Intrusive Geotechnical Investigation Report

Coffs Harbour Jetty Foreshore Precinct

PSM4842-007R REV6 28 February 2025

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1. Executive Summary

This report presents the results of the geotechnical investigation undertaken for the proposed Coffs Harbour Jetty Foreshore Precinct at Jetty Beach, Coffs Harbour (**the Site**). The work was undertaken in accordance with PSM proposal PSM4842-003L dated 27 April 2023. The investigation aimed to assess site conditions, soil properties and potential challenges for future development. Borehole drilling and test pit excavation along with laboratory testing of soil samples were undertaken.

From the geotechnical investigation, several soil units were identified, including TOPSOIL, FILL, NATURAL SAND, NATURAL CLAY and BEDROCK. Based on the identified units, recommendations for development include careful consideration of soil conditions during foundation design and construction. Monitoring of groundwater levels, influenced by tidal fluctuations and weather conditions, is advised to manage potential impacts on construction activities.

It is recommended that further intrusive geotechnical investigations are undertaken at the location of each specific development following finalisation of designs to confirm or revise the provided geotechnical parameters.

2. Introduction

Property and Development NSW (PDNSW) is continuing to lead the revitalisation of the Coffs Harbour Jetty Foreshore Precinct (the Precinct) on behalf of the NSW Government. Pells Sullivan Meynink (PSM) has been engaged by PDNSW to prepare a geotechnical investigation report that characterises subsurface conditions of the precinct and to provide preliminary geotechnical advice.

This geotechnical investigation report supports a Planning Justification Report that outlines proposed amendments to the Coffs Harbour Local Environmental Plan (CHLEP) 2013 and will be submitted to the Department of Planning, Housing and Infrastructure (DPHI) as part of a State Assessed Planning Proposal (planning proposal).

As Coffs Harbour continues to grow as a Regional City, the NSW Government and Coffs Harbour City Council have, through various strategic planning exercises, identified four key strategic priorities to reimagine its direction and respond to current and future challenges and opportunities:

- Deliver a regional economy (CHCC LSPS, 2020; CH Economic Development Strategy, 2017) that is diverse, sophisticated and able to retain businesses and skills
- Evolve the tourism offering CHCC LSPS, 2020) with improved attractions, activities and accommodation
- Provide more housing (CHCC LSPS, 2020) in accessible locations, including affordable housing
- Provide better connections between places with more sustainable movement choices (CHRCAP, 2021; CHCC, 2020).

As a large, strategically located and wholly government owned site, the Precinct represents a significant opportunity to deliver on each of these key regional priorities. In this planning proposal, PDNSW seeks to celebrate the unique location, history and culture of the Jetty Foreshore to deliver outcomes for the benefit of the Coffs Harbour community. The revitalisation will be staged and funded, over time, to deliver the shared community vision.

2.1 Our shared community vision

Coffs' family playground, a precinct of parks and places, that connects community with Country. The community is and always has been at the heart of creating a thriving regional economy and destination for Coffs Harbour. Shaped with the community, our vision is to ensure The Jetty Foreshore will become a world-class oceanfront precinct through the principles shown in Inset 1.

Inset 1: Vision for the Coffs Harbour Jetty Foreshore.

3. The Precinct

The Precinct, wholly owned by the NSW Government, is strategically significant to the State and to the Coffs Harbour region. The Precinct is located on the traditional lands of the Gumbaynggirr people, in saltwater freshwater Country. It encompasses approximately 62 hectares of foreshore land, 5km east of the Coffs Harbour CBD, located on the Coffs Harbour coast with direct access to the Pacific Ocean. Access is provided on Marina Drive in the north, and Camperdown Street in the south, with Jordan Esplanade bisecting the site north to south. A Precinct map showing existing conditions is provided at Inset 2.

The west boundary is generally defined by the railway line and Coffs Harbour Railway Station. To the north the Precinct borders a culturally significant site known as “Happy Valley”, which has been returned as freehold land to the Coffs Harbour and District Local Aboriginal Land Council (LALC). Gallows and Boambee Beaches are located to the south of the Precinct, where Littoral Rainforest occurs. Coffs Harbour itself, the Pacific Ocean, Muttonbird Island and South Coffs Island (Corambirra Point) form the eastern boundary.

The Precinct is a popular destination for both locals and tourists offering a variety of attractions and amenities. These include Jetty Beach and extensive parklands with biodiversity value, as well as items of heritage significance such as the Coffs Harbour Jetty and Ferguson’s Cottage, owned by the Coffs Harbour LALC. Further, the Coffs Harbour Fisherman’s Co-op, the Coffs Harbour Yacht Club, weekly Sunday markets, and community hub building (recently delivered by PDNSW) are located within the Precinct. Various public works including breakwater and boat ramp upgrades have been undertaken over recent years to support the marina function.

There are redeveloped and well-maintained parts in the area however, much can be done to enhance the Coffs Harbour Jetty Foreshore Precinct. A large portion of the Precinct is currently gravelled, and a large area of residual railway land is fenced off and inaccessible to the public, as shown in Inset 3. While gravelled areas provide informal overflow parking, they do not reflect the potential of this foreshore.

Inset 2: Coffs Harbour Jetty Foreshore Precinct (source: SJB).

Inset 3: Existing State of the Precinct Rail Lands and Gravelled Areas (Source: PDNSW).

4. The Illustrative Masterplan

The planning proposal is supported by an Illustrative Masterplan (Inset 4) that presents a potential development outcome that could be realised at the Coffs Harbour Jetty Foreshore Precinct – it is not prescriptive nor is it determined. The Illustrative Masterplan builds on the shared vision created via extensive community and stakeholder consultation and provides further detail in relation to land use and development outcomes sought for the Precinct.

The Place Principles shown in Inset 5, agreed with the community, guided the formation of the Illustrative Masterplan.

The Illustrative Masterplan is broadly organised across six sub-precincts that will each have a distinct character and function. These are identified as:

1. Foreshore Parklands – with improved amenities, proposed new board walk and nature-based playground.
2. The Marina – An active marina revitalised to accommodate local marine based businesses that reflect their regional importance.
3. North Park – Functional open space with recreational courts and formalised parking.

4. Jetty Hub – A hub of residential and tourist accommodation supporting activation, tourism and regional attraction located adjacent to the current Jetty Walkway, with massing capped at 6 storeys stepping down in scale when closer to public areas.
5. Activity Hub and Village Green – An active village green that delivers increased public open space connected to the existing foreshore parklands and may include family-friendly food and beverage, community uses and club houses or facilities to support events. A local business activity zone connected to the rail station.
6. Corambirra Point – A new regional tourist destination on the site of the former Deep Sea Fishing Club site including publicly accessible cafes and restaurants, a function space, activity centre and tourist accommodation.

A precinct map showing the Illustrative Masterplan and the six distinct zones is provided at Inset 6.

Inset 4: Illustrative Masterplan (Source: SJB).



Gathering place
Become the premier place on the North Coast where all are welcome and feel at home, now and in the future



Seamlessly connected
Tie the city structure and regional networks into the precinct and provide accessibility for all abilities throughout



Sustainable economy
Foster a wider mix of uses that leverage existing industry to create a balance of local employment opportunities and waterfront activation



Resilient environment
Be the exemplar for the North Coast on adapting to climate change by safeguarding existing assets and mitigating future risk



Choice destination
Enhance the precinct as a family friendly collection of local and regional destinations offering an accessible, engaging, safe, comfortable and inclusive environment day and night



Celebrate Country
Ensure opportunities for Gumbaynggirr people to Care for Country and heal Country, with long-term community involvement, cultural activation and education, and protection of significant heritage sites

Inset 5: Community-Led Place Principles.

Inset 6: Sub-Precinct Map (Source: SJB).

5. The Planning Proposal

The master planning of large-scale precincts follows a highly consultative and stepped approach. The current step, which paves the way for the revitalisation of the Coffs Harbour Jetty Foreshore Precinct, is the application for a State Assessed Planning Proposal, which is a legislated process.

PDNSW is lodging a planning proposal with the Department of Planning, Housing and Infrastructure that seeks approval for:

- Changes to permissible land uses
- Changes to permissible maximum building heights
- Planning controls for future State Significant Development Applications including design guidelines and design excellence processes.

This geotechnical investigation report supports this planning proposal.

6. Background

6.1 General

PSM previously completed a desktop study for the proposed precinct (Ref: PSM4842-002L dated 13 September 2023). The desktop study was to inform preliminary site conditions and to identify any initial geotechnical issues to be addressed. The results of the geotechnical investigation included in this report further contribute to the initial

findings of the desktop study with regards to the indicative masterplan and rezoning submission comprising the overarching aim of the report.

The following documents were provided to PSM from the aforementioned study:

- Property and Development NSW, Request for Tender PROC3143 dated 14 July 2022:
  - Part A - Conditions of Tendering
  - Part B - Tender Schedules
  - Part C - The Services.

A revised Masterplan for the proposed development (Ref. NSW Government "*Coffs Jetty Revitalisation Refined Masterplan*" dated December 2022) has been provided since the completion of the desktop study, to assist with the geotechnical investigation described herein.

Based on the provided documents, it is understood that the proposed development at the Site will comprise the following:

- Upgrading of the foreshore parkland area between Jordan Esplanade and the beach
- Construction of multiple, multi-storey residential and commercial buildings with basement car parking
- Re-development of the existing Marina and Fish Co-op
- Multi-storey tourist building at the southern end of the development area
- Realigning and managing of carparking across the precinct, and
- Creation of an accessible connection to the Jetty Foreshore from the city.

7. Geotechnical Investigation

An intrusive geotechnical investigation was undertaken across the proposed Coffs Harbour Jetty Foreshore Precinct and is described in the following sections. The geotechnical investigation was undertaken within the wider masterplan and not restricted to the areas which are to be rezoned.

7.1 Fieldwork

The fieldwork was undertaken between 31 July 2023 and 4 August 2023 and included the following:

- Drilling of six (6) boreholes with a track mounted drill rig, drilling to depths of between 2.5 m and 12.4 m. The drilling works employed rotary auger drilling and was boring techniques in soils and some weathered bedrock and NMLC coring techniques in the underlying bedrock
- Standard penetration tests (SPTs) at regular intervals within the soil units
- Excavation of sixteen (16) test pits with a 5 tonne excavator to depths of between 0.6 m and 2.9 m
- Perth sand penetrometer (PSP) testing adjacent to each test pit.

The fieldwork was conducted under the full-time supervision of a PSM engineer who undertook the following tasks:

- Directing the service locating and investigation locations
- Preparing engineering field logs of material encountered
- Collecting soil samples for laboratory testing documented in Section 7.2
- Conducting point load testing on recovered rock cores
- Photographing recovered rock cores
- Undertaking PSP testing.

Prior to the investigation, the borehole and test pit locations were checked by a certified service locator under the supervision of a PSM geotechnical engineer to detect for the presence of underground services.

Boreholes were drilled to either a pre-determined maximum depth of 12 m as per PSM fee proposal, PSM4842-003L dated 27 April 2023, or terminated at a shallower depth following poor core return indicative of existing rock fill.

Test pits were terminated at a maximum depth of 3.0 m indicative of the machine limit or collapse of the material in the test pit.

Upon completion, each borehole was reinstated by backfilling with cuttings and/or fine gravels and compacted by tamping with hard tools or the excavator bucket.

Figure 1 presents the borehole and test pit locations. The location of the boreholes and test pits was recorded using a hand-held GPS with a horizontal accuracy of approximately ±5 m.

Figures 2 to 7 present some selected site photos.

Appendix A presents the engineering borehole and test pit logs of the materials encountered.

Appendix B presents test pit photographs.

Appendix C presents the results of the point load testing.

Appendix D presents the results of the PSP testing.

7.2 Laboratory Testing

7.2.1 California Bearing Ratio

PSM recovered four (4) bulk soil samples from the test pits for the CBR testing. The following sample preparation was undertaken prior to CBR testing:

- Compact to 98% Standard Maximum Dry Density at optimum moisture content (OMC)
- Four (4) day-soaked sample; and
- 4.5 kg surcharge.

Table 1 presents a summary of the CBR test results. The laboratory test report is included in Appendix E.

Table 1 - CBR Test Results

Sample Location and Depth (m)	Inferred Geotechnical Unit	Soaked CBR (%)	Optimum Moisture Content (%)	Standard Maximum Dry Density (t/m^3)	Swell (%)
TP02 (0.5 - 0.8 m)	CLAY FILL	11	32.0	1.29	0.0
TP04 (0.5 - 0.8 m)	SAND	6[1]	7.2	1.48	1.0
TP09 (1.0 - 1.5 m)	SAND	16	6.3	1.44	1.0
TP16 (0.2 - 0.6 m)	SANDY GRAVEL FILL	25	13.4	1.75	0.5

(1) CBR with 2.5 mm penetration

7.2.2 Aggressivity and Salinity Testing

Eight (8) disturbed soil samples were retrieved for aggressivity and salinity testing in an analytical laboratory. Sampling locations are summarised in Table 2. The following tests were undertaken:

- Cation Exchange Capacity (CEC) of calcium, magnesium, potassium and sodium
- Exchange sodium percentage
- Salinity (EC 1:5, one part soil to five parts water)
- Soil pH
- Chlorides
- Sulphates
- Resistivity.

Table 2 presents a summary of the results. The laboratory test report is presented in Appendix F.

Table 2 - Summary of Aggressivity and Salinity Testing Results

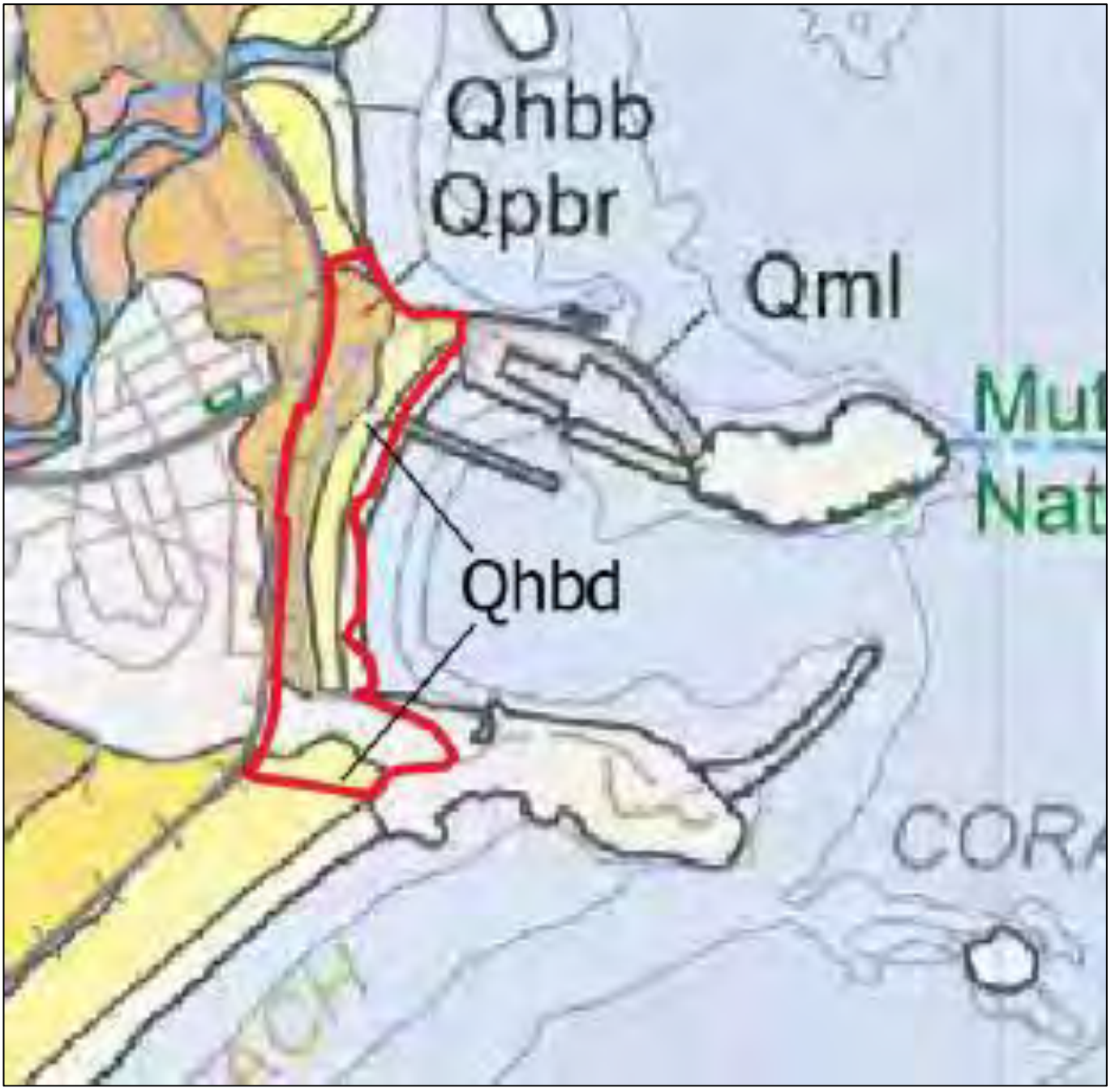
Sample ID (Depth)	Exchangeable Cations [meq/100g]					Exchange Sodium [%]	pH	Electrical Conductivity [µS/cm]	Sulfate [mg/kg]	Chloride [mg/kg]	Resistivity [ohm cm]
	Ca	Mg	K	Na	CEC						
TP01 (1.0 m)	1.6	<0.2	<0.2	<0.2	1.6	<0.2	7.8	27	<10	<10	37000
TP04 (0.5 m)	0.5	<0.2	<0.2	<0.2	0.5	<0.2	8.9	42	<10	<10	23800
TP06 (1.0 m)	1.5	<0.2	<0.2	<0.2	1.5	<0.2	7.7	119	<10	<10	8400
TP09 (0.3 m)	2.9	<0.2	<0.2	<0.2	2.9	<0.2	7.8	65	<10	<10	15400
TP10 (0.8 m)	0.7	<0.2	<0.2	<0.2	0.7	<0.2	9.0	54	<10	<10	18500
TP12 (1.0 m)	2.8	<0.2	<0.2	<0.2	2.8	<0.2	7.8	58	<10	20	17200
TP14 (0.5 m)	0.4	<0.1	<0.1	<0.1	0.4	3.4	7.0	8	<10	<10	125000
TP16 (1.0 m)	2.2	<0.2	<0.2	<0.2	2.2	<0.2	7.5	28	<10	<10	35700

8. Site Conditions

8.1 Geological Setting

As discussed in the desktop study previously undertaken by PSM and reproduced below, the Coffs Harbour 1:100,000 Coastal Quaternary Geology Map (2007), shown in Inset 7, indicates that the Site is underlain by:

- Pleistocene Sediments *(Qpbr)*, comprising of marine sand, indurated sand and gravel, and
- Holocene Sediments *(Qhbb & Qhbd)*, comprising of marine sand, shells and gravel.



Inset 7: **Snippet of the Coffs Harbour Geological Map.**

(1:100,000) (approximate site extent in red)

A further reference to the Dorrigo-Coffs Harbour 1:250,000 Geological map (1971) indicates that the Site is underlain by:

- Quarternary sediments *(Qs)* comprising beach and dune sand, and
- Rocks of the Brooklana Formation *(Cb)* comprising siliceous argillite, slate and rare siliceous greywacke.

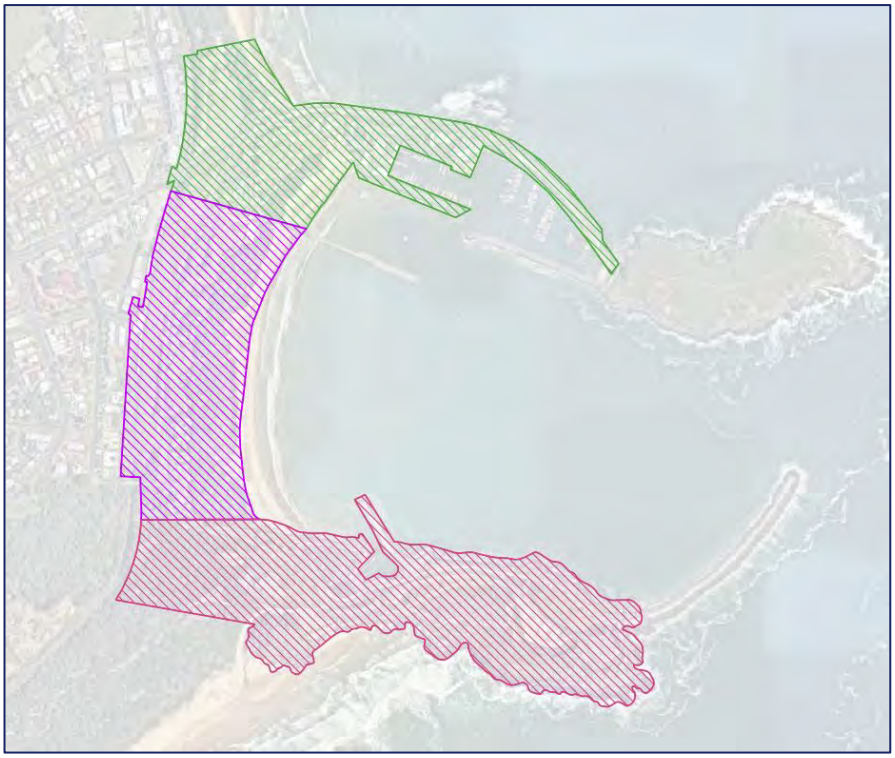
8.2 Surface Conditions

The Site currently serves as the foreshore to Jetty Beach located on the eastern boundary of the Site. A railway line is located along the western extent of the proposed development area.

The Site can be sectioned into three distinct portions, namely the northern, central and southern areas. Inset 8 presents the approximate extent of the portions of the site to be described. Each area is discussed below:

- The northern portion of the site consists of a large open-air carpark and a developed area with restaurants and boat clubs. The remainder and minor portion of the northern section consists of parkland. It is understood by PSM, based on anecdotal information from locals, that the open-air carpark previously consisted of an old timber mill with an accompanying rail line assisting in the movement of lumber.
- The central section of the site encompasses a strip of parkland in a north to south orientation. This section of the site has Jordan Esplanade in the centre of the section with parks and recreation areas to the east. The rail corridor and sparsely vegetated areas cover the western section. There are minor built structures located within this section i.e., public toilets, barbeque pits and playgrounds. It is noted that the topography within the grassed area tends to be undulating with distinct mounds observed throughout the area.
- The southern section of the site is noted to currently be undergoing road works to upgrade thoroughfare within the section of the site. The restaurant, Jetty Beach House, is located at a significantly higher elevation to the surrounding area which consists of an unsealed carpark and a boat ramp. It is noted that there is a rock outcrop present within the area.

In general, the topography is relatively flat with the site sloping gently eastwards towards the ocean. The majority of the site consists of parks with some sealed areas integrated into the existing landform. It is noted that topography changes are more exaggerated towards the southern end of the site.



Inset 8: Surface Condition Zoning.

8.3 Inferred Subsurface Conditions

8.3.1 Historical Photos

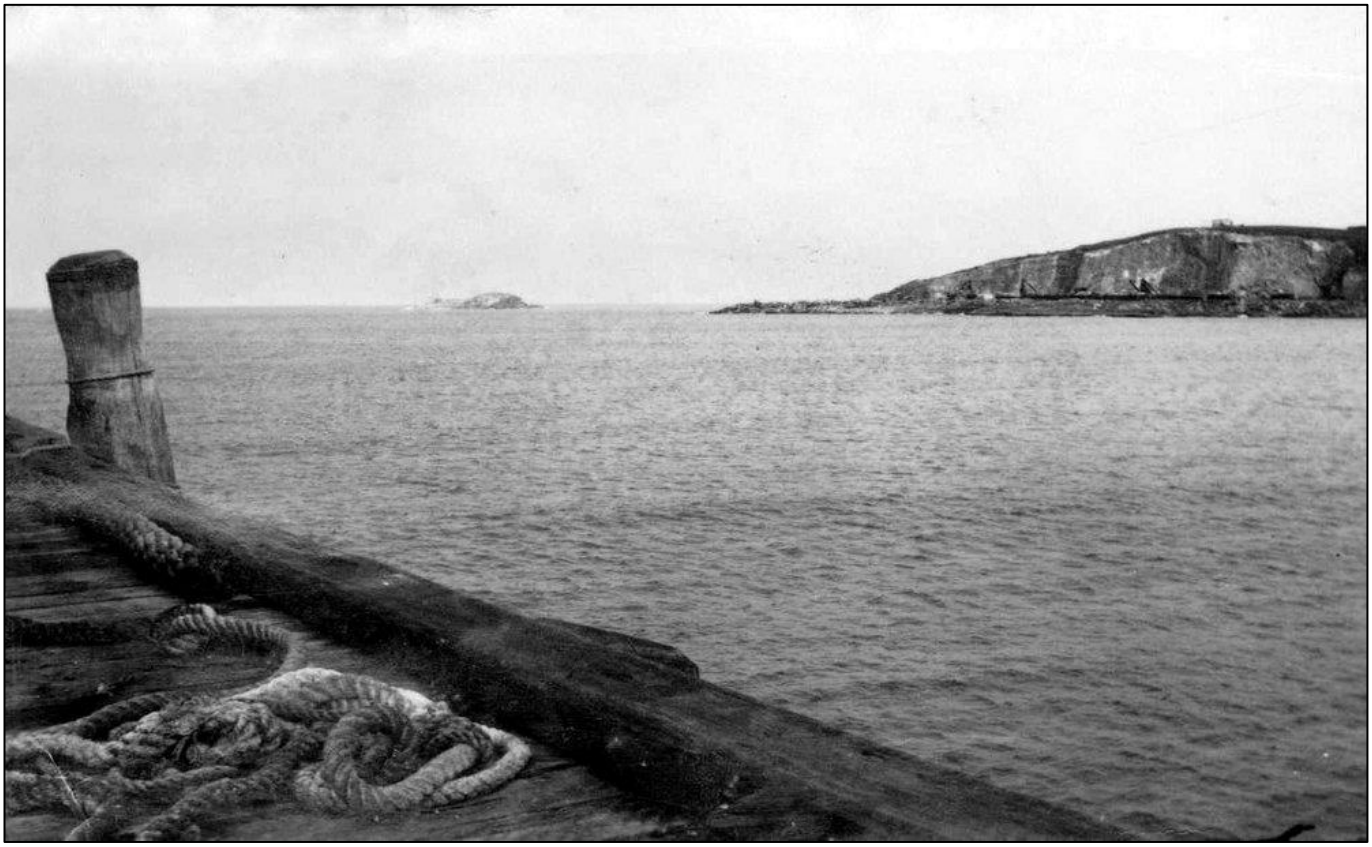
Based on publicly available historical information and anecdotal information from Coffs Harbour locals, PSM understands that the southern section of the Site was previously a quarry which has since ceased operations. A timber mill was also located at the northern end of the foreshore.

We have reviewed available aerial photos of the Site, though it is noted that aerial imagery prior to 1979 was not found. Appendix G presents the aerial images.

Based on the historical photos and publicly available historical archives, we note:

- The quarry originally began operations on South Coffs Island, now called Corambirra Point, in the early 1900's.
- In 1913 construction began to connect South Coffs Island to the mainland and establish a breakwall to the east of the island.
- The extent of the backfilling operation is not clear, however, it is anticipated that the south-eastern extent of the proposed development area around the existing Deep Sea Fishing Club is likely to comprise a significant volume of backfill material including Argillite and Siltstone boulders, cobbles and gravel.
- The overall development Site has remained largely untouched since the late 1970's.

Inset 9 below shows a photograph of the old quarry taken from the Coffs Harbour jetty, though the date of the photograph is not known.



Inset 9: Historic Photograph Taken from the Jetty Towards the Old Quarry.

(Sourced from Coffs Collections website https://coffs.recollect.net.au/nodes/view/69566 on 31 August 2023)

8.3.2 PSM Test Pits and Boreholes – July and August 2023

The subsurface conditions encountered within the boreholes and test pits are summarised in Table 3. We note that the test pits and boreholes are at discrete locations only so some variability can be expected e.g. localised fill, depths to rock and soil characteristics.

Table 4 presents the inferred reduced level (RL) to the top of the inferred geotechnical units encountered. Elevations at the location of the boreholes and test pits has been estimated using publicly available digital elevation mapping (DEM) data, and not a detailed survey. As such, the elevations shown in Table 4 are indicative only.

The encountered subsurface conditions were generally consistent with the published information and other geotechnical investigations completed in the vicinity.

Table 3 - Summary of Inferred Geotechnical Units Encountered in Boreholes and Test Pits

Unit Name	Approximate Depth to the Top of Unit (m)	Description
TOPSOIL	0	Silty SAND to Silty SAND with gravel; brown to dark brown, fine to coarse grained, gravel is sub-angular to angular up to 50 mm, with organics Silty CLAY to Silty CLAY with gravel; dark brown, low to medium plasticity, gravel is angular up to 10 mm, trace organics Clayey SAND with silt; dark brown, coarse grained, clay is low plasticity, with organics
FILL	0 - 0.2	SAND trace clay to SAND with clay trace gravel; dark brown, medium grained, clay is low plasticity, gravel is angular up to 30 mm Sandy GRAVEL/ Gravelly SAND to GRAVEL with cobbles; brown and grey, sand is fine to medium grained, gravel is angular to sub-angular up to 100 mm CLAY to CLAY with sand; brown and orange, medium to high plasticity, sand is coarse grained Clayey GRAVEL/ Gravelly CLAY; orange and grey, clay is low to medium plasticity, gravel is sub-angular to sub-rounded up to 100 mm
NATURAL SAND	0.2 - 2.0	SAND to SAND with gravel: yellow to yellow and brown, coarse grained, gravel is sub-angular up to 30 mm, minor bands of medium plasticity clay, inferred medium dense to dense
NATURAL CLAY	6.0 - 7.9	CLAY: grey mottled red to grey and brown, high plasticity
BEDROCK	6.3 - 11.9	ARGILLITE (metamorphous siltstone): grey, red and brown, highly weathered to moderately weathered, medium strength, iron stained, highly fractured SILTSTONE: grey, moderately weathered, medium strength

Table 4 - RL's to the Top of Inferred Geotechnical Units Encountered in Boreholes and Test Pits

ID	Approximate Reduced Level (RL) to Top of Unit (m AHD)					
	TOPSOIL	FILL	NATURAL SAND	NATURAL CLAY	BEDROCK	EOH
BH01	2.4	2.0	1.8	NE	-6.9	-8.8
BH02	5.7	5.5	3.7	-0.3	-0.6	-6.2
BH03	5.3	5.1	4.5	-2.6	NE	-7.1
BH04	4.3	4.1	2.5	-1.7	-7.6	-8.1
BH05	NE	7.7	NE	NE	NE	3.1
BH06	NE	8.1	NE	NE	NE	5.6
TP01	NE	5.7	5.3	NE	NE	3.2
TP02	NE	5.2	3.2	NE	NE	2.5
TP03	5.6	5.5	5.1	NE	NE	2.7
TP04	6.0	5.9	5.4	NE	NE	3.7
TP05	3.6	3.5	2.3	NE	NE	0.8
TP06	3.0	2.9	2.0	NE	NE	0.6
TP07	4.8	4.7	4.3	NE	NE	2.2
TP08	2.8	2.7	2.5	NE	NE	0.5
TP09	4.4	4.3	4.0	NE	NE	1.8
TP10	3.1	3.0	2.6	NE	NE	0.6
TP11	4.1	4.0	NE	NE	NE	3.5
TP12	4.8	4.6	3.1	NE	NE	3.0
TP13	4.5	4.3	3.4	NE	NE	2.1
TP14	14.7	14.7	14.5	NE	NE	11.8
TP15	7.9	7.7	NE	NE	NE	5.2
TP16	8.6	8.4	NE	NE	NE	5.6

(1) RLs estimated from Elevation Foundation Spatial Data (ELVIS), 1 metre Resolution Digital Elevation Model
(2) EOH = End of Hole
(3) NE = Not Encountered

8.4 Groundwater

Groundwater was unable to be observed in the boreholes due to the drilling methodology adopted i.e. wash boring. Groundwater was observed in the following test pits and depths:

- TP05 at 1.8 m
- TP06 at 1.7 m
- TP08 at 1.8 m
- TP10 at 2.3 m.

No long-term groundwater monitoring was undertaken for the site. It is noted that groundwater levels can be affected by such things as weather conditions and soil permeability and as a result can vary over time. Groundwater was encountered in the above test pits at around RL 1 m. Our expectation is that groundwater would be located between RL 0 m and RL 2 m and rise further from the beach, and will also be heavily influenced by ocean tidal levels

9. Salinity and Aggressivity/Corrosivity Assessment

9.1 Soil Chemistry

The salinity and aggressivity test results summarised in Table 2 indicate the following:

- pH of the soil samples analysed to be in the range of 7.0 to 9.0
- Concentrations of chlorides in samples analysed to be in the range <10 mg/kg to 20 mg/kg
- Concentrations of sulphates in samples analysed to be <10 mg/kg
- The 1:5 soil to water extraction and subsequent electrical conductivity ($EC_{1:5}$) of the soil samples analysed to be in the range of 8 µS/cm to 119 µS/cm
- Cation Exchange Capacity (CEC) in samples analysed to be in the range 0.4 meq/100g to 2.9 meq/100g
- Exchange Sodium Percentage (ESP) in samples analysed to be in the range of <0.2% to 3.4%
- Resistivity to be in the range of 8400 ohm.cm to 125000 ohm.cm.

9.2 Salinity

Site investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (EC_e). The method of conversion from $EC_{1:5}$ to EC_e (electrical conductivity of saturated extract) is based on DLWC (2002) and given by $EC_e = EC_{1:5} \times M$, where M is the multiplication factor based on "Soil Texture Group".

The "Soil Texture Group" of the samples tested were assessed during our investigation. The salinity classification for the soil samples that were tested are presented in Table 5.

Table 5 - Salinity Classification

Sample ID	$EC_{1:5}$ (dS/m)	Soil Type	M	EC_e (dS/m)	Salinity Class
TP01 (1.0 m)	0.027	Sand	17	0.459	Non-saline
TP04 (0.5 m)	0.042	Sand (Fill)	17	0.714	Non-saline
TP06 (1.0 m)	0.119	Sand	17	2.023	Slightly-saline
TP09 (0.3 m)	0.065	Light Medium Clay (Fill)	8	0.520	Non-saline
TP10 (0.8 m)	0.054	Sand	17	0.918	Non-saline
TP12 (1.0 m)	0.058	Sand (Fill)	17	0.986	Non-saline
TP14 (0.5 m)	0.008	Sand	17	0.136	Non-saline
TP16 (1.0 m)	0.028	Sand (Fill)	17	0.476	Non-saline

It is assessed that the soils on site are typically classified as "Slightly-saline" to "Non-saline". It is noted that the soil samples were taken from the in-situ natural soils and fill materials located above the groundwater.

9.3 Corrosivity / Aggressivity

Table 4.8.1 and Clause 4.8.2 of AS3600 (2018) '*Concrete Structures'* provides criteria for exposure classification for concrete in sulphate soils and saline soils based on sulphates in soil and groundwater, soil electrical conductivity (EC_e) and pH of soil. On the basis of the sulphate and pH testing completed, we assess the exposure classification for concrete in sulphate soils above the tidal zone (i.e. up to 1 m above the highest astronomical tide) or splash zone to be "A2".

Testing of groundwater was not undertaken at the time of the investigation, however, given the proximity of the development area to the ocean, it is anticipated that groundwater comprises highly saline sea water. As per Table 4.3 of AS3600 (2018) the exposure classification for concrete structures located within the tidal/splash zone is C2.

Similarly, Table 6.4.2(C) of Australian Standard AS2159 (2009) '*Piling - Design and Installation*', provides criteria for exposure classification for concrete piles based on sulphates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. On the basis of the soil sulphates, pH testing completed and assumption of disturbed soil, we assess the exposure classification for concrete piles in the soil to be "Mild".

Table 6.4.2(A) of AS2159 (2009) indicates that the exposure classification for concrete piles within the tidal/splash zone of sea water is "Severe".

Table 6.5.2(C) of the Australian Standard AS2159-2009, *'Piling - Design and Installation'*, provides criteria for exposure classification for steel piles based on resistivity, soil and groundwater pH, and chlorides in soil and groundwater. On the basis of the pH, chloride, resistivity testing completed and assumption of disturbed soil, we assess the exposure classification for steel piles in the soil above the tidal zone to be "Non-aggressive".

Table 6.5.2(A) of AS2159 (2009) indicates that the exposure classification for concrete piles within the tidal/splash zone of tropical/subtropical sea water (north of 30° South) is "Very Severe".

9.4 Sodicity

Sodicity provides a measure of the likely dispersion on wetting and to shrink/swell properties of a soil. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from these laboratory results, ranging from <0.2% to 3.4%, indicates that the soils are "Non-sodic" when compared to the criteria listed in "Site Investigations for Urban Salinity", (DLWC, 2002).

10. Discussion

10.1 General

We note that structural engineering drawings for specific structures have not been received for the proposed development. The design advice provided in the following sections has been prepared on the details specified in Section 6 i.e. proposed construction of multiple, multi-storey residential and commercial buildings with basement car parking, construction of on-grade car parks and upgrading of existing parklands.

The engineering parameters provided below are for preliminary planning and design of development works. Additional intrusive investigation should be undertaken at specific locations for the proposed built structures to confirm or revise the provided parameters.

10.2 Excavation Conditions

Based on the results of the geotechnical investigation, it is anticipated that any excavation will include TOPSOIL/FILL and NATURAL SAND soil units. Excavation in soil should be achievable using conventional earth moving equipment (e.g., excavators and dozers). Though considered highly unlikely, excavation of the medium to high strength BEDROCK may require the use of hydraulic impact breakers, rock saws and/or rock grinders, if encountered.

Prospective contractors should make their own assessment of excavatability based on our logs and their experience. It is our experience that excavatability is heavily dependent on both the operator and the plant used.

10.3 Permanent and Temporary Batters

The batter slope angles shown in Table 6 are recommended for the design of batters up to 2 m height and above the groundwater table, subject to the following controls:

1. The batters shall be protected from erosion.
2. Permanent batters shall be drained.
3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
4. Where loads are imposed or structures/services are located within on batter height of the crest of the batter, further advice should be sought.

Table 6 – Design Batter Slope Angles

Unit	Temporary	Permanent
TOPSOIL/FILL	2.5H: 1V	3H: 1V
NATURAL SAND	2H: 1V	2.5H: 1V

Steeper batters may be possible subject to further advice, typically involving inspection during construction.

The batters should be inspected by an experience geotechnical engineer or engineering geologist during excavation to confirm the batter advice provided and assess the need for localised support.

10.4 Excavation Support

Cuts in the TOPSOIL/FILL and NATURAL SAND units steeper than the recommended permanent batter slopes in Table 6 will need to be supported by some form of retaining structure or ground reinforcements.

The selection of the appropriate retention system is a matter of design. The designer should consider the following factors in making its selection:

- Technical factors:
  - Performance
  - Ground conditions (this is addressed below with the design parameters)
  - Surcharge loading and
  - Proximity of structures, buildings and roads, etc.
- Non- technical factors:
  - Cost (to build and to maintain)
  - Other constraints such as real estate, neighbouring site/boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following:

- Proposed wall geometry
- Effective soil strength parameters in Table 7
- Water pressure (depending on the type of structure).

Note that design of retention systems may be based on either K_a or K_o earth pressures. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on K_o pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for K_o pressures do not, of themselves, ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Both surface and sub-surface drainage needs to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

If relying on a passive support from embedment of piles into the BEDROCK unit (e.g., a cantilevered piled wall or propped or anchored piled wall), the designer shall ignore the support provided in the upper 0.5 m of embedment and can adopt a lateral resistance of one third of the allowable bearing pressure (ABP) in Table 7.

Table 7 - Engineering Parameters of Inferred Geotechnical Units

Inferred Unit	Bulk Unit Weight (kN/m3)	Soil Effective Strength Parameters		Ultimate Bearing Pressure under Vertical Centric Loading[2] (kPa)	Allowable Bearing Pressure (ABP) under Vertical Centric Loading[3] (kPa)	Ultimate Shaft Adhesion (kPa)	Elastic Parameters	
		c' (kPa)	φ' (deg)				Long Term Youngs Modulus (MPa)	Poisson's Ratio
TOPSOIL/FILL	18	0	28	N/A	N/A	N/A	8	0.3
NATURAL SAND	18	0	30	420	150[1]	N/A	30	0.3
NATURAL CLAY	18	0	30	420	150[1]	N/A	10	0.3
BEDROCK	22	N/A	N/A	6000	1500	350	200	0.2

(1) Pad Footings (for ABP of 150 kPa) should have a minimum horizontal dimension of 1 m and a minimum embedment depth of 0.5 m
(2) Ultimate values occur at large settlement (>5% of minimum footing)
(3) ABP is an end bearing pressure to cause settlement of <1% of minimum footing.

As discussed in Section 6.1, the engineering parameters provided in Table 7 are for preliminary planning and design purposes and additional intrusive investigation should be undertaken for specific built structures to confirm the engineering parameters for detailed design.

10.5 Foundations

10.5.1 Pad Footings

It is anticipated that the proposed multi-storey buildings will be supported on pile footings within the NATURAL SAND, NATURAL CLAY or BEDROCK unit. However, lightweight structures could be supported by pad footings founded on or within the NATURAL SAND and NATURAL CLAY unit below the FILL.

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 7. Further advice should be sought if the footings are located adjacent to a batter or wall.

We note that an allowable bearing pressure (ABP) is not a soil property. It depends on many factors such as the size of the footings, the embedment depth, the load direction and eccentricity, the stiffness of the footing, the adopted factor of safety (FOS), as well as the soil properties. As footings get bigger or deeper the capacity increases rapidly, and as the load gains eccentricity or becomes inclined, the capacity reduces rapidly.

Settlements in the NATURAL SAND and NATURAL CLAY units can be estimated using the elastic moduli provided in Table 7. When assessing the settlement of the shallow footings, the designer needs to consider the additional ground settlement due to the total building load on both shallow and deeper units.

The differential settlement due to the building load shall also be assessed.

Foundation conditions at the proposed shallow pad footing locations should be inspected by a suitably qualified geotechnical engineer prior to the pouring of concrete.

Where footings are located within the zone of influence of an existing batter or retaining wall, the bearing capacity may need to be reduced and further advice should be sought. The zone of influence is defined as the zone above a 2H:1V line extending from the toe of the batter or the toe of the retaining wall.

10.5.2 Piles on Bedrock

Piles should be designed in accordance with the requirements in AS 2159 (2009) '*Piling - Design and Installation*'. The parameters provided in Table 7 may be adopted in the design of piles found within the BEDROCK unit. It is considered that continuous flight auger (CFA) piles would be an appropriate piling methodology given the subsurface sand materials and shallow groundwater.

The designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer through pile inspections prior to pouring concrete. Where the installation method does not allow confirmation of founding conditions, additional drilling or adopting a lower ABP may be required.
- Deflection should be checked using the recommended elastic parameters in Table 7.
- Where adjacent foundation details differ (e.g., pile and pad, differing loads or ground conditions), differential settlement should also be assessed.

With regards to the pile design, we recommend that:

- A basic geotechnical strength reduction factor, Φ_{gb} = 0.60 (AS2159 CL. 4.3.2) be adopted for a high redundancy system for an assessed average risk rating (ARR) between 2.5 and 3.0. This should be reviewed to suit the specific design and appropriate pile testing proposed by the structural/pile designers in accordance with the requirements of AS2159.

  We note that according to AS2159 cl. 8.2.4(c), the following pile testing requirements are given:

  – Serviceability: 1% of piles to be tested for ARR 2.5-2.99 (Table 8.2.4(A))

  – Pile shaft integrity: level of testing to be nominated by designer.
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc.
- If a geotechnical strength reduction factor, Φg = 0.40 is adopted then no pile testing will be required (AS2159 Clause 8.2.4 (b)).

Any structural settlement due to shortening (or extension) of the footing element itself should be considered.

Where the founding or loading conditions between footings vary, consideration should be given to the effects of differential settlements.

10.5.3 Floating Piles

Piles founded within the NATURAL SAND or NATURAL CLAY units (floating piles) may also be considered for the proposed built structures though additional intrusive investigation involving cone penetration tests (CPTs) should be undertaken to confirm engineering parameters of the NATURAL SAND and NATURAL CLAY for detailed design.

CPTs involve continuously pushing a cone with friction sleeve attachment attached to metal rods into the ground through a hydraulic ram attached to a truck. The resistance to penetration and friction are measured and plotted over a continuous depth to assist with detailed pile design in soil units. CPTs will terminate on bedrock.

The CPT data will allow detailed design of piles founded in the NATURAL SAND or NATURAL CLAY.

If this option is considered, advice from a specialist pile contractor shall be sought, as the ultimate bearing capacity and pile settlements will depend on pile type, installation method, verification method etc.

For preliminary design and planning purposes, the following engineering parameters can be used:

- Ultimate pile capacity of 1,100 kN for a 0.6 m diameter bored pile founded 6 m into at least medium dense NATURAL SAND
- Ultimate pile capacity 850 kN for a 0.6 m diameter bored pile founded 4 m into very stiff NATURAL CLAY.

Where floating piles are founded in the NATURAL SAND unit, the effect of the underlying NATURAL CLAY unit on pile capacity and settlements shall be considered.

10.6 Pavements

Four (4) CBR tests were undertaken on samples collected from TP02, TP04, TP09 and TP16.

Subgrade CBR for pavement design depends on the material at the finished subgrade levels. The CBR test undertaken by PSM (refer to Table 1) indicates a CBR value of between 6% and 25%.

Given the results of the CBR testing we consider that a design CBR of 6% can be adopted, subject to specific CBR testing being undertaken at subgrade level when pavement layouts are finalised. This is particularly important where imported clay fill is used as the subgrade material.

11. General

The geotechnical investigation described above presents a broad overview of the geotechnical conditions for the proposed development works within the Coffs Harbour Jetty Foreshore Precinct. Further geotechnical investigation is recommended as each specific building design is developed and would likely include CPTs and boreholes within the specific building footprint, though this would be informed by the proposed development.

Advice for site preparation works, including earthworks specifications if required, can also be provided following development of building designs.

Should there be any queries, please do not hesitate to contact the undersigned.

Yours Sincerely

KEN TONG LEE
GEOTECHNICAL ENGINEER

WILLIAM PIPER
ASSOCIATE GEOTECHNICAL ENGINEER

DAVID PICCOLO
PRINCIPAL

Encl.

Figure 1	Site Locality Plan
Figure 2	Selected Site Photographs (1 of 6)
Figure 3	Selected Site Photographs (2 of 6)
Figure 4	Selected Site Photographs (3 of 6)
Figure 5	Selected Site Photographs (4 of 6)
Figure 6	Selected Site Photographs (5 of 6)
Figure 7	Selected Site Photographs (6 of 6)
Appendix A	Engineering Logs
Appendix B	Test Pit Photos
Appendix C	Point Load Testing
Appendix D	PSP Testing
Appendix E	CBR Results
Appendix F	Aggressivity and Salinity Testing
Appendix G	Historical Aerial Photographs

Brisbane

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+61 7 3220 8300

Sydney

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North Ryde NSW 2113
+61 2 9812 5000

Melbourne

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Geelong VIC 3220
+61 3 7068 5699

Perth

Level 3 22 Delhi Street
West Perth WA 6005
+61 8 9462 8400

513017 513267 513517 513767 514017

6647890 6647640 6647390 6647140 6646890 6646640

TP01 TP02 TP03 TP04 TP05 TP06 TP07 TP08 TP09 TP10 TP11 TP12 TP13 TP14 TP15 TP16

BH01 BH02 BH03 BH04 BH05 BH06

Legend

- Approximate Site Extent
- Borehole
- Test Pit

Notes

1. Aerial imagery sourced from Nearmap.com dated 26 February 2023.

Scale 1:4,000

N

0 25 50 75 100 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

P S M

Created By:	Revision:
PSM	A
Date:	Paper Size:
28 Aug 2023	A3

JBSG
Coffs Harbour Revitalisation
Coffs Harbour Jetty and Foreshore

SITE LOCALITY PLAN

PSM4842-007R

FIGURE 1

Photo 1: General site conditions looking south from TP01

Photo 2: General site conditions looking south from TP16

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

SELECTED SITE PHOTOGRAPHS (1 OF 6)

31 JULY TO 4 AUGUST 2023

PSM4842-007R	Figure 2

Photo 3: Exposed rock outcrop at southern boundary of the Site

Photo 4: Shell fragment observed within NATURAL unit

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

SELECTED SITE PHOTOGRAPHS (2 OF 6)

31 JULY TO 4 AUGUST 2023

PSM4842-007R	Figure 3

Photo 5: Typical fill unit

Photo 6: Typical natural unit

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

SELECTED SITE PHOTOGRAPHS (3 OF 6)

31 JULY TO 4 AUGUST 2023

PSM4842-007R	Figure 4

Photo 7: Typical bedrock unit

Photo 8: Excavator utilised

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

SELECTED SITE PHOTOGRAPHS (4 OF 6)

31 JULY TO 4 AUGUST 2023

PSM4842-007R	Figure 5

Photo 9: Drill Rig utilised

Photo 10: General site conditions looking north west from TP06

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

SELECTED SITE PHOTOGRAPHS (5 OF 6)

31 JULY TO 4 AUGUST 2023

PSM4842-007R	Figure 6

Photo 11: General site conditions looking south from TP07

Photo 12: Encountered deleterious materials from TP12

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

SELECTED SITE PHOTOGRAPHS (6 OF 6)

31 JULY TO 4 AUGUST 2023

PSM4842-007R	Figure 7

Appendix A
Engineering Logs

Borehole ID

BH01

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	01/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513636 m E 6647676 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		SPT 0.50-0.95 m 4,7,7 N=14			0			TOPSOIL; Silty SAND: brown, fine to medium grained	M			
										SAND trace clay: dark brown, medium grained, clay is low plasticity	M			0.40: INFERRED FILL
										SAND: red and brown, fine to medium grained				0.60: INFERRED NATURAL
							1			Becomes brown only.	M to W			
WB		C		SPT 1.50-1.95 m 4,6,7 N=13								MD to D		
				SPT 3.00-3.45 m 7,13,17 N=30			2							
							3			SAND: grey, coarse grained				
				SPT 4.50-4.95 m 7,10,14 N=24			4					MD		

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	01/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513636 m E 6647676 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
WB		C					6 7 8 9			SAND: grey, coarse grained *(continued)*		MD		
										Continued on cored borehole sheet				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	01/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513636 m E 6647676 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting: Comacchio Geo 205 Inclination: -90° RL Surface: No survey
Barrel Type and Length: Bearing: Datum: AHD Operator: Mulligan Geotechnical

Drilling Information							Rock Substance						Rock Mass Defects	
Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						6						
						7						
						8						
						9		Continued from non-cored borehole sheet				
NMLC	90% Water RETURN	31	0					ARGILLITE: grey, highly weathered, medium strength, highly fractured				CZ, RF CZ, RF JT, 68°, RF, PR, RF CZ, RF
								CORE LOSS: 0.81 m				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH01

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	01/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513636 m E 6647676 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting: Comacchio Geo 205 | Inclination: -90° | RL Surface: No survey
Barrel Type and Length: | Bearing: | Datum: AHD | Operator: Mulligan Geotechnical

Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Graphic Log	Material Description (ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration)	Weathering (XW HW MW SW FR)	Strength Is(50) (● - Axial, ○ - Diametral) (VL 0.1 L 0.3 M 1 H 3 VH 10 EH)	Defect Spacing (mm) (<20 60 200 600 1000)	Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)
NMLC	90% Water RETURN	31	0				Core loss	CORE LOSS: 0.81 m *(continued)*				
NMLC	90% Water RETURN	100	0			11	Argillite	ARGILLITE: grey, highly to moderately weathered, medium strength, highly fractured	HW–MW	M	<20–60	CZ, RF CZ, RF
						12, 13, 14		Hole Terminated at 11.23 m Target depth, borehole backfilled with excavated spoil				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

CORE PHOTOS BH01

(Core Photo 1 OF 1)

PSM4842-007R	Appendix A

Borehole ID

BH02

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	31/07/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513418 m E 6647628 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N								TOPSOIL: Silty SAND; dark brown, fine grained	M			
										Sandy GRAVEL: grey, gravel is angular up to 50 mm, sand is fine grained				0.20: INFERRED FILL
							1			SAND with gravel: brown, fine to medium grained, gravel is angular up to 30 mm	M			
				SPT 1.50-1.95 m 1,1,2 N=3						SAND: brown, fine to medium grained	M			
WB		N					2			SAND: brown and grey, medium to coarse grained		MD to D		2.00: INFERRED NATURAL
				SPT 3.00-3.45 m 6,8,8 N=16			3							
				SPT 4.50-4.95 m 11,18,22 N=40			4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	31/07/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513418 m E 6647628 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
WB		N					6			SAND: brown and grey, medium to coarse grained *(continued)*		MD to D		
										CLAY with gravel: grey, gravel is sub-angular up to 20 mm (possibly extremely weathered ARGILLITE)				
										Continued on cored borehole sheet				
							7							
							8							
							9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID
BH02
Page 3 of 4

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	31/07/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513418 m E 6647628 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Barrel Type and Length:		Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information | **Rock Substance** | **Rock Mass Defects**

Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Material Description (ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration)	Weathering (XW HW MW SW FR)	Strength Is(50) (● - Axial, ○ - Diametral; VL 0.1 L 0.3 M 1 H 3 VH 10 EH)	Defect Spacing (mm) (<20 60 200 600 1000)	Defect Descriptions / Comments (Description, alpha/beta, infilling or coating, shape, roughness, thickness, other)
						6	Continued from non-cored borehole sheet				CZ, RF
NMLC	90% Water RETURN	90	0	Is(50) d=1.24 a=0.43 MPa		7	ARGILLITE: grey and red, highly weathered, medium strength, ironstained	HW	M		CZ, RF JT, 20°, CN, PR, S BP, 2°, CN, ST, S CZ, RF JT, 55°, CN, CU, S JT, 10°, CN, PR, S CZ, RF JT, 30°, RF, PR, RF BP, 2°, CN, IR, RF
							CORE LOSS: 0.10 m				
		100	75	Is(50) d=2.32 a=0.43 MPa		8	ARGILLITE: grey and red, highly weathered, medium, ironstained	HW	M		BP, 10°, CN, PR, S BP, 9°, CN, PR, S BP, 9°, CN, IR, RF JT, 2°, CN, CU, S JT, 26°, RF, CU, S BP, 2°, CN, CU, S CZ, RF SM, CL JT, 44°, CN, PR, RF BP, 3°, RF, PR, RF JT, 11°, CN, ST, RF JT, 11°, CN, ST, RF JT, 13°, CN, ST, S JT, 13°, CN, ST, S JT, 25°, RF, ST, RF JT, 43°, CN, CU, RF JT, 11°, CN, CU, RF
		100	41	Is(50) d=1.16 MPa Is(50) d=2.04 a=0.49 MPa		9					JT, 11°, CN, CU, RF CZ, RF JT, 70°, CN, CU, S BP, 3°, CN, CU, RF JT, 14°, CN, IR, S JT, 32°, RF, PR, S JT, 13°, CN, PR, RF JT, 7°, CN, RF, RF JT, 20°, CN, RF, RF JT, 20°, CN, RF, RF JT, 11°, CN, RF, RF

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	31/07/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513418 m E 6647628 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting: Comacchio Geo 205 Inclination: -90° RL Surface: No survey
Barrel Type and Length: Bearing: Datum: AHD Operator: Mulligan Geotechnical

Drilling Information							Rock Substance					Rock Mass Defects	
Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
NMLC	90% Water RETURN	100	41					ARGILLITE: grey and red, highly weathered, medium strength, ironstained *(continued)*				JT, 80°, CN, CU, RF JT, 30°, CN, PR, RF CZ, RF
		100	65	Is(50) d=1.32 a=0.5 MPa		11		ARGILLITE: grey and brown, moderately weathered, medium strength				CZ, RF BP, 2°, CN, PR, RF JT, 6°, CN, ST, RF JT, 23°, CN, PR, RF JT, 23°, CN, PR, RF JT, 26°, CN, PR, RF JT, 61°, RF, PR, RF CZ, RF BP, 2°, CN, IR, RF JT, 28°, CN, PR, RF JT, 10°, CN, UN, RF SM, CL JT, 13°, CN, PR, RF
				Is(50) d=1.12 a=0.42 MPa		12		Hole Terminated at 11.90 m Target depth, borehole backfilled with excavated spoil				
						13						
						14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

CORE PHOTOS BH02

(Core Photo 1 OF 1)

PSM4842-007R	**Appendix A**

Borehole ID

BH03

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	02/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	02/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513356 m E 6647379 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		SPT 0.50-0.95 m 5,8,6 N=14			1			TOPSOIL: Silty SAND with gravel: brown, fine to medium grained, gravel is sub-angular up to 60 mm	D to M			0.20: INFERRED FILL
										Sandy GRAVEL: grey to dark grey, angular gravel up to 60 mm, sand is medium grained	M			
										SAND with gravel: brown and yellow, coarse grained, gravel is angular up to 20 mm	D			
										SAND: brown and yellow, coarse grained				0.80: INFERRED NATURAL
WB		C		SPT 1.50-1.95 m 4,5,7 N=12			2					MD to D		
				SPT 3.00-3.45 m 3,4,5 N=9			3							
				SPT 4.50-4.95 m 13,21,21 N=42			4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	02/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	02/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513356 m E 6647379 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
WB		C					6			SAND: brown and yellow, coarse grained *(continued)*		MD to D		
							7							
							8			CLAY: grey mottled red				7.90: INFERRED CLAY Colour changed observed from water return
							9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	02/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	02/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513356 m E 6647379 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
WB		C					11			CLAY: grey mottled red *(continued)*				
NMLC		C	100% Water RETURN				12			CLAY: grey mottled red, high plasticity		VSt		11.90: Coring began at 11.9 m
							13			Hole Terminated at 12.40 m Target depth, borehole backfilled with excavated spoil				
							14							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Borehole ID

BH04

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513347 m E 6646938 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		SPT 0.50-0.95 m 6,4,4 N=8			1			TOPSOIL: Silty CLAY with gravel: dark brown, medium plasticity, gravel is angular up to 20 mm	D to M			0.20: INFERRED FILL
										CLAY: dark brown, medium plasticity	M			
										SAND with clay trace gravel: yellow and brown, coarse grained, clay is low plasticity, red mottled brown, gravel is angular up to 10 mm	D			
WB		C		SPT 1.50-1.95 m 2,6,4 N=10			2			SAND trace clay trace gravel: brown, coarse grained, clay is low plasticity, gravel is angular up to 10 mm				
										SAND: yellow, coarse grained				1.80: INFERRED NATURAL
				SPT 4.50-4.95 m 11,12,18 N=30			3					D		
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513347 m E 6646938 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
WB		C					6			SAND: yellow, coarse grained *(continued)*		D		
										CLAY: grey and brown				6.00: INFERRED CLAY Colour changed observed from water return
							7							
							8							
							9							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513347 m E 6646938 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								Soil Description				Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
WB		C					11			CLAY: grey and brown *(continued)*				
							12			Continued on cored borehole sheet				
							13							
							14							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	31/07/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513347 m E 6646938 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting: Comacchio Geo 205 Inclination: -90° RL Surface: No survey
Barrel Type and Length: Bearing: Datum: AHD Operator: Mulligan Geotechnical

Drilling Information							Rock Substance					Rock Mass Defects	
Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						11		Continued from non-cored borehole sheet				
NMLC	100% Water RETURN	100	76	Is(50) d=2.36 a=0.86 MPa		12		SILTSTONE: grey, moderately weathered, medium strength	SW	M ● ○	600–1000	JT, 10°, CN, IR, RF JT, 9°, CN, PR, RF JT, 33°, CN, PR, RF
						13		Hole Terminated at 12.40 m Target depth, borehole backfilled with excavated spoil				
						14						

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

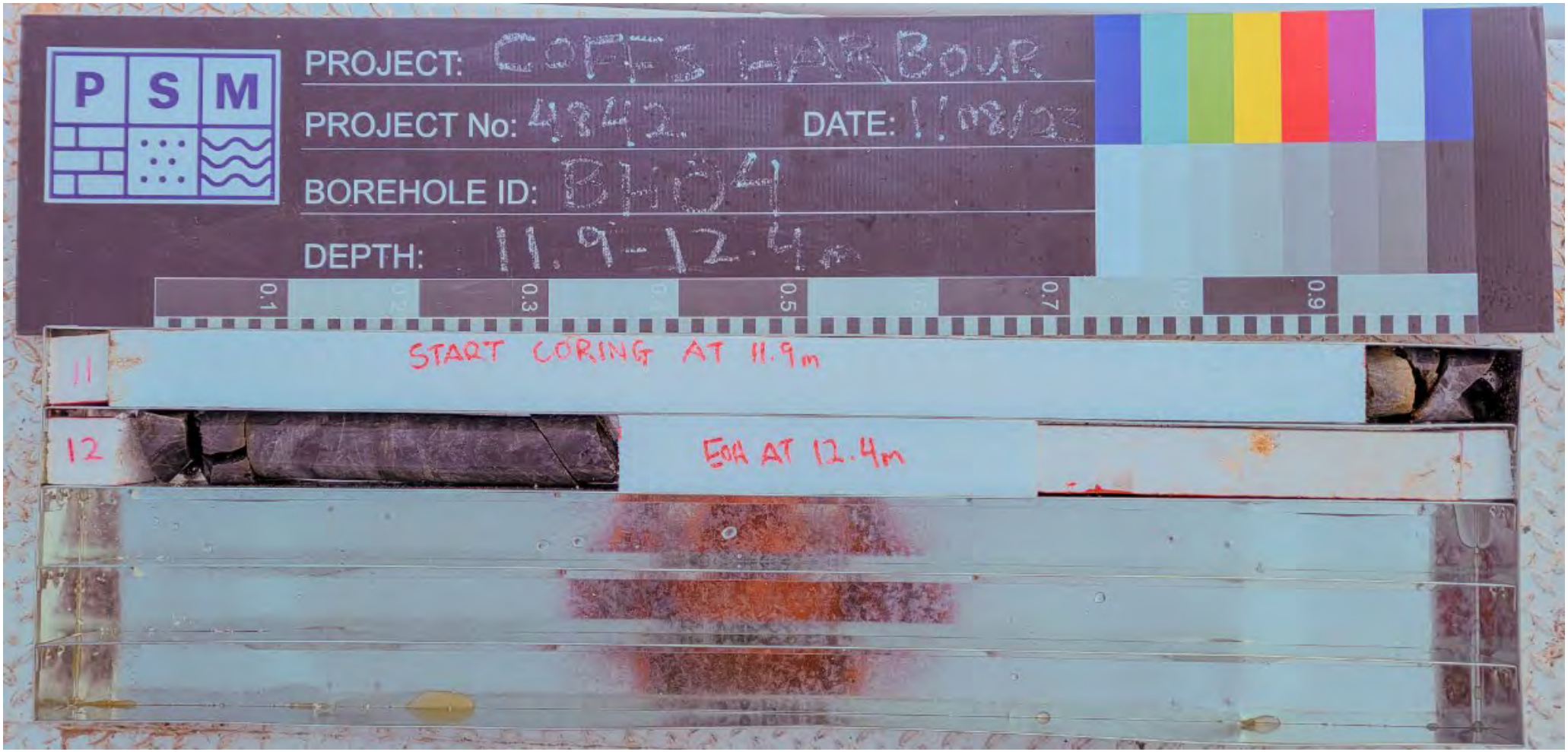
Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations



JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

CORE PHOTOS BH04

(Core Photo 1 OF 1)

PSM4842-007R	Appendix A

Borehole ID

BH05

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	01/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513585 m E 6646662 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								Soil Description					Observations
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500	Structure, Zoning, Origin, Additional Observations
AD/T		N		SPT 0.50-0.65 m 6,20/0mm HB N=R						Silty CLAY with gravel: dark brown, medium plasticity, gravel is angular up to 15 mm	M			0.00: INFERRED FILL
										Gravelly CLAY/ Clayey GRAVEL: dark brown, low to medium plasticity, gravel is angular of \argilite origin up to 50 mm	M			
										Continued on cored borehole sheet				
							1							
							2							
							3							
							4							

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	01/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	01/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513585 m E 6646662 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting: Comacchio Geo 205 Inclination: -90° RL Surface: No survey
Barrel Type and Length: Bearing: Datum: AHD Operator: Mulligan Geotechnical

Drilling Information							Rock Substance				Rock Mass Defects	
Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
								Continued from non-cored borehole sheet				
NMLC	0% Water RETURN	30	0			1		Gravelly CLAY/ Clayey GRAVEL: dark brown, low to medium plasticity, gravel is angular of argilite origin up to 50 mm				CZ, RF
								CORE LOSS: 0.7 m				
		50	0			2		GYPSUM: Placed in attempt to seal casing, recovered during drilling				CZ, RF
								GRAVELS and COBBLES: fill of majority argilite origin, sub-angular to rounded up to 100 mm				CZ, RF JT, 7°, RF, ST, RF JT, 18°, RF, IR, RF JT, 24°, CN, ST, RF CZ, RF
								CORE LOSS: 0.6 m				
		35	0	Is(50) d=1.28 MPa		3		GRAVELS and COBBLES: fill of majority argilite origin, sub-angular to rounded up to 100 mm		○		CZ, RF CZ, RF JT, 27°, CL, PR, RF JT, 38°, CL, UN, RF
								CORE LOSS: 0.22 m				
		100	0					GRAVELS and COBBLES: fill of majority argilite origin, sub-angular to rounded up to 100 mm				CZ, RF
								CORE LOSS: 0.27 m				
				Is(50) d=1.2 MPa		4		GRAVELS and COBBLES: fill of majority argilite origin, sub-angular to rounded up to 100 mm		○		CZ, RF JT, 89°, RF, PR, RF JT, 88°, RF, PR, RF CZ, RF
								Hole Terminated at 4.58 m Difficult drilling due to boulder and cobble inclusions in fill				

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube
WPT - Water pressure test

Water
Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss
Core recovered (hatching indicates material)
No core recovery

Weathering
XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type
FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating
CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness
SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape
PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JBS&G

Coffs Harbour Jetty Revitalisation

Coffs Harbour, NSW

CORE PHOTOS BH05

(Core Photo 1 OF 1)

PSM4842-007R	Appendix A

Borehole ID

BH06

Engineering Log - Non Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	02/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	02/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513601 m E 6646621 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting:	Comacchio Geo 205	Inclination:	-90°	RL Surface:	No survey		
Hole Diameter:	120 mm	Bearing:		Datum:	AHD	Operator:	Mulligan Geotechnical

Drilling Information								***Soil Description***				***Observations***
Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log / Classification Symbol	Material Description SOIL NAME: Plasticity, behaviour or particle characteristics of primary component, colour, secondary components, additional observations	Moisture Condition	Consistency / Relative Density	Hand Penetrometer UCS (kPa) 100 200 300 400 500 / Structure, Zoning, Origin, Additional Observations
AD/T		N					1		TOPSOIL: Silty SAND with gravel: dark brown, medium grained, gravel is angular up to 10 mm	M		0.00: INFERRED FILL
									SAND with clay: brown, medium grained, clay is low plasticity	M		
							2		Gravelly SAND/ Sandy GRAVEL: brown and grey, sand is medium grained, gravel is fine grained of argilite origin, angular up to 30 mm	M		
									Continued on cored borehole sheet			
							3					
							4					

Method
AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
SPT - Standard penetration test
PT - Push tube
AS - Auger screwing
CT - Continuous push tube 1.5m long 76mm diameter

Penetration
No resistance
Refusal

Water
Inflow
Partial Loss
Complete Loss

Samples and Tests
U - Undisturbed Sample
D - Disturbed Sample
SPT - Standard Penetration Test
ES - Environmental Sample
TW - Thin Walled
LB - Large Disturbed Sample

Moisture Condition
D - Dry
M - Moist
W - Wet

Consistency/Relative Density
VS - Very soft
S - Soft
F - Firm
St - Stiff
VSt - Very stiff
H - Hard
VL - Very loose
L - Loose
MD - Medium dense
D - Dense
VD - Very dense
Ce - Cemented
C - Compact

Logged in accordance with AS 1726:2017 Geotechnical site investigations

Engineering Log - Cored Borehole

Project No.: PSM4842

Client:	JBS&G	Commenced:	02/08/2023
Project Name:	Coffs Harbour Jetty Revitalisation	Completed:	02/08/2023
Hole Location:	Refer to Figure 1	Logged By:	KTL
Hole Position:	513601 m E 6646621 m N MGA2020 Zone 56	Checked By:	WP

Drill Model and Mounting: Comacchio Geo 205 Inclination: -90° RL Surface: No survey

Barrel Type and Length: Bearing: Datum: AHD Operator: Mulligan Geotechnical

Drilling Information							***Rock Substance***				***Rock Mass Defects***	
Method	Water	TCR (%)	RQD (%)	Samples and Field Tests	RL (m)	Depth (m)	Graphic Log	Material Description ROCK NAME: particle/grain characteristics, colour, fabric/texture, inclusions or minor components, moisture, mineral composition, alteration	Weathering XW HW MW SW FR	Strength Is(50) ● - Axial ○ - Diametral VL L M H VH EH 0.1 0.3 1 3 10	Defect Spacing (mm) <20 60 200 600 1000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
						1						
						2		Continued from non-cored borehole sheet				
NMLC	50% Water RETURN	35	0					GRAVEL FILL: sub-angular to rounded gravel of alluvial origin up to 30 mm CORE LOSS: 0.36 m				
						3		Hole Terminated at 2.50 m Difficult drilling due to boulder and cobble inclusions in fill				
						4						

Method

AD/T - Auger drilling TC bit
AD/V - Auger drilling V bit
WB - Washbore
HQ3- Wireline core (63.5 mm)
PQ3- Wireline core (85.0 mm)
SPT- Standard penetration test
PT - Push tube

WPT - Water pressure test

Water

Inflow
Partial Loss
Complete Loss

Graphic Log/Core Loss

Core recovered (hatching indicates material)
No core recovery

Weathering

XW - Extremely Weathered
HW - Highly Weathered
MW - Moderately Weathered
SW - Slightly Weathered
FR - Fresh

Strength

VL - Very Low
L - Low
M - Medium
H - High
VH - Very High
EH - Extremely High

Defect Type

FT - Fault
SS - Shear Surface
SZ - Shear Zone
BP - Bedding parting
SM - Seam
IS - Infilled Seam
JT - Joint
CO - Contact
CZ - Crushed Zone
VN - Vein
FZ - Fracture Zone
BSH - Bedding Shear
DB - Drilling Break

Infilling/Coating

CN - Clean
SN - Stain
VN - Veneer
CO - Coating
RF - Rock fragments
G - Gravel
S - Sand
Z - Silt
CA - Calcite
CL - Clay
FE - Iron
QZ - Quartz
X - Carbonaceous

Roughness

SL - Slickensided
POL - Polished
S - Smooth
RF - Rough
VR - Very Rough

Shape

PR - Planar
CU - Curved
UN - Undulating
ST - Stepped
IR - Irregular

Logged in accordance with AS 1726:2017 Geotechnical site investigations

JBS&G	
Coffs Harbour Jetty Revitalisation	
Coffs Harbour, NSW	
CORE PHOTOS BH06	
(Core Photo 1 OF 1)	
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EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP01
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513403, N: 6647779 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 04/08/2023	LOGGED BY : KTL CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

DEPTH (m)	PENETRATION (VE, E, F, H)	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
0.0		N					Gravelly SAND: brown and grey, sand is fine to medium grained, gravel is sub-angular to angular up to 70 mm of argilite origin	D			0.00: INFERRED FILL
0.40m							SAND: yellow, coarse grained	M	MD		
0.5											
0.70m							CLAY: brown, medium plasticity	M	St		
0.80m							SAND: brown, coarse grained				
1.0				1.00m ES-1							
							Becomes yellow only at 1.3 m.				
1.5								M	MD		
2.0											
2.50m							Hole Terminated at 2.50 m Collapse				
2.5											
3.0											
3.5											
4.0											
4.5											
5.0											

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP02
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513451, N: 6647836 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 04/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa 100 200 300 400	STRUCTURE & Other Observations
	N			0.0			Sandy GRAVEL: dark brown, angular up to 100 mm, sand is coarse grained, minor amounts of deleterious materials (bricks, rubbish)	D			0.00: INFERRED FILL
			0.50m CBR-1	0.5			0.50m SAND: pale grey and brown, coarse grained	D			
			0.80m				0.60m CLAY: brown, high plasticity	D			
				1.0			0.80m SAND: dark brown, coarse grained, significant presence of bark and timber	D			
				1.5							
				2.0			2.00m SAND: yellow, coarse grained	M	MD		2.00: INFERRED NATURAL
				2.5			2.70m Hole Terminated at 2.70 m Collapse				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP03
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513378, N: 6647552 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa	STRUCTURE & Other Observations
0.0			0.10m TOPSOIL: Silty SAND with gravel: dark brown, coarse grained, gravel is sub-angular to angular up to 20 mm	M			0.10: INFERRED FILL
			Sandy GRAVEL: brown and grey, angular up to 150 mm, sand is medium to coarse grained	D			
0.5			0.50m SAND with gravel: yellow, coarse grained, gravel is sub-angular up to 30 mm	D to M	MD		0.50: INFERRED NATURAL
1.0			1.30m SAND: orange, coarse grained				
1.5							
2.0				M	MD		
2.5			2.90m				
3.0			Hole Terminated at 2.90 m Collapse				
3.5							
4.0							
4.5							
5.0							

SUPPORT: N
PENETRATION: VE, E, F, H
GROUND WATER LEVELS
SAMPLES & FIELD TESTS

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP04
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513382, N: 6647465 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa (100 200 300 400)	STRUCTURE & Other Observations
	N		0.50m CBR-2 ES-2 0.80m	0.0			0.10m TOPSOIL: Silty CLAY: dark brown, low to medium plasticity GRAVEL: grey, angular gravel up to 40 mm	D			0.10: INFERRED FILL
				0.5			0.60m SAND: yellow, coarse grained				
				1.0							
				1.5				M	MD		
				2.0			2.30m Hole Terminated at 2.30 m Collapse				
				2.5							
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP05
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513418, N: 6647402 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

DEPTH (m)	PENETRATION (VE, E, F, H)	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
0.0		N					0.10m TOPSOIL: Silty SAND with gravel: dark brown, coarse grained, gravel is sub-rounded to sub-angular up to 10 mm	D			0.10: INFERRED FILL
							GRAVELS: grey and brown, gravel is angular up to 50 mm	D			
							0.30m CLAY: brown and orange, medium to high plasticity	D			
0.5											
1.0							1.10m CLAY with sand: yellow and brown, medium plasticity, sand is coarse grained	D			
							1.30m SAND: yellow, coarse grained	M	MD to D		1.30: INFERRED NATURAL
1.5							Becomes orange at 1.6 m				
							1.80m SAND: grey, coarse grained	W	MD		
2.0											
2.5							2.80m Hole Terminated at 2.80 m Collapse				
3.0											
3.5											
4.0											
4.5											
5.0											

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP06
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513391, N: 6647322 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

DEPTH (m)	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa	STRUCTURE & Other Observations
0.0	N					0.10m TOPSOIL: Silty CLAY trace sand: dark brown, low to medium plasticity, sand is coarse grained	M			0.10: INFERRED FILL
						Gravelly SAND trace clay: brown, coarse grained, gravel is sub-angular to angular up to 30 mm, clay is low plasticity	M			
0.5						0.40m CLAY: brown and yellow, medium plasticity	D to M			
1.0			1.00m ES-1			1.00m SAND: yellow, coarse grained	M	MD to D		
1.5						1.70m SAND: grey, coarse grained	W	D		
2.0						2.40m Hole Terminated at 2.40 m Collapse				
2.5										
3.0										
3.5										
4.0										
4.5										
5.0										

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP07
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513333, N: 6647283 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

VE / E / F / H PENETRATION	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa (100 / 200 / 300 / 400)	STRUCTURE & Other Observations
	N			0.0			0.10m TOPSOIL: Silty SAND trace gravel: dark brown, coarse grained, gravel is angular to sub-angular up to 20 mm GRAVEL: grey, angular up to 60 mm	D			0.10: INFERRED FILL
				0.5			0.50m SAND: yellow and brown, coarse grained Becomes yellow only at 0.8 m.	D to M	MD		0.50: INFERRED NATURAL
				1.0							
				1.5							
				2.0							
				2.5			2.60m Hole Terminated at 2.60 m Collapse				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PIT NO :TP08

FILE / JOB NO : PSM4842
SHEET : 1 OF 1

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

POSITION : E: 513359, N: 6647216 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

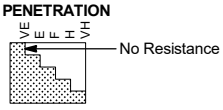
VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa 100 200 300 400	STRUCTURE & Other Observations
	N			0.0			0.10m TOPSOIL: Silty SAND: dark brown, coarse grained	M			0.10: INFERRED FILL
							CLAY with sand: brown and grey mottled red, medium plasticity, sand is coarse grained	M			
				0.5			0.30m SAND: brown and yellow, coarse grained				
				1.0				M	MD to D		
				1.5							
				2.0							
							2.30m Hole Terminated at 2.30 m Collapse				
				2.5							
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

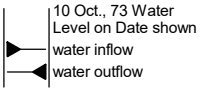
METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION



WATER



SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP09
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513323, N: 6647166 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

VE / PENETRATION (E, F, H)	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
	N			0.0			0.10m TOPSOIL: Silty CLAY: dark brown, medium plasticity	D			
			0.30m ES-1				CLAY: brown, medium plasticity	M			0.10: INFERRED FILL
				0.5			0.40m SAND: yellow, coarse grained				
			1.00m CBR-1	1.0							
			1.50m	1.5				M	D		
				2.0							
				2.5			2.60m Hole Terminated at 2.60 m Collapse				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PIT NO :TP10

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513353, N: 6647116 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

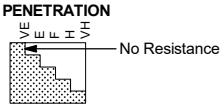
VE / PENETRATION E F H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa 100 200 300 400	STRUCTURE & Other Observations
	N		0.80m ES-1	0.0			0.10m TOPSOIL: Silty CLAY: dark brown, medium plasticity	M			0.10: INFERRED FILL
							CLAY trace gravel: orange and brown, medium plasticity, gravel is angular up to 10 mm	M			
				0.5			0.30m SAND: yellow, coarse grained	M			
							0.40m CLAY: brown, medium plasticity	M			
							0.50m SAND: yellow, coarse grained	M to W	MD to D		
				1.0							
				1.5							
				2.0							
				2.5			2.50m Hole Terminated at 2.50 m Collapse				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

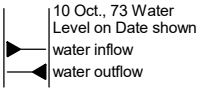
METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION



WATER



SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
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See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP11
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513336, N: 6647095 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL — CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

DEPTH (m)	PENETRATION (VE, E, F, H)	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
0.0	VE	N					0.10m TOPSOIL: Silty CLAY: dark brown, low to medium plasticity	D			0.10: INFERRED FILL
							CLAY: red and brown, medium plasticity	D			
0.5							0.60m				
							Hole Terminated at 0.60 m Test pit abandoned due to presence of buried service				
1.0											
1.5											
2.0											
2.5											
3.0											
3.5											
4.0											
4.5											
5.0											

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP12
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513335, N: 6646990 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 03/08/2023	LOGGED BY : KTL — CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

DEPTH (m)	PENETRATION (VE, E, F, H)	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
0.0		N					TOPSOIL: Silty CLAY with gravel: dark brown, medium plasticity, gravel is angular up to 10 mm	M			
0.20m							CLAY with gravel: orange, high plasticity, gravel is angular up to 10 mm	M			
0.50m							SAND with clay: dark brown and red, coarse grained, clay is medium plasticity, significant presence of deleterious materails (construction debris, cloth, bricks)				
0.5											
1.0				1.00m ES-1				M			
1.50m							GRAVEL: grey, angular up to 150 mm of argilite origin				
1.70m											
1.80m							SAND: yelloiw, coarse grained	M	D		1.70: INFERRED NATURAL
1.5							Hole Terminated at 1.80 m Collapse				
2.0											
2.5											
3.0											
3.5											
4.0											
4.5											
5.0											

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP13
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513365, N: 6646879 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 04/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

VE / PENETRATION (E, F, H)	SUPPORT	GROUNDWATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
	N			0.0			TOPSOIL: Clayey SAND with silt: dark brown, coarse grained, clay is low plasticity	M			
				0.20m			SAND with gravel: dark brown, coarse grained, gravel is rounded to sub-rounded up to 40 mm				
				0.5				M			
				1.0							
				1.10m			SAND: yellow, coarse grained				1.10: INFERRED NATURAL
				1.5				M	MD		
				2.0			Localised pocket of argilite gravel present at 2.0 m				
				2.40m			Hole Terminated at 2.40 m Collapse				
				2.5							
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP14
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513483, N: 6646741 (MGA2020 Zone 56)	SURFACE ELEVATION :	
EQUIPMENT TYPE : 5 ton excavator	METHOD : E	
DATE EXCAVATED : 04/08/2023	LOGGED BY : KTL	CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE		

DRILLING | MATERIAL

DEPTH (m)	PENETRATION (VE, E, F, H)	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa (100, 200, 300, 400)	STRUCTURE & Other Observations
0.0		N					TOPSOIL: Silty SAND: dark brown, coarse grained	M			
0.20m							SAND: yellow, coarse grained				
0.5				0.50m ES-1				M	MD		
0.70m							CLAY with gravel: dark brown and grey, medium plasticity, gravel is sub-angular up to 50 mm	M	St		
0.90m							Sandy CLAY with gravel: orange, low to medium plasticity, sand is coarse grained, gravel is sub-angular up to 5 mm	M	St		
1.0											
1.30m							CLAY with gravel: orange, medium plasticity, gravel is sub-angular of argilite origin up to 60 mm, minor ironstaining observed, minor structure observed within CLAY				
1.5											
2.0								D	St		
2.5							Becomes brown at 2.4 m.				
2.90m							Hole Terminated at 2.90 m Machine Limit				
3.0											
3.5											
4.0											
4.5											
5.0											

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY
- VS - Very Soft
- S - Soft
- F - Firm
- St - Stiff
- VSt - Very Stiff
- H - Hard
- VL - Very Loose
- L - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense
- C - Compact
- Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PIT NO :TP15

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513590, N: 6646669 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 04/08/2023	LOGGED BY : KTL CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

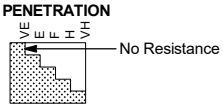
VE / PENETRATION / E / F / H	SUPPORT	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETRO-METER kPa 100 200 300 400	STRUCTURE & Other Observations
	N			0.0			TOPSOIL: Silty CLAY with sand with gravel: dark brown, low to medium plasticity, sand is medium to coarse grained, gravel is angular up to 10 mm	M			
				0.20m			Gravelly SAND/ Sandy GRAVEL: yellow and brown, corase grained, gravel is angular up to 50 mm	M			
				0.40m			CLAY: orange and brown, medium plasticity	M			
				0.50m			Clayey GRAVEL/ Gravelly CLAY: orange and grey, clay is low to medium plasticity, gravel is sub-angular to sub-rounded up to 100 mm				
				0.5							
				1.0							
				1.5				M			
				2.0							
				2.5							
				2.70m			Hole Terminated at 2.70 m Collapse				
				3.0							
				3.5							
				4.0							
				4.5							
				5.0							

PHOTOGRAPHS NOTES ☐ YES ☐ NO

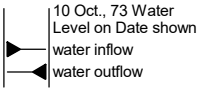
METHOD
- N Natural Exposure
- X Existing Excavation
- E Backhoe/Excavator
- B Bulldozer Blade
- R Ripper

SUPPORT
- T Timbering
- N No Shoring

PENETRATION



WATER



SAMPLES & FIELD TESTS
- U - Undisturbed Sample
- D - Disturbed Sample
- B - Bulk Disturbed Sample
- MC - Moisture Content
- HP - Hand Penetrometer (UCS kPa)
- VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
- PBT - Plate Bearing Test
- ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
- D - Dry
- M - Moist
- W - Wet

CONSISTENCY/ RELATIVE DENSITY

VS	- Very Soft
S	- Soft
F	- Firm
St	- Stiff
VSt	- Very Stiff
H	- Hard
VL	- Very Loose
L	- Loose
MD	- Medium Dense
D	- Dense
VD	- Very Dense
C	- Compact
Ce	- Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

EXCAVATION - GEOTECHNICAL LOG

PROJECT : Coffs Harbour Jetty Revitalisation
LOCATION : Refer to Figure 1

PIT NO :TP16
FILE / JOB NO : PSM4842
SHEET : 1 OF 1

POSITION : E: 513606, N: 6646690 (MGA2020 Zone 56)	SURFACE ELEVATION :
EQUIPMENT TYPE : 5 ton excavator	METHOD : E
DATE EXCAVATED : 04/08/2023	LOGGED BY : KTL — CHECKED BY : WP
EXCAVATION DIMENSIONS : 0.45 m WIDE	

DRILLING | MATERIAL

DEPTH (m)	SUPPORT	SAMPLES & FIELD TESTS	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY RELATIVE DENSITY	HAND PENETROMETER kPa	STRUCTURE & Other Observations
0.0	N	0.20m CBR-1			TOPSOIL: Silty SAND wih gravel: dark brown, coarse grained, gravel is angular up to 40 mm	M			
0.20m					Sandy GRAVEL/ Gravelly SAND: browna nd grey, sand is coarse grained, gravel is sub-angular to sub-rounded up to 50 mm	M			
0.5		0.60m							
0.80m					SAND with gravel: dark brown, coarse grained, gravel is sub-angular to sub-rounded up to 50 mm				
1.0		1.00m ES-1				M			
1.5									
2.0									
2.20m					CLAY with gravel: orange and grey, high plasticity, gravel is sub-angular up to 40 mm				
2.5					Becomes grey only at 2.6 m	M			
3.00m					Hole Terminated at 3.00 m Target depth				
3.0									
3.5									
4.0									
4.5									
5.0									

PHOTOGRAPHS NOTES ☐ YES ☐ NO

METHOD
N Natural Exposure
X Existing Excavation
E Backhoe/Excavator
B Bulldozer Blade
R Ripper

SUPPORT
T Timbering
N No Shoring

PENETRATION
VE E F H VH — No Resistance

WATER
10 Oct., 73 Water Level on Date shown
water inflow
water outflow

SAMPLES & FIELD TESTS
U - Undisturbed Sample
D - Disturbed Sample
B - Bulk Disturbed Sample
MC - Moisture Content
HP - Hand Penetrometer (UCS kPa)
VS - Vane Shear; P-Peak, R-Remouded (uncorrected kPa)
PBT - Plate Bearing Test
ES - Environmental Sample

CLASSIFICATION SYMBOLS & SOIL DESCRIPTION
Based on Unified Soil Classification System

MOISTURE
D - Dry
M - Moist
W - Wet

CONSISTENCY/ RELATIVE DENSITY
VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard
VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense
C - Compact
Ce - Cemented

See Explanatory Notes for details of abbreviations & basis of descriptions.

Appendix B
Test Pit Photos

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 01

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 02

PSM4842-007R	APPENDIX B

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 03

Pells Sullivan Meynink

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 04

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 05

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 06

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 07

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 08

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 09

PSM4842-007R	APPENDIX B

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 10

PSM4842-007R	**APPENDIX B**

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 11

PSM4842-007R	**APPENDIX B**

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 12

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 13

PSM4842-007R	APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 14

PSM4842-007R	APPENDIX B

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 15

Pells Sullivan Meynink

PSM4842-007R

APPENDIX B

Pells Sullivan Meynink

JBS&G

Coffs Harbour Revitalisation

Coffs Harbour Jetty and Foreshore

TEST PIT PHOTOS

TEST PIT 16

PSM4842-007R	APPENDIX B

Appendix C
Point Load Testing

Pells Sullivan Meynink

POINT LOAD STRENGTH INDEX TEST RESULTS

Job No.	***PSM4842***	**Sheet**	**1 of 1**
Project	***Coffs Harbour Jetty Revitalisation***		

Test Method	*AS 4133.4.1-2007 Methods of testing rocks for engineering purposes - Determination of point load strength index*	Sampling Technique	*NLMC*	Sampling Date	*31/07/2023 - 02/08/2023*
		Storage History	*North Ryde office storage*	Testing Date	*31/07/2023 - 02/08/2023*
Test Machine	*GSA 6510-0704*	Moisture Condition	*Natural*	Tested By	*KTL*
Calibration Date	*14/1/2021*	Loading Rate	*< 30 seconds*		

Rock Type	Location	Depth (m)	Diametral Tests					Axial Tests						AS 1726:2017 Strength Class
			D (mm)	L (mm)	P (kN)	$I_{s(50)}$ (MPa)	Failure Mode	W (mm)	D (mm)	P (kN)	I_s (MPa)	$I_{s(50)}$ (MPa)	Failure Mode	
ARGILITE	***BH02***	***6.73***	*50*	*65*	*> 3.1*	***> 1.2***	*Bad break*	*50*	*45*	*3.2*	*1.1*	***1.2***	*Along defect*	***H***
ARGILITE	***BH02***	***7.48***	*50*	*150*	*> 5.8*	***> 2.3***	*Bad break*	*50*	*50*	*1.3*	*0.4*	***0.4***	*Along defect*	***M / H***
ARGILITE	***BH02***	***8.90***	*50*	*100*	*> 2.9*	***> 1.1***	*Bad break*							
ARGILITE	***BH02***	***9.85***	*50*	*60*	*> 5.1*	***> 2.1***	*Bad break*	*50*	*30*	*1.0*	*0.5*	***0.5***	*Along defect*	***M / H***
ARGILITE	***BH02***	***16.09***	*50*	*162*	*> 3.3*	***> 1.3***	*Bad break*	*50*	*37*	*1.2*	*0.5*	***0.5***	*Along defect*	***M / H***
ARGILITE	***BH02***	***11.31***	*50*	*60*	*> 2.8*	***> 1.1***	*Bad break*	*50*	*42*	*1.1*	*0.4*	***0.4***	*Along defect*	***M / H***
ARGILITE	***BH04***	***12.06***	*50*	*290*	*> 5.9*	***> 2.4***	*Bad break*	*50*	*50*	*2.6*	*0.8*	***0.9***	*Along defect*	***M / H***
ARGILITE	***BH05***	***3.35***	*50*	*170*	*> 3.2*	***> 1.3***	*Bad break*							
ARGILITE	***BH05***	***4.25***	*50*	*250*	*> 3.0*	***> 1.2***	*Bad break*							

By:	***KTL***	**Checked:**	***WP***
Date:	***22/8/2023***		

Appendix D
PSP Testing

DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM4842	**Sheet**	1 **of** 3
Project	**Coffs Harbour Jetty Revitalisation**	**Date**	31/07/2023 - 04/08/2023

Test Method *AS 1289.6.3.3. - 1997 Methods of Testing Soils for Engineering Purposes - Perth sand penetrometer test*

Drop Height *510 mm*
Hammer Mass *9 kg*
Tip Type *FLAT*

Tested by

Test Depth LOCATION	*DCP* TP01	*DCP* TP02	*DCP* TP03	*DCP* TP04	*DCP* TP05	*DCP* TP06
0.10	14	2	20+	2	2	2
0.20	20+	6	EOH R/HB	5	6	6
0.30	EOH R/HB	5		9	20	6
0.40		7		14	6	5
0.50		5		20+	8	4
0.60		5		EOH R/HB	9	4
0.70		4			8	4
0.80		3			9	6
0.90		2			12	8
1.00		2			9	6
1.10		2			10	6
1.20		1			9	12
1.30		1			11	10
1.40		2			8	9
1.50		1			7	9
1.60		2			9	9
1.70		4			5	11
1.80		5			13	10
1.90		5			7	10
2.00		6			5	11
2.10		6			EOH	EOH
2.20		EOH				
2.30						
2.40						
2.50						
2.60						
2.70						
2.80						
2.90						
3.00						
3.10						
3.20						
3.30						
3.40						
3.50						
3.60						
3.70						
3.80						
3.90						
4.00						

Comments: R/HB - Refusal and hard bouncing
EOH - End of Hole

DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM4842	**Sheet**	2 **of** 3
Project	**Coffs Harbour Jetty Revitalisation**	**Date**	31/07/2023 - 04/08/2023

Test Method *AS 1289.6.3.3. - 1997 Methods of Testing Soils for Engineering Purposes - Perth sand penetrometer test*

Tested by

Drop Height *510 mm*
Hammer Mass *9 kg*
Tip Type *FLAT*

Test Depth LOCATION	*DCP* TP07	*DCP* TP08	*DCP* TP09	*DCP* TP10	*DCP* TP11	*DCP* TP12
0.10	8	2	6	2	4	8
0.20	10+	4	8	4	7	8
0.30	EOH R/HB	7	11	6	10	10
0.40		10	13	8	9	8
0.50		8	14	8	8	5
0.60		10	14	6	11	10
0.70		10	19	7	12	13
0.80		11	14	6	18	12
0.90		9	20	8	12	8
1.00		9	15	10	12	8
1.10		7	15	10	11	10
1.20		8	13	10	12	7
1.30		9	EOH	8	12	6
1.40		7		8	15	6
1.50		7		8	EOH	9
1.60		7		8		10
1.70		9		6		19
1.80		10		8		9
1.90		10		9		17
2.00		8		8		25
2.10		EOH		EOH		EOH
2.20						
2.30						
2.40						
2.50						
2.60						
2.70						
2.80						
2.90						
3.00						
3.10						
3.20						
3.30						
3.40						
3.50						
3.60						
3.70						
3.80						
3.90						
4.00						

Comments: R/HB - Refusal and hard bouncing
EOH - End of Hole

DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM4842	**Sheet**	3 **of** 3
Project	**Coffs Harbour Jetty Revitalisation**	**Date**	31/07/2023 - 04/08/2023

Test Method *AS 1289.6.3.3. - 1997 Methods of Testing Soils for Engineering Purposes - Perth sand penetrometer test*

Tested by

Drop Height *510 mm*
Hammer Mass *9 kg*
Tip Type *FLAT*

Test Depth LOCATION	*DCP* TP13	*DCP* TP14	*DCP* TP15	*DCP* TP16	*DCP*	*DCP*
0.10	3	3	2	3		
0.20	6	3	4	5		
0.30	9	5	4	9		
0.40	6	5	7	22+		
0.50	6	5	9	EOH R/HB		
0.60	5	5	8			
0.70	14	4	7			
0.80	11	5	10			
0.90	9	9	8			
1.00	10	11	11			
1.10	7	6	11			
1.20	7	6	18			
1.30	6	4	11			
1.40	8	8	9			
1.50	7	14	10			
1.60	8	8	12			
1.70	8	12	11			
1.80	8	25+	10			
1.90	8	EOH R/HB	11			
2.00	EOH		9			
2.10			EOH			
2.20						
2.30						
2.40						
2.50						
2.60						
2.70						
2.80						
2.90						
3.00						
3.10						
3.20						
3.30						
3.40						
3.50						
3.60						
3.70						
3.80						
3.90						
4.00						

Comments: R/HB - Refusal and hard bouncing
EOH - End of Hole

Appendix E
CBR Results

115 Wicks Road
Macquarie Park, NSW 2113
Telephone: 02 9888 5000
Facsimile: 02 9888 5001

SOIL TEST SERVICES
ABN 43 002 145 173

FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: PSM Admin Pty Ltd
PSM Job No.: PSM4842

Report No.: L4926 - 1
Report Date: 17/08/2023
Page 1 of 1

TESTPIT NUMBER	TP 02	TP 04	TP 09	TP 16
DEPTH (m)	0.50 - 0.80	0.50 - 0.80	1.00 - 1.50	0.20 - 0.60
Surcharge (kg)	4.5	4.5	4.5	4.5
Maximum Dry Density (t/m^3)	1.29 STD	1.48 STD	1.44 STD	1.75 STD
Optimum Moisture Content (%)	32.0	7.2	6.3	13.4
Moulded Dry Density (t/m^3)	1.26	1.45	1.41	1.72
Sample Density Ratio (%)	98	98	98	98
Sample Moisture Ratio (%)	100	102	102	97
Moisture Contents				
Insitu (%)	29.3	4.4	3.8	9.3
Moulded (%)	31.9	7.4	6.4	13.0
After soaking and				
After Test, Top 30mm(%)	35.3	25.5	26.5	16.0
Remaining Depth (%)	29.1	23.7	23.7	14.8
Material Retained on 19mm Sieve (%)	4*	0	0	22*
Swell (%)	0.0	1.0	1.0	0.5
C.B.R. value: @2.5mm penetration		6		
@5.0mm penetration	11		16	25

NOTES: Sampled and supplied by client. Samples tested as received.

- Refer to appropriate Test Pit logs for soil descriptions
- Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.
- Date of receipt of sample: 08/08/2023.

NATA Accredited Laboratory Number:1327

Accredited for compliance with ISO/IEC 17025 - Testing.
This document shall not be reproduced except
In full without approval of the laboratory. Results relate only to the items tested or sampled.

17/08/2023
Authorised Signature / Date
(D. Treweek)

Appendix F
Aggressivity and Salinity Testing Results

CERTIFICATE OF ANALYSIS

Work Order	: **ES2326799**	Page	: 1 of 4
Client	: **PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: Ken Tong Lee	Contact	: Customer Services ES
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone	: ----	Telephone	: +61-2-8784 8555
Project	: PSM4842	Date Samples Received	: 09-Aug-2023 18:45
Order number	: ----	Date Analysis Commenced	: 15-Aug-2023
C-O-C number	: ----	Issue Date	: 17-Aug-2023 16:34
Sampler	: Ken Tong Lee		
Site	: ----		
Quote number	: EN/333		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP01@1.0m	TP04@0.5m	TP06@1.0m	TP09@0.3m	TP10@0.8m
			Sampling date / time	04-Aug-2023 00:00	03-Aug-2023 00:00	03-Aug-2023 00:00	03-Aug-2023 00:00	03-Aug-2023 00:00
Compound	CAS Number	LOR	Unit	ES2326799-001	ES2326799-002	ES2326799-003	ES2326799-004	ES2326799-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	7.8	8.9	7.7	7.8	9.0
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	27	42	119	65	54
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	6.8	4.0	8.4	7.9	4.8
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	37000	23800	8400	15400	18500
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	1.6	0.5	1.5	2.9	0.7
ø Exchangeable Magnesium	----	0.2	meq/100g	<0.2	<0.2	<0.2	<0.2	<0.2
ø Exchangeable Potassium	----	0.2	meq/100g	<0.2	<0.2	<0.2	<0.2	<0.2
ø Exchangeable Sodium	----	0.2	meq/100g	<0.2	<0.2	<0.2	<0.2	<0.2
ø Cation Exchange Capacity	----	0.2	meq/100g	1.6	0.5	1.5	2.9	0.7
ø Exchangeable Sodium Percent	----	0.2	%	<0.2	<0.2	<0.2	<0.2	<0.2
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	<10	<10	<10	<10
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	TP12@1.0m	TP14@0.5m	TP16@1.0m	----	----
			Sampling date / time	03-Aug-2023 00:00	04-Aug-2023 00:00	04-Aug-2023 00:00	----	----
Compound	CAS Number	LOR	Unit	ES2326799-006	ES2326799-007	ES2326799-008	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**7.8**	**7.0**	**7.5**	**----**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**58**	**8**	**28**	**----**	**----**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**17.4**	**3.8**	**10.7**	**----**	**----**
EA080: Resistivity								
Resistivity at 25°C	----	1	ohm cm	**17200**	**125000**	**35700**	**----**	**----**
ED006: Exchangeable Cations on Alkaline Soils								
ø Exchangeable Calcium	----	0.2	meq/100g	**2.8**	**----**	**2.2**	**----**	**----**
ø Exchangeable Magnesium	----	0.2	meq/100g	<0.2	**----**	<0.2	**----**	**----**
ø Exchangeable Potassium	----	0.2	meq/100g	<0.2	**----**	<0.2	**----**	**----**
ø Exchangeable Sodium	----	0.2	meq/100g	<0.2	**----**	<0.2	**----**	**----**
ø Cation Exchange Capacity	----	0.2	meq/100g	**2.8**	**----**	**2.2**	**----**	**----**
ø Exchangeable Sodium Percent	----	0.2	%	<0.2	**----**	<0.2	**----**	**----**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**----**	**0.4**	**----**	**----**	**----**
Exchangeable Magnesium	----	0.1	meq/100g	**----**	<0.1	**----**	**----**	**----**
Exchangeable Potassium	----	0.1	meq/100g	**----**	<0.1	**----**	**----**	**----**
Exchangeable Sodium	----	0.1	meq/100g	**----**	<0.1	**----**	**----**	**----**
Cation Exchange Capacity	----	0.1	meq/100g	**----**	**0.4**	**----**	**----**	**----**
Exchangeable Sodium Percent	----	0.1	%	**----**	**3.4**	**----**	**----**	**----**
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	<10	<10	**----**	**----**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	**20**	<10	<10	**----**	**----**

Appendix G
Historical Aerial Photographs

513017 513267 513517 513767 514017

6647890 6647640 6647390 6647140 6646890 6646640

513017 513267 513517 513767 514017

Legend

Approximate Site Extent

Notes

1. Aerial imagery sourced from NSW Historical Image Viewer dated 1979.

Scale 1:4,000

N

0 25 50 75 100 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

P S M

Created By: PSM	Revision: A
Date: 31 Aug 2023	Paper Size: A3

JBSG
Coffs Harbour Revitalisation
Coffs Harbour Jetty and Foreshore

HISTORICAL AERIAL IMAGERY
1979

PSM4842-007R | APPENDIX G

513017 513267 513517 513767 514017

6647890 6647640 6647390 6647140 6646890 6646640

513017 513267 513517 513767 514017

Legend

Approximate Site Extent

Notes

1. Aerial imagery sourced from NSW Historical Image Viewer dated 1984.

N

Scale 1:4,000

0 25 50 75 100 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

P S M

Created By: PSM	Revision: A
Date: 31 Aug 2023	Paper Size: A3

JBSG
Coffs Harbour Revitalisation
Coffs Harbour Jetty and Foreshore

HISTORICAL AERIAL IMAGERY
1984

PSM4842-007R | APPENDIX G

513017 513267 513517 513767 514017

6647890 6647640 6647390 6647140 6646890 6646640

513017 513267 513517 513767 514017

Legend

Approximate Site Extent

Notes

1. Aerial imagery sourced from NSW Historical Image Viewer dated 1994.

N

Scale 1:4,000

0 25 50 75 100 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

P S M

Created By:	Revision:
PSM	A
Date:	Paper Size:
31 Aug 2023	A3

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Coffs Harbour Jetty and Foreshore

HISTORICAL AERIAL IMAGERY
1994

PSM4842-007R

APPENDIX G

513017 513267 513517 513767 514017

6647890 6647640 6647390 6647140 6646890 6646640

513017 513267 513517 513767 514017

Legend

Approximate Site Extent

Notes

1. Aerial imagery sourced from Nearmap.com dated 31 July 2011.

Scale 1:4,000

N

0 25 50 75 100 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

P S M

Created By: PSM	Revision: A
Date: 31 Aug 2023	Paper Size: A3

JBSG
Coffs Harbour Revitalisation
Coffs Harbour Jetty and Foreshore

HISTORICAL AERIAL IMAGERY
2011

PSM4842-007R | APPENDIX G

513017 513267 513517 513767 514017

6647890 6647640 6647390 6647140 6646890 6646640

513017 513267 513517 513767 514017

Legend

Approximate Site Extent

Notes

1. Aerial imagery sourced from Nearmap.com dated 26 February 2023.

Scale 1:4,000

N

0 25 50 75 100 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

P S M

Created By: PSM	Revision: A
Date: 31 Aug 2023	Paper Size: A3

JBSG
Coffs Harbour Revitalisation
Coffs Harbour Jetty and Foreshore

HISTORICAL AERIAL IMAGERY
2023

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