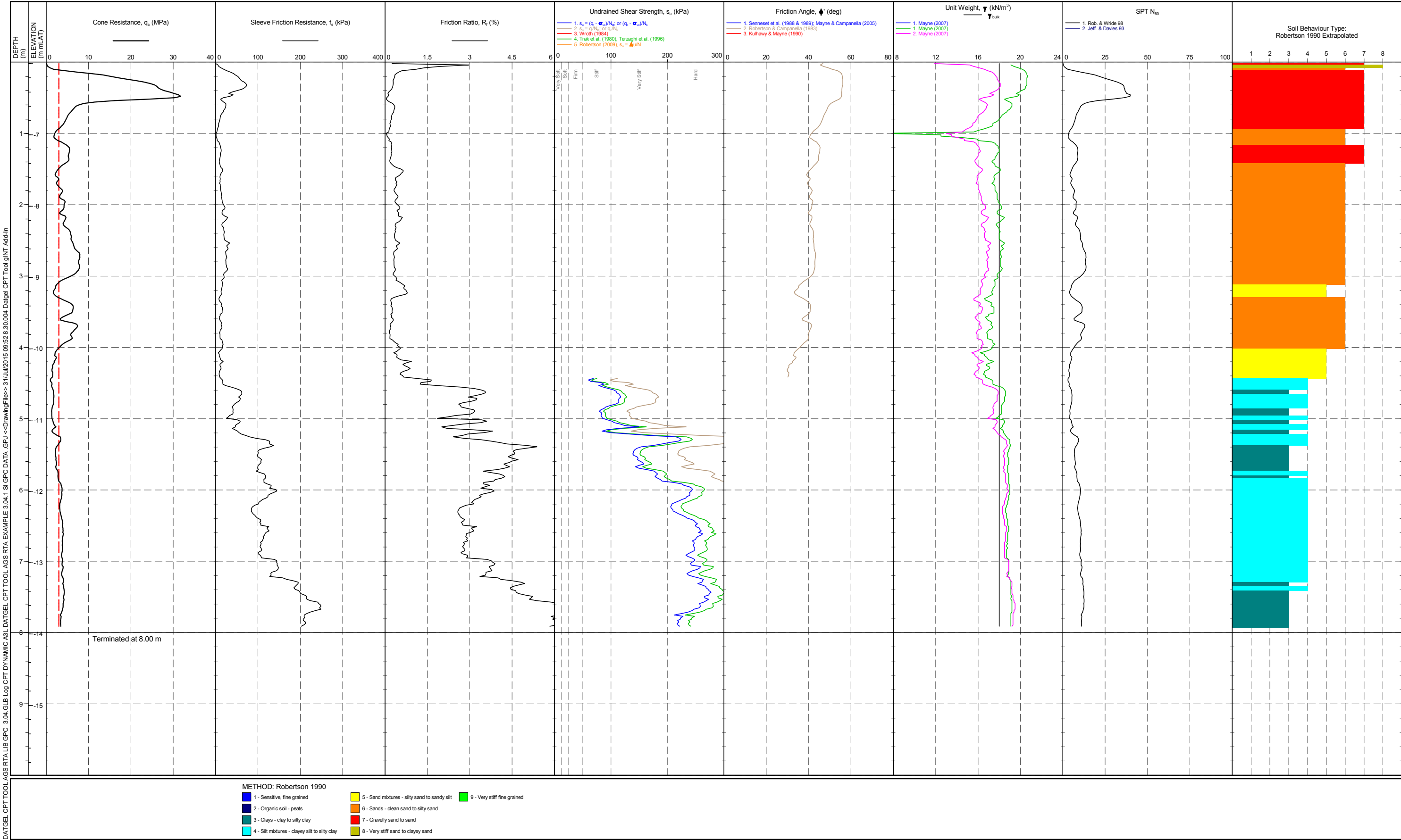




PointID

WBI-2

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 331380.1 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7358473.6 m	CONE ID : EC40	APPROVED BY :		DATE : 26/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -5.98 m LAT				

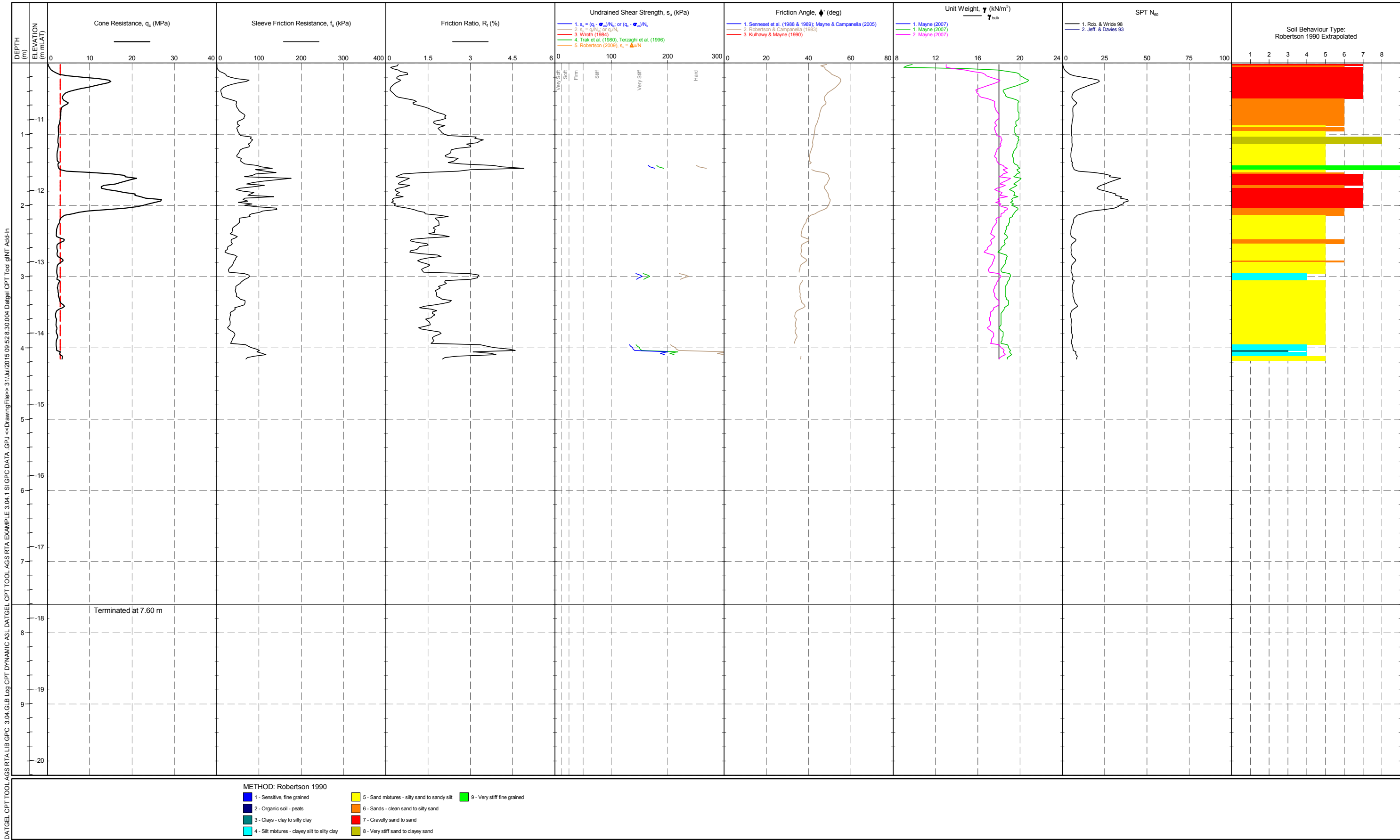




PointID

WBI-4

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 332401.0 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7357246.6 m	CONE ID : EC40	APPROVED BY :		DATE : 24/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -10.21 m mLAT				

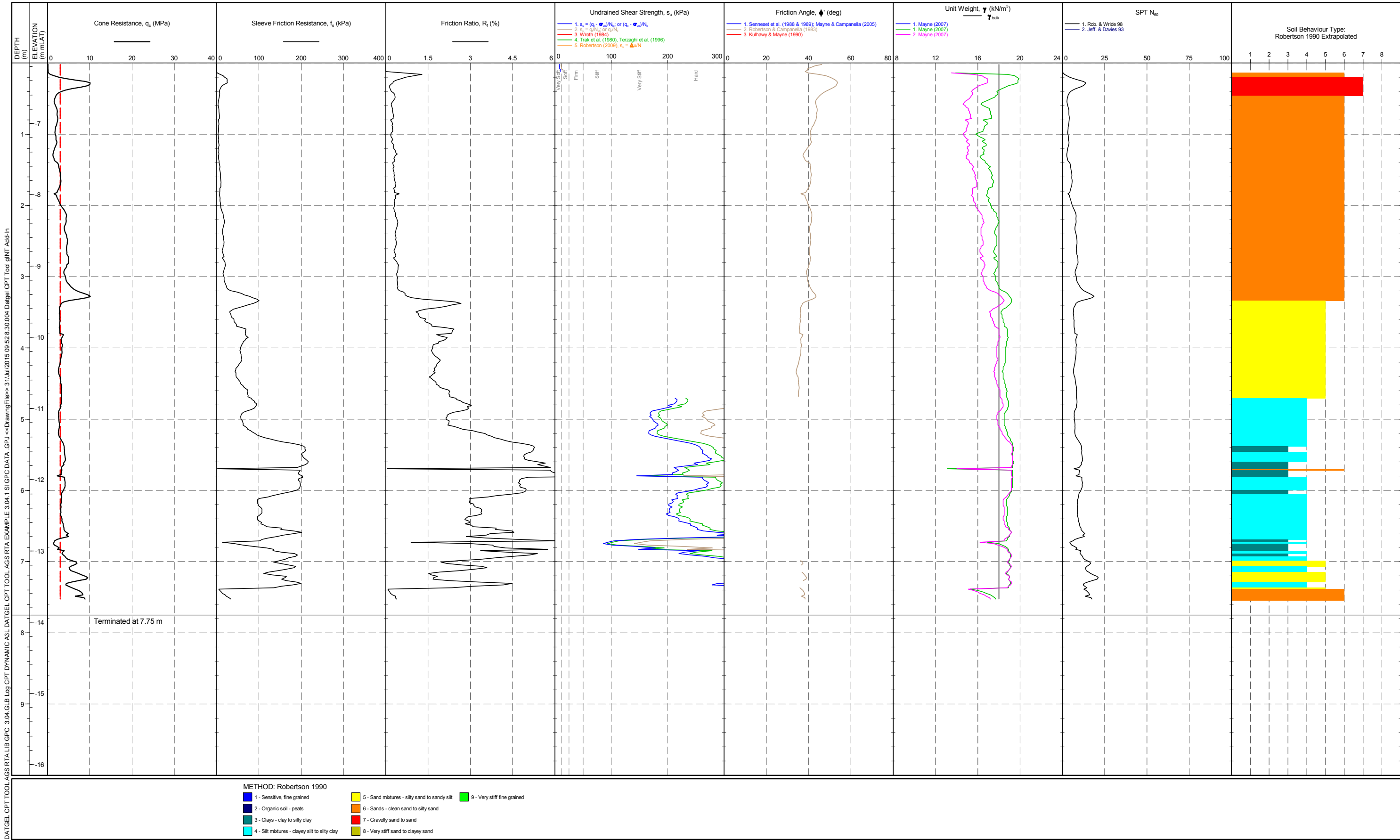




PointID

WBI-5

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 332980.2 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAS	NORTHING : 7356544.7 m	CONE ID : EC40	APPROVED BY :		DATE : 23/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -6.15 m mLAT				

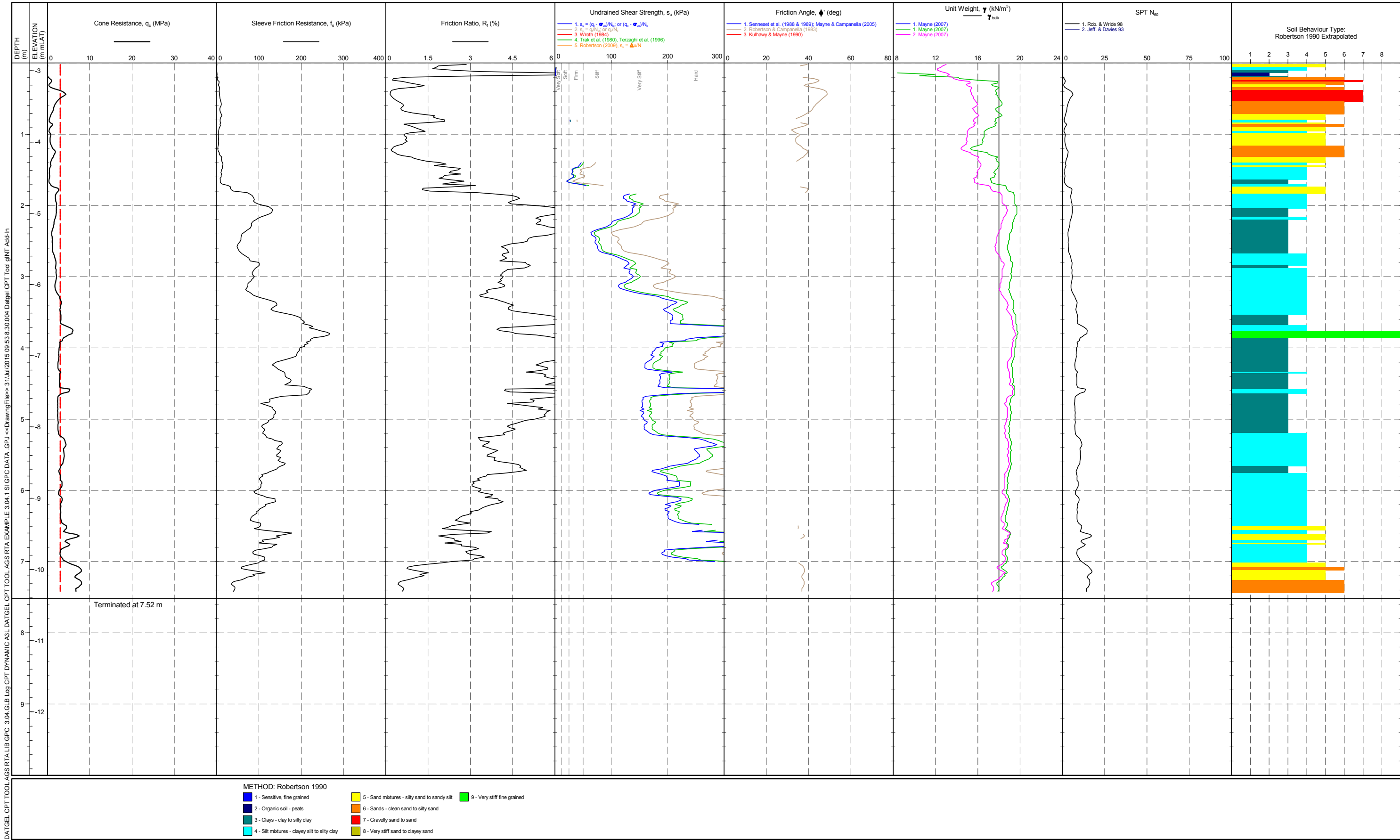




PointID

WBI-9

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 1
ENGINEER : GEI/KAP/AC/BT	EASTING : 332911.9 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7355170.3 m	CONE ID : EC40	APPROVED BY :		DATE : 27/02/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -2.89 m LAT				



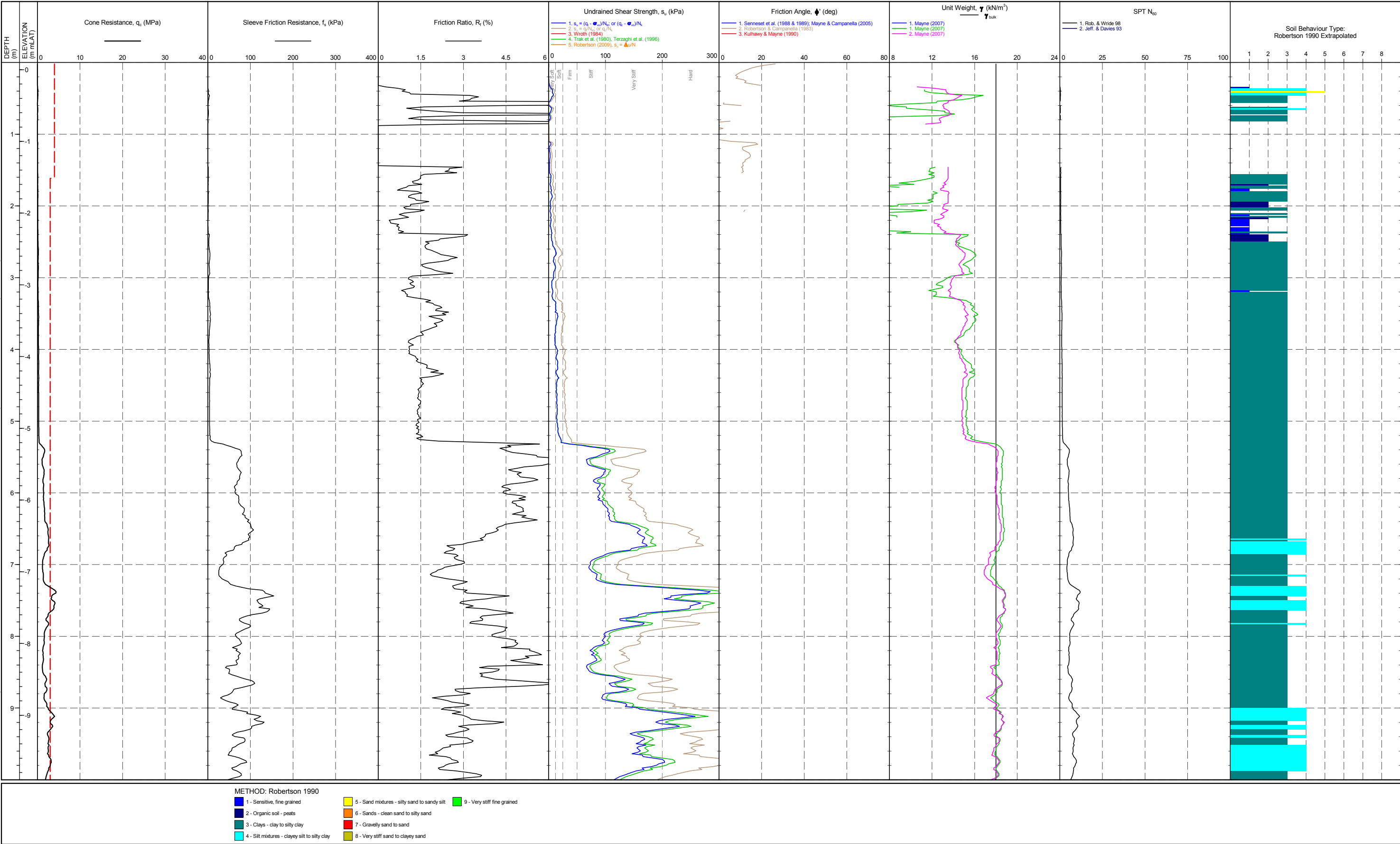


PointID

WBS-1

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 2
ENGINEER : GEI/KAP/AC/BT	EASTING : 312809.5 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7371737.6 m	CONE ID : EC40	APPROVED BY :		DATE : 01/03/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : 0.10 m mLAT				

DATGEL CPT TOOL AGS RTA LIB GPC 3.04.GLB Log CPT DYNAMIC AXI DATGEL CPT TOOL AGS RTA EXAMPLE 3.04.1 SI GPC DATA.GPJ <<DrawingFile>> 31/Jul/2015 09:58:30.004 Darger CPT Tool gINT Add-In

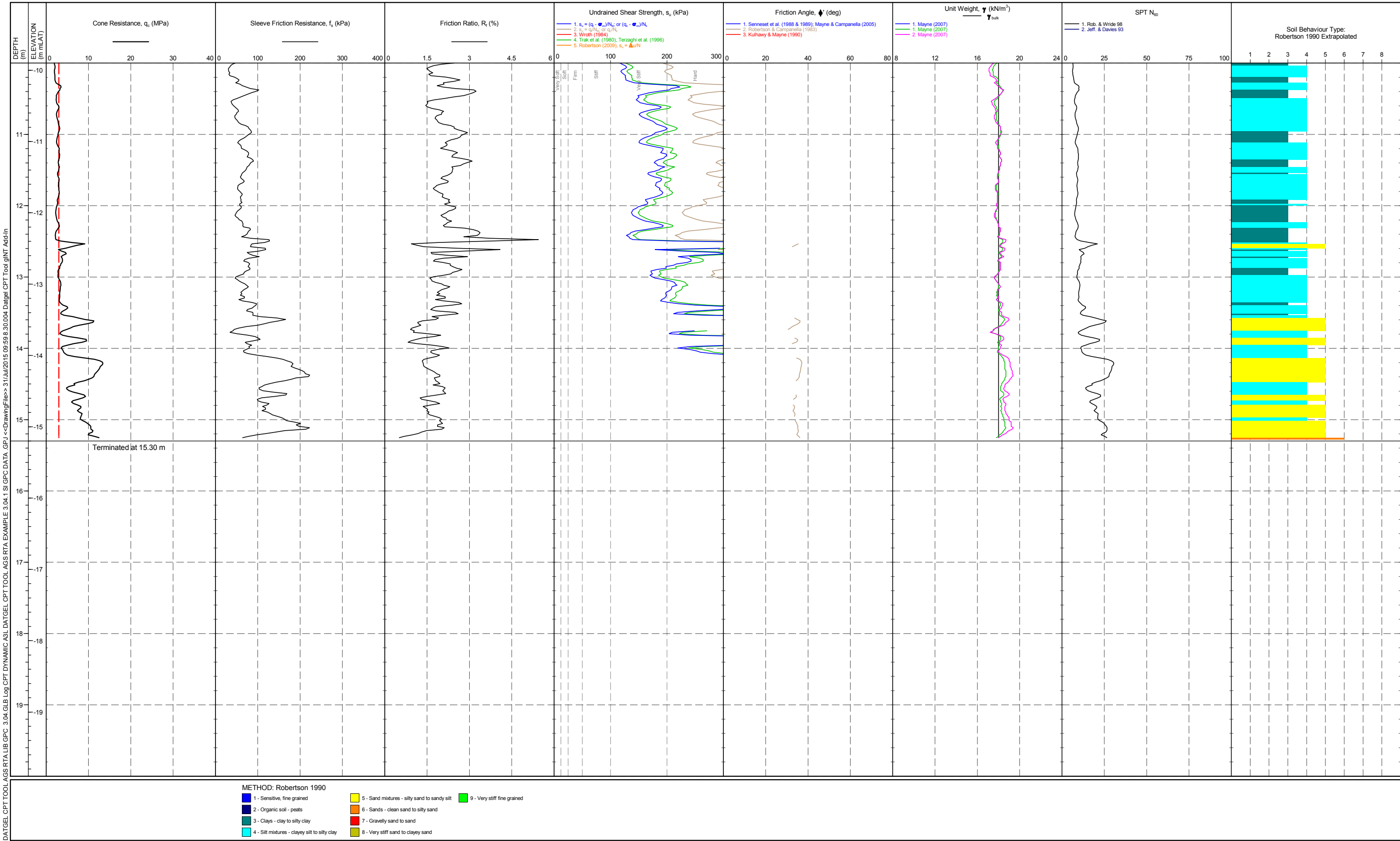




PointID

WBS-1

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 2 OF 2
ENGINEER : GEI/KAP/AC/BT	EASTING : 312809.5 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7371737.6 m	CONE ID : EC40	APPROVED BY :		DATE : 01/03/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : 0.10 m mLAT				



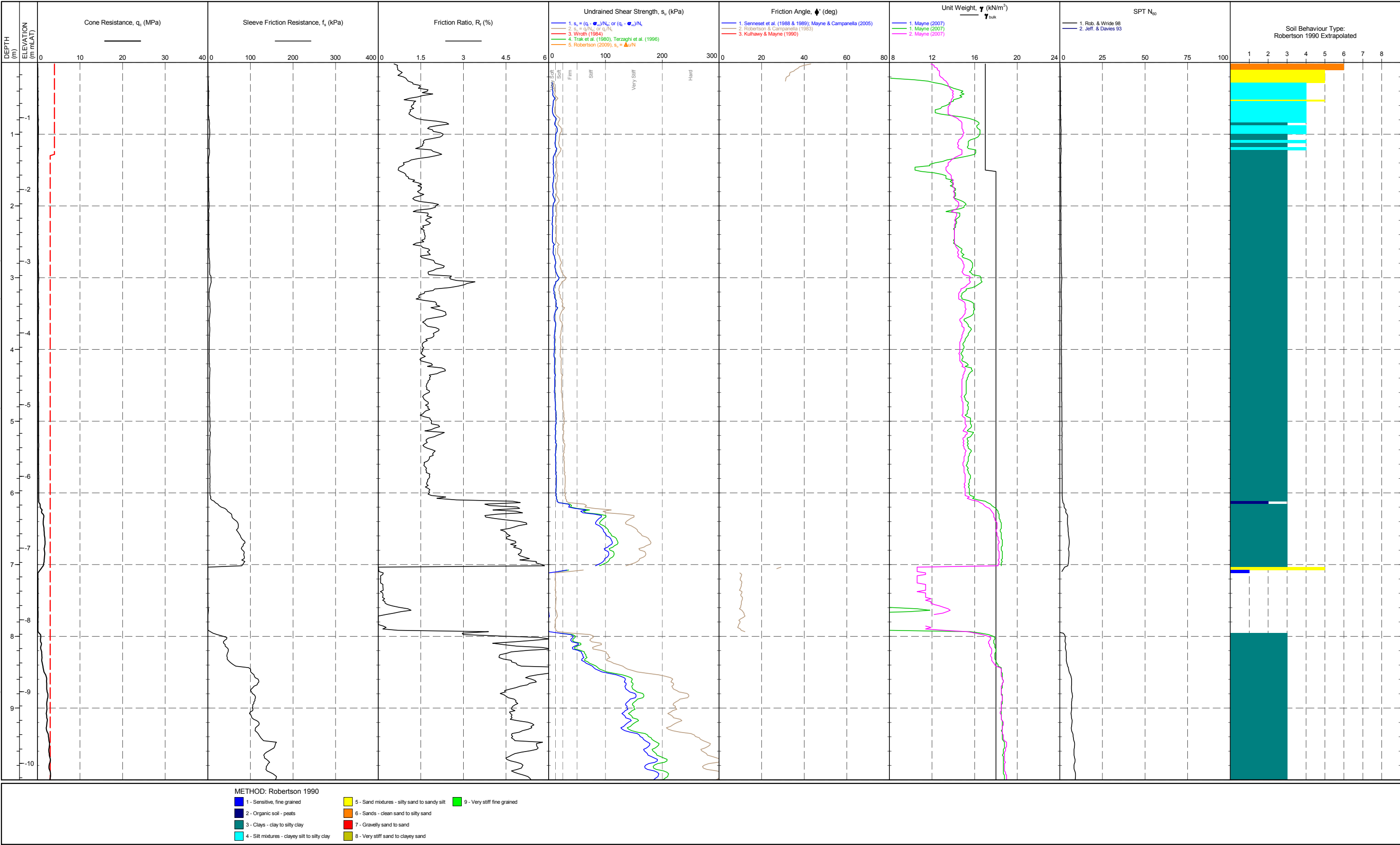


PointID

WBS-2

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 1 OF 2
ENGINEER : GEI/KAP/AC/BT	EASTING : 312932.6 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAs	NORTHING : 7371099.6 m	CONE ID : EC40	APPROVED BY :		DATE : 01/03/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -0.23 m mLAT				

DATGEL CPT TOOL AGS RTA LIB GPC 3.04.GLB Log CPT DYNAMIC AXI DATGEL CPT TOOL AGS RTA EXAMPLE 3.04.1 SI GPC DATA.GPJ <<DrawingFile>> 31/JUL/2015 09:59:53.0004 Darger CPT Tool gINT Add-In



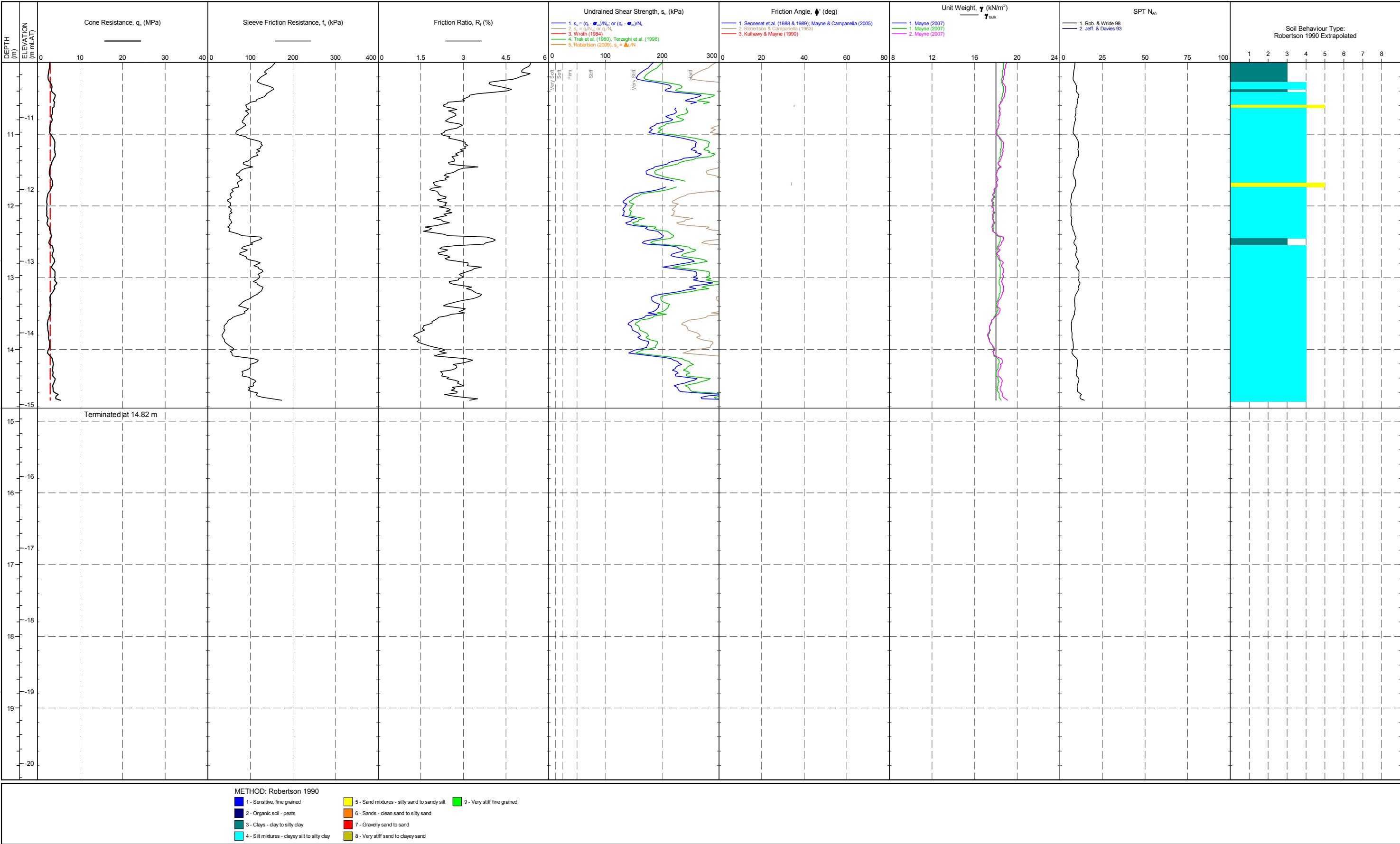


PointID

WBS-2

CLIENT : Gladstone Ports Corporation	AREA :	RIG :	CHECKED BY :	REMARK	SHEET : 2 OF 2
ENGINEER : GEI/KAP/AC/BT	EASTING : 312932.6 m	CONE TYPE : C	CHECKED DATE :		STATUS :
PROJECT : Offshore Geotechnical Investigation GPC DMPAS	NORTHING : 7371099.6 m	CONE ID : EC40	APPROVED BY :		DATE : 01/03/2015
LOCATION : Gladstone, QLD	COORD. SYS. : WGS 84 UTM Zone 56	OPERATOR :	APPROVED DATE :		
PROJECT No. : 245852	ELEVATION : -0.23 m mLAT				

DATGEL CPT TOOL AGS RTA LUB GPC 3.04.GLB Log CPT DYNAMIC AXI DATGEL CPT TOOL AGS RTA EXAMPLE 3.04.1 SI GPC DATA.GPJ <<DrawingFile>> 31/Jul/2015 09:59 & 3.0.0.04 Darger CPT Tool gINT Add-In



- METHOD: Robertson 1990
- | | | |
|---|--|-----------------------------|
| 1 - Sensitive, fine grained | 5 - Sand mixtures - silty sand to sandy silt | 9 - Very stiff fine grained |
| 2 - Organic soil - peats | 6 - Sands - clean sand to silty sand | |
| 3 - Clays - clay to silty clay | 7 - Gravelly sand to sand | |
| 4 - Silt mixtures - clayey silt to silty clay | 8 - Very stiff sand to clayey sand | |



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Philippines, Qatar, Singapore, South Africa,
Swaziland, Tanzania, Thailand, Uganda,
United Arab Emirates, Vietnam, Zimbabwe.