Pacific Geotech
Consulting Geotechnical Engineers

GEOTECHNICAL REPORT: Proposed Oonoonba Urban Development

Abbott Street

Oonoonba

Economic Development Queensland

June 2025

PG-12108

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Consulting Geotechnical Engineers

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23rd June, 2025

Economic Development Queensland
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CC: Nicole.gillies@edq.qld.gov.au; sharee.wiki@edq.qld.gov.au

ATTN: ANNA VANGSNESS

Dear Madam,

GEOTECHNICAL INVESTIGATION – PROPOSED OONOONBA URBAN DEVELOPMENT ABBOTT STREET, OONOONBA

Enclosed is a copy of our report for the above project dated June 2025. An electronic copy of the report has been issued.

Should you have any queries regarding this report, please do not hesitate to contact Ben Elsmore or Tony Lee at this office.

Yours faithfully,

B. ELSMORE (RPEQ 19656)

For and on behalf of
PACIFIC GEOTECH PTY LTD

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Appendices

1.0 INTRODUCTION

This report contains the results of the geotechnical investigation and provides advice and recommendations relating to the following:

- Subsurface conditions in accordance with AS 1726-2017
- Groundwater conditions
- Indicative site classification in accordance with AS 2870-2011
- Earthworks recommendations including:
    - Suitability of cut for reuse as fill
    - Compaction standards
    - Stripping depths
    - Trafficability
    - Excavatability
    - Safe temporary batter slopes for cuts
    - Fill batter slopes
- Retention considerations
- Retaining wall design parameters
- Earthquake/liquefaction considerations in accordance with AS 1170.4-2024
- Foundation Recommendations including:
    - High-level and deep support options
    - Bearing capacity and skin friction design values
    - Predicted settlements
- Indicative Pavement Design Parameters
- Preliminary trenchless installation considerations

Proposed Development

It is understood that the proposed development is to comprise the construction of various infrastructure across the site. The variation works are understood to consist of the following:

- Road intersection upgrades
- Drainage corridors
- Sewer pump station
- Infrastructure DECOP works including:
    a. Water trunk infrastructure 002, 003, 004 & 005
    b. Sewer trunk infrastructure SG002, SG003, SG004

c. Road/active transport trunk infrastructure PC002, PC001 & PC003

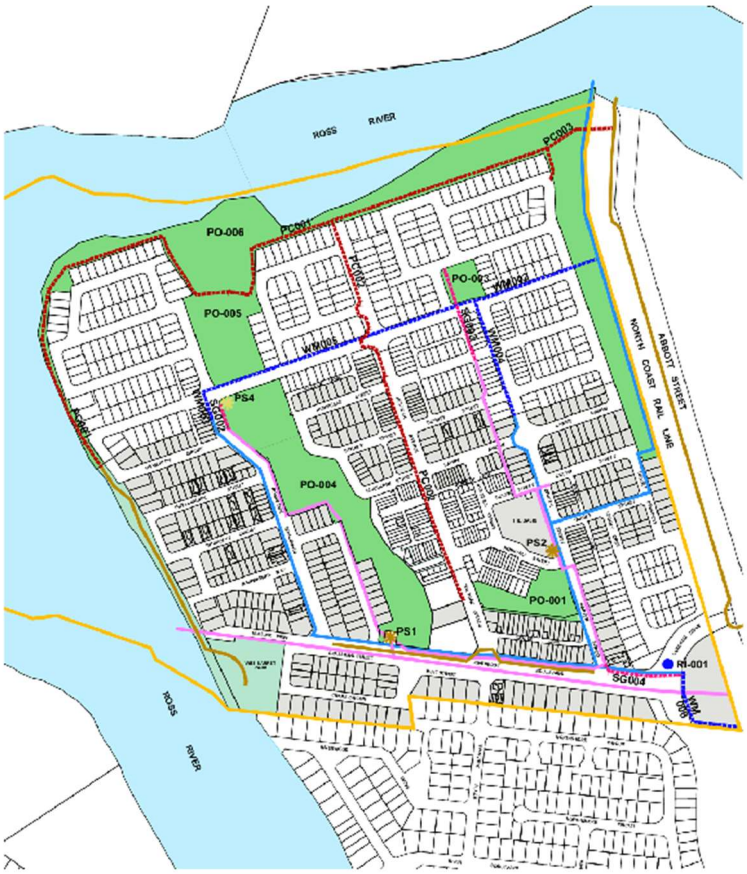
d. Open space trunk infrastructure PO-001, PO-003, PO-004, PO-005, PO 006

No information regarding the proposed bulk earthworks has been provided. Bulk cuts and fills in the order of 1m to 2m in depth/thickness are anticipated.

No information regarding the depth of the proposed trunk water/sewer mains or the sewer pump station wet well has been provided. Excavations to depth in the order of 3m to 4m are anticipated. It is further anticipated that a combination of open trenching and trenchless installation methods will be required to construct the trunk mains.

The proposed development is indicated below.

PROPOSED DEVELOPMENT



2.0 METHODOLOGY

The geotechnical investigation comprised of the following components of work:

Sewer Pump Station

The investigation involved the drilling of one (1) borehole (SP1-1), extending to a depth of 1.9m (refusal in weathered rock) using a Compac 018 drilling rig and 100mm solid flight augers. A Dynamic Cone Penetrometer test (DCP) was performed adjacent to the borehole.

Sewer Trunk Infrastructure (Borehole S4, CPTS3 and CPTS4)

The investigation involved the drilling of one (1) borehole (S4), extending to a depth of 3.0m using a Compac 018 drilling rig and 100mm solid flight augers. A Dynamic Cone Penetrometer test (DCP) was performed adjacent to the borehole.

In addition to the borehole, two (2) Cone Penetrometer tests (S3 and SP4) were pushed to a refusal depth of 0.96m (S3) and 11.04m (SP4) using our truck mounted cordless push equipment.

Water Trunk Infrastructure (Boreholes WM2, WM4, WM5-1, WM 2 4 5 and CPT's WM5-1, WM5-2)

The investigation involved the drilling of four (4) boreholes (WM2, WM4, WM5-1 and WM 2 4 5), extending to depths ranging between 0.45m (drilling rig refusal in fill) and 6.0m using a Compac 018 drilling rig and 100mm solid flight augers. Dynamic Cone Penetrometer tests (DCP's) were performed adjacent to the boreholes.

In addition to the boreholes, two (2) Cone Penetrometer tests (WM 5-1 and WM 5-2) were pushed to refusal depths of 1.68m (WM 5-2) and 3.32m (WM 5-1) using our truck mounted cordless push equipment. At the location of WM5-1, several attempts were made to penetrate the upper-level soils. Predrilling of the CPT tests was required.

Road Active Transport (CPT's PC 1-1, PC 1-2, PC 1-3, PC 1-5, PC 1-6, PC 3 and Boreholes PC 2-2 and PC 3)

The investigation involved the drilling of two (2) boreholes (PC 3 and PC 2-2), extending to depths of 3.0m (PC3) and 4.5m (PC 2-2) using a Compac 018 drilling rig and 100mm solid flight augers. Dynamic Cone Penetrometer tests (DCP's) were performed adjacent to the borehole.

In addition to the boreholes, five (5) Cone Penetrometer tests (PC 1-1, PC 1-2, PC 1-3, PC 1-5 and PC 1-6) were pushed to refusal depths ranging between 1.26m and 12.54m using our truck mounted cordless push equipment.

Open Space (CPT's PO 3-1 and PO 3-2 and Borehole PO 3-3)

The investigation involved the drilling of one (1) borehole (PO3-3), extending to a depth of 0.65m (drilling rig refusal) using a Compac 018 drilling rig and 100mm solid flight augers. A Dynamic Cone Penetrometer test (DCP) was performed adjacent to the borehole.

In addition to the borehole, two (2) Cone Penetrometer tests (PO 3-1 and PO 3-2) were pushed to refusal depths of 6.06m (PO 3-2) and 9.12m (PO 3-1) using our truck mounted cordless push equipment.

Abbott Street Intersection (Boreholes AS1 to AS4 inclusive)

The investigation involved the drilling of four (4) boreholes (AS1 to AS4 inclusive), each extending to a depth of 1.5m using a Compac 018 drilling rig and 100mm solid flight augers. Dynamic Cone Penetrometer tests (DCP's) were performed adjacent to the boreholes.

Lakeside Intersection (Boreholes LS1 and LS2)

The investigation involved the drilling of four (4) boreholes (AS1 to AS4 inclusive), each extending to a depth of 1.5m using a Compac 018 drilling rig and 100mm solid flight augers. Dynamic Cone Penetrometer tests (DCP's) were performed adjacent to the boreholes.

The soil classification descriptions and field tests were carried out in general accordance with Australian Standards.

AS 1726	Geotechnical Site Investigations
AS 1289	Methods of Testing Soils for Engineering Purposes

Borehole records, Dynamic Cone Penetrometer test results, the laboratory test certificates and a site plan showing the test locations are appended to the report.

3.0 SITE DESCRIPTION

The site of the proposed development is located at Abbott Street, Oonoonba. The site is bound by the Ross River to the north and west, the rail corridor and Abbott Street to the east, and Lakeside Drive, Riveredge Boulevard and Mizuo View to the south.

At the time of the investigation, the southern portion of the site supported existing residential properties with associated roads and parks. An existing sewer pump station is located on the northern side of Riveredge Boulevard. Within the existing parks, several small masonry and boulder retaining walls are evident.

The northern and western portion of the development area is typically vacant.

Vegetation comprised of grass as well as some trees and shrubs. Several tracks have been cut through the northern portion of the site.

The topography of the site is typically flat and low lying.

Drainage at the site was considered poor due to the topography. Within the existing parks, large drainage areas including drainage swales and stormwater infrastructure is evident.

Refer following aerial and site photographs for typical site conditions.

AERIAL IMAGE

SITE PHOTOGRAPHS

Image A – The Lakeside Drive/Riveredge Boulevard Intersection looking west

Image B – The Abbott Street/Lakeside Drive intersection looking south

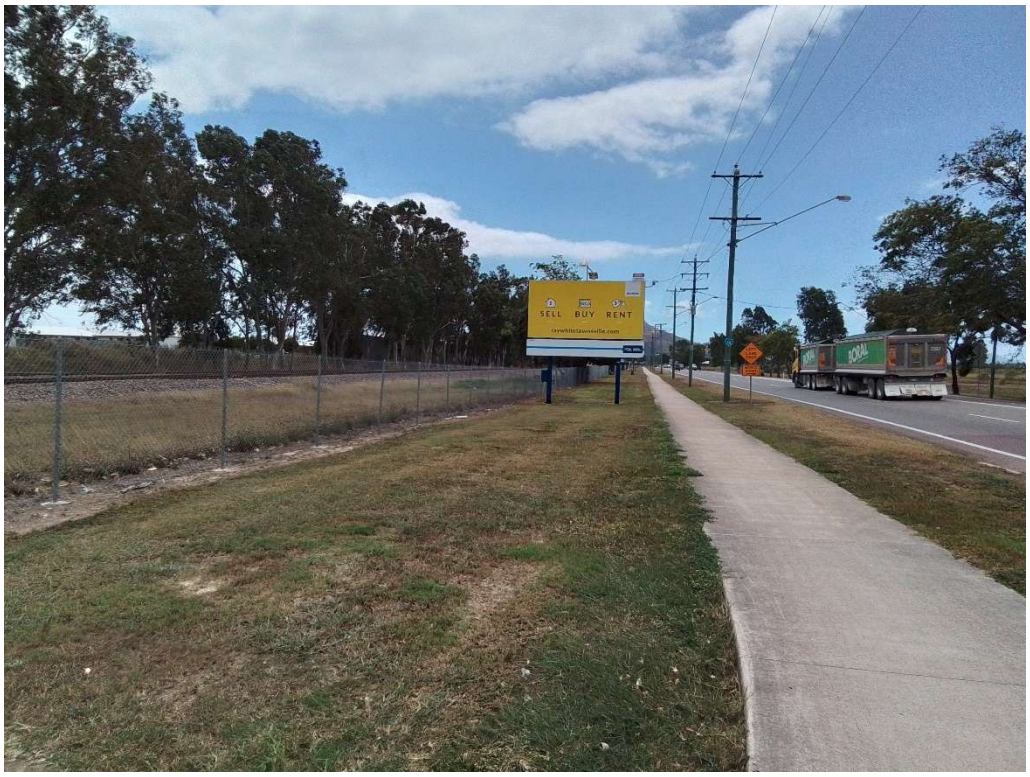


Image C – Looking north along Abbott Street

Image D – Looking west towards the stub at the end of Dorney Street

Image E – Looking east across the back of the properties fronting Lawrie Avenue

Image F – Looking north across the north eastern portion of the site

Image G – Looking north along the western boundary adjacent to the Ross River

Image H – Looking south west along the western boundary showing a stockpile of boulders

4.0 GEOTECHNICAL MODEL

The subsurface profile encountered in the boreholes and CPT's typically consisted of gravel, sand and clay fill material at the ground surface which is underlain by natural clay, which is typically soft to firm, firm and stiff near the ground surface but increases in strength to become very stiff and hard with depth. Natural sand, silty sand, silty gravelly sand and clayey sand was also encountered and is typically medium dense and dense in consistency with areas of very loose and loose sand encountered.

In several boreholes, the natural soils are underlain by extremely weathered (XW) and highly weathered (HW) sandstone rock of extremely low and very low strength which extends to the borehole termination depths.

No information in relation to the compaction status of the encountered fill material is available. On this basis, the existing fill is considered to be uncontrolled in accordance with AS 3798-2007.

Table 1 presents a summary of the encountered subsurface profile. Detailed borehole record sheets are appended to this report.

TABLE 1 SUBSURFACE PROFILE SUMMARY

BH/CPT No.	Existing Fill	Natural					BH TD
		Clay		Sand		XW/HW Rock	
		Soft-Firm	Stiff-Hard	Very Loose/ Loose	Medium Dense/ Dense		
BH SP1-1	0.0-1.1	1.1-1.6	1.6-1.85	NE	NE	1.85-TD	1.9*
CPT S3	0.0-TD	NE	NE	NE	NE	NE	0.96+
BH S4	0.0-0.1	1.6-TD	0.1-1.3	NE	1.3-1.6	NE	3.0
CPT SP4	0.0-1.1	NE	1.1-1.9 7.7-9.2	NE	1.9-7.7 9.2-TD	NE	11.04
BH WM2	0.0-TD	NE	NE	NE	NE	NE	0.45+
BH WM4	0.0-0.7	1.8-2.1	0.7-1.8 2.1-2.3	NE	NE	2.3-TD	3.0
BH WM5-1	0.0-0.8	NE	0.8-TD	NE	NE	NE	3.0
CPT WM5-1	0.0-0.8	2.2-2.7	0.1-2.2 2.7-TD	NE	NE	NE	3.32
CPT WM5-2	0.6-TD (3)	NE	NE	NE	NE	NE	1.68
BH WM 2 4 5	0.0-2.0	2.0-3.5 5.5-TD	NE	NE	3.5-5.5	NE	6.0
CPT PC 1-1	0.0-0.8	NE	0.8-1.2 2.0-3.8 6.2-TD	NE	1.2-2.0 3.8-6.2	NE	6.76
CPT PC 1-2	0.0-0.6	NE	0.6-4.2 6.8-TD	4.2-6.8	NE	NE	12.54
CPT PC 1-3	0.0-0.3	5.0-5.2	0.3-5.0 5.2-5.4 6.1-TD	5.4-6.1	NE	NE	7.8
CPT PC 1-5	0.0-1.0	NE	1.4-3.6 4.8-TD	NE	1.0-1.4 3.6-4.8	NE	8.04
CPT PC 1-6	0.0-TD	NE	NE	NE	NE	NE	1.26
CPT PC 3	NE	NE	NE	NE	0.0-TD	NE	1.32
BH PC3	NE	NE	2.6-TD	NE	0.0-2.6	NE	3.0
BH PC 2-2	0.0-3.4	3.4-TD	NE	NE	NE	NE	4.5
CPT PO 3-1	0.0-0.6	NE	0.6-4.6 6.6-7.0 7.3-TD	NE	4.6-6.6 7.0-7.3	NE	9.12
CPT PO 3-2	0.0-0.8	0.8-2.4	2.4-TD	NE	NE	NE	6.06
BH PO 3-3	NE	NE	NE	NE	0.0-TD	NE	0.65*
BH AS1	0.0-0.1	0.8-TD	0.6-0.8	NE	0.1-0.6	NE	1.5
BH AS2	0.0-0.9	NE	0.9-TD	NE	NE	NE	1.5
BH AS3	0.0-0.12	NE	0.12-TD	NE	NE	NE	1.5
BH AS4	0.0-0.2	NE	0.9-TD	0.2-0.9	NE	NE	1.5
BH LS 1	0.0-0.2	NE	0.6-TD	0.2-0.6	NE	NE	1.5
BH LS 2	0.0-0.5	NE	0.5-TD	NE	NE	NE	1.5

Notes:
1. All depths in metres below ground level at time of investigation.
2. NE - Not Encountered; TD - Termination Depth; * - Borehole Terminated at Maximum T.C Bit Refusal in Rock; + - Borehole Terminated at Maximum T.C Bit Refusal in Fill.
3. CPT was predrilled to 0.6m.

Groundwater and wet soils were encountered in several of the boreholes drilled as part of this investigation. A summary of the groundwater conditions encountered in the boreholes is summarised in Table 2 below.

TABLE 2 SUMMARY OF DRILL BIT LIMITS

Borehole No.	Depth Wet Soils Noted (m)	Standing Groundwater Depth Measured (m)
S4	1.3	1.6
WM4	1.1	1.8
SP1-1	1.1	NE
WM 5-1	1.4	NE
WM 2 4 5	3.5	NE
PC3	2.6	NE
AS1	0.8	1.1
AS2	0.9	NE
LS1	1.1	NE
LS2	1.1	NE

It is expected that water levels at the site will be heavily influenced by the levels in the adjacent Ross River. Seepage could be expected through the surficial soils, the permeable sand soil and along the fill/natural soil and natural soil/rock interface following periods of rainfall.

5.0 LABORATORY TESTING

Laboratory testing was carried out on samples retrieved from the site investigation program and was directed towards assessing the reactivity and subgrade characteristics of the subsurface material.

Laboratory testing included:-

- Shrink/Swell Index - to assess the reactivity of the subsurface material.
- Unconfined Compressive Strength (Qu) – to assess the compressive strength of the natural clay soils.
- California Bearing Ratio - to assess the subgrade characteristics of the subsurface material under soaked conditions.

The results of the laboratory testing are contained in Appendix C.

6.0 EARTHWORKS AND SITE PREPARATION CONSIDERATIONS

At the time of writing this report, the extent of the proposed earthworks was not known. Based on the topography of the site, it is expected that bulk earthworks in the order of 1m to 2m in depth/thickness could be expected for the general road works and open space areas. In addition to this, excavations for service trenches associated with the water and sewer trunk mains and sewer pump station are required and depending on the installation method, these excavations could extend to depths in the order of 3m to 4m, subject to civil design.

It is recommended that the following site preparation and earthworks procedures be carried out as part of the earthworks procedures during development.

- All earthworks operations should be carried out in general accordance with AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments".
- Trafficability across the site at the time of the investigation was assessed to be fair with no difficulties encountered.
- If significant rainfall events occur during the earthworks operation, some difficulties could be experienced in trafficing the exposed surface, particularly if the surficial topsoil/fill is removed to expose the natural clays which will soften when saturated. Where the natural sands are exposed and dry out, rutting of this material could be expected and difficulties in trafficking these sands using wheeled vehicles could be expected. Consideration could be given to constructing haulage roads in highly trafficked areas to maintain all weather access.
- Some difficulties in the area have been experienced in dealing with the surficial sands. Trafficability is very limited in this material when the sands are wet of optimum moisture content. The sands encountered on-site have performed poorly when saturated. Particular attention should be paid to ensuring sufficient coverage of the sands will be available with the structural fill to provide a suitable bridging/capping layer. In the area of the cut/fill interface, some over-excavation and replacement may be required to allow trafficability across the site in the long term.
- All topsoil (i.e. soil containing organic matter) and soils containing deleterious matter should be stripped from the construction area at the commencement of the earthworks operation.
- The stripped surface should be proof rolled using a large vibrating roller of minimum weight of 12 tonnes, to identify areas of weak surficial soils and to compact the upper level material.
- Root balls from trees removed should have the organic matter fully removed and the excavation backfilled in a controlled manner.
- The majority of the soils on site will be suitable for re-use as structural fill, provided material is free of organic matter and deleterious material. It is likely that the soils require conditioning to bring the soils to optimum. If the clays were overly moist, difficulty in achieving compaction of the materials will be encountered and moisture conditioning will be required.
- Preferential disposal of the silty/clayey sands should be undertaken, to reduce the potential handling issues associated with this material.
- The natural clays would be expected to be highly reactive and if they are re-used as structural fill on site, an increase in the potential ground surface movements may result.
- Imported fill should be of fair to good quality with a minimum Soaked CBR value of 10%, a maximum lss=1.0% and a maximum particle size of 75mm.

- All filling should be undertaken in layer thicknesses of approximately 250mm (or as appropriate for the compaction equipment being used). Fill should be compacted to a minimum dry density ratio of 98% Standard in accordance with AS1289 5.1.1 at a placement moisture content of ±2% of Optimum Moisture Content (OMC).
- Field density testing should be carried out to check the standard of compaction achieved and the placement moisture content. The frequency and extent of testing should be as per guidelines in AS.3798-2007.
- All earthworks operations should be performed under Level 1 supervision, in general accordance with the requirements of AS3798 and should be certified as controlled fill by the testing authority.

7.0 EXCAVATION CHARACTERISTICS

Based on the results of the investigation, excavations to the required depths should be achievable using conventional earthmoving machinery such as a drott or small dozer in bulk excavations and small to medium sized excavators (~5-20t) fitted with general purpose and toothed buckets in confined excavations.

At BH SP1-1 where shallow refusal in weathered rock was encountered, the use of larger equipment such as large excavators (~30t or larger) fitted with ripper attachments and potentially hydraulic rock breakers may be required.

Once the depth of the wet well at this location is known, further investigations such as a test pit or a cored bored may be required to further assess the nature of the weathered rock below the borehole refusal depth.

8.0 BATTERS

It is understood that cut/fill batters to possibly up to 1m to 2m in height may result as part of the earthworks on site. In areas where trenching is proposed, excavations of up to 3m to 4m or possibly more could be expected.

Considering the proposed maximum height of cuts, maximum short term batter slopes of 30 degrees and maximum long term batter slopes of 20 degrees are recommended for the stiff or better clays and medium dense or better sands (subject to inspection at the time of excavation). Steeper batters are possible by use of retaining structures.

Where soft to firm clays or loose sands are encountered, these materials will need to be retained as unsupported batter slopes in these wet, weak materials are not recommended.

Where batters are located above the soft to firm clays, the global stability of the batters should be assessed to ensure a suitable factor of safety can be achieved.

For excavations of a very short-term nature, and subject to assessment of factors such as the conditions at the time of excavation, length of time excavations are to remain

open, working conditions/requirements and most importantly the soil structure in the cut face, etc., steeper excavations could be possible. Pacific Geotech should be contacted to determine an appropriate profile when construction details have been finalised.

It is essential that batters be suitably protected from erosion and scour. Runoff should not be allowed to discharge directly across the batters.

8.1 Trenching Considerations

As part of the proposed works, the installation of trunk water and sewer mains as well as a pump station are proposed. Significant issues such as groundwater and collapsing soils are expected to be encountered along the alignment of the mains.

Within the natural very loose sands and weak clays, the stability of narrow trenches is likely to be problematic and temporary support of the trench is likely to be required. Temporary support options would typically comprise of the following:

- A shoring box, potentially requiring end plates to support the ends of the excavation from collapse. In areas where sands are exposed and the water table is encountered, a shoring box may not be suitable as dewatering of the excavation within the shoring box may be difficult and liquefaction of the sands is expected to occur.
- Sheet piles, potentially requiring predrilling through the upper-level fill material.
- A caisson system – likely only suitable at manhole/pump station wet well locations.

Dewatering of trenches/confined excavations is expected to be required where trenches extend through the existing fill and stiff to hard natural clays and into the underlying weak clays or sands.

Within the clays, inflow rates are expected to be low to moderate and may be controllable using base sump pumps.

Where excavations extend into the natural sands, inflow rates are expected to be high likely requiring perimeter spear pumps or similar to maintain dry working conditions during the installation of pipes and backfilling.

9.0 SITE CLASSIFICATION

The final site classification will be dependent on the bulk earthworks undertaken, treatment of the existing fill and where the extremely reactive soils are used in the fill profile.

In accordance with AS 2870-2011 '*Residential Slabs and Footings*' the site taken as a whole in its existing condition would be classified as Class 'P' due to the depth of existing fill.

The results of the site investigation indicate that there is a significant variation in soil types and associated reactivity across the site.

Based on the results of the borehole drilling and laboratory testing, the site classifications will typically be Class 'M' in accordance with AS 2870-2011 '*Residential Slabs and Footings'* adopting a depth of soil moisture variation (H_s) of 2.3m (Zone 3).

Localised areas where highly reactive clays were encountered could range up to Class 'H2' in accordance with AS 2870-2011 for the existing soil profiles.

Where the highly reactive clays are excavated and reused as structural fill, a higher classification may result. Pacific Geotech should be engaged as part of the proposed bulk earthworks planning to ensure than an optimal site classification can be achieved following bulk earthworks.

It is recommended that the readers satisfy themselves that the use of AS 2870-2011 is applicable for the proposed design and the above site classification re-confirmed following the completion of the bulk earthworks operation.

10.0 FOUNDATIONS

10.1 General

No information in relation to the type of structures proposed is available. For the proposed trunk mains, foundations are expected to be constructed for manholes, sewer pump stations and other ancillary structures.

The most suitable type of foundation for the proposed structures will depend on factors such as the location of the footing, the final design loads, the ability of the structure to tolerate settlement and construction considerations.

10.2 High-Level Footings

A high-level footing system could be adopted for the support of the proposed structures.

An allowable bearing capacity of 100kPa in the natural stiff clays and medium dense sands, 200kPa in the natural very stiff or better clays and dense sands and 500kPa in the weathered rock would be available, subject to inspection at the time of excavation.

It should be noted that weaker layers below the upper level stiff or better clays was noted at several locations. In these areas, some reduction in the provided allowable bearing capacities may be required.

In areas where weak soils are encountered, some foundation treatment works may be considered for lightly loaded structures such as mains and manholes.

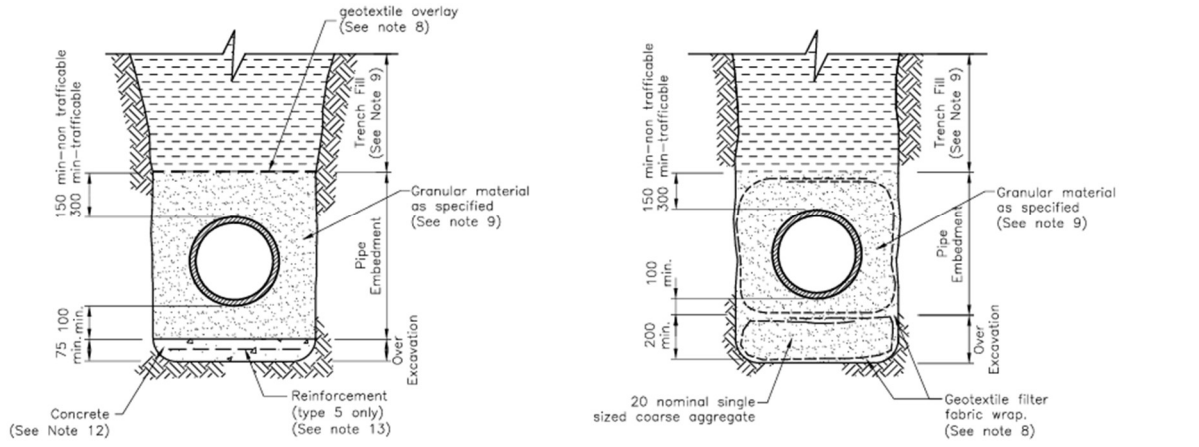
It is recommended that once the location of structures and the foundation levels are further developed that additional assessment by Pacific Geotech be undertaken.

For preliminary planning purposes, consideration could be given to undertaking foundation improvement works such as rock/gravel replacement beneath the pipes/manhole structures. This methodology is preliminary only but must be further assessed once the design is refined.

With reference to the Townsville City Council standard drawings for pipe support (Trench Types 5, 6 and 7 as shown on Standard Drawing SD-461-B-Pipe Embedment Support Types), a pillow foundation consisting of over-excavation of the foundation and replacement using either a pillow foundation or geo-grid reinforcement. The extent of over-excavation and replacement should be assessed for individual structures and pipe alignments.

Figure 1 below presents the pipe foundation replacement options.

Figure 1 – Possible Trench Supports (Townsville City Council Standard Drawing)



TYPES 5 & 6 SUPPORT
UTILISING CONCRETE FOUNDATION
NON–REINFORCED (TYPE 5)
REINFORCED (TYPE 6)
(RIGID & FLEXIBLE PIPES)
USE LIMITED TO 1000 SPANS OF LOW BEARING CAPACITY GROUND. (SOFT CLAYS AND LOOSE SAND)
LONGER LENGTHS SUBJECT TO INDIVIDUAL ASSESSMENT.

TYPE 7 SUPPORT
UTILISING GEOTEXTILE PILLOW FOUNDATION
(RIGID & FLEXIBLE PIPES)

EMBEDMENT TYPES TO BE SPECIFIED IN DESIGN DRAWINGS

Where uncontrolled fill is encountered, footings should be deepened to penetrate the uncontrolled fill material.

It is recommended that footing inspections be undertaken by Pacific Geotech, following excavation, to confirm the specified founding strata has been reached.

It is recommended that masonry walls supported on high level footings founding in the fill or natural clay be suitably articulated.

Where footings are located adjacent to excavations such as underground service trenches, it is recommended that the footings be deepened to found at least 200mm below a line drawn up at 45 degrees from the base of the trench.

For horizontally loaded structural elements such as thrust blocks, the parameters presented in Table 3 below can be used to calculate the ultimate lateral resistance of horizontally loaded elements.

TABLE 3 CHARACTERISTIC DESIGN PARAMETERS FOR PIPELINE DESIGN

Material	Soil Consistency	Undrained Shear Strength (cu) kPa	Unit Weight (γ) kN/m³	Effective Strength Parameters		Lateral Earth Pressure Passive Coefficient (k_p)	Native Soil Modulus (E') MPa [1]
				Effective Cohesion (c') kPa	Effective Friction Angle (Ø') kPa		
Sand	Very Loose/ Loose	-	17	0	30	3.00	1 [2]
	Medium Dense	-	19	0	32	3.25	6
	Dense	-	20	0	34	3.54	8
Clay	Soft-Firm	15	19	0	23	2.28	1 [2]
	Firm	25	19	2	24	2.37	1 [2]
	Stiff	50	20	3	25	2.41	1 [2]
	Very Stiff	100	20	4	26	2.56	1 [2]
	Hard	200	21	5	28	2.77	1 [2]
XW Sandstone	Extremely Low Strength	250	21	8	32	3.25	6
HW Sandstone	Very Low/Low Strength	300	21	10	33	3.39	10

Notes:
1. Native soil modulus values are based on values presented in Table 3.2 in AS.2566.
2. No reliable values are presented in AS.2566 for high plasticity clay soils.

Lateral resistance is provided by passive pressure acting on the thrust block and by friction between the base and sides of the thrust block and founding material.

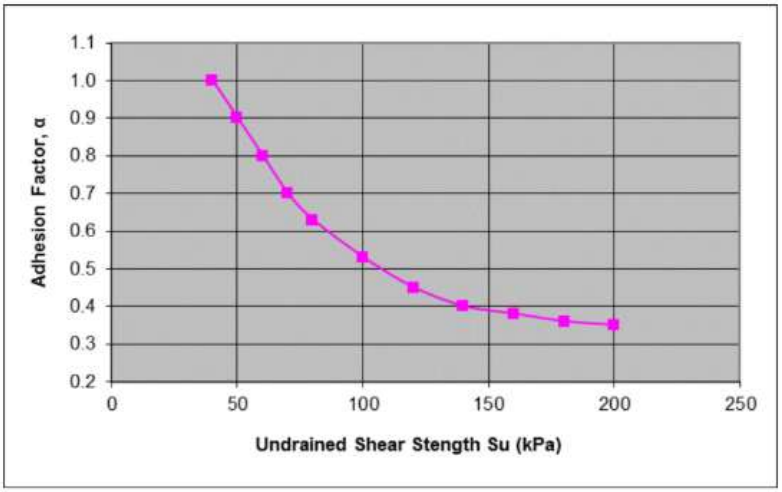
For short term loading in clay soils, passive pressure can be assessed as a uniform pressure distribution given as $2S_U$ (kPa) and the ultimate friction resistance can be calculated using:

$$F_s = \alpha . S_U$$

Where,

- F_s is the ultimate frictional resistance between the base and sides of the thrust block and the founding soils (kPa)
- S_U is the undrained shear strength of the soil (kPa)
- α is a reduction factor which varies with S_U as shown in Figure 2 below.

Figure 2 – Reduction Factor for Assessment of Friction Resistance



For long term loading in clay soils and for granular soils, the passive pressure can be averaged over the depth range of the thrust block on the following trapezoidal pressure distribution:

$$P_p = K_p\gamma H + 2c'\sqrt{k_p}$$

Where,

- Pp is the passive pressure (kPa)
- Kp is the passive earth pressure coefficient
- γ is the bulk density of the soil (kN/m3)
- H is the depth below the ground surface level
- c' is the effective cohesion of the soil (kPa)

Below the design water table, the bulk density is replaced by the buoyant density and a hydrostatic pressure distribution given by 10hw (kPa) added to the lateral earth pressure, where hw (m) is the depth below the design water table.

For long term loading in clay soils or in gravel or sand soils, the base friction resistance force can be assessed as:

$$F = q.\tan\delta + a.c' \text{ (kN)}$$

Where

- q is the average effective vertical pressure applied by the base of the thrust block (kPa)
- δ is the friction angle between concrete and soil which can be taken as 0.67φ' (°)
- φ' is the effective angle of internal friction of the soil (°)

Passive resistance can only be considered where the face of the footing directly abuts the soil mass. Passive resistance must be ignored where the footings are constructed using formwork unless the void is backfilled with cement stabilised sand or similar.

Suitable factors of safety must be achieved for lateral resistance. Considering the movement required to mobilise passive pressure, a factor of safety of 3 is recommended for lateral resistance for the thrust blocks.

10.3 Deep Foundations

If the bearing capacities of the upper level soils are considered inadequate or unsuitable material is encountered etc., consideration should be given to adopting a deep foundation system for the support of the proposed structures.

Bored or CFA grout injected piles, driven piles or possbily timber push or screw piles could be considered for the support of the proposed structure, if required. Bored piles in areas where weak soils and groundwater was encountered may not be suitable due to the potential for collapsing soils and softening of the base of the pile.

The deep foundation system should be designed in accordance with the recommendations of AS 2159-2009 'Piling - Design and Installation'.

The ultimate geotechnical strength ($R_{d,ug}$) of piles can be calculated using the unfactored, ultimate shaft adhesion and end bearing values given in Table 4. The $R_{d,ug}$ values given in Table 4 will need to be multiplied by a suitable geotechnical strength reduction factor ($ø_g$) to obtain the design geotechnical strength ($R_{d,g}$) of piles. In accordance with AS2159-2009, the $ø_g$ value must be determined by the designer, but based on the anticipated site, design and installation risk factors, a preliminary $ø_g$ value of 0.43 is suggested. Higher values may be applicable with suitable supervision and should be confirmed on a site specific basis.

If working stress methods are used in the pile design, the $R_{d,ug}$ values given in Table 4 will need to be divided by a factor of safety of 2.5 to caluculate the maximum single pile working load.

TABLE 4 ULTIMATE (UNFACTORED) PILE DESIGN PARAMETERS

Material		Ultimate Unfactored End Bearing* (kPa)		Ultimate Unfactored Shaft Adhesion* (kPa)
		L < 4D	L > 4D	
Existing Fill and Weak Soils		NR	NR	10
Natural Clay	Stiff	300	600	25
	Very Stiff	600	900	35
	Hard	1200	1800	50
Natural Sand	Medium Dense	800	1000	25
	Dense	1200	1600	40
XW/HW Sandstone	Extremely Low/ Very Low Strength	1800	2700	90

Notes:
*Geotechnical strength reduction factor needs to be applied to these parameters.
1. NR – Not Recommended.
2. L – pile socket length; D – pile diameter.

Construction Considerations

The bases of bored pile holes must be thoroughly cleaned of all loose soil and debris using a proper cleaning tool. The practice of adding water and spinning the auger is generally not acceptable.

Where groundwater is encountered, inflow rates are expected to be slow requiring the piles to be poured immediately following drilling. An allowance for the use of steel liners, which will likely have to be socketed into rock to achieve an impermeable seal against any water charged soils above, should be made if structures are proposed in these areas. The groundwater seepages may be controllable by pumping. Shaft adhesion must be ignored for the portion of the pile that is permanently lined.

Drilling piles is not only dependent on the subsurface profile characteristics, but also the type (power and size) of the bored pile drilling rig, drilling teeth, size of pile, etc. It is recommended that a specialist drilling contractor be consulted to be able to manage the above conditions and materials encountered.

During construction, all bored piles must be inspected by a geotechnical engineer to confirm the geotechnical strength parameters presented in Table 4 and to check the capacity of the piles.

10.4 Design Parameters for Lateral Loading

Geotechnical characteristic design parameters for use in lateral resistance assessments were developed based on visual and tactile assessments of the materials encountered in the drilled boreholes. The geotechnical characteristic design parameters for the encountered materials are presented in Table 3 in Section 10.0 can be adopted for the assessment of lateral resistance.

For shallow footings, lateral resistance is provided by passive pressure acting on the pad footing and by friction between the pad footing and the founding material. Passive resistance can only be considered where the face of the footing directly abuts the soil mass. Passive resistance must be ignored where the footings are constructed using formwork unless the void is backfilled with cement stabilised sand or similar.

The passive resistance of concrete footings can be assessed using a passive pressure distribution given by:

$pp = \mu H$ (kPa)

Where,

- μ is given by two-thirds of the effective friction angle (φ') values presented in Table 3.
- H (m) is the depth of the footing or beam below the ground surface.

This ultimate frictional resistance between the base of the concrete footing and the founding material can be based on a friction factor (tan μ). A suitable factor of safety must be applied to the ultimate lateral resistance when assessing the lateral stability of the footing structure. Suitable factors of safety must be achieved for lateral resistance. Considering the movement required to mobilise passive pressure, a factor of safety of 3 is recommended for lateral resistance for shallow footings.

Lateral resistance for pile footings can be assessed using "Broms Theory'' or in commercial software programs such as LPile, Allpile or Wallap.

For long term loading, the ultimate lateral soil resistance (p_U) in Broms Theory is a triangular distribution and for a socket depth of L(m) below the ground level can be calculated as:

$$p_U = \mu.L.Kp \text{ (kPa)}$$

where,

- μ (kN/m^3) is the relevant density of the weathered rock
- L (m) is the depth below ground level
- Kp is the passive earth pressure coefficient

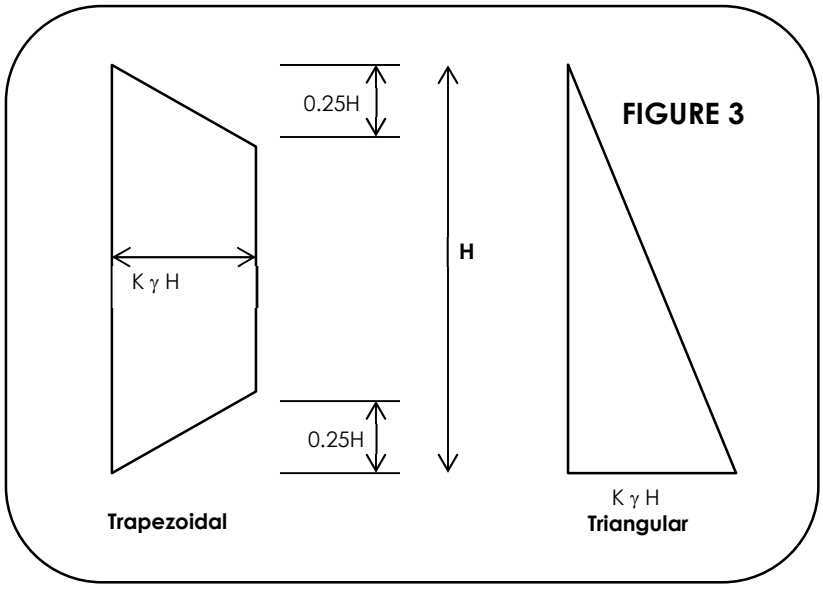
When assessing the ultimate lateral soil resistance force, the effective pile diameter can be taken as three times the actual pile diameter.

The short-term ultimate soil reaction for piles in clay soils can be assessed as $9S_U$. The Broms Theory for lateral resistance in clay soils requires that soil resistance is considered to be zero from the ground surface to a depth of 1.5 d where d is the diameter of the pile.

11.0 RETAINING WALLS

Retaining walls should be specifically engineer designed in accordance with AS 4678-2002 (Ref 9).

The design of flexible retaining walls could be undertaken using a triangular pressure distribution and the earth pressure parameters given in Table 5. Flexible walls are those which are free to rotate or tilt (such as cantilevered walls) and should be designed using active (Ka) earth pressure coefficient. Rigid walls are those which are restrained against rotation or tilt (i.e. single anchored/propped walls) and should be designed using the at-rest earth pressure (Ko) and a trapezoidal pressure distribution as per Figure 3.



Passive resistance (Kp) at the toe of the wall should be ignored in the zone where future disturbance (e.g. services trenches) could occur.

The effects of surcharge in the retained zone should be included by multiplying the vertical pressure developed by the surcharge by the appropriate lateral earth pressure coefficient. Allowance should also be made for the surcharge due to sloping crests if applicable.

TABLE 5 EARTH PRESSURE COEFFICIENTS (NON-SLOPING CREST BACKFILL)

Material		Unit Weight (kN/m³)	Friction Angle (degrees)	Active Ka	At Rest Ko	Passive Kp
Controlled Fill*		19	24	0.45	0.60	2.40
Natural Sand	Very Loose/Loose	17	28	0.36	0.53	2.77
	Medium Dense	19	32	0.31	0.47	3.25
	Dense	20	33	0.29	0.46	3.39
Natural Clay	Soft-Firm	19	23	0.44	0.61	2.28
	Stiff/Very Stiff	20	26	0.39	0.56	2.56
	Hard	20	28	0.36	0.53	2.77
XW/HW Rock	Extremely Low-Very Low Strength	21	33	0.29	0.46	3.39

Notes: * Depends on fill material type and level of compaction. Assumes material compacted under 'Level 1' supervision.

Preference should be given to adopting thin soil layers and using small hand-controlled compaction equipment during backfilling against retaining walls. This is in order to limit the stress applied to the walls during construction. Should heavy compaction be required, then wall stresses will be well in excess of Ko and temporary propping should be used.

Clay backfill should not be placed dry of optimum moisture content, as this can lead to increased future swelling with changes to moisture content or inundation from water creating additional load on the back of the wall.

It is recommended that all retaining walls be drained for full height in order to minimise hydrostatic pressure build-up behind the wall. Additional guidelines on wall drainage are provided in Appendix G of AS 4678-2002.

12.0 PAVEMENT DESIGN CONSIDERATIONS

Following bulk earthworks, it is expected that a combination of new controlled clay fill material, natural sands and natural clay soil is expected to form the subgrade for new pavements. Some over-excavation and replacement of the natural silty sands may be required to achieve a satisfactory proof roll outcome.

Soaked CBR testing was undertaken on samples recovered from site and the results are summarised in Table 6.

TABLE 6 PAVEMENT DESIGN PARAMETERS

Borehole	Depth	Soaked CBR Value (%)	Swell (%)
AS1	0.4-1.5	2.5	2.0
AS2	0.4-1.5	8.0	0.5
AS3	0.3-1.4	10.0	0.0
LS1	0.3-1.5	4.0	1.5
LS2	0.6-1.4	12.0	0.0

Considering the nature of the materials which are expected to form the subgrade for new pavements, design parameters are presented in Table 7 below.

TABLE 7 PAVEMENT DESIGN PARAMETERS

Material	Indicative Soaked CBR (%)	Modulus of Subgrade Reaction (kPa/mm)
New Controlled Fill	Dependent on Classification	
Clay	2 - 4	20 – 30
Sand	6 - 8	40 – 50

The values presented in Table 7 should be confirmed with additional on-site sampling and testing following the bulk earthworks operation on site.

Specific additional construction considerations are offered in regard to the construction of the pavements on the site:-

- Suitable subsurface drainage should be installed around the perimeter of the pavements.
- It should be ensured that the subgrade of the pavement is suitably graded to allow any seepage to flow from under the pavement to the perimeter drains.

- Pavement materials should comply with MRTS05 8.4.3 specifications and the corresponding minimum dry density ratios are recommended:

i)	Lower Sub-base	(Type 2.5)	100% (Standard)
ii)	Sub-base	(Type 2.3)	100% (Standard)
iii)	Base	(Type 2.1)	100% (Modified)

- Inspections and testing should be carried out by Pacific Geotech following the completion of the bulk earthworks to confirm subgrade conditions across the pavement areas.

13.0 TRENCHLESS CONSIDERATIONS

Considering the locations of the proposed mains trenchless installation methods such as pipe jacking and horizontal directional drilling (HDD) may be utilised to install the mains. Broad commentary in relation to trenchless installation is presented below.

The following comments are offered with respect to trenchless installation works:

- Consideration must be given when selecting the appropriate drill bit as the alignment is likely to encounter variable face conditions ranging from soft to hard clays, loose to dense sands and extremely/highly weathered (XW/HW) sandstone rock. Variations in subsurface conditions over relatively short distances were noted in the boreholes/CPT's and must be allowed for.
- Consideration must be given to the feasibility of maintaining drilling pressure and preventing collapse of the drill hole within cohesionless sand soils during drilling operations. The use of casing may be required to achieve a seal into the less permeable natural clay soils or weathered rock to prevent collapsing of water affected soils and cohesionless soils and a loss of drilling fluids.
- Clay based soils of medium and high plasticity may be encountered. The selection of drilling products and propellants must reflect the plasticity of the soils with respect to maintaining mud circulation during drilling operations. Clay soils may block drill bits and reduce circulation which may lead to delays if appropriate measures are not employed to deal with these conditions.
- Consideration must be given to the reactivity of the clay soils encountered which may be subject to swelling during drilling works. Delays between drilling and pipe installation should be avoided where possible.
- The presence of existing in ground elements must be considered as these elements may present environmental issues and cause difficulty maintaining drilling pressure as drilling mud may transmit through adjacent trench systems and out of the ground.
- Significant issues with groundwater are expected to be encountered and are expected to result in the collapse of sand soils. The presence of groundwater must be reflected in pipeline design.

A specialist contractor must be consulted to address the comments provided above. It is important that the contractor understands the potential variations in subsurface conditions along the alignment to prevent delays associated with incorrect drill bit selection, loss of drilling pressure and environmental concerns.

14.0 LIMITATIONS

We have prepared this report for the Proposed Oonoonba Urban Development at Abbott Street, Oonoonba . The report is provided for the exclusive use of Economic Development Queensland, for this project only and for the purposes outlined in the report. It should not be used by, or relied upon, for other projects on the same or different sites or by a third party. In preparing this report, we have relied upon information provided by the client or their agents.

The results are indicative of the subsurface conditions on site only at the specific testing locations. Subsurface conditions can change between test locations and the design and construction should take the spacing of the testing and testing methods adopted and the potential for variation between the test locations.

It is recommended that Pacific Geotech be engaged to provide advice and ensure the development is undertaken in accordance with the assumptions made in writing this report.

This is not to reduce the level of responsibility accepted by Pacific Geotech, but rather to ensure that the parties who may rely on the information contained in this report are aware of the responsibilities they assume in doing so.

B. ELSMORE (RPEQ 19656)

For and on behalf of
PACIFIC GEOTECH PTY LTD

APPENDICES

APPENDIX A

NOTES RELATING TO THIS REPORT

Notes Relating to this Report

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis.

Every care has been taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical conditions and contains recommendations or suggestions for design and construction. However, unexpected variations in ground conditions will occur. The potential for this will depend partly on testing, spacing and sampling frequency.

If variations are identified, Pacific Geotech would be pleased to assist with additional investigations or advice to resolve the matter.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Description and Classification Methods

The description and classification of soils and rocks used in this report are based on AS 1726.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the percent of other particles present (e.g. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silty	0.002 to 0.06mm
Sand	0.06 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density which can be correlated from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very Loose	less than 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) and can be quantified by the Pocket Penetrometer test, Vane Shear test, laboratory testing or engineering examination. The strength terms are defined as follows:

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 - 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 - 400
Hard	greater than 400
Friable	strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc.

Planarity	
CU	Curved
DIS	Discontinuous
IR	Irregular
PR	Planar
ST	Stepped
UN	Undulose

Roughness	
POL	Polished
RJ	Rough
S	Smooth
SL	Slickened
VR	Very Rough

Defects	Type
BP	Bedding Parting
CL	Cleavage
CO	Contact
CS	Crushed Seam
CZ	Crushed Zone
DB	Drilling Break
DK	Dyke
DL	Drill Lift
DZ	Decomposed Zone
FC	Fracture
FL	Foliation
FZ	Fracture Zone
HB	Handling Break
IS	Infilled Seam
JT	Joint
H	Schistosity
SI	Sill
SM	Seam
SS	Shear Seam
SZ	Shear Zone
VN	Vein
VO	Void

Sampling

Sampling is undertaken during the fieldwork to allow examination of the soil or rock and to allow laboratory testing to be undertaken.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content and minor constituents. Bulk samples are similar but of greater volume required for some test procedures such as CBR testing.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and collecting a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

Investigation Methods

Test Pits: These are typically undertaken with a backhoe or a tracked excavator, allowing examination of the insitu soils. Limitations of test pits are the problems associated with collapse of the pits, disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of typical diameter of between 50mm to 75mm advance manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as fill, gravel, hard clays and collapse of the borehole (typically in non-cohesive soil).

Continuous Spiral flight Augers: The borehole is advanced using 65mm to 100mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. Augers of up to 300mm in diameter are used to recover larger volumes of sample. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights. Samples can be disturbed and layers may become mixed. Augering below the groundwater table can be less reliable than augering above the water table.

A Tungsten Carbide (TC) bit for auger drilling into rock can be used to indicate rock strength and continuity by variation in drilling resistance and from examination of recovered rock fragments but provides only an indication of the likely rock strength. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is advanced by a bit attached to the end of a hollow rod string, with water being pumped down the drill rods and returned up the annulus of the borehole, carrying the drill cuttings. Changes in stratification can be determined from the return, together with information from "feel" and rate of penetration.

The borehole can be stabilised through the use of drilling mud as a circulating fluid. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. This technique provides a reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel is used, which gives a core of about 50mm diameter. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a disturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposed", Test 6.3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer, with a free fall of 760mm. The sample is driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense soils, hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of , say, 4, 6 and 7 blows, as
  N = 13
  4, 6, 7
- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as
  N > 30
  15, 30/40mm

Cone Penetrometer Testing (CPT): Cone Penetrometer Testing with or without pore pressure measurement (CPTu) is carried out using a Cone Penetrometer in general accordance with AS 1289 6.5.1, 1999.

In the tests, a 36mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the fractional resistance on a separate 135mm long sleeve, immediately behind the cone. Pore Pressure is recovered through a pore ring located either within, or more usually immediately behind the cone/tip.

As penetration occurs (at a rate of approximately 20mm per second) and data is recorded every 20mm of penetration, the results are presented graphically.

The information provided on the plot comprises:

- Cone resistance – expressed in mPa
- Sleeve friction – expressed in kPa
- Friction ratio – the ratio of sleeve friction to cone resistance expressed as a percentage.
- Pore pressure in kPa
- Tilt of probe (in degrees).

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and rising to 2% to as high as 8%, and higher in organic soils. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes, etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive.

Dynamic Cone Penetrometers:

Dynamic Cone Penetrometer (DCP) tests are carried out by driving a 16mm diameter rod into the ground with a 9kg sliding hammer dropping 510mm and counting the blows for successive 100mm increments of penetration.

Logs

The borehole or test pit logs are an interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of the boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

Groundwater

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be flushed from the hole and drilling mud must be washed out of the hole or 'reverted' chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes from which ongoing monitoring can be undertaken.

Fill

The present of fill materials can often be determined only by the inclusion of foreign objects (e.g. bricks, steel ,etc.) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult to reliably determine the extent of the fill.

Laboratory Testing

Laboratory testing is carried out in general accordance with Australian Standard 1289 'Methods of Testing Soil for Engineering Purposes'.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage.

Review of Design

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/constraints are quite complex, it is prudent to have a design review.

Site Inspection

Pacific Geotech would be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related:

Requirements could range from:

i. a site visit to confirm that conditions exposed are no worse than those interpreted, to
ii. a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
iii. full time engineering present on site.

APPENDIX B

BOREHOLE RECORD SHEETS

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
LS1
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	Compac 018	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			B 0.30-1.50 m			0.20		SM	FILL Silty SAND (SM) Loose, fine to medium grained, dark grey black, with low plasticity clay, with fine sized gravel, wet to moist (with organics).	0 5 10 15 20 25
						0.5		SM	NATURAL Silty SAND (SM) Dense, fine to medium grained, pale yellow brown, with low plasticity clay, dry.	
						0.60		CI	Sandy CLAY (CI) Hard, medium plasticity, pale yellow brown, fine to medium grained sand, moist.	
						0.80		CH	Silty CLAY (CH) Very stiff, high plasticity, pale grey mottled pale yellow brown pale orange brown, with fine grained sand, moist.	
						1.0				
						1.10		CI-CH	Sandy CLAY (CI-CH) Stiff, medium to high plasticity, pale orange brown mottled pale grey blue pale grey and pale red brown, fine to medium grained sand, wet to moist.	
						1.50				
						1.5			Hole Terminated at 1.50 m	
						2.0				
						2.5				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal at 0.23m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
LS2
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	Compac 018	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			B 0.60-1.40 m			0.10		SM	FILL Silty SAND (SM) Medium dense to dense, fine to medium grained, dark brown, with low plasticity clay, with fine sized gravel, dry (with organics).	0 5 10 15 20 25
						0.20		GM	FILL Silty Sandy GRAVEL (GM) Medium dense to dense, fine to medium sized, pale grey, fine to medium grained sand, dry.	
						0.23		GM	Bitumen (PAV)	
						0.50			FILL Silty Sandy GRAVEL (GM) Dense, fine to medium sized, pale yellow brown, fine to medium grained sand, dry.	
						0.5		CI	NATURAL Sandy CLAY (CI) Hard, medium plasticity, pale yellow brown, fine to medium grained sand, moist.	
						1.0				
						1.10		CI-CH	Sandy CLAY (CI-CH) Stiff to very stiff, medium to high plasticity, pale grey mottled pale yellow brown, fine to medium grained sand, wet to moist.	
						1.50				
						1.5			Hole Terminated at 1.50 m	
						2.0				
						2.5				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
PC2-2
Page 1 of 2

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	08/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	WB
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:		RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: WB

Drilling Information							***Soil Description***		
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional
AD/T						0.5		SP	FILL SAND (SP) Very loose to loose, fine grained, orange brown, dry.
						1.0			
						1.5			
						1.80		SC	FILL Clayey SAND (SC) Loose to medium dense, medium grained, pale orange brown, low plasticity clay, dry.
						2.0			
						2.5			

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Support
C - Casing

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Remarks
1. Groundwater not encountered.

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Consulting Geotechnical Engineers

Borehole No.
PC2-2
Page 2 of 2

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	08/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	WB
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:		RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: WB

Drilling Information							***Soil Description***		
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional
AD/T								SC	FILL Clayey SAND (SC) Loose to medium dense, medium grained, pale orange brown, low plasticity clay, dry. *(continued)*
						3.40		CL	NATURAL Sandy CLAY (CL) Soft to firm, low plasticity, pale brown, medium grained sand, moist.
						3.5			
						4.0			
						4.50			
						4.5			Hole Terminated at 4.50 m
						5.0			
						5.5			

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Support
C - Casing

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Remarks
1. Groundwater not encountered.

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Consulting Geotechnical Engineers

Borehole No.
PC3
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	04/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T						0.0		SM	NATURAL Silty SAND (SM) Dense, fine to medium grained, pale brown, with low plasticity clay, with fine sized gravel, dry.	0 5 10 15 20 25
			D 0.60-1.00 m			0.5				
						1.0				
						1.5				
						1.60		SM	Silty Gravelly SAND (SM) Dense, fine to medium grained, grey, fine sized gravel, dry (river sand).	
						2.0				
						2.5				
			D 2.60-3.00 m			2.60		CH	Silty CLAY (CH) Stiff, high plasticity, pale grey mottled pale yellow brown, with fine grained sand, wet to moist.	
						3.00			Hole Terminated at 3.00 m	

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Remarks
1. Groundwater not encountered.
2. DCP refusal at 0.03m.

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
PO3-3
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	04/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							***Soil Description***			***DCP***
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T						0.10		SM	NATURAL Silty SAND (SM) Medium dense, fine to medium grained, dark grey, with low plasticity clay, dry (with organics).	0 5 10 15 20 25
						0.5		SM	Silty SAND (SM) Dense to very dense, fine to medium grained, grey, with low plasticity clay, trace fine sized gravel, dry.	
						0.65			Hole Terminated at 0.65 m	
						1.0				
						1.5				
						2.0				
						2.5				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal at 0.14m.
3. Maximum TC refusal at 0.65m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
S4
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	04/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			D 0.20-0.50 m			0.10		SM	FILL Silty SAND (SM) Loose, fine to medium grained, dark grey black, with low plasticity clay, with fine sized gravel, wet to moist (with organics).	0 5 10 15 20 25
								CI	NATURAL Sandy CLAY (CI) Hard, medium plasticity, pale yellow brown, fine to medium grained sand, moist.	
			D 0.60-1.00 m			0.5				
						1.0				
			D 1.10-1.30 m			1.10		CI-CH	Silty CLAY (CI-CH) Very stiff, medium to high plasticity, pale grey mottled pale yellow brown, with fine grained sand, moist.	
			U50 1.20-1.30 m			1.30		SP	SAND (SP) Medium dense, fine to medium grained, pale yellow brown mottled pale grey, with low to medium plasticity clay, wet to moist.	
			U50 1.50-1.70 m PP=40kPa			1.5				
						1.60		CI-CH	Sandy CLAY (CI-CH) Soft to firm, medium to high plasticity, pale orange brown mottled pale grey and pale red brown, fine to medium grained sand, wet.	
						2.0				
						2.5				
			D 2.60-3.00 m			3.00			Hole Terminated at 3.00 m	

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater encountered at 1.60m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
SP1-1
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	Compac 018	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T						0.10		SM	FILL Silty SAND (SM) Medium dense, fine to medium grained, dark grey, with low plasticity clay, with fine sized gravel, moist to dry (with organics).	0 5 10 15 20 25
								SM	FILL Silty SAND (SM) Medium dense, fine to medium grained, dark grey, with low to medium plasticity clay, trace fine sized gravel, moist to dry.	
						0.5				
						0.60		CH	FILL Silty CLAY (CH) Stiff, high plasticity, grey, with fine grained sand, wet to moist (with sand layering throughout, fissured).	
						1.0				
			D 1.10-1.50 m			1.10		CI-CH	NATURAL Silty Sandy CLAY (CI-CH) Soft to firm, medium to high plasticity, pale grey, fine to medium grained sand, wet to moist.	
			U50 1.40-1.60 m			1.5				
						1.60		CI-CH	Silty Sandy CLAY (CI-CH) Stiff to very stiff, medium to high plasticity, pale grey, fine to medium grained sand, wet to moist.	
						1.85				
						1.90			SANDSTONE (HW) Highly weathered, very low strength, fine to medium grained, pale yellow brown and pale grey white.	
									Hole Terminated at 1.90 m	
						2.0				
						2.5				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal at 1.72m.
3. Maximum TC refusal at 1.85m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

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Consulting Geotechnical Engineers

Borehole No.
WM2
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Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	04/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							***Soil Description***		
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional
AD/T						0.10		SM	FILL Silty SAND (SM) Loose, fine to medium grained, dark grey, with low plasticity clay, with fine sized gravel, dry (with organics).
						0.45		GM	FILL Silty Sandy GRAVEL (GM) Dense to very dense, fine to medium sized, grey, fine to medium grained sand, dry (with cobbles throughout).
						0.5			Hole Terminated at 0.45 m
						1.0			
						1.5			
						2.0			
						2.5			

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. Maximum TC refusal at 0.45m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

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Consulting Geotechnical Engineers

Borehole No.
WM4
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T		▽	D 1.10-1.50 m U50 1.40-1.60 m PP=190kPa D 2.60-3.00 m			0.10 0.5 0.70 1.0 1.10 1.5 1.80 2.0 2.10 2.30 2.5 3.00		SM GM CI CI-CH CI-CH CI-CH	FILL Silty Gravelly SAND (SM) Medium dense to dense, fine to medium grained, dark grey, fine to medium sized gravel, moist to dry (with organics). FILL Silty Sandy GRAVEL (GM) Dense to very dense, fine to medium sized, pale grey grey brown, fine to medium grained sand, dry (with cobbles throughout). NATURAL Silty CLAY (CI) Stiff, medium plasticity, dark grey, with fine to medium grained sand, moist. Silty CLAY (CI-CH) Stiff, medium to high plasticity, pale grey mottled pale yellow brown, with fine to medium grained sand, wet to moist. Sandy CLAY (CI-CH) Firm, medium to high plasticity, pale grey mottled pale orange brown, fine to medium grained sand, wet. Sandy CLAY (CI-CH) Stiff to very stiff, medium to high plasticity, pale grey mottled pale orange brown, fine to medium grained sand, wet. SANDSTONE (XW) Extremely weathered, extremely low strength, fine to medium grained, pale orange brown and pale grey. Hole Terminated at 3.00 m	0 5 10 15 20 25

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater encountered at 1.80m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
WM5-1
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			U50 1.40-1.54 m PP=260kPa			0.10		SM	FILL Silty SAND (SM) Medium dense to dense, fine to medium grained, grey, with low plasticity clay, with fine sized gravel, dry (with organics).	0 5 10 15 20 25
						0.5		GM	FILL Silty Sandy GRAVEL (GM) Dense, fine to medium sized, pale grey brown, fine to medium grained sand, with low plasticity clay, dry (with organics).	
						0.80		CI	NATURAL Silty CLAY (CI) Very stiff, medium plasticity, dark grey, with fine grained sand, moist.	
						1.0				
						1.10		CI-CH	Silty CLAY (CI-CH) Very stiff, medium to high plasticity, pale grey mottled pale yellow brown, with fine grained sand, moist.	
						1.40		CI-CH	Sandy CLAY (CI-CH) Stiff, medium to high plasticity, pale grey mottled pale yellow brown, fine to medium grained sand, wet to moist.	
						1.5				
						2.0				
						2.10		CI-CH	Sandy CLAY (CI-CH) Very stiff to hard, medium to high plasticity, pale grey mottled pale yellow brown, fine to medium grained sand, wet to moist.	
			D 2.60-3.00 m			2.5				
						3.00			Hole Terminated at 3.00 m	

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

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Borehole No.
WM 2 4 5
Page 1 of 2

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	08/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	WB
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:		RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: WB

Drilling Information							***Soil Description***		
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional
AD/T						0.5 1.0 1.5 2.0 2.00 2.5 2.70		CL	FILL Gravelly CLAY (CL) Very stiff, low plasticity, pale grey-brown, coarse sized gravel, dry.
								CL	NATURAL CLAY (CL) Soft to firm, low plasticity, dark grey, moist to dry.
								CI	Sandy CLAY (CI) Soft, medium plasticity, pale grey, fine grained sand, moist.

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Support
C - Casing

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Remarks
1. Groundwater not encountered.

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Borehole No.
WM 2 4 5
Page 2 of 2

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	08/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	WB
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:		RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: WB

Drilling Information							Soil Description		
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional
AD/T						3.5		Cl	Sandy CLAY (Cl) Soft, medium plasticity, pale grey, fine grained sand, moist. *(continued)*
						3.50		SC	Clayey SAND (SC) Medium dense, medium grained, pale grey pale orange brown, low to medium plasticity clay, wet to moist.
						4.0			
						4.5			
						5.0			
						5.5			
						5.50		CL	Sandy CLAY (CL) Firm to stiff, low plasticity, pale grey green pale yellow brown, medium to coarse grained sand, trace medium to coarse sized gravel, wet to moist.
						6.00			Hole Terminated at 6.00 m

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Support
C - Casing

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Remarks
1. Groundwater not encountered.

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Borehole No.
AS1
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Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T		▽	B 0.40-1.50 m			0.10		SM	FILL Silty SAND (SM) Medium dense, fine to medium grained, grey, with low plasticity clay, with fine sized gravel, dry (with organics).	0 5 10 15 20 25
						0.5		SM	NATURAL Silty SAND (SM) Medium dense to dense, fine to medium grained, grey, with low plasticity clay, dry.	
						0.60		CI-CH	Silty CLAY (CI-CH) Hard, medium to high plasticity, grey mottled pale yellow brown, with fine grained sand, moist to dry.	
						0.80		CH	Silty CLAY (CH) Firm, high plasticity, pale grey mottled pale yellow brown, with fine grained sand, wet to moist.	
						1.0				
						1.10		CH	Silty CLAY (CH) Soft to firm, high plasticity, pale grey, with fine grained sand, wet.	
						1.50				
						1.5			Hole Terminated at 1.50 m	
						2.0				
						2.5				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater encountered at 1.10m.
2. DCP refusal at 0.48m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

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Consulting Geotechnical Engineers

Borehole No.
AS2
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	Compac 018	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			B 0.40-1.50 m			0.10		SM	FILL Silty SAND (SM) Medium dense, fine to medium grained, grey, with low plasticity clay, with fine sized gravel, dry (with organics).	
						0.5		SM	FILL Silty SAND (SM) Dense, fine to medium grained, pale yellow brown, with low plasticity clay, with fine sized gravel, dry.	
						0.60		GM	FILL Silty Sandy GRAVEL (GM) Dense, fine to medium sized, dark grey, fine to medium grained sand, with low to medium plasticity clay, moist.	
						0.90		CH	NATURAL Silty CLAY (CH) Stiff, high plasticity, pale grey mottled pale yellow brown, with fine grained sand, wet to moist.	
						1.0				
						1.50				
						1.5			Hole Terminated at 1.50 m	
						2.0				
						2.5				

0 5 10 15 20 25

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal at 0.13m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
AS3
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	Compac 018	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			B 0.40-1.50 m			0.12		GM	FILL Silty Sandy GRAVEL (GM) Dense, fine to medium sized, pale grey, fine to medium grained sand, dry.	0 5 10 15 20 25
						0.20		CL-CI	NATURAL Sandy CLAY (CL-CI) Very stiff, low to medium plasticity, pale orange brown, fine to medium grained sand, moist to dry.	
						0.5		CI-CH	Silty CLAY (CI-CH) Very stiff, medium to high plasticity, grey, with fine grained sand, moist.	
						0.80		CI	Sandy CLAY (CI) Very stiff, medium plasticity, pale yellow brown, fine to medium grained sand, moist.	
						1.0				
						1.50			Hole Terminated at 1.50 m	
						1.5				
						2.0				
						2.5				

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

Pacific Geotech
Consulting Geotechnical Engineers

Borehole No.
AS4
Page 1 of 1

Project No.: PG-12108

Client:	Economic Development Queensland	Commenced:	03/10/2024
Project Name:	Proposed Acoustic Barrier	Logged By:	RR
Hole Location:	Abbott Street, Oonoonba	Checked By:	
Hole Position:			
Drill Model and Mounting:	PDR	RL Surface:	No survey
Hole Diameter:		Datum:	AHD Operator: RR

Drilling Information							Soil Description			DCP
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm
AD/T			B 0.30-1.40 m			0.20		SM	FILL Silty SAND (SM) Medium dense to dense, fine to medium grained, dark grey, with low plasticity clay, with fine sized gravel, dry (with organics).	
						0.5		SM	NATURAL Silty SAND (SM) Dense, fine to medium grained, pale yellow brown, with low plasticity clay, with fine sized gravel, dry.	
						0.90		CI-CH	Silty CLAY (CI-CH) Hard, medium to high plasticity, pale grey, with fine grained sand, moist to dry.	
						1.0				
						1.20		CI-CH	Sandy CLAY (CI-CH) Hard, medium to high plasticity, pale grey mottled pale yellow brown, fine to medium grained sand, moist.	
						1.50			Hole Terminated at 1.50 m	
						1.5				
						2.0				
						2.5				

0 5 10 15 20 25

Method
AS - Auger
RR - Rock Roller
WB - Washbore

Water
Level (Date)
Inflow

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
B - Bulk Sample

Remarks
1. Groundwater not encountered.
2. DCP refusal at 0.14m and 0.53m.

Support
C - Casing

Classification Symbols and Soil Descriptions
Based on Unified Soil Classification System

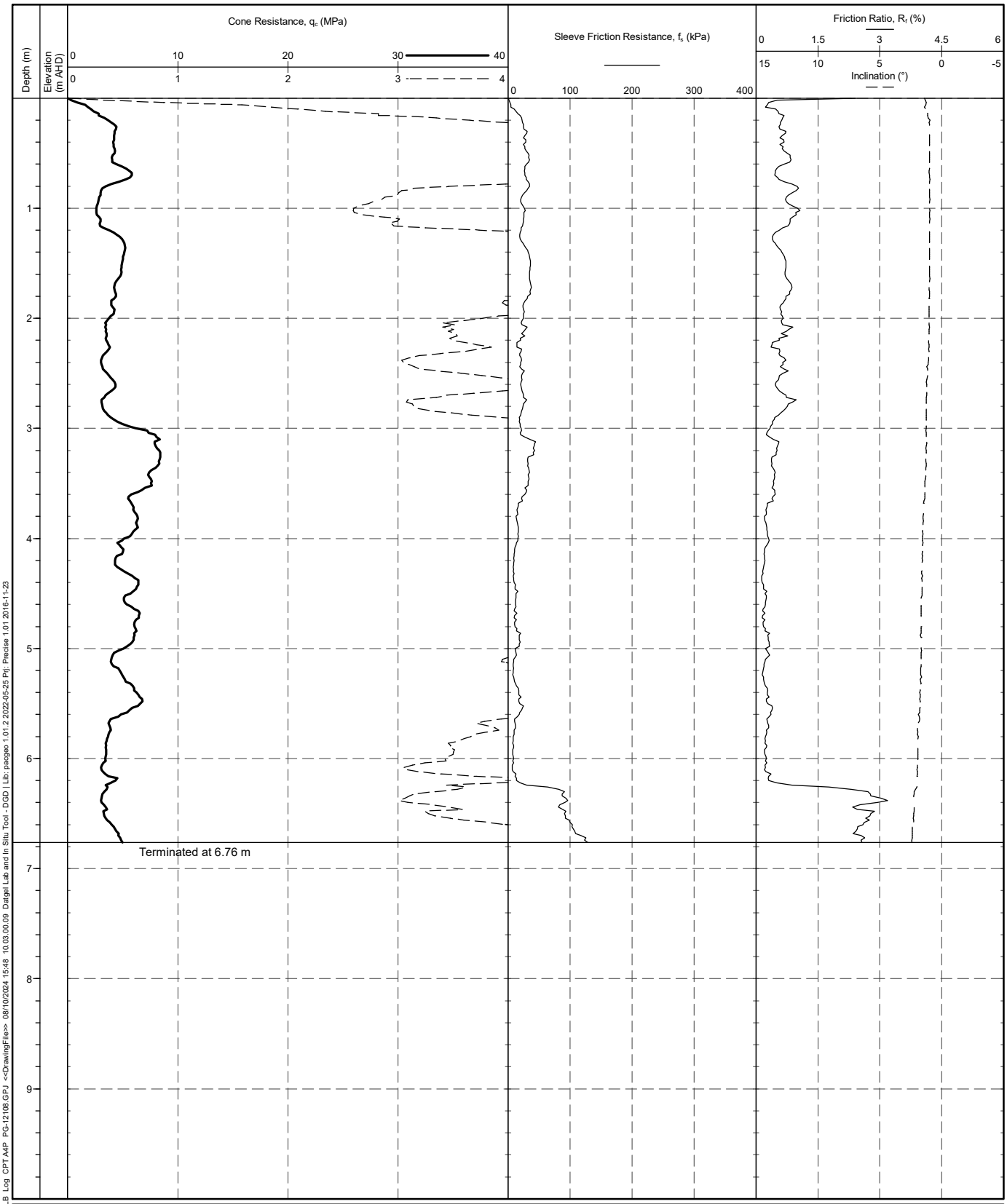
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PC 1-1

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 18/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



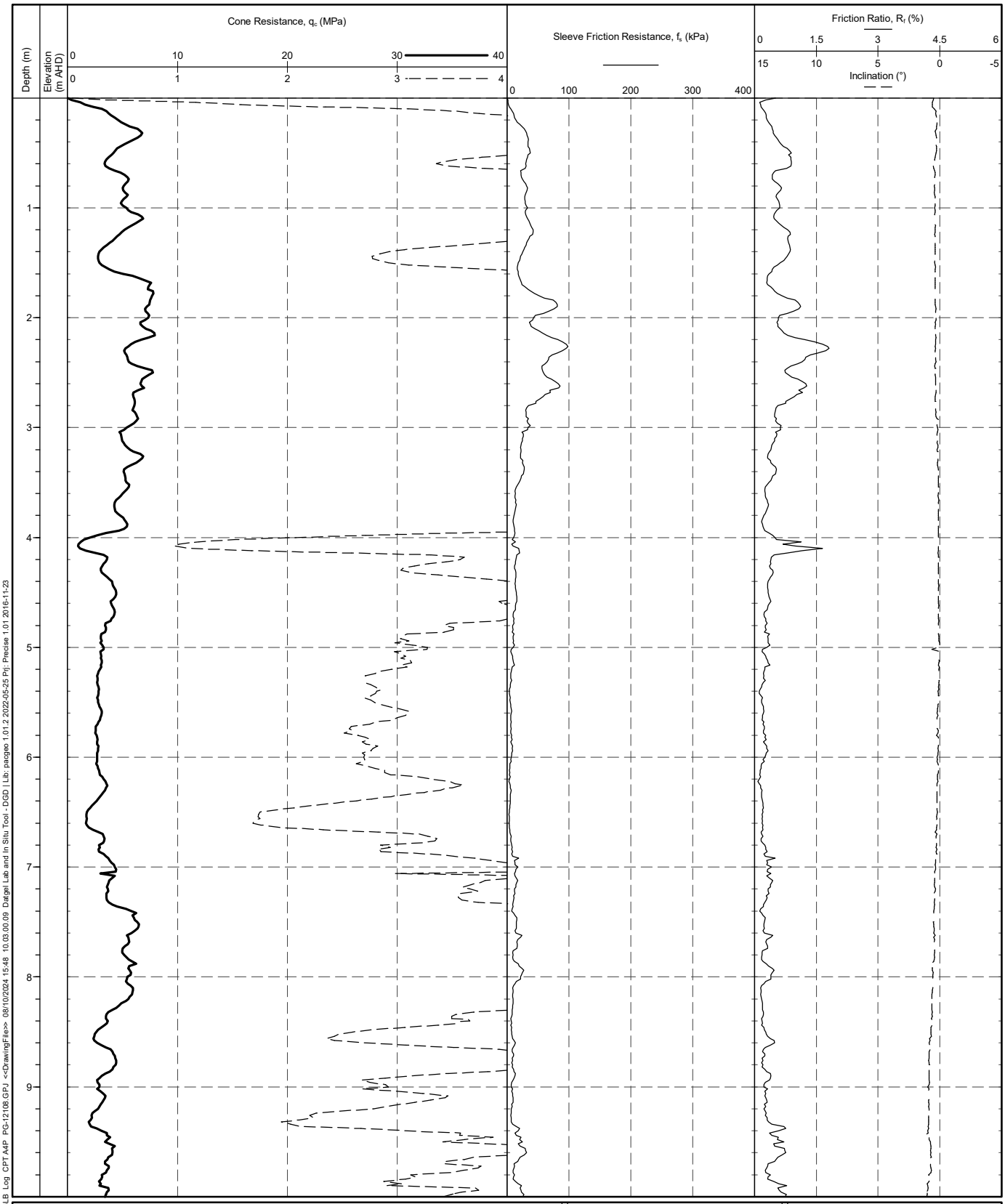
RIG	:	CHECKED BY	:	REMARK
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID
CPT - PC 1-2

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 2
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 18/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



RIG	:	CHECKED BY	:	REMARK
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

ER PACGEO 1.01.2 LIB GLB Log CPT A4P PG-12108.GPJ <<DrawingFile>> 08/10/2024 15:48 10.03.00.09 Datgel Lab and In Situ Tool - DGD | Lib: pacgeo 1.01.2 2022-05-25 Prj: Precise 1.01 2016-11-23

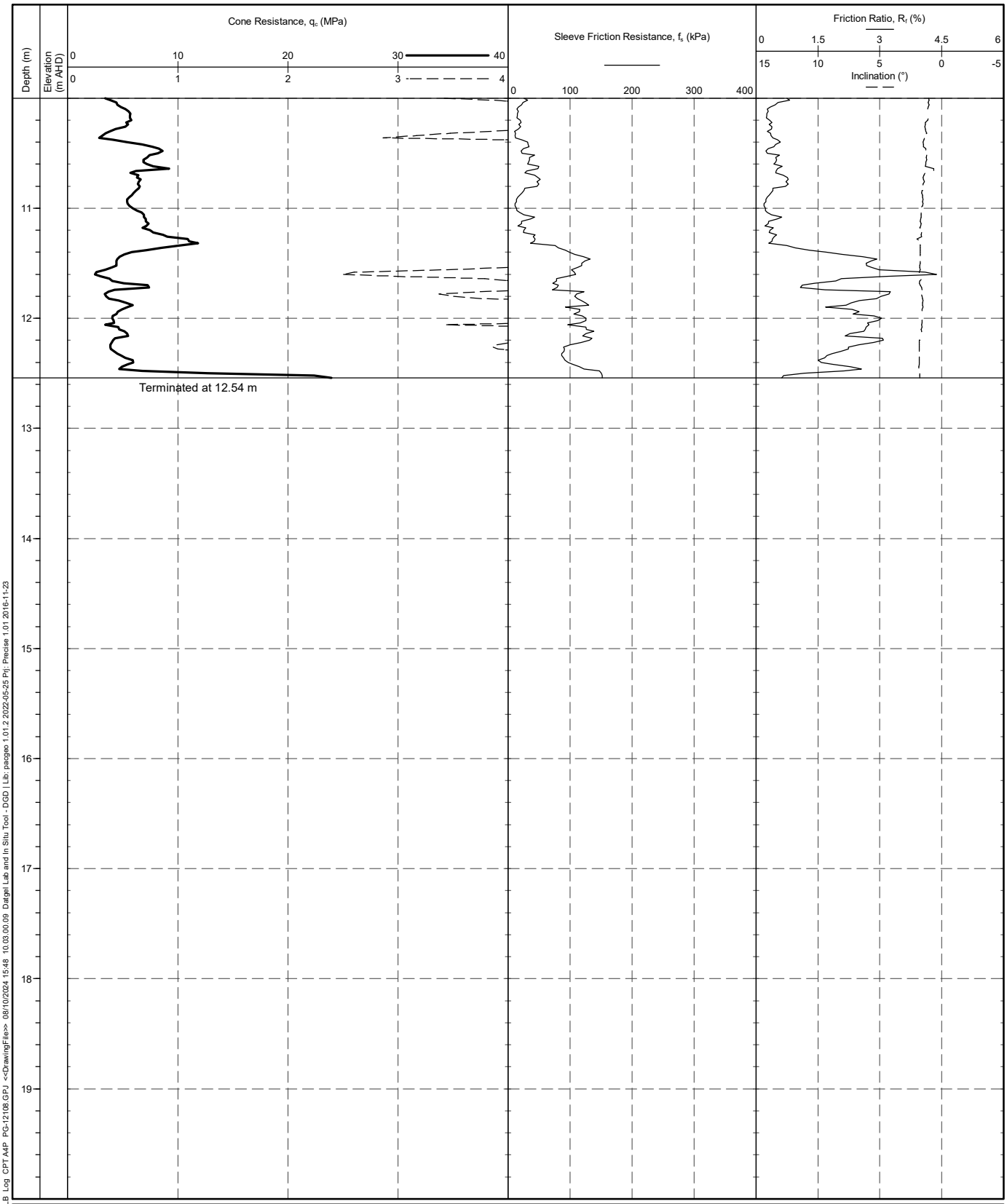
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PC 1-2

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 2 OF 2
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 18/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

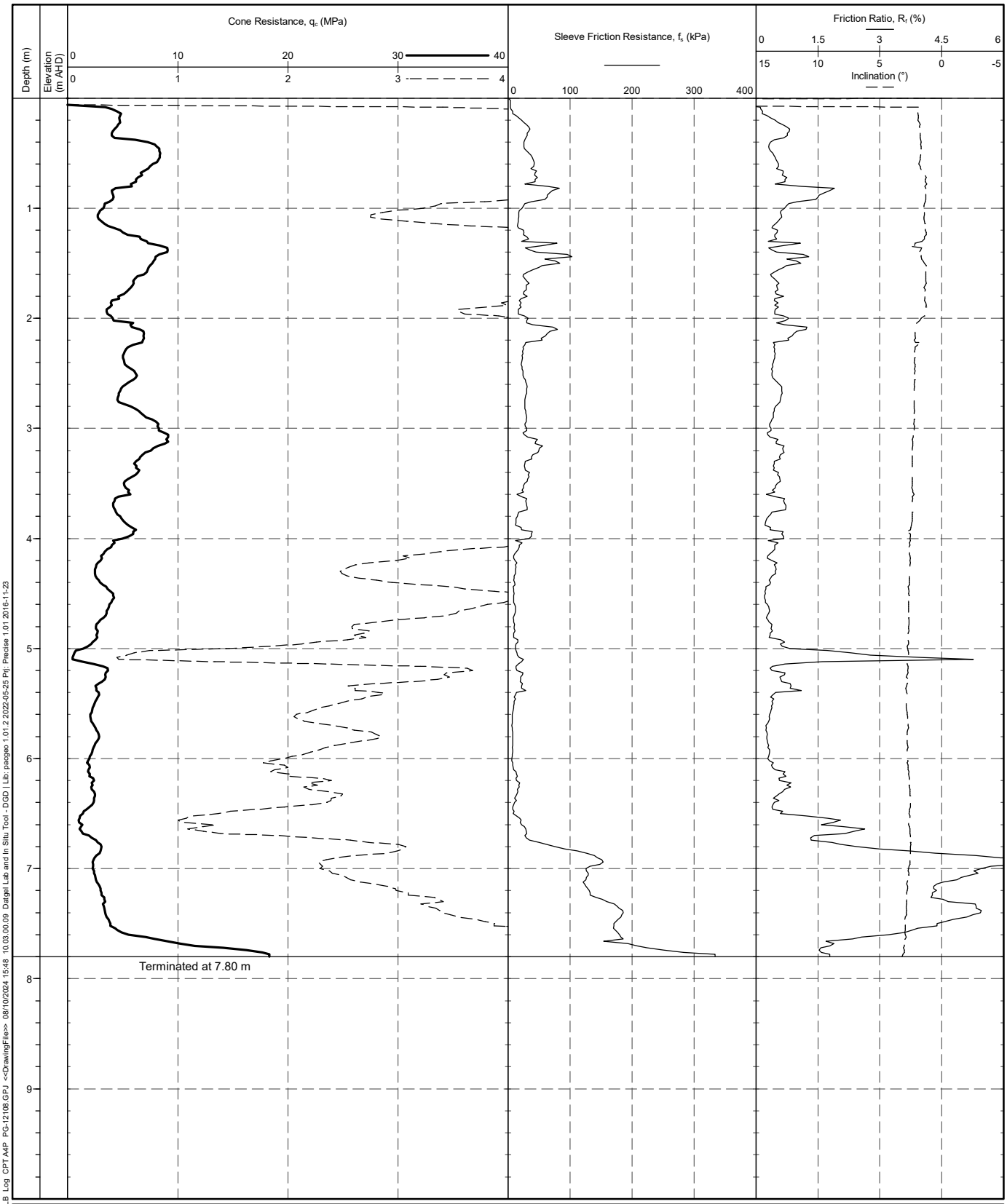
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PC 1-3

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 18/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



RIG	:	CHECKED BY	:	REMARK
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

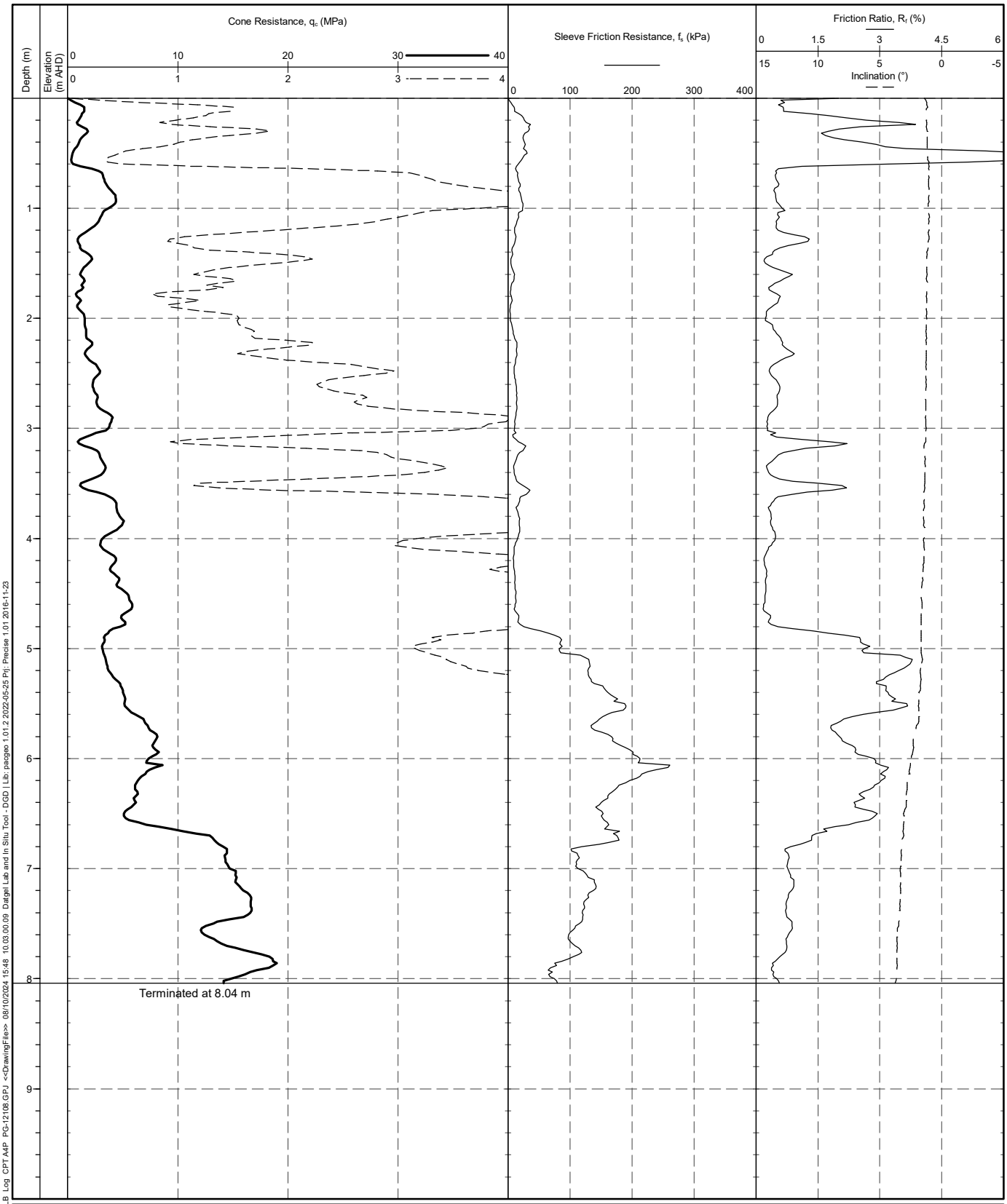
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PC 1-5

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 26/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

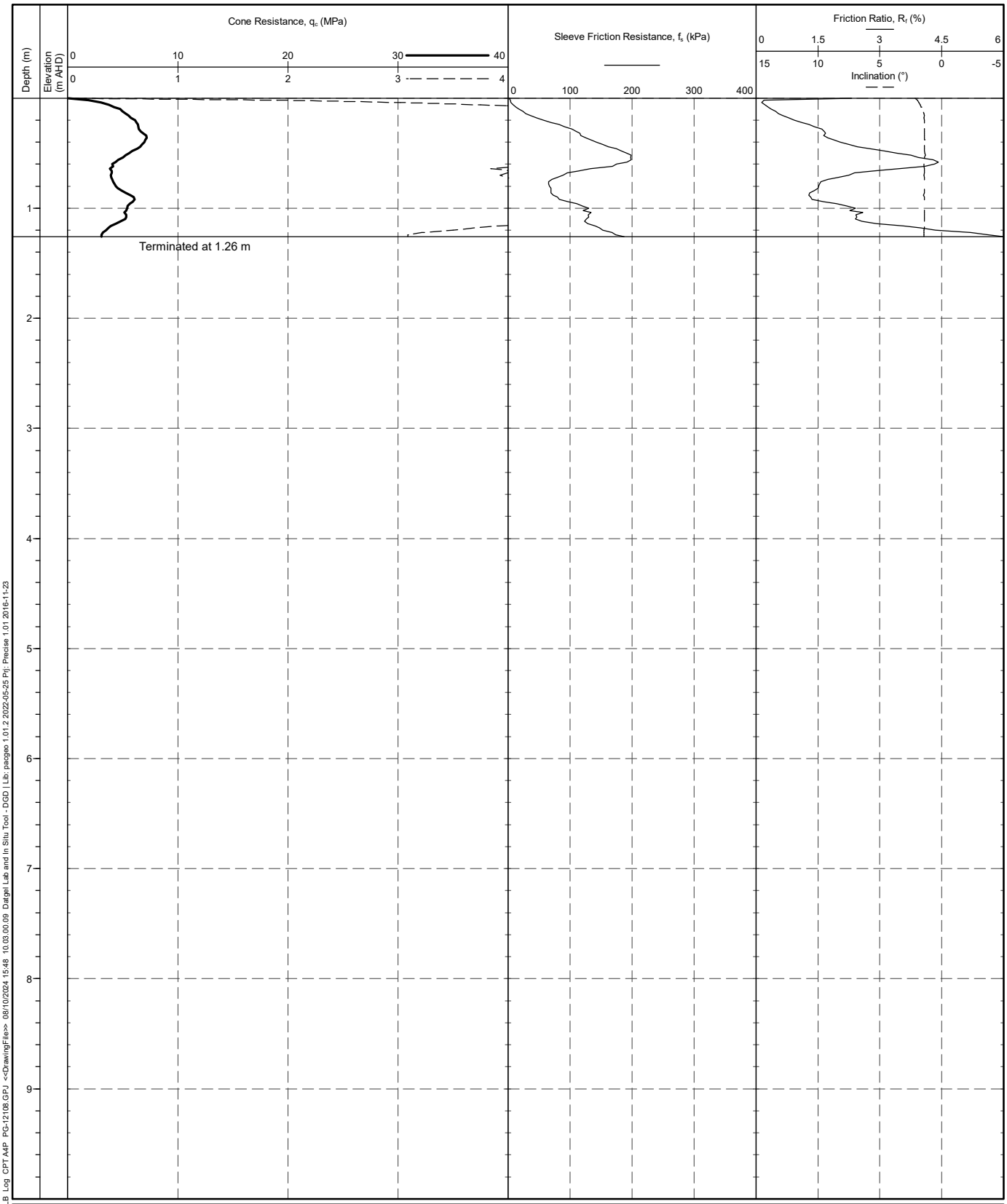
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PC 1-6

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 26/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

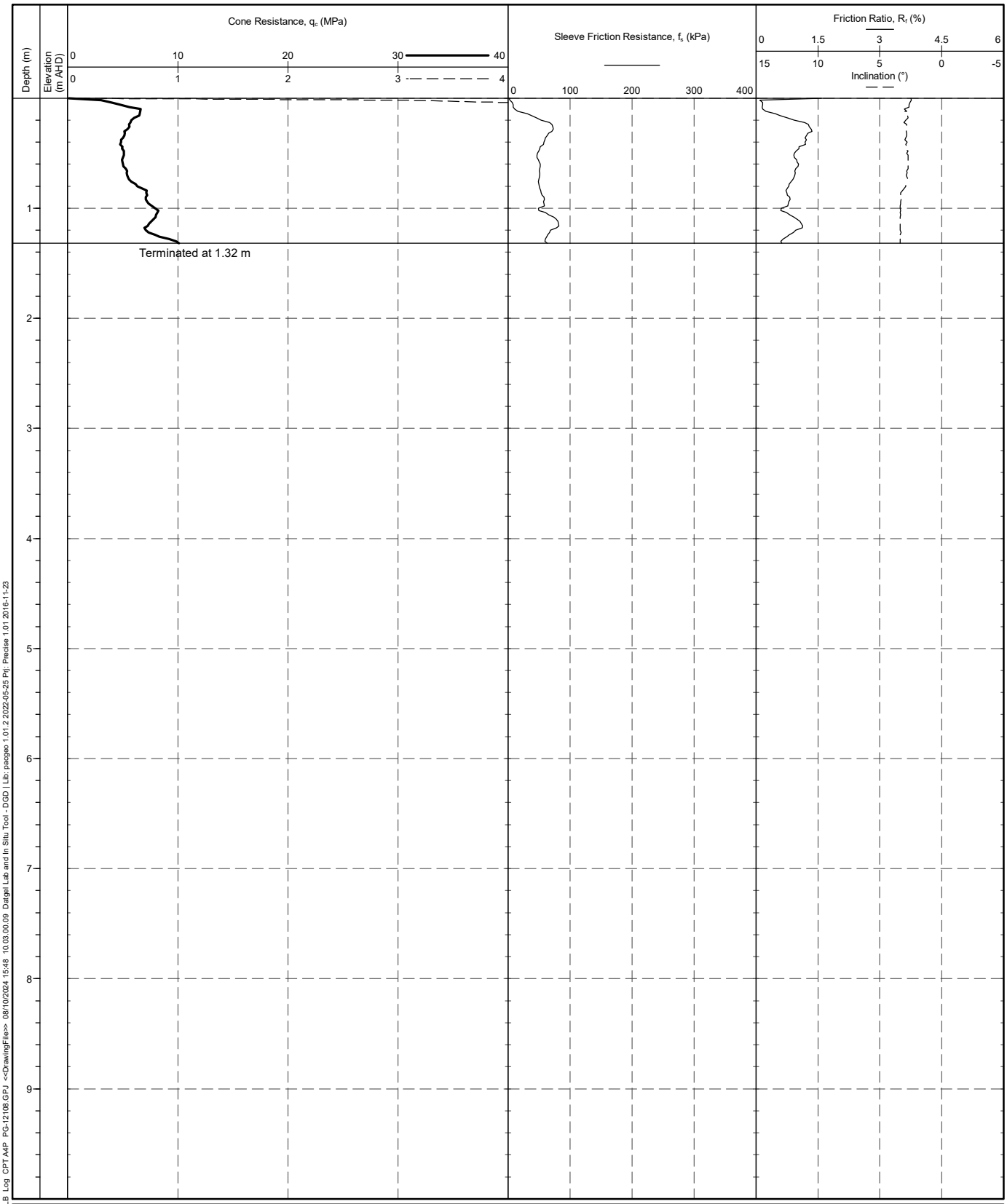
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PC 3

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 26/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

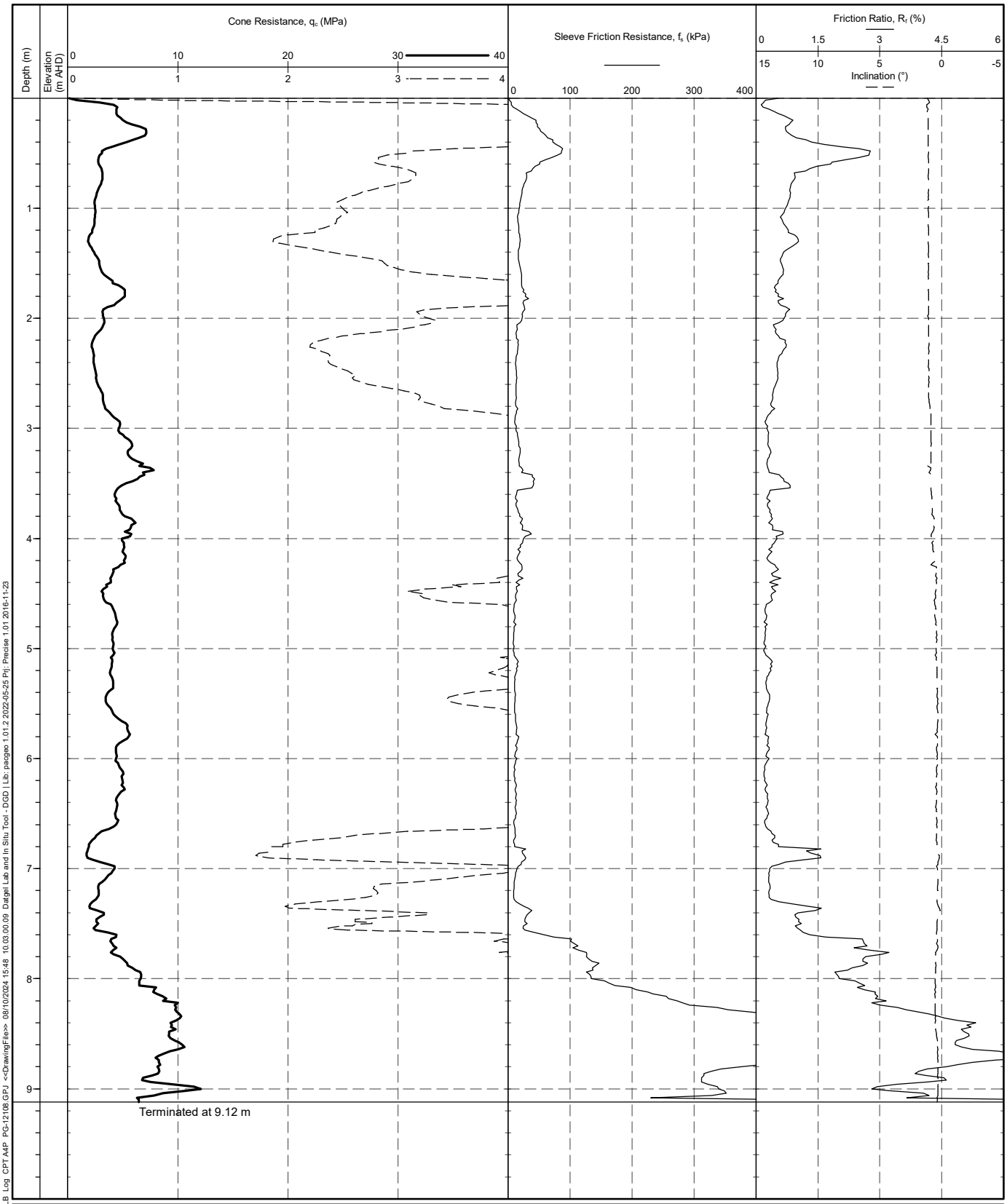
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PO 3-1

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 18/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

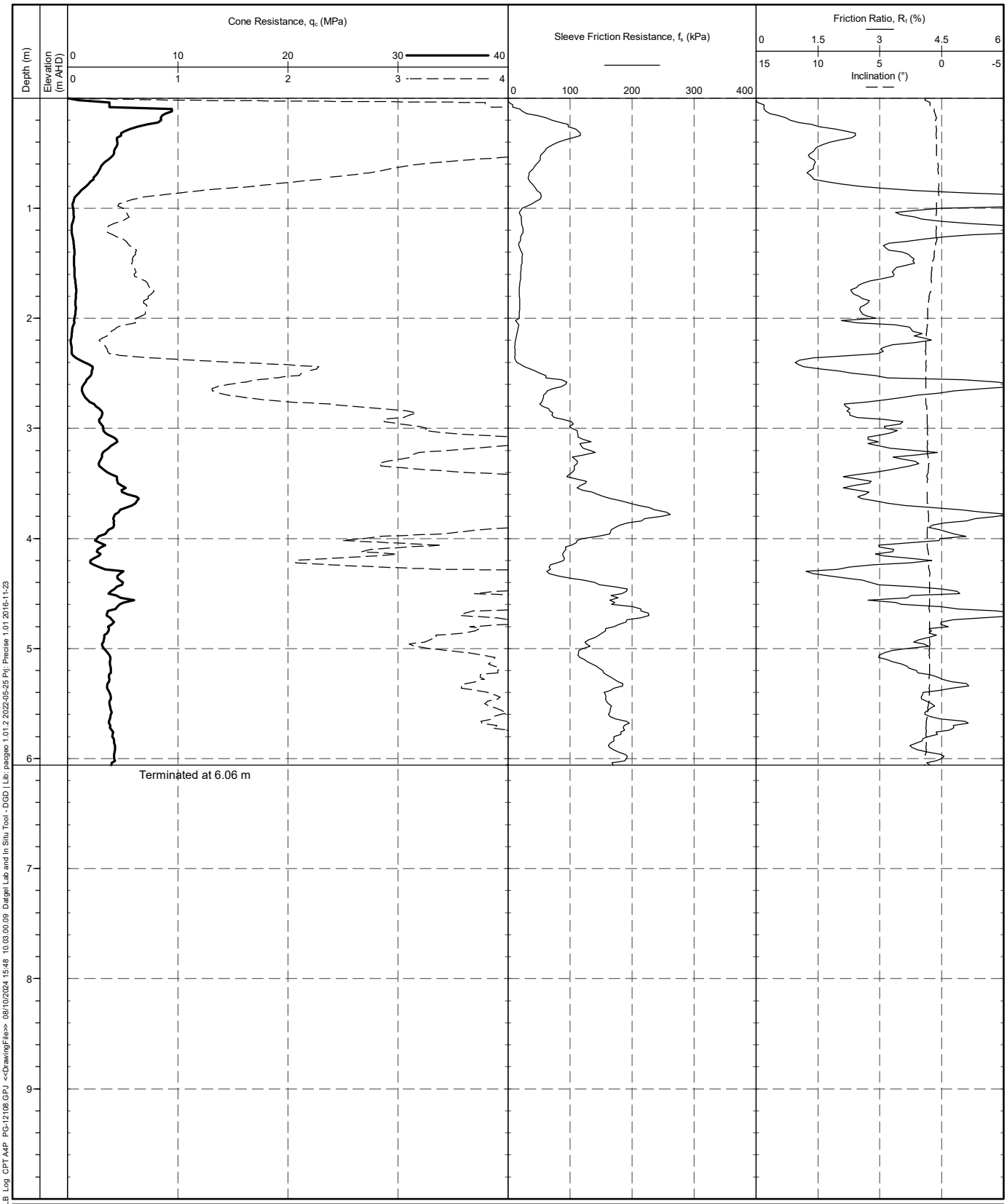
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - PO 3-2

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 26/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

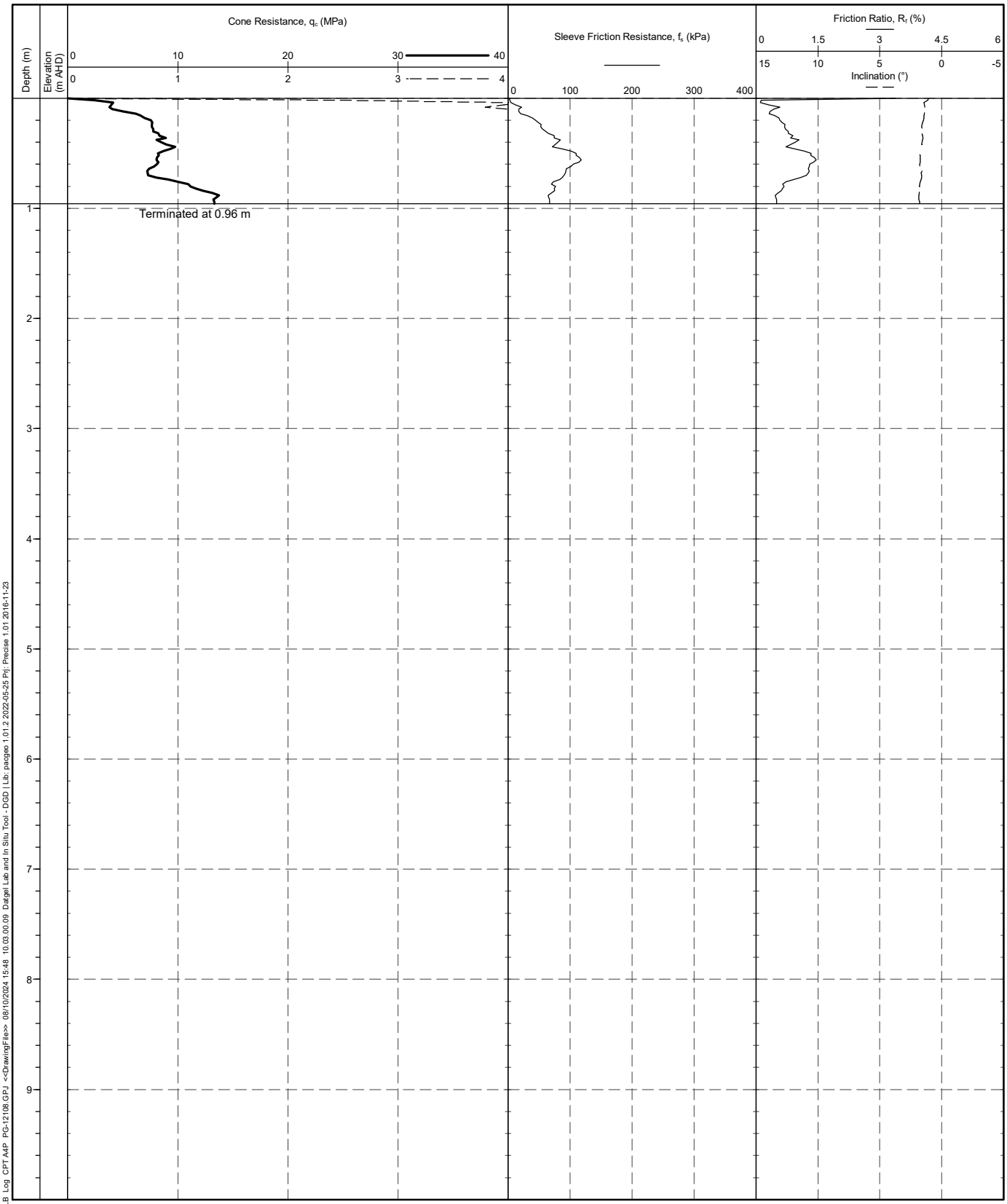
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - S3

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 26/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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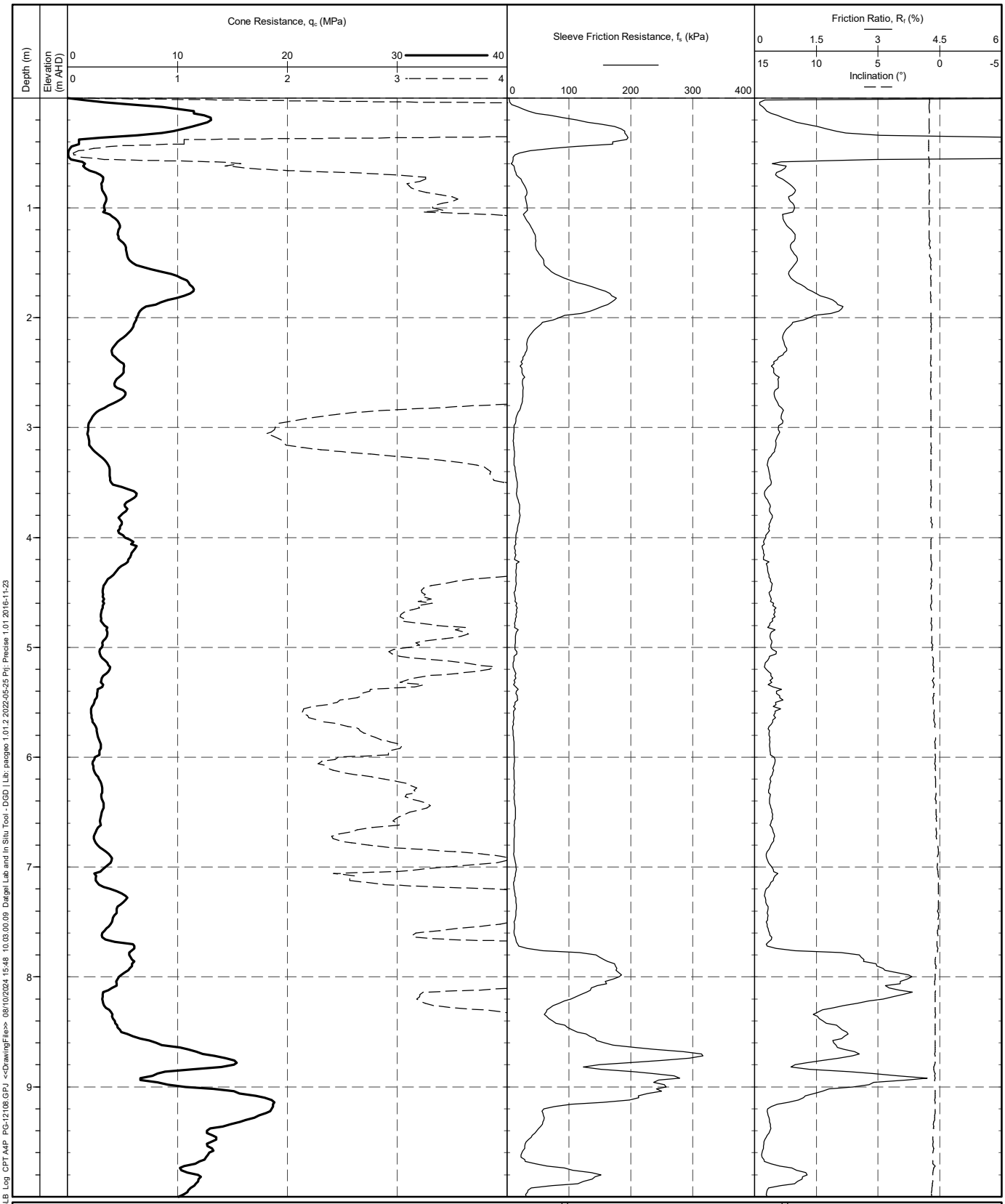
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID
CPT - SP4

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 2
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 25/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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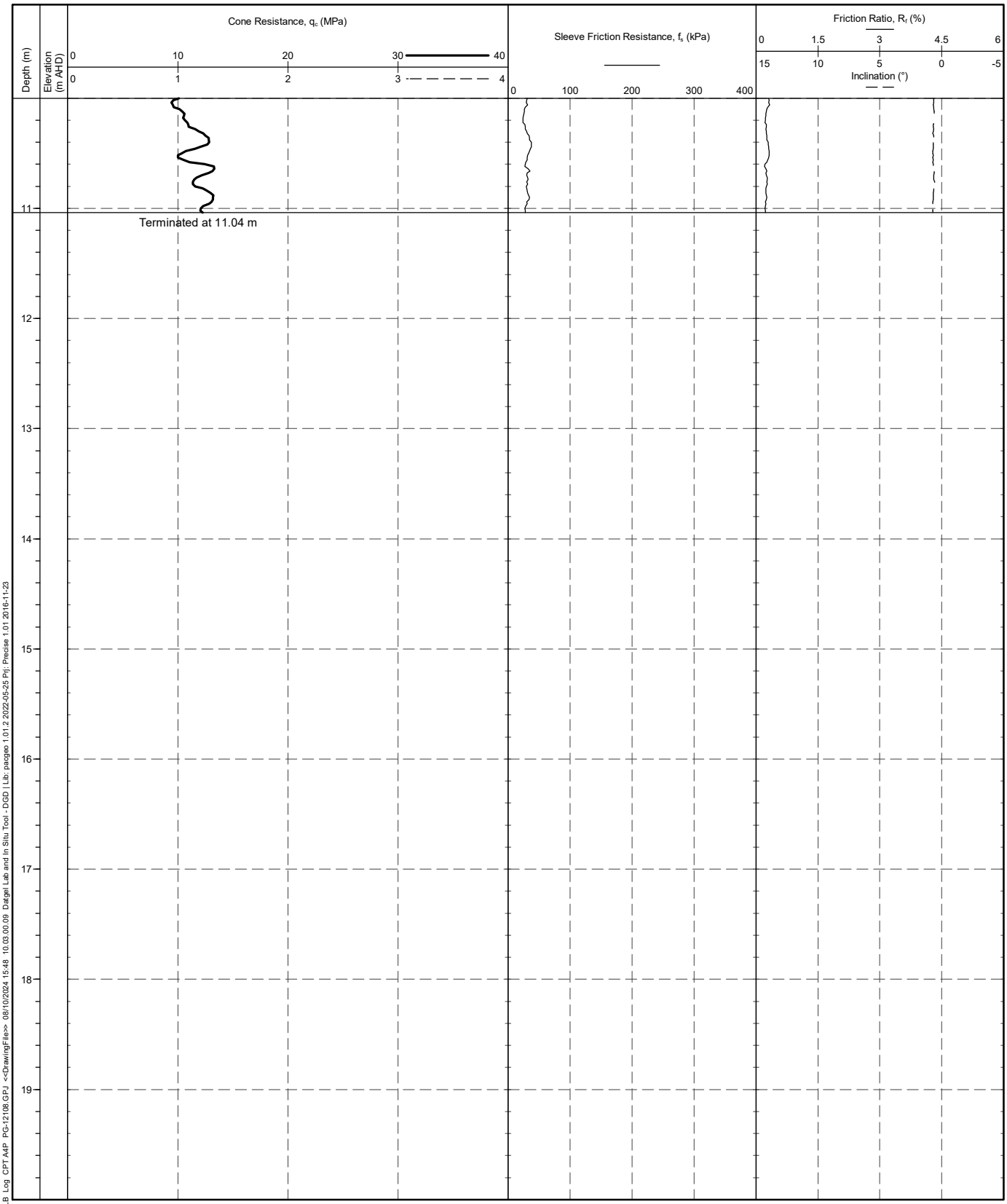
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID
CPT - SP4

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 2 OF 2
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 25/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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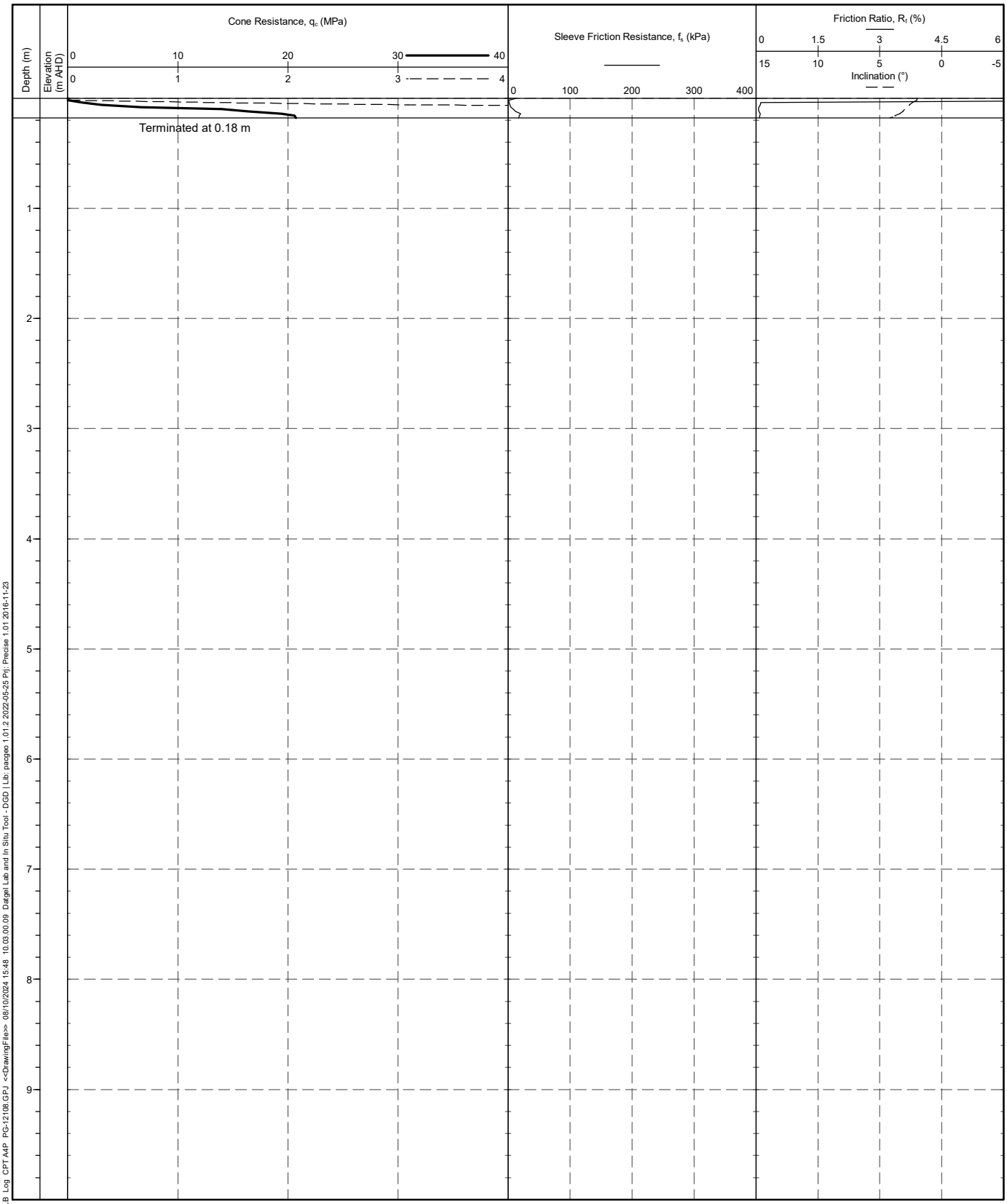
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID
CPT - WM 5-1 Test1

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 25/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



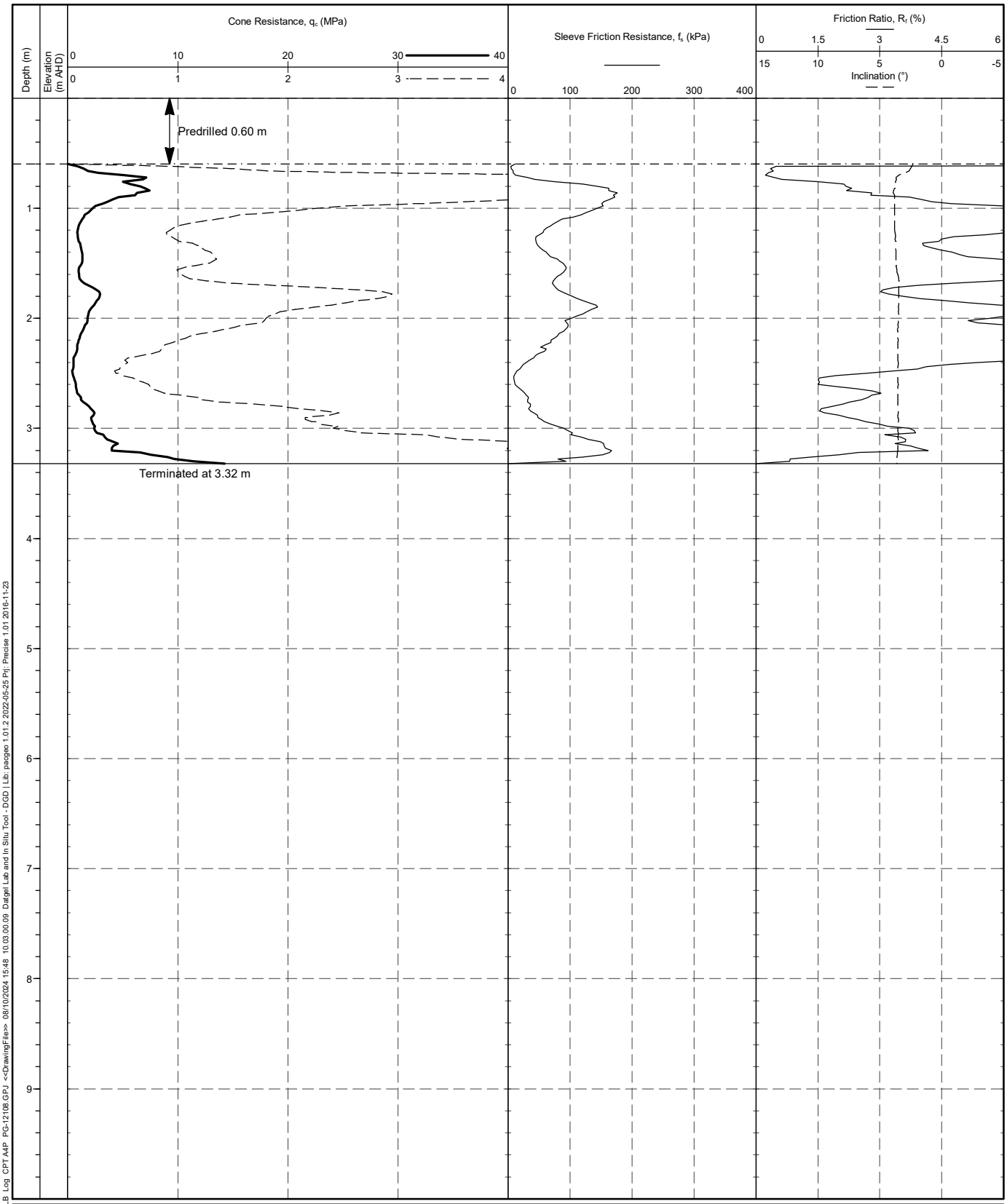
RIG	:	CHECKED BY	:	REMARK
CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID
CPT - WM 5-1 Test2

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 25/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

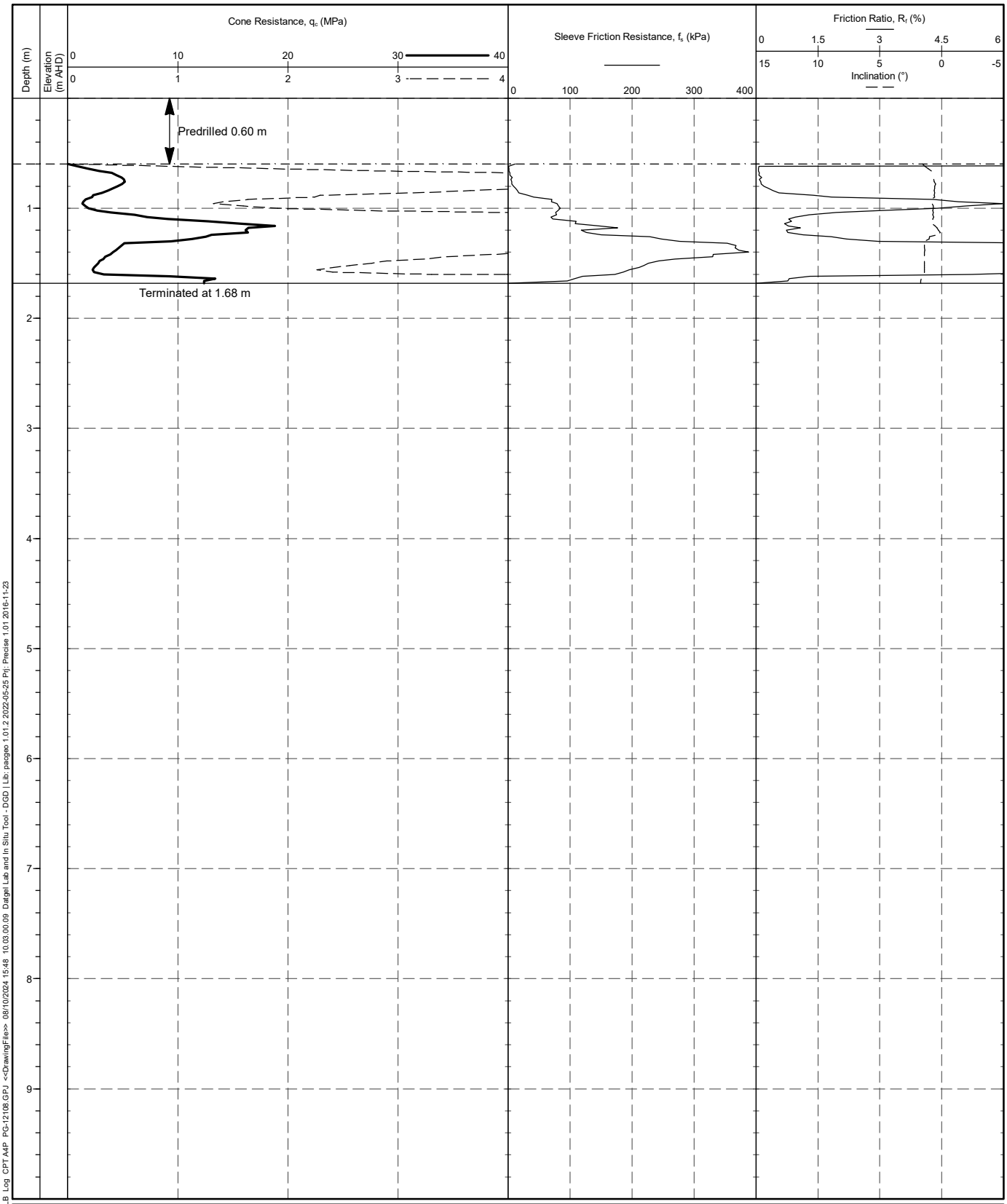
CPT LOG

Pacific Geotech
Consulting Geotechnical Engineers

PointID

CPT - WM 5-2

CLIENT	: Economic Development Queensland	AREA	: PG 12108	SHEET	: 1 OF 1
ENGINEER	:	EASTING	:	STATUS	:
PROJECT	: Proposed Acoustic Barrier	NORTHING	:	DATE	: 25/09/2024
LOCATION	: Abbott Street, Oonoonba	COORD. SYS.	: MGA94 Zone 56		
PROJECT No.	: PG-12108	ELEVATION	:		



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CONE TYPE	: Geotech AB	CHECKED DATE	:	
CONE ID	: 5821	APPROVED BY	:	
OPERATOR	: WB	APPROVED DATE	:	

APPENDIX C

LABORATORY TEST CERTIFICATES

Pacific Geotech
Consulting Geotechnical Engineers

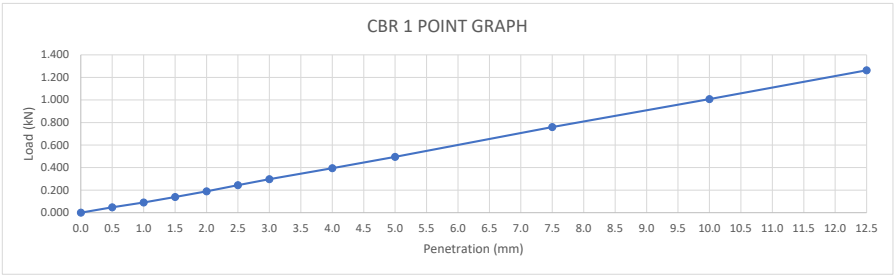
CALIFORNIA BEARING RATIO REPORT (1 POINT)

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera QLD 4209	REPORT NUMBER:	PG-12108-CBR-AS1
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	11/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.1.1

SAMPLE LOCATION:	**AS1 (0.4m-1.5m)**
SAMPLE NUMBER:	24-2837
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	5/12/2024
PREPERATION METHOD:	AS 1289.1.1
MOISTURE CONTENT METHOD:	AS1289.2.1.1
MATERIAL TYPE:	Sandy Clay, Brown

MAXIMUM DRY DENSITY (t/m³):	1.71
OPTIMUM MOISTURE CONTENT (%):	17.7
COMPACTIVE EFFORT:	Standard
COMPACTION METHOD:	AS1289.5.1.1
LABORATORY DENSITY RATIO:	100.0
LABORATORY MOISTURE RATIO:	99.5
DRY DENSITY BEFORE SOAK (t/m³):	1.71
DRY DENSITY AFTER SOAK (t/m³):	1.71
FIELD MOISTURE CONTENT:	18.0
MOISTURE CONTENT AT COMPACTION BEFORE SOAK (%):	17.6
MOISTURE CONTENT OF TOP 30mm AFTER PENETRATION (%):	21.1
MOISTURE CONTENT REST OF SAMPLE AFTER PENETRATION (%):	19.1
SWELL (%):	2.0
CBR SURCHARGE (Kg):	4.5
SOAKING PERIOD (Days):	4
CURING TIME (Hours):	51
PERCENTAGE OVERSIZE MATERIAL RETAINED ON 19mm SIEVE (%):	0
METHOD OF ESTABLISHING PLASTICITY:	Visual/Tactile Assessment

CBR 2.5mm (%):	2.0
CBR 5mm (%):	2.5
CBR VALUE (%):	**2.5**



NATA
WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 - Testing
Pacific Geotech Pty Ltd - Accreditation No. 21130
Gold Coast Laboratory - Site No. 25487

Approved Signatory
Ian Masman
Laboratory Manager

Report Remarks: -

P: (07) 5636 4680 F: (07) 5636 0286 E: info@pacgeo.com.au
3 Jowett Street, Coomera, Qld, 4209 | PO Box 499, Paradise Point, Qld, 4216
www.pacgeo.com.au
ABN: 62 615 248 952

Pacific Geotech
Consulting Geotechnical Engineers

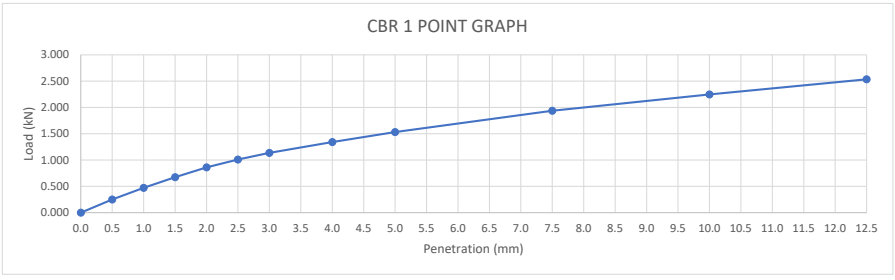
CALIFORNIA BEARING RATIO REPORT (1 POINT)

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera QLD 4209	REPORT NUMBER:	PG-12108-CBR-AS2
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	11/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.1.1

SAMPLE LOCATION:	**AS2 (0.4m-1.5m)**
SAMPLE NUMBER:	24-2838
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
PREPERATION METHOD:	AS 1289.1.1
MOISTURE CONTENT METHOD:	AS1289.2.1.1
MATERIAL TYPE:	Sandy Clay, Brown

MAXIMUM DRY DENSITY (t/m³):	1.83
OPTIMUM MOISTURE CONTENT (%):	13.8
COMPACTIVE EFFORT:	Standard
COMPACTION METHOD:	AS1289.5.1.1
LABORATORY DENSITY RATIO:	99.5
LABORATORY MOISTURE RATIO:	103.0
DRY DENSITY BEFORE SOAK (t/m³):	1.83
DRY DENSITY AFTER SOAK (t/m³):	1.83
FIELD MOISTURE CONTENT:	13.8
MOISTURE CONTENT AT COMPACTION BEFORE SOAK (%):	14.2
MOISTURE CONTENT OF TOP 30mm AFTER PENETRATION (%):	17.0
MOISTURE CONTENT REST OF SAMPLE AFTER PENETRATION (%):	15.5
SWELL (%):	0.5
CBR SURCHARGE (Kg):	4.5
SOAKING PERIOD (Days):	4
CURING TIME (Hours):	71
PERCENTAGE OVERSIZE MATERIAL RETAINED ON 19mm SIEVE (%):	0
METHOD OF ESTABLISHING PLASTICITY:	Visual/Tactile Assessment

CBR 2.5mm (%):	8.0
CBR 5mm (%):	8.0
CBR VALUE (%):	**8.0**



NATA
WORLD RECOGNISED ACCREDITATION

Accredited for Compliance with ISO/IEC 17025 - Testing

Pacific Geotech Pty Ltd - Accreditation No. 21130

Gold Coast Laboratory - Site No. 25487

Approved Signatory

Ian Masman
Laboratory Manager

Report Remarks: -

P: (07) 5636 4680 F: (07) 5636 0286 E: info@pacgeo.com.au
3 Jowett Street, Coomera, Qld, 4209 | PO Box 499, Paradise Point, Qld, 4216
www.pacgeo.com.au
ABN: 62 615 248 952

Pacific Geotech
Consulting Geotechnical Engineers

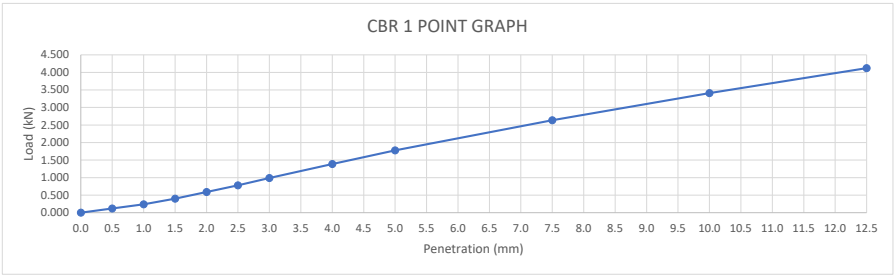
CALIFORNIA BEARING RATIO REPORT (1 POINT)

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera QLD 4209	REPORT NUMBER:	PG-12108-CBR-AS3
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	11/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.1.1

SAMPLE LOCATION:	**AS3 (0.3m-1.4m)**
SAMPLE NUMBER:	24-2839
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
PREPERATION METHOD:	AS 1289.1.1
MOISTURE CONTENT METHOD:	AS1289.2.1.1
MATERIAL TYPE:	Sand, Brown

MAXIMUM DRY DENSITY (t/m³):	1.70
OPTIMUM MOISTURE CONTENT (%):	11.5
COMPACTIVE EFFORT:	Standard
COMPACTION METHOD:	AS1289.5.1.1
LABORATORY DENSITY RATIO:	100.0
LABORATORY MOISTURE RATIO:	98.5
DRY DENSITY BEFORE SOAK (t/m³):	1.70
DRY DENSITY AFTER SOAK (t/m³):	1.70
FIELD MOISTURE CONTENT:	9.9
MOISTURE CONTENT AT COMPACTION BEFORE SOAK (%):	11.3
MOISTURE CONTENT OF TOP 30mm AFTER PENETRATION (%):	13.0
MOISTURE CONTENT REST OF SAMPLE AFTER PENETRATION (%):	12.0
SWELL (%):	0.0
CBR SURCHARGE (Kg):	4.5
SOAKING PERIOD (Days):	4
CURING TIME (Hours):	51
PERCENTAGE OVERSIZE MATERIAL RETAINED ON 19mm SIEVE (%):	0
METHOD OF ESTABLISHING PLASTICITY:	Visual/Tactile Assessment

CBR 2.5mm (%):	8.0
CBR 5mm (%):	10.0
CBR VALUE (%):	**10.0**



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Report Remarks: -

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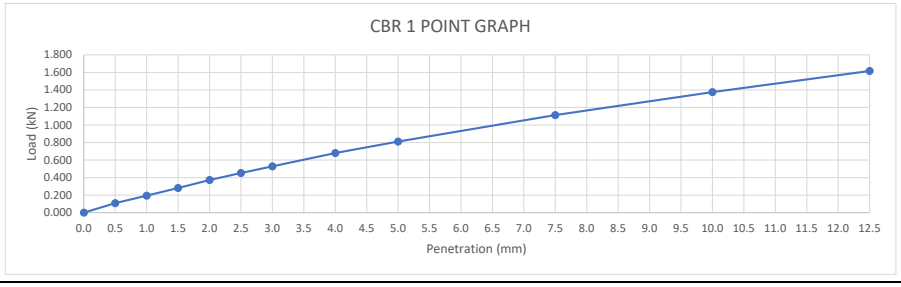
CALIFORNIA BEARING RATIO REPORT (1 POINT)

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera QLD 4209	REPORT NUMBER:	PG-12108-CBR-LS1
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	11/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.1.1

SAMPLE LOCATION:	**LS1 (0.3m-1.5m)**
SAMPLE NUMBER:	24-2840
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
PREPERATION METHOD:	AS 1289.1.1
MOISTURE CONTENT METHOD:	AS1289.2.1.1
MATERIAL TYPE:	Sandy Clay, Brown

MAXIMUM DRY DENSITY (t/m³):	1.80
OPTIMUM MOISTURE CONTENT (%):	12.6
COMPACTIVE EFFORT:	Standard
COMPACTION METHOD:	AS1289.5.1.1
LABORATORY DENSITY RATIO:	99.5
LABORATORY MOISTURE RATIO:	102.5
DRY DENSITY BEFORE SOAK (t/m³):	1.79
DRY DENSITY AFTER SOAK (t/m³):	1.79
FIELD MOISTURE CONTENT:	12.5
MOISTURE CONTENT AT COMPACTION BEFORE SOAK (%):	12.9
MOISTURE CONTENT OF TOP 30mm AFTER PENETRATION (%):	18.5
MOISTURE CONTENT REST OF SAMPLE AFTER PENETRATION (%):	16.8
SWELL (%):	1.5
CBR SURCHARGE (Kg):	4.5
SOAKING PERIOD (Days):	4
CURING TIME (Hours):	1095158
PERCENTAGE OVERSIZE MATERIAL RETAINED ON 19mm SIEVE (%):	0
METHOD OF ESTABLISHING PLASTICITY:	Visual/Tactile Assessment

CBR 2.5mm (%):	3.5
CBR 5mm (%):	4.0
CBR VALUE (%):	**4.0**



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Approved Signatory
Ian Masman
Laboratory Manager

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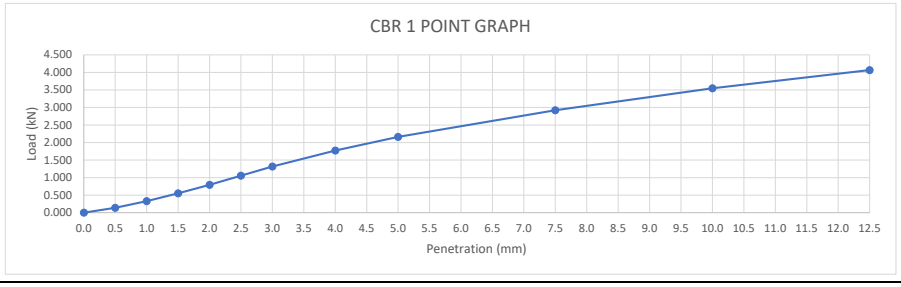
CALIFORNIA BEARING RATIO REPORT (1 POINT)

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera QLD 4209	REPORT NUMBER:	PG-12108-CBR-LS2
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	11/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.1.1

SAMPLE LOCATION:	**LS2 (0.6m-1.4m)**
SAMPLE NUMBER:	24-2841
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
PREPERATION METHOD:	AS 1289.1.1
MOISTURE CONTENT METHOD:	AS1289.2.1.1
MATERIAL TYPE:	Gravelley Sand, Brown

MAXIMUM DRY DENSITY (t/m³):	1.93
OPTIMUM MOISTURE CONTENT (%):	10.9
COMPACTIVE EFFORT:	Standard
COMPACTION METHOD:	AS1289.5.1.1
LABORATORY DENSITY RATIO:	100.0
LABORATORY MOISTURE RATIO:	100.0
DRY DENSITY BEFORE SOAK (t/m³):	1.93
DRY DENSITY AFTER SOAK (t/m³):	1.93
FIELD MOISTURE CONTENT:	10.6
MOISTURE CONTENT AT COMPACTION BEFORE SOAK (%):	10.9
MOISTURE CONTENT OF TOP 30mm AFTER PENETRATION (%):	12.7
MOISTURE CONTENT REST OF SAMPLE AFTER PENETRATION (%):	11.7
SWELL (%):	0.0
CBR SURCHARGE (Kg):	4.5
SOAKING PERIOD (Days):	4
CURING TIME (Hours):	48
PERCENTAGE OVERSIZE MATERIAL RETAINED ON 19mm SIEVE (%):	0
METHOD OF ESTABLISHING PLASTICITY:	Visual/Tactile Assessment

CBR 2.5mm (%):	10.0
CBR 5mm (%):	12.0
CBR VALUE (%):	**12.0**



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Form: ER 027.1

UNCONFINED COMPRESSIVE STRENGTH - SOIL (Qu) REPORT

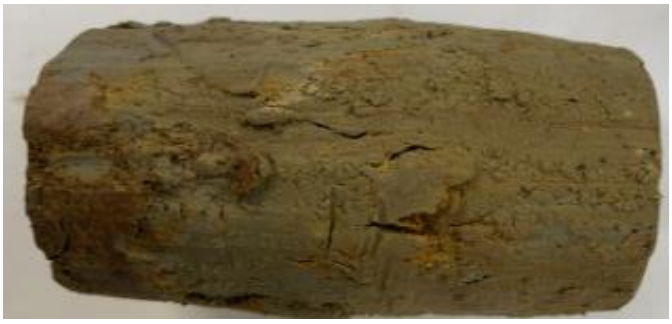
CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera Q 4209	REPORT NUMBER:	PG-12108-F2-1.4 - Qu
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	10/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.4.1, 2.1.1

SAMPLE LOCATION:	**F2, 1.4m, U50**
SAMPLE NUMBER:	24-2829
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
MATERIAL TYPE:	Silty Clay

SPECIMEN DIMENSIONS	SPECIMEN DIMENSIONS
AVERAGE HEIGHT (mm):	83.7
AVERAGE DIAMETER (mm):	52.4
AVERAGE HEIGHT TO DIAMETER RATIO:	1.60

WET DENSITY (t/m³):	1.3
MOISTURE CONTENT (%):	26.3

STRAIN AT FAILURE (%):	15.6
MODE OF FAILURE:	Simple Shear
COMPRESSIVE STRENGTH (kPa):	**132**



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SHRINK SWELL INDEX REPORT

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera, Qld 4209	REPORT NUMBER:	PG-12108-F3-1.3 - SS
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	10/12/2024
PROJECT LOCATION:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.7.1.1, 2.1.1 & 2.1.4

SAMPLE LOCATION:	**F3,1.3m, U50**
SAMPLE NUMBER:	24-2824
SAMPLING METHOD:	SAMPLE AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	5/12/2024
MATERIAL TYPE:	**Sandy Clay**

SHRINKAGE MOISTURE CONTENT (%):	17.9
SHRINKAGE (%):	2.3
SWELL MOISTURE CONTENT INITIAL (%):	19.5
SWELL MOISTURE CONTENT FINAL (%):	23.2
SWELL (%):	0.0
UNIT WEIGHT (t/m³):	1.98
SHRINK SWELL INDEX Iss (%):	**1.3**
CRACKING:	Slight
CRUMBLING:	None
ESTIMATED PERCENTAGE OF INERT INCLUSIONS (%):	0

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SHRINK SWELL INDEX REPORT

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera, Qld 4209	REPORT NUMBER:	PG-12108-F4-1.4 - SS
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	10/12/2024
PROJECT LOCATION:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.7.1.1, 2.1.1 & 2.1.4

SAMPLE LOCATION:	**F4, 1.4m, U50**
SAMPLE NUMBER:	24-2825
SAMPLING METHOD:	SAMPLE AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	5/12/2024
MATERIAL TYPE:	**Sandy Clay**

SHRINKAGE MOISTURE CONTENT (%):	16.5
SHRINKAGE (%):	1.0
SWELL MOISTURE CONTENT INITIAL (%):	16.7
SWELL MOISTURE CONTENT FINAL (%):	20.1
SWELL (%):	0.0
UNIT WEIGHT (t/m³):	2.09
SHRINK SWELL INDEX Iss (%):	**0.6**
CRACKING:	Slight
CRUMBLING:	Slight
ESTIMATED PERCENTAGE OF INERT INCLUSIONS (%):	0

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Form: ER 027.1

UNCONFINED COMPRESSIVE STRENGTH - SOIL (Qu) REPORT

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera Q 4209	REPORT NUMBER:	PG-12108-F10-2.1 - Qu
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	10/12/2024
PROJECT ADDRESS:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.6.4.1, 2.1.1

SAMPLE LOCATION:	**F10, 2.1m, U50**
SAMPLE NUMBER:	24-2828
SAMPLING METHOD:	AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
MATERIAL TYPE:	Sandy Clay

SPECIMEN DIMENSIONS	SPECIMEN DIMENSIONS
AVERAGE HEIGHT (mm):	71.9
AVERAGE DIAMETER (mm):	46.8
AVERAGE HEIGHT TO DIAMETER RATIO:	1.54

WET DENSITY (t/m³):	2.0
MOISTURE CONTENT (%):	25.7

STRAIN AT FAILURE (%):	7.9
MODE OF FAILURE:	Parabolic Shear
COMPRESSIVE STRENGTH (kPa):	**178**

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SHRINK SWELL INDEX REPORT

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera, Qld 4209	REPORT NUMBER:	PG-12108-SP1-1-1.4 - SS
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	10/12/2024
PROJECT LOCATION:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.7.1.1, 2.1.1 & 2.1.4

SAMPLE LOCATION:	**SP1-1, 1.4m, U50**
SAMPLE NUMBER:	24-2826
SAMPLING METHOD:	SAMPLE AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	5/12/2024
MATERIAL TYPE:	**Silty Sandy Clay**

SHRINKAGE MOISTURE CONTENT (%):	22.3
SHRINKAGE (%):	4.0
SWELL MOISTURE CONTENT INITIAL (%):	26.2
SWELL MOISTURE CONTENT FINAL (%):	32.3
SWELL (%):	0.0
UNIT WEIGHT (t/m³):	1.93
SHRINK SWELL INDEX Iss (%):	**2.2**
CRACKING:	Slight
CRUMBLING:	None
ESTIMATED PERCENTAGE OF INERT INCLUSIONS (%):	0

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SHRINK SWELL INDEX REPORT

CLIENT:	Economic Development Queensland	PROJECT NUMBER:	PG - 12108
CLIENT ADDRESS:	c/o 3 Jowett Street, Coomera, Qld 4209	REPORT NUMBER:	PG-12108-WM4-1.4 - SS
PROJECT NAME:	Proposed Intersection Upgrade	REPORT DATE:	10/12/2024
PROJECT LOCATION:	Abbott Street, Oonoonba	TEST METHOD:	AS 1289.7.1.1, 2.1.1 & 2.1.4

SAMPLE LOCATION:	**WM4, 1.4m, U50**
SAMPLE NUMBER:	24-2827
SAMPLING METHOD:	SAMPLE AS SUPPLIED
SAMPLED BY:	PACIFIC GEOTECH
DATE SAMPLED:	3/10/2024
DATE TESTED:	6/12/2024
MATERIAL TYPE:	**Silty Clay**

SHRINKAGE MOISTURE CONTENT (%):	26.1
SHRINKAGE (%):	5.9
SWELL MOISTURE CONTENT INITIAL (%):	26.9
SWELL MOISTURE CONTENT FINAL (%):	31.9
SWELL (%):	4.9
UNIT WEIGHT (t/m³):	1.98
SHRINK SWELL INDEX Iss (%):	**4.6**
CRACKING:	Slight
CRUMBLING:	Slight
ESTIMATED PERCENTAGE OF INERT INCLUSIONS (%):	0

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APPENDIX D

SITE PLAN

Borehole CPT

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Drawn ER	Project:	Proposed Acoustic Barrier	Drawing No. PG-12108-01 Section One	A4
Date SEP-24	Location:	Abbott Street, Oonoonba		
Checked	Client:	Economic Development Queensland		

● *Borehole* ● *CPT*

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Drawn ER	Project:	Proposed Acoustic Barrier	Drawing No. PG-12108-02 VER 2 Section Two	A4
Date SEP-24	Location:	Abbott Street, Oonoonba		
Checked	Client:	Economic Development Queensland		