

Geotechnical Investigation Report

Jabiru Redevelopment – Report No.1
Power Station – Lot 2303

5057P027



Prepared for
Northern Territory Government (NTG)

4 July 2020

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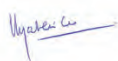
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1 INTRODUCTION

Construction Sciences Pty Ltd (“Construction Sciences”) has been engaged by the Northern Territory Government (“the Client”) to undertake a preliminary geotechnical investigation required for the design and construction of a proposed power station located at lot 2303, Jabiru, NT, as part of the overarching Jabiru Futures Project. This report presents the results of Construction Sciences’ geotechnical investigation as factual information in addition to an interpretative geotechnical assessment of the site conditions relevant to the proposed power station development (Report No.1) and as requested at tender.

1.1 Proposed Development

We understand that the project includes the construction of a new hybrid power station consisting of a solar array and thermal generation, fuel storage and connectivity infrastructure within the Lot 2303 site.

1.2 Objectives

Based on the information provided, and our experience of similar developments, the objectives of the study are to:

- Assess subsurface soil and groundwater conditions across the proposed development area within the investigation depth;
- Provide a summary of laboratory test results inclusive of requested Revised Universal Soil Loss Equation (RUSLE) testing suite results as per the NTG and sub-consultants’ requests;
- Provide ultimate and allowable bearing pressure and settlement estimates for suitable foundations systems including base bearing and shaft adhesion;
- Provide a site classification in accordance with AS2780-2011 “Residential Slabs and Footings”;
- Provide geotechnical design parameters for foundation design
- Provide comments and recommendations on erosion control measures for temporary and permanent works;
- Provide comments and recommendations on constructability constraints including excavatability, onsite material suitability,
- Identify the presence of Acid Sulphate Soils (ASS) (if any);
- Recommend appropriate footing subgrade preparation procedures including compaction criteria; and
- Provide comments on other geotechnical risk/hazards identified from this investigation, which may affect proposed development.

1.3 Scope of Works

The scope of works for the geotechnical investigation therefore includes the following;

- Completion of Safe Work Method Statement and underground services locating before undertaking fieldwork;
- Undertaking a site walkover to observe existing site features and to take record photographs;
- Excavation of a total of twelve (12) test pits at proposed locations approved by the client, extending to a depth of 2.0m, and visually observe the underlying strata and groundwater conditions;
- Conducting Dynamic Cone Penetrometer (DCP) testing adjacent to each test pit to a maximum depth of 2 m;
- Advancing a total of four (4) boreholes at proposed locations approved by the client, extending to a depth of 5.0m and including Standard Penetration testing (SPT) at 1.0m intervals, and visually observe the underlying strata and groundwater conditions

-
- Collecting disturbed soil samples for subsequent laboratory testing for soil classification such as Particle Size Distribution (PSD), Atterberg limits, California Bearing Ratio (CBR), pH Field & Fox, Chromium Suite, Emerson Class Number, PSD by Hydrometer, organic matter content, pH, Salinity and Electrical Conductivity and Thermal Resistivity;
 - Completion of insitu Electrical Resistivity Testing (ERT) using the 4-pin Wenner Method at electrode spacings of 3m, 6m and 9m as approved by the client;
 - Preparation of this report outlining the investigation results, with conclusions and recommendations.

This report and the information presented herein must be read in conjunction with our attached “*General Notes*” and “*Important Information*”.

2 INVESTIGATION WORK

2.1 Fieldwork

Fieldwork for the investigation was carried out between the 1st and the 6th of June. The works were organized into four different stages as described below:

1. Survey location and clearance of services at a total of 16 test locations, including test pits, nominated borehole and additional boreholes, carried out on the 2nd and 3rd of June;
2. DCP, Excavation, sampling and logging of twelve test pits (12) carried out from the 3rd June to the 4th June;
3. Ground Electrical Resistivity Testing (ERT) completed on the 12th of June;
4. Geotechnical drilling, sampling and logging of four (4) boreholes carried out from the 20th to the 21st June.

The test pits and borehole locations are shown in Site Location Plan (Appendix A). The field coordinates of the test pits and boreholes are displayed in table 2-1 below. The materials encountered at each test pit and borehole location are described on test pit and borehole logs attached in Appendix B.

In addition to the nominated locations proposed in the initial SoW, additional test pits (TP08, TP09, TP10, TP11 and TP12) were excavated which locations are shown in the plan.

Dynamic Cone Penetrometer (DCP) tests were completed in accordance with [AS1289.6.3.2 "Determination of the Penetration Resistance of a Soil – 9kg Dynamic Cone Penetrometer Test"](#). DCP blow counts are included on the test pit and borehole log profiles, Appendix B.

As requested, insitu testing of electrical resistivity was undertaken in accordance with the Wenner method and utilized a AEMC 6471 Digital Ground Resistance and Soil Resistivity Tester. Electrode spacing's of 3m, 6m and 9m were adopted. Electrical resistivity test results have been presented in section 5.6 of this report.

All laboratory based thermal resistivity testing was completed in accordance with ASTM D5334-14 *Standard Test Method for Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure*. Thermal resistivity test results have been presented in table 4-4.

Fieldwork was carried out in general accordance with Australian Standard, AS 1726:2017 '[Geotechnical Site Investigations](#)' and under full time supervision of an engineering geologist from Construction Sciences.

Table 2-1 Coordinates and termination depths of test pits and boreholes.

Original Site ID	Test Reference	Easting (m)	Northing (m)	Proposed Depth (m)	Termination depth (m)
BH01	BH01	266818.00	8600233.00	5.00	5.45
BH02	BH02	266817.00	8600288.00	5.00	6.45
BH03	BH03	266912.00	8600288.00	5.00	5.27
BH04	BH04	266916.00	8600236.00	5.00	5.18
BH05	TP02	266823.00	8600375.00	2.00	1.75
BH06	TP03	267088.00	8600385.00	2.00	2.10
BH07	TP04	267363.00	8600382.00	2.00	2.00
BH08	TP05	267367.00	8600236.00	2.00	2.00
BH09	TP06	267127.00	8600220.00	2.00	0.50
BH10	TP07	267093.00	8600304.00	2.00	1.25

BH11	TP01	266806.00	8600106.00	2.00	2.00
BH12	TP08	266813.62	8599831.96	2.00	1.70
BH13	TP09	267362.03	8599813.45	2.00	2.10
BH14	TP10	266931.85	8600219.58	2.00	0.60
BH15	TP11	267040.02	8600341.98	2.00	2.00
BH16	TP12	267284.12	8600266.97	2.00	2.00

2.2 Laboratory Testing

Samples of representative strata were recovered and returned to our NATA accredited soils laboratory for geotechnical tests and sent to ALS for chemical suite testing. The following tests were carried out on selected samples.

- Particle Size Distribution (PSD) test
- Atterberg Limits Tests
- Particle Size Distribution (by Hydrometer)
- Emerson Class Number
- 4-day soaked CBR (including MDD)
- Chromium Suite
- pH Field & Fox
- Organic matter content
- pH, Salinity and EC
- Thermal Resistivity Testing – four-point dryback (85/90/95/100% SMDD and in accordance with ASTM D5334-14)

The laboratory test results are included in **Appendix D**. Laboratory testing was carried out in accordance with Australian Standard AS1289 '*Methods of Testing Soils for Engineering Purposes*' and other relevant standards for the chemical suite testing.

3 SITE DESCRIPTION

3.1 Site Location

The proposed power station site is located approximately 2 km north of the Jabiru town centre as shown in Figure 3-2. The area of investigation covered approximately 0.33 square kilometres and the Figure 3-2 below highlights the proposed thermal generation area in orange square box, of which approximately 6000 square metres and the array footprint in blue of approximately 0.1 square kilometres.

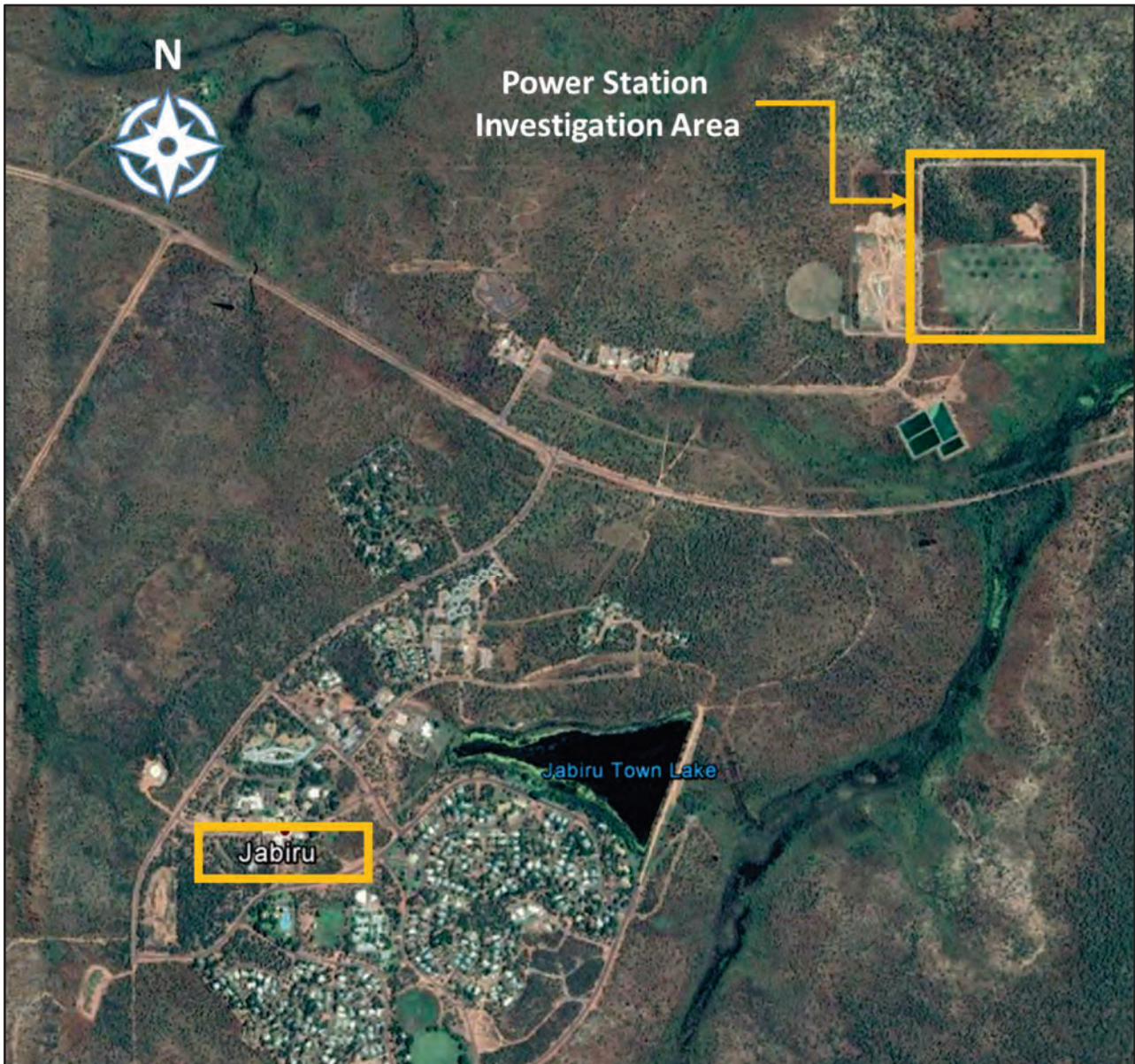


Figure 3-1 Overview of Power Station Investigation Area relative to Jabiru



Figure 3-2 Overview of Test pits and borehole locations at Jabiru – Power Station

3.2 Site Description

Some of the test pits and boreholes were located near access areas of the perimeter (BH01, BH02, TP01, TP02, TP03, TP04, TP05 and TP09) and minor bush clearance was required to access remaining test pit and borehole locations (BH03, BH04, TP07, TP10, TP11 and TP12). TP06 was excavated on a clear area of an old quarry. The proposed Power Station is located next to the Jabiru rubbish tip to the west, and the township water treatment facility to the south. The site is generally covered with small to large trees, shrubs and vegetation that consisted mainly of eucalyptus and bush flora.

The area was relatively flat with natural ground sloping towards the south, south-east with an approximate difference in elevation of 7m from 32m at TP02, to 25 m at TP08, and from 32 m at TP04 m to 21 m at TP09. Location TP09 represented the lowest point in the investigation area and presented the only location in which groundwater was encountered (at 1.8 m bgl).

In general, boreholes and test pits were drilled/excavated on flat surfaces. Figure 3-3 to Figure 3-6 show an overview of the topography surrounding some of the test pit locations.



Figure 3-3 Overview of surrounding of locations TP02 (left) and TP04 (right)



Figure 3-4 Overview of surrounding of locations TP06 (left) and TP09 (right)



Figure 3-5 Overview of surrounding of locations TP10 (left) and TP12 (right)



Figure 3-6 Overview of surrounding of locations TP07 during location mark up and underground service clearance.



Figure 3-7 View looking south-east toward BH02 (Left), view looking north-west toward BH04

3.3 Regional Geology

Reference was made to the AUSGIN Geoscience Portal, geological maps, which indicated that the investigation locations were likely to be underlain by one main geological unit:

- Undifferentiated unconsolidated alluvial, colluvial and residual deposits: sand, soil, silt, gravel, duricrust, etc. from the Cenozoic Era (0-66 million years).

Figure 3-8 shows an annotated geological map excerpt with the locations of boreholes and test pits.

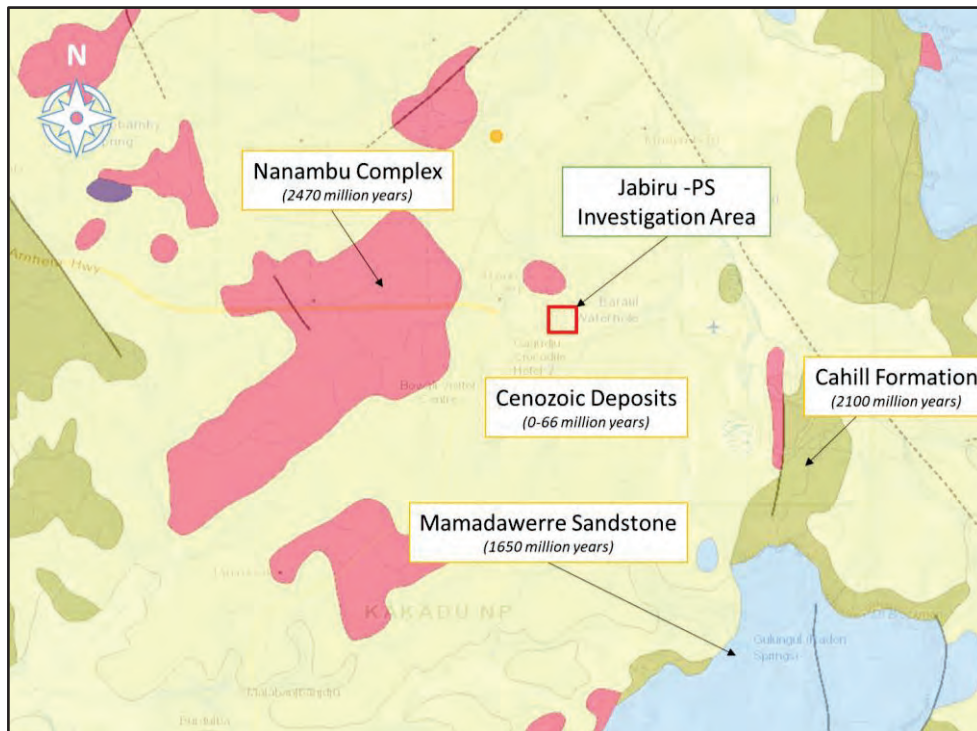


Figure 3-8 Geological map with Test pits and borehole location at Jabiru – Power Station

The northern part of Kakadu is located on the Cahill Formation (age approximately 2.1 billion years) and is the location of mineralization of economic significance, in particular uranium. The Cahill Formation is overlain by younger Mamadawerre Sandstone (age approximately 1650 million years) that forms part of the Arnhem Land Plateau. Weathering of the sandstone in the early to middle Tertiary period (approximately 20-30 million years ago) has exposed parts of the Archaean Nanambu Complex (age approximately 2470 million years).

3.4 Groundwater

Groundwater was encountered at TP09, located at the lowest point of the investigation area, at a depth of 1.85 m below ground level. Groundwater was not observed at the remainder of the test pits to maximum termination depth to 2.0 m. However, groundwater was encountered in boreholes at 3.2 m to 4.5 m. A summary of encountered groundwater levels both during and 24hrs after drilling have been presented below. Groundwater levels can be influenced by many factors including regional groundwater level, local and regional drainage, geology, rainfall, changes in land use and groundwater extraction.

Table 3-1 Observed Groundwater Levels

Observed Groundwater Levels		
BH ID	Groundwater level observed during drilling (m)	Groundwater level measured 24hrs after drilling (m)
BH01	4.0	3.9
BH02	3.2	3.2
BH03	4.5	4.0
BH04	4.0	3.7

4 SUBSURFACE CONDITIONS

4.1 Subsurface Strata

The subsurface profile encountered at each test location was observed to be fairly consistent across the investigation area, consisting generally of:

1. *Unit 1* - Gravelly sandy topsoil/alluvium, followed by;
2. *Unit 2* - A residual soil presenting as gravel with sand, followed by;
3. *Unit 3* - Extremely weathered material excavated as sandy gravel with a low plasticity clay portion, followed by;
4. *Unit 4* - Extremely weathered material excavated as silty sandy clay observed during the deep-level borehole drilling within the proposed thermal generation site footprint.

Tables 4-1 and table 4-2 below present a summary of the materials encountered at each of the borehole and test pit locations during the investigation. Test pit and borehole logs been included in Appendix B and should be referred to for a detailed description of the subsurface conditions.

A number of longitudinal sections cut along six critical areas of the site have also been included in this report and presented in Appendix C. It is noted that each of the investigation locations were picked up using a hand-held GPS and as a result the accuracy of recovered coordinates (Easting, Northing, RL) provided in section 2 above and used as input data into the development of borehole/testpit longitudinal sections are limited to approximately +/- 4-6m. All longitudinal sections should therefore be considered as indicative only.

Table 4-1 Subsurface strata intervals (m) for test pits

Soil Descriptions/ Depth (m)								
TP No.	FILL	TOPSOIL/ ALLUVIUM		RESIDUAL			XW Material	TD
		Gravelly SAND / sandy GRAVEL (Unit 1)	SAND (Unit 1)	Gravelly SAND	Sandy GRAVEL (Unit 2)	GRAVEL with Sand and with clay (Unit 2)	Sandy GRAVEL with clay (Unit 3b)	
	L-MD	MD-D	L-MD	L-MD^	MD-D	MD-D	D-VD	
TP01		0.0-0.30				0.30-1.50	1.5-TD	2.00*
TP02		0.0-0.18	0.18-0.5			0.50-0.90	0.9-TD	1.75 ^R
TP03		0.0-0.10	0.10-0.20		0.20-1.00	1.00-1.50	1.50-TD	2.10*
TP04		0.0-0.10			0.10-0.80		0.80-TD	2.00*
TP05		0.0-0.25				0.25-0.90	0.90-TD	2.00*
TP06						0.0-0.20	0.20-TD	0.50 ^R
TP07		0.0-0.15			0.15-0.90		0.90-TD	1.25 ^R
TP08		0.0-0.20				0.20-0.70	0.70-TD	1.75 ^R
TP09	0.0-0.20		0.20-1.00	1.00-TD				2.10*
TP10		0.0-0.15				0.15-0.4	0.40-TD	0.60 ^R
TP11		0.0-0.20				0.20-1.00	1.00-TD	2.00*
TP12		0.0-0.20				0.20-0.80	0.80-TD	2.00*

Notes:

- a) All depths measured in metres below ground level at the time of investigation
- b) R = Refusal (Bucket refusal for a TP)
- c) ^ geotechnical design consideration not required
- d) * Target depth achieved

e) L = Loose, MD = Medium Dense, D = Dense, VD = Very Dense

Table 4-2 Subsurface strata (m) intervals

Soil Descriptions/ Depth (m)								
BH No.	TOPSOIL / ALLUVIUM	RESIDUAL	XW Material					TD
	SAND/ silty SAND	Sandy GRAVEL (Unit 2)	Sandy GRAVEL/SAND with gravel and clay		Sandy Silty CLAY			
	L-MD (<i>Unit 1</i>)	MD-D (<i>Unit 2</i>)	MD (<i>Unit 3a</i>)	D-VD (<i>Unit 3b</i>)	S-F (Unit 4a)	VSt (Unit 4b)	H (Unit 4b)	
BH01	0.0-0.10	0.10-0.80	-	0.80-3.2	-	3.2-5.45	5.0-TD	5.45
BH02	0.0-0.2	0.20-0.70	-	0.70-1.80	3.0-6.0	-	6.00-TD	6.45
BH03	0.0-0.20	0.20-0.50	0.50-2.35	-	-	2.35-4.00	4.0-TD	5.27
BH04	0.0-0.3	0.30-0.70	-	0.70-3.0	-	-	3.0-TD	5.18

Notes:

- a) All depths measured in metres below ground level at the time of investigation
- b) TD = Target depth
- c) L = Loose, MD = Medium Dense, D = Dense, VD = Very Dense, S = Soft, F = Firm, VSt = Very Stiff, H=Hard

4.2 Laboratory Test Results

Samples recovered from the test pits and boreholes were tested in our NATA endorsed laboratory for testing, which included moisture content, Particle Size Distribution (PSD), Atterberg Limits (AL), CBR and Emerson Classification; selected samples were tested for Thermal Resistivity.

All laboratory testing recommended by CS was reviewed on receipt of the test summary logs in consultation with senior engineers and approval was received prior to commencing. Based on the SoW, the testing was divided into groups, geotechnical testing and RUSLE testing. The RUSLE Testing suite was proposed by the NTG and sub-consultants and as a result the test results are presented as factual information only.

4.2.1 Geotechnical Testing

An overview of the results of the geotechnical testing indicated the following:

Table 4-3 Summary of Material Classification including PSD, Plasticity and Linear Shrinkage

TP / BH ID	Depth (m)	% Gravel	% Sand	% Fines	LL (%)	PL (%)	PI (%)	Linear Shrinkage (%)	Field Moisture Content (%)
TP01	0.3-0.9	65	26	9	22	14	8	4	5.6
TP02	0.9-1.75	51	37	12	25	20	5	2	10.2
TP03	1.0-1.5	62	28	10	25	18	7	3	8.4
TP05	0.9-2.0	51	35	14	28	21	7	3	9.9
TP09	1.0-2.10	38	47	15	26	13	13	3.5	11.2
TP12	0.2-0.8	55	34	11	20	16	4	2	4.9

BH04	2.8-3.25	4	54	42	40	24	16	9	14.6
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Notes:

- a) LL = Liquid Limit, PL = Plastic Limit, PI = Plasticity Index
b) TBC = To be confirmed after release of test results

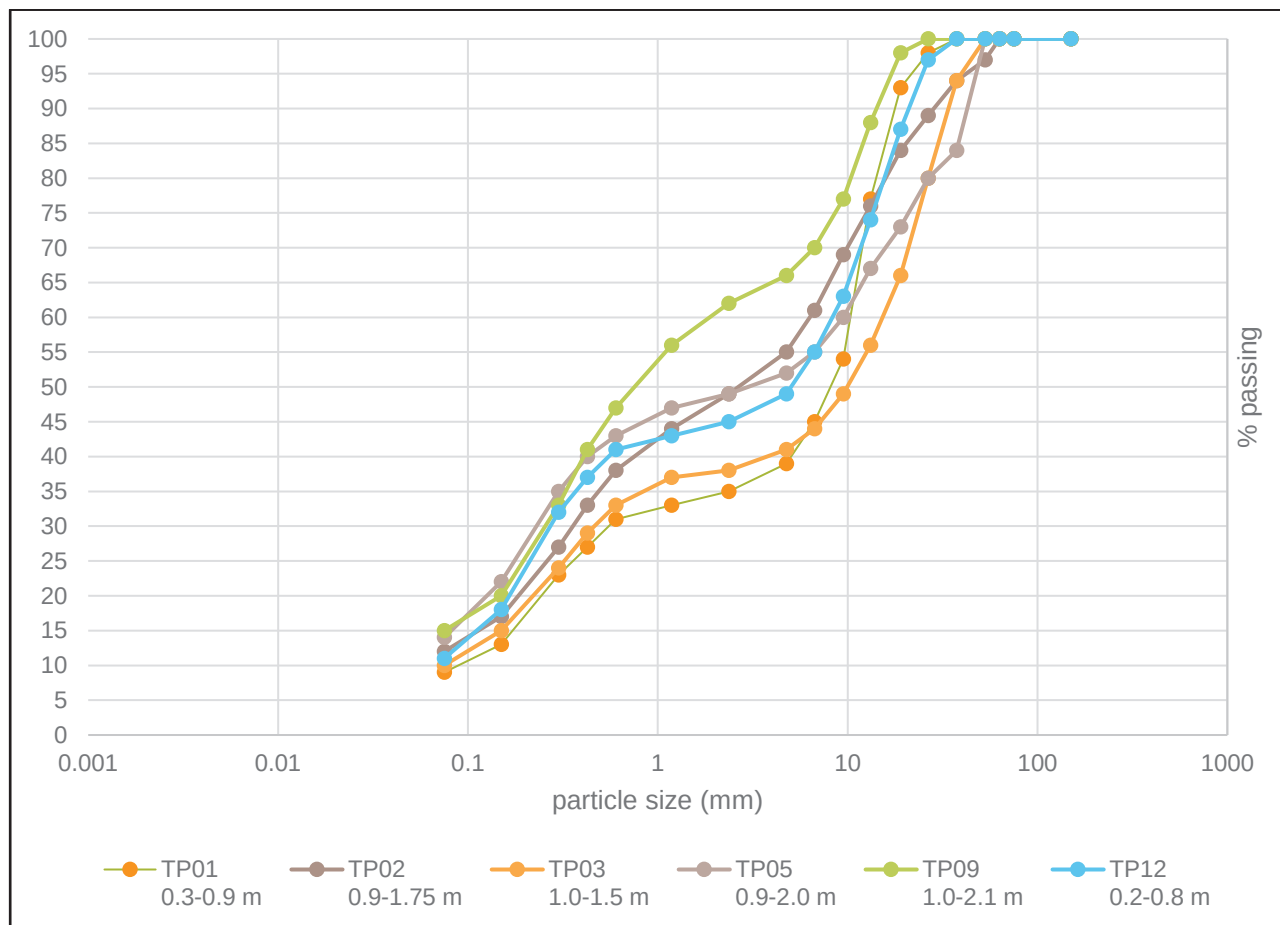


Figure 4-1 Particle Size Distribution at Power Station

Table 4-4 Summary of Emerson Class Number Results.

TP / BH ID	Depth (m)	Emerson Class Number
TP01	0.0-1.0	5
TP04	0.0-1.0	5
TP05	0.0-1.0	5
TP07	0.0-1.75	5
TP08	0.0-1.0	5
TP09	0.0-1.0	5
TP10	0.0-1.0	5
TP11	0.0-1.0	5
TP12	0.0-1.0	5

Notes:

- a) Emerson Class Number results have been presented under the geotechnical testing heading however were for the purposes of RUSLE identification as requested by the NTG and subconsultants

Table 4-5 Summary of CBR Test Results

TP / BH ID	Depth (m)	MMDD (t/m ³)	CBR Swell (%)	CBR (%)
TP03	0.2-1.0	2.15	0.0	35
TP05	0.25-0.9	2.05	0.0	45

Notes:

- b) MMDD = Modified Maximum Dry Density

Table 4-6 Summary of Thermal Resistivity Test Results

TP ID	Depth (m)	Thermal Resistivity (mK/W)^							
		85% SMDD ^(a)		90% SMDD ^(a)		95% SMDD ^(a)		100% SMDD ^(a)	
		Wet*	Dry*	Wet*	Dry*	Wet*	Dry*	Wet*	Dry*
TP01	1.5-2.0	1.008	3.110	0.826	2.170	0.579	1.481	0.512	1.206
TP03	0.2-1.0	1.636	4.276	0.722	1.609	0.678	1.748	0.517	1.207
TP04	0.80-2.00	0.852	2.812	0.676	1.992	0.552	1.490	0.468	1.181
TP05	0.25-0.9	1.523	3.410	0.609	1.387	0.559	1.258	0.480	1.154

Notes:

- a) * Indicative moisture content only; refer to formal test reports for accurate moisture content
b) ^ Calibration (C Factor) Applied
c) ^(a) rounded figures; refer to formal thermal resistivity test reports for accurate degree of compaction achieved.
d) SMDD = Standard Maximum Dry Density

4.2.2 RUSLE Laboratory Analysis

4.2.2.1.1 Revised Universal Soil Loss Equation Testing (RUSLE)

As requested, Construction Sciences collected samples of near surface soils for laboratory analysis against the Revised Universal Soil Loss Equation (RUSLE). As per direction provided by the NTG's external environmental consultant (CDM Smith), a preferred analytical testing suite consisting of the following was requested:

- Particle Size Distribution by Hydrometer;
- pH, Electrical Conductivity and Salinity;
- Emerson Class Numbers;
- Total Organic matter (by combustion);
- Moisture Content;
- Acid Sulphate Screening via pH field & fox and Chromium Suite.

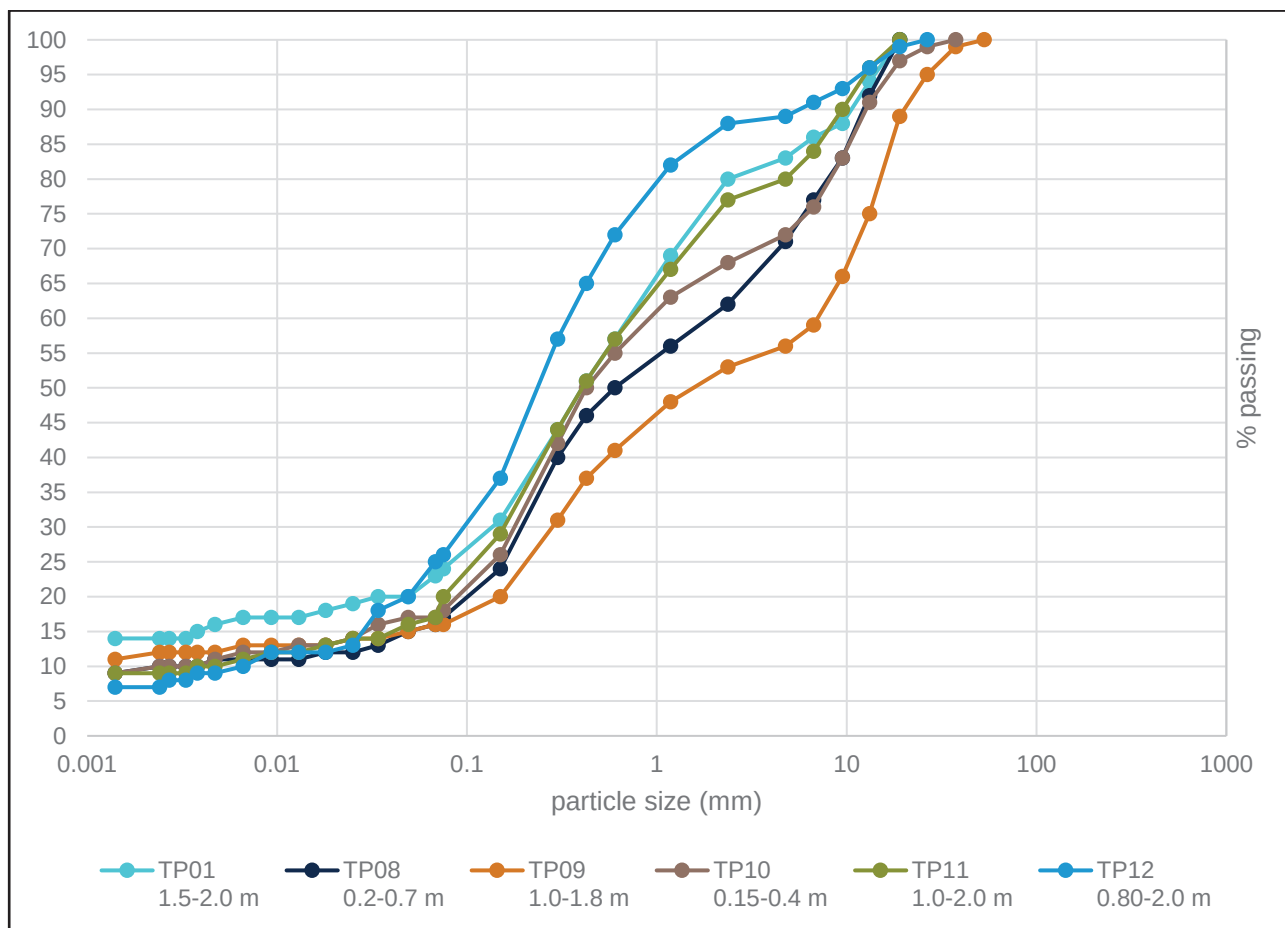


Figure 4-2 Particle Size Distribution by Hydrometer showing fine distribution at Power Station

All RUSLE laboratory test results have been included in Appendix E of this report.

4.2.3 ACID SULFATE SOIL INVESTIGATION

4.2.3.1 Acid Sulfate Field Screening Testing

The proposed Jabiru Power Station site is noted to be located on land situated between 20-33m AHD and surrounded by undifferentiated unconsolidated alluvial, colluvial and residual deposits composed of sand, soil, silt, gravel, duricrust, etc. from the Cenozoic Era (0-66 million years) (AUSGIN Geoscience Portal, 2020). The location indicates the site has potential to be underlain by ASS. Due to the proposed excavation depths and potential of encountering ASS, and ASS investigation onsite was conducted. Samples were collected and analysed utilising field screening tests and laboratory Chromium Suite testing.

4.2.3.2 Acid Sulfate Field Screening Testing

The pH screening test results indicate that the site is impacted by Actual Acid Sulphate Soils (AASS) and Potential Acid Sulphate Soils (PASS).

Samples were initially assessed utilising the ASS screening tests – pH_{field} (pH_f) and pH_{field} oxidised (pH_{fox}). The ASS screening tests returned pH_f results ranging from 5.6 to 7.0 and pH_{fox} results between 3.9 and 5.2. The variation of pH_f to pH_{fox} ranged from 1.0 to 2.4, with all samples producing a difference between pH_f and pH_{fox} greater than or equal to 1 pH unit. These results indicate the presence of PASS across all investigation locations. A difference of greater than 1 pH unit, pH_{fox} less than 3 and an explosive reaction are typical indicators of the presence of PASS. Though as the pH_{fox} results were on average 4.42, the presence of organic matter within the samples may have also attributed to the pH_{fox} results and reaction intensities. A summary of results are detailed in Table 4-7.

Analyte	LOR	TP01PSE02	TP01PSE03	TP01PSE05	TP01PSE06	TP02PSE02	TP02PSE03	TP02PSE05	TP02PSE06	TP04PSE02	TP04PSE03	TP04PSE05	TP04PSE06
pH (F)	0.1	6.6	6.3	6	5.9	6.2	6.5	6.2	6.2	6.1	6.2	6.1	6
pH (Fox)	0.1	4.9	4.8	4.6	4.4	4.1	4.8	4.6	4.7	3.9	3.9	4.2	4.3
Reaction Rate	1	2	2	2	2	2	2	2	2	2	2	2	2
Classification		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
Analyte	LOR	TP05PSE02	TP05PSE03	TP05PSE05	TP05PSE06	TP07PSE02	TP07PSE03	TP07PSE04	TP08PSE02	TP08PSE03	TP08PSE05	TP08PSE06	TP09PSE02
pH (F)	0.1	6.2	6.1	6.2	6.1	6.2	6.3	6.2	6.1	5.7	5.6	5.6	6.6
pH (Fox)	0.1	4.2	4.1	4.4	4.2	4.5	4.7	4.7	4.4	4.5	4.4	4.6	5.1
Reaction Rate	1	2	2	2	2	2	2	2	3	2	2	2	2
Classification		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	AASS	PASS
Analyte	LOR	TP09PSE03	TP09PSE05	TP09PSE06	TP10PSE02	TP11PSE02	TP11PSE03	TP11PSE05	TP11PSE06	TP12PSE02	TP12PSE03	TP12PSE05	TP12PSE06
pH (F)	0.1	7	7	7	6.8	6.4	6.3	6.2	6.2	6.1	6.2	6	6.1
pH (Fox)	0.1	5.2	5.2	5.2	4.4	4.4	4.5	4.6	4.7	4.6	4.6	4.6	4.5
Reaction Rate	1	2	2	2	2	2	2	2	2	2	2	2	2
Classification		PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

Table 4-7 pH field and pH fox results summary

4.2.3.3 Laboratory Chromium Suite Analysis

Due to the field screening tests indicating the potential for soils on the site to be impacted by both AASS and PASS, nineteen (19) samples across all locations at depths of 0 – 2.0m were selected to undergo the quantitative laboratory Chromium Suite Test Method (AS4969). The results of the laboratory analysis indicate that soils are mildly acidic in nature and are best classified as Non-Acid Sulphate Soils.

Titrateable Actual Acidity (TAA) is a measure of existing acidity in the soil. TAA results above the laboratory's Limit of Reporting (LOR) (0.02%S) were not observed in any of the samples tested. All samples recorded a pH_{KCl} between 5.1 and 5.6, indicating soils are acidic in nature.

Chromium Reducible Sulfur (S_{Cr}) levels are a measure of unoxidised sulphur based acidity remaining in the soil and PASS. S_{Cr} levels recorded across the site ranged from 0.007 - 0.015%S. No samples recorded S_{Cr} levels above the action criteria of 0.03%S. A liming rate of 1kg/m³ is recommended to address the limited risk presented by these levels. This treatment is a suitable pathway to managing the acidic soils onsite. Table 4-8 details a summary of the laboratory results.

Table 1-2 Chromium suite results summary

Analyte	Units	LOR	TP01PSE01 0-1m	TP01PSE04 1-2m	TP02PSE01 0-1m	TP02PSE04 1-2m	TP04PSE01 0-1m	TP04PSE04 1-2m	TP05PSE01 0-1m	TP05PSE04 1-2m	TP06PSE01 0-1m	TP07PSE01 0-1m
pH KCl	pH Unit	0.1	5.5	5.3	5.5	5.4	5.2	5.2	5.3	5.3	5.1	5.3
TTA	% pyrite S	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
SCr	% S	0.05	0.08	0.012	0.013	0.011	0.007	0.008	0.007	0.009	0.008	0.011
Net Acidity	% S	0.02	<0.02	0.02	0.02	0.02	<0.02	0.02	<0.02	0.02	0.02	0.02
Liming Rate	kg CaCO ₃ /t	1	<1	1	1	1	<1	1	<1	<1	<1	1
Analyte	Units	LOR	TP08PSE 01 0-1m	TP08PSE 04 1-2m	TP09PSE 01 0-1m	TP09PSE 04 1-2m	TP10PSE 01 0-1m	TP11PSE 01 0-1m	TP11PSE 04 1-2m	TP12PSE 01 0-1m	TP12PSE 04 1-2m	
pH KCl	pH Unit	0.1	5.2	5.1	5.6	5.4	5.5	5.4	5.5	5.5	5.3	
TTA	% pyrite S	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
SCr	% S	0.05	0.014	0.013	0.011	0.012	0.01	0.009	0.008	0.01	0.015	
Net Acidity	% S	0.02	0.03	0.03	<0.02	0.02	0.02	0.02	<0.02	0.02	0.02	
Liming Rate	kg CaCO ₃ /t	1	1	1	<1	1	1	<1	<1	1	1	

Table 4-8 Chromium suite results summary

4.2.3.4 Acid Sulfate Soil Management

Results of the quantitative laboratory Chromium Suite Tests indicate that the soils scheduled for disturbance are not impacted by ASS. A site specific ASSMP is not required for works to proceed in the investigation area.

5 GEOTECHNICAL ASSESSMENT

Based on the information provided it is understood that the proposed project will involve the design and construction of a power station and will include a solar array facility with accompanying thermal generation, fuel storage and connectivity infrastructure. It is expected that the following design and construction elements are of relevance to this geotechnical investigation report:

- Clearing and grubbing of the site;
- Associated civil works including grading and levelling of the solar array and building footprint sites, provisioning of surface and subsurface drainage, construction of access roads/tracks, excavation and backfilling of cable trenches;
- Construction of suitable foundation systems for all structures included in the solar array and thermal generation and fuel storage developments.

Based on our understanding of the proposed development the following sections have been provided to assist with the geotechnical aspects of the design and construction process.

5.1 Earthworks

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

The site should be stripped of any topsoil containing tree roots and organics from the access track, trench or building footprint areas, and stockpiled for later use, if required. This material is not considered suitable for use as trench backfill for structural fill but may be stockpiled for final reinstatement landscaping purposes. A topsoil stripping depth would generally be in the order of up to 0.3m based on the test pit logs across the investigation locations, however, variations to this depth may be encountered over the site.

Any existing fill must be considered to be uncontrolled unless certification can be provided to state otherwise. It is generally recommended to remove any fill and replace it with select fill material if below proposed foundations, at or below the subgrade level of proposed roads/tracks or at or below proposed pipe invert levels.

Prior to the placement of any select fill for any structural or civil infrastructure, the site should be proof rolled using a heavy, self-propelled, smooth drum vibrating roller, capable of operating in variable frequency modes. Any loose/soft areas should be removed and replaced with a select fill under 'controlled' conditions.

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

5.1.1 Excavatability

It is expected that all excavation works will be undertaken in order to facilitate the completion of the following tasks as part of the solar farm construction project:

- Clearing/stripping of all unsuitable material topsoil at proposed access roads/tracks and building footprints;
- Excavations of trenches in order to house and re-direct all electrical cabling.

It is expected that all colluvium and residual soil material will undergo 'easy digging' and should be able to be excavated using standard earthmoving equipment. It is expected that the observed extremely weathered (XW) rock will undergo at minimum 'hard digging' using a large backhoe and face shovel or rock breaker.

However, the excavation contractor should inspect the engineering test pit logs obtained during our ground investigation to make their own judgement as to likely productivity, bulking factors, or suitability of specific plant

5.1.2 Structural Fill

Material won from any excavation of the site would generally comprise of sandy gravel/ gravelly sand material. Such material is considered of reasonable quality for reuse provided that there is no deleterious material and organics present.

To minimise the potential for post compaction volume, change due to moisture content variations, any structural fill that contains cohesive strata, should be placed in loose layers not greater than 200mm thick at a moisture content in the range of -2% to +2% of the standard optimum moisture content, and be compacted to a minimum dry density ratio of 98% standard compaction as per AS1289 5.1.1. Clay bearing fill should be compacted using a minimum 10 tonne static pad foot roller. Additional, measures should be adopted to ensure that clay fill material is not allowed to dry out prior to the placement of succeeding layers of fill and final covering with building slabs and road pavements.

Any structural free draining sand fill should be placed in loose layers not greater than 200mm thick, flooded, if necessary, and compacted to a minimum density index of 75% as per AS1289 5.5.1 using a static smooth roller drum not less than 10 tonne in static weight.

It is recommended that the placement of all structural fill be inspected and tested to a Level 1 requirement during the earthworks operations to ensure that all fill is placed in a '*controlled manner*', in accordance with AS3798-2007 '*Guidelines on Earthworks for Commercial and Residential Developments*'.

5.1.3 Excavation Support and Batter Stability

Requirements outlined by relevant occupational health and safety regulations will need to be met in relation to the construction, support and safe working environment for any excavation. This includes that confined excavations or trenches deeper than 1.5m be benched or supported by temporary means such as sheet piles or shoring boxes should personnel need to work within the excavation unless certified as safe and stable by a suitably qualified geotechnical engineer.

The contractor shall assess any potential impact of the proposed construction works to adjacent utilities and surrounding infrastructure. It is recommended that regular trench inspections be carried out by a geotechnical engineer to ensure conditions are safe for workers and adjoining infrastructure.

Any temporary excavations exceeding the relevant occupational health and safety regulations should only be done on the basis of site-specific geotechnical advice and should be regularly inspected and certified by a suitably qualified geotechnical engineer.

The contractor shall assess any potential impact of the proposed construction works to adjacent utilities and surrounding infrastructure.

Any temporary excavations exceeding the relevant occupational health and safety regulations should be regularly inspected and certified by a geotechnical engineer.

Inclement weather conditions will affect the performance of any open excavations and all works and staff should be evacuated from the immediate area in case of wet weather. A geotechnical engineer shall re-inspect temporary excavations prior to recommencing work in affected excavations.

Care should be taken to ensure that there is no surcharge from stockpiled materials and building or vehicular loads to at least the excavation depth beyond the crest of excavations.

Table 5-1 below provides generalised recommendations for batter slopes for permanent and temporary slopes of no greater than 3m or above groundwater level, whichever is shallower:

Table 5-1 Recommended Batter Slopes

Recommended Batter Slopes		
Material Type	Temporary Slopes (short term)	Permanent Slopes (long term)
Alluvium (Medium Dense or better Sand) – Unit 1	1V:2H	NR
Residual (Medium Dense to Dense Sandy Gravel / Gravel) – Unit 2	1V:2H	1V:2.5H

XW Rock – Unit 3	1V:1H	1V:1.5H
Fill Batters ⁽¹⁾	1V:2H	1V:2H

Notes:

- a) NR = Not recommended
- b) Short Term = any batter that is expected to remain open for no longer than a 2 week period. Suitable drainage measures should be provided for all batter slopes and areas where water may pond or a drainage path may form, resulting in soil erosion, such as around building footings. As a minimum, surface drainage should be installed at the top of all batter slopes to divert water away from the batter face
- c) Denotes requirements for detailed stability assessment
- d) (1) all fill batters should be overfilled, compacted and cut back at the maximum angles recommended above and with some form of erosion protection to minimise potential scour effects due to weathering.
- e) R = Refusal (Bucket refusal for a TP)

As inferred above, inclement weather conditions may affect the performance of sections of open excavations and all works and staff should be evacuated from the immediate area in case of wet weather. A geotechnical engineer should re-inspect temporary excavations prior to work recommencing in affected excavations.

Care should be taken to ensure that there is no surcharge from stockpiled materials and building or vehicular loads to at least the excavation depth beyond the crest of excavations.

Some areas identified loose granular colluvial sandy materials that can be unstable when benching and installing pipework. A range of temporary support measures may be considered in these instances, e.g. sheet piles and shoring boxes.

5.2 Geotechnical Design Parameters

Preliminary geotechnical parameters relevant to design of foundation, excavation and retaining walls, following site preparation and earthworks procedure, are provided in Table 5-2 with respective geological units below based on geotechnical information obtained during our investigation from test pits for the site, and our experience of materials of similar nature and history on other projects. These parameters will be reviewed and updated in the final report, if required, after completion of drilling boreholes.

Table 5-2 Preliminary Geotechnical Design Parameters for Strength and Deformation

Material Type	Soil Consistency / Density	Unit weight γ (kN/m ³)	Undrained shear strength c_u (kPa)	Drained friction angle Φ' (°)	Drained cohesion c' (kPa)	Young's Modulus, E (MPa)	Poisson's Ratio, ν
SAND (Alluvium) – Unit 1	Medium dense	19	-	32	0	35	0.3
Sandy Gravel or Gravel (Residual soil) – Unit 2 and Unit 3a	Medium dense to dense	20	-	35	0	50	0.3
Extremely Weathered Rock – Unit 3b	Not considered having rock strength (Excavated as Sandy Gravel and very dense in soil strength)	22	-	38	0	60	0.30
Extremely Weathered Rock – Unit 4a	Not considered having rock strength (Excavated Sandy Silty CLAY)	20	100	28	7	30	0.30

Material Type	Soil Consistency / Density	Unit weight γ (kN/m ³)	Undrained shear strength c_u (kPa)	Drained friction angle Φ' (°)	Drained cohesion c' (kPa)	Young's Modulus, E (MPa)	Poisson's Ratio, ν
	and Very Stiff to Hard)						
Extremely Weathered Rock – Unit 4b	Not considered having rock strength (Excavated Sandy Silty CLAY and Soft to Firm – encountered at BH02)	17	25	24	2	8	0.30

5.3 Structural Footings

Based on the nature of the proposed development and the subsurface conditions encountered via shallow test pit excavation and deep-level (~5m) geotechnical borehole drilling, it is considered that either high level or deep footing systems could be suitable subject to the loading conditions and required functions of structural elements. Due to the presence of gravels and lateritic XW material expressed across the site, driven piles would not be considered a suitable deep level foundation option. It is considered that bored piers or slab/strip footings placed onto compacted natural strata may be suitable however subject to further discussion with the client to better understand the function of the proposed development.

The deep-level drilling investigation identified some significant variability in the underlying lateritic extremely weathered material. Soft to firm Sandy Silty CLAY layer associated with groundwater encountered at depths between 3 m and 6 m in BH02 presents a potential geotechnical risk to the project. It is considered that the structural elements planned for design/construction in this area of the site may be exposed to excessive settlement and inadequate bearing capacity and should become the subject of further investigation once the project has progressed through the conceptual stages. At this stage of preliminary investigation, we have not been provided with a detailed building footprint plan, and for this reason, some indicative shallow and deep level foundation options, capacities and parameters provided in the following section should be considered for the purposes of preliminary assessment and completeness based on all of the investigation data gathered as part of this study. In the event that highly loaded building structures are required to be built within the vicinity of the BH02 location, it is recommended that further investigation at the detailed design stage is completed to better define the coverage of the encountered poor ground conditions.

It is recommended that an inspection and insitu testing be undertaken by an experienced and qualified geotechnical engineer during the excavation of all shallow footings and deep foundations (and prior to placing reinforcing steel) to verify the competence of the foundation strata and confirm the options, capacities and parameters provided as part of this preliminary bearing capacity assessment.

In general, it is recommended to avoid wet foundation soils and as such it would be preferable to carry out any construction works during the dry season. However, if construction in the wet season is necessary, then the bases of all foundation excavations should be blinded to restrict wetting of the foundation soils and to provide a working platform for construction of the footings.

5.3.1 Site Classification in accordance with AS2870-2011

Ground movement as a result of moisture change in the soil can be estimated based on the guidelines presented in AS2870 – 2011 '*Residential Slab and Footings*', which provides a system of site classification as shown in Table 5-2 for residential slabs and footing design. The standard is intended for use with residential buildings but can be applied to commercial buildings if the imposed loads are similar to those imposed by residential structures.

Table 5-3 General Definitions of Site Classification

Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay or silt sites with slight ground movement from moisture changes
M	Moderately reactive clay or silt sites which can experience moderate ground movement from moisture changes
H1	Highly reactive clay site, which can experience high ground movement from moisture changes
H2	Highly reactive clay site, which can experience very high ground movement from moisture changes
E	Extremely reactive sites, which can experience extreme ground movement from moisture changes
A to P	Filled sites
P	Sites which include: soft soils, such as soft clays, silts or organic soils, loose sands, landslip, mine subsidence, collapsing soils, soils subject to erosion, reactive sites subject to abnormal moisture conditions, sites with highly variable conditions such as weathered dolerite dykes, and sites which cannot be classified otherwise.

Ground movement as a result of moisture change in the soil can be estimated based on the guidelines presented in AS2870 – 2011. Following section regarding site preparation and earthworks, the site could be preliminary classified as **Class 'S'** (Slightly reactive clay or silt sites with slight ground movement from moisture changes) due to the presence of some fines within the soil matrix.

This final site classification should be confirmed during and after site preparation and earthworks by an experienced geotechnical engineer, as earthworks can result in a change in the site classification.

5.3.2 Shallow Foundations

As a preliminary, following the site preparation and earthwork completed as per recommendation in Section 6.1, foundations for structures upon compacted natural materials or engineered fill should be designed for allowable bearing capacity shown in Table 5-4 for footings width up to 2.0 m with minimum embedment depth of 500 mm below ground level.

Table 5-4 Shallow /Pad Footing Allowable Bearing Capacity at facilities location

Soil Strata	Consistency	Allowable Bearing Capacity (kPa)
Engineered Fill	MD-D	150
SAND (Alluvium) – Unit 1	MD-D	150
Sandy GRAVEL / GRAVEL (Residual) – Unit 2	MD-D	150
GRAVEL (Residual) – Unit 2	MD-D	180
XW Rock – Unit 3b	D-VD	250

Settlement should be checked when the loading conditions and footing details are known at the design stage. To mitigate the risk of differential settlement, it is recommended that all footings for each structural element be founded in similar natural strata. Where variations in founding depths/materials are expected across a single or connected structural element, it is recommended that allowances are made for potential differential settlement, including structural articulation.

It is recommended that an inspection and insitu testing be undertaken by an experienced geotechnical engineer during the excavation of all footings (and prior to placing reinforcing steel) to verify the competence of target foundation strata.

5.3.3 Deep Level Footings

A deep level foundation solution conducive with the encountered site conditions would include bore piers. Using the Australian Standard AS2159-2009 '*Piling - Design and Installation*', the design of a bored pile foundation system may be based on the following formulae:

$$E_d \leq R_{d,g}$$

where	$R_{d,g}$	=	$\phi_g R_{d,ug}$
	$R_{d,g}$	=	Design Geotechnical Strength
	E_d	=	design action effect (design load as the combination of factored loads which produce the most adverse effect on the pile).
	ϕ_g	=	Geotechnical Reduction Factor
	$R_{d,ug}$	=	Design Ultimate Geotechnical Strength
	$R_{d,ug}$	=	$f_s A_s + f_b A_b$
	f_s	=	Ultimate skin friction pressure
	f_b	=	Ultimate base bearing pressure
	A_b	=	Plan area of pile base
	A_s	=	Surface area of pile

For piles founding into clay or weathered rock:

	f_s	=	$S \alpha$
	f_b	=	$S N_c$
where	α	=	Adhesion factor
	N_c	=	Bearing capacity factor which varies between 5 and 9 depending on the depth of the pile
	S	=	Undrained shear strength

The parameters shown in Table 5-2 may be used for footing design purposes. However, if bored piles are adopted, the base of the piles must be inspected during construction to ensure that material of adequate capacity supports each pile. The designer/construction contractor is directed AS2159-2009 'Piling - Design and Installation' for further details regarding the minimum requirements of bored pier construction.

Table 5-5 Bearing Capacities for Bored Piles

Material Description	Design Equivalent Skin Friction $\phi_g f_s$ (kPa)		Design Equivalent Base Bearing Capacity $\phi_g f_b$ (kPa)	
	Allowable	Ultimate	Allowable	Ultimate
Alluvium / Residual Soil (Unit 1 / Unit 2)	NR	NR	NR	NR
XW Rock (Unit 3a)	NR	NR	NR	NR
XW Rock (Unit 3b)	10	40	280	700
XW Rock (Unit 4a)	NR	NR	NR	NR
XW Rock (Unit 4b/Unit 4c)	20	50	200	500

Notes:

- NR = Not recommended
- Ignore top 1.5m of profile in pile capacity calculations.
- The above values were compiled assuming that the pile depth will be at least 5 times that of its pile diameter.
- A geotechnical strength reduction factor (ϕ_g) of 0.4 has been applied to the ultimate parameters in the calculation of the above design equivalent capacities.

Settlement calculations would depend upon the loads applied and proposed founding strata. However, shallow or deep level footings founded into Dense to Very Dense XW rock, or Very Stiff to Hard XW Rock strata would not be expected to settle significantly (less than 20mm) provided the applied loads are less than the capacities provided above.

5.4 Pavement Subgrade

Two (2) bulk subgrade samples were selected for testing from test pits TP03 and TP05 to provide an indication of the existing near surface Sandy Gravel and Gravel (Residual soil) as subgrade support. The tested material comprised sandy gravel and gravel with clay and sand portions. The soaked California Bearing Ratio (CBR) tests sampled from the area produced results of 35% and 45% from samples recovered from TP03 and TP05 respectively. The CBR tests were performed on samples compacted to a target density ratio of 95% of modified maximum dry density (MMDD) and about standard optimum moisture content. The swell percentage achieved was 0% across the two respective CBR samples tested.

To allow for natural variations in subsurface conditions, it is suggested that a preliminary design CBR value of 20% be adopted in design with the gravel and 10% with sand.

Based on Austroad's Publication '*Guide To Pavement Technology, Part 2: Pavement Structural Design*', Section 5.6 specifies a modulus of subgrade can be estimated as:

Modulus of Subgrade (MPa) = 10 x CBR

It is noted in this document that this relationship is an approximation and the modulus values have been found to vary between 5 x CBR to 20 x CBR.

Drainage measures should be adopted to ensure that the subgrade does not become saturated in service. The exposed subgrade should be closely inspected at the time of construction to ensure that a material of lower than the assumed design strength is not adopted as a subgrade support base. Should weaker subgrade material be encountered, consideration should be given to removing and replacing the weak strata with a higher quality material, or making a reassessment in design.

5.5 Dispersivity and Surface/Subsurface Drainage and Erosion

Emerson Class tests were carried out on nine (9) predominant near surface soil samples as requested by the client. Given the consistency of near surface material, all of the test results returned an Emerson Class Number of 5. This indicates that the soils across the site are non-dispersive. They also indicate the soils have a medium potential for erosion and high a potential to cause environmental harm if disturbed. Given the medium potential to erode, it is recommended that all general erosion and sediment controls are put in place during the construction.

Effective erosion and sedimentation control measures relevant for clearing and trenching operations should be installed and maintained for the duration of construction. Adequate drainage of all working areas shall be maintained throughout the period of construction to ensure run-off of water can only pond as provisioned for in a planned erosion and sedimentation control system. Rainfall and runoff on exposed slopes of dispersive clays can cause severe erosion and/or trench instability.

Suitable surface drainage measures should be provided upslope of areas where water may pond or otherwise enter excavated trenches, or a drainage path may form resulting in soil erosion.

Consideration should also be given to the permeability of any proposed bedding and backfill materials and also the depth and flow direction of groundwater at the site.

If the material is used and remained as fill on site, to prevent the erosion, any water runoff from the upslope of the site should be collected and diverted away from the structures. The finished surface level of the site should be graded to fall away from the structures and their foundations.

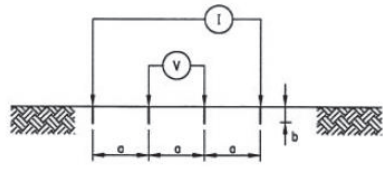
5.6 Ground Resistivity

Ground resistivity testing was undertaken on the 12th June 2020 at the proposed sites. Due the inaccessibility of the initially proposed testing area, in between BH01-BH02-BH03 and BH04, resistivity testing was conducted in accessible areas of the perimeter road, next to BH02 and BH03, previously clear for access to excavate TP10. This testing was performed with a AEMC 6471 digital ground tester. Electrical Soil Resistivity was measured according to *ASTM G57-06 Standard Test Method for Field Measurements of Soil Resistivity Using*

the *Wenner Four-Electrode Method* at electrode spacings of 3 m, 6 m and 9 m in perpendicular directions when possible. This option was very limited due to the presence of a fence surrounding the perimeter.

The field data is summarised on Appendix F and a table summarising the average apparent resistivity of soils is presented in Table 6-4 below.

Table 5-1 displays the average field values in ohms (Ω) of Electrical Resistivity (R_W) per electrode spacing (a), being (b) the depth of the electrode as equation below:



$$\rho_E = \frac{4 \cdot \pi \cdot a \cdot R_W}{1 + \frac{2 \cdot a}{\sqrt{a^2 + 4 \cdot b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Equation 5-1 Wenner equation to calculate Apparent Resistivity

When electrode depth is small compared to the distance between electrodes (a), the formula to calculate the apparent resistivity (ρ_E) can be reduced to:

$$\rho_E = 2 \pi a R_W$$

Based on this formula, average values of apparent resistivity have been calculated and summarized in Table 5-1 and 5-2.

Table 5-6 Average Electrical Resistivity (Ω m) by test pits and borehole locations

Location	3 m	6 m	9 m
BH02 / N-S	2242	1550	1233
BH02 / E-W	3010	1316	621
BH03 / E-W	5509	2885	1390
TP04 / N-S	2408	error	error
TP04 / E-W	2965	1891	1918

Note:

- a) Error = Potential system error occurred during measurement at TP04 likely due to over reading caused by poor contact between electrode and near surface sandy material. Reiterative readings attempted without success.

6 CONSTRUCTION INSPECTIONS

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

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

7 CONCLUSION

The preceding sections of this report should be read for a full description of the conclusions and recommendations made. The following is a summary of the conclusions and recommendations with regards to the geotechnical investigation for the proposed Jabiru Power Station Development:

- Field work comprised the service location of testpits and boreholes; a total of twelve (12) test pits to an average target depth of 1.7m, four (4) auger boreholes to an average depth of 5m, and ground resistivity tests at two (2) locations. Representative samples were recovered for geotechnical and environmental/chemical analysis.
- The subsurface profile encountered at each test location was observed to be fairly consistent across the investigation area, consisting generally of gravelly sandy topsoil followed by gravel with sand residual soil, followed by extremely weathered material (lateritic) excavated as sandy gravel with a low plasticity clay portion, followed by an extremely weathered material (lateritic) which was excavated as silty sandy clay at further depth.
- Groundwater was encountered at a depth of 1.85m below ground level at TP09, and an average of 3.9m below ground level during borehole drilling. However, groundwater levels can be influenced by many factors including regional groundwater level, local and regional drainage, geology, rainfall, changes in land use and groundwater extraction.
- The site preparation work should generally be carried out in accordance with AS3798-2007 'Guidelines on Earthworks for Commercial and Residential Developments'.
- A summary the requirements of the RUSLE Testing scope has been included as section 4.2.2 of this report.
- A summary of acid sulfate soils (ASS) investigations has been included as section 4.2.3 of this report. The results of the laboratory analysis indicate that the soils are mildly acidic in nature and are best classified as Non-Acid Sulfate Soils.
- It is expected that all alluvium and residual soil material will undergo 'easy digging' and should be able to be excavated using standard earthmoving equipment. It is expected that the observed extremely weathered (XW) rock (Laterite) will undergo at minimum 'hard digging' using a large backhoe and face shovel or rock breaker. However, the excavation contractor should inspect the engineering test pit logs obtained during our ground investigation to make their own judgement as to likely productivity, bulking factors, or suitability of specific plant
- Material won from any excavation of the site would generally comprise of sandy gravel/ gravelly sand material. Such material is considered of reasonable quality for reuse provided that there is no deleterious material and organics present. All placement of fill is to be placed under controlled conditions and in accordance with AS3798-2007 'Guidelines on Earthworks for Commercial and Residential Developments'.
- Generally, batter slopes of geometry 1V:2H in the short term and 1V:2.5H in the long term are acceptable for the near surface material encountered on site. Despite this, all batter slopes should be inspected and certified by a CS geotechnical engineer.
- Based on the classification test results, the estimated surface movement of the existing soil profile due to seasonal variations in moisture content is of less than 20mm across the site. This indicates that the site may generally be classified Class S Slightly Reactive in accordance with AS2870-2011 '*Residential Slabs and Footings*' after completion of site preparation and earthwork recommended in Section 5.1.
- Based on the nature of the proposed development and the subsurface conditions encountered it is considered that either high level or deep footing systems could be suitable subject to the loading conditions and required functions of structural elements. However, due to the presence of gravels and lateritic XW material expressed across the site, driven piles would not be considered a suitable deep level foundation option.

-
- A potential geotechnical risk was identified from depths of 3-6m at BH02. Reference is made to section 5.3 for greater detail of the findings.
 - Pavements may be designed based on a preliminary subgrade CBR of 20% for the sandy gravel or gravel. If sand was encountered as subgrade this subgrade CBR value should be limit to 10 %.
 - An Emerson Class Number of 5 has been assigned to the near surface material encountered on site. This indicates that the soils across the site are non-dispersive. They also indicate the soils have a medium potential for erosion and high potential to cause environmental harm if disturbed

Should the subsurface conditions other than those described in this report be encountered, Construction Sciences should be consulted immediately and appropriate modification be developed and implemented if necessary.

Your faithfully,



Ricardo Herraes
Engineering Geologist
For Construction Sciences



Joe Oo
Senior Geotechnical Engineer

GENERAL NOTES



Construction Sciences

March 2017

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GENERAL

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

TEST HOLE LOGGING

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

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

GROUNDWATER

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

INTERPRETATION OF RESULTS

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

CHANGE IN CONDITIONS

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

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

FOUNDATION DEPTH

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

REPRODUCTION OF REPORTS

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

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this firm.

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• Sunshine Coast • Geelong • Ipswich • Gold Coast New South Wales • Sydney • Newcastle
• Coffs Harbour Victoria • Bendigo • Dandenong • Tullamarine • Geelong



APPENDIX

A

SITE LOCATION MAP



**Construction
Sciences**

Legend



Borehole



Test pit



Additional Test pits



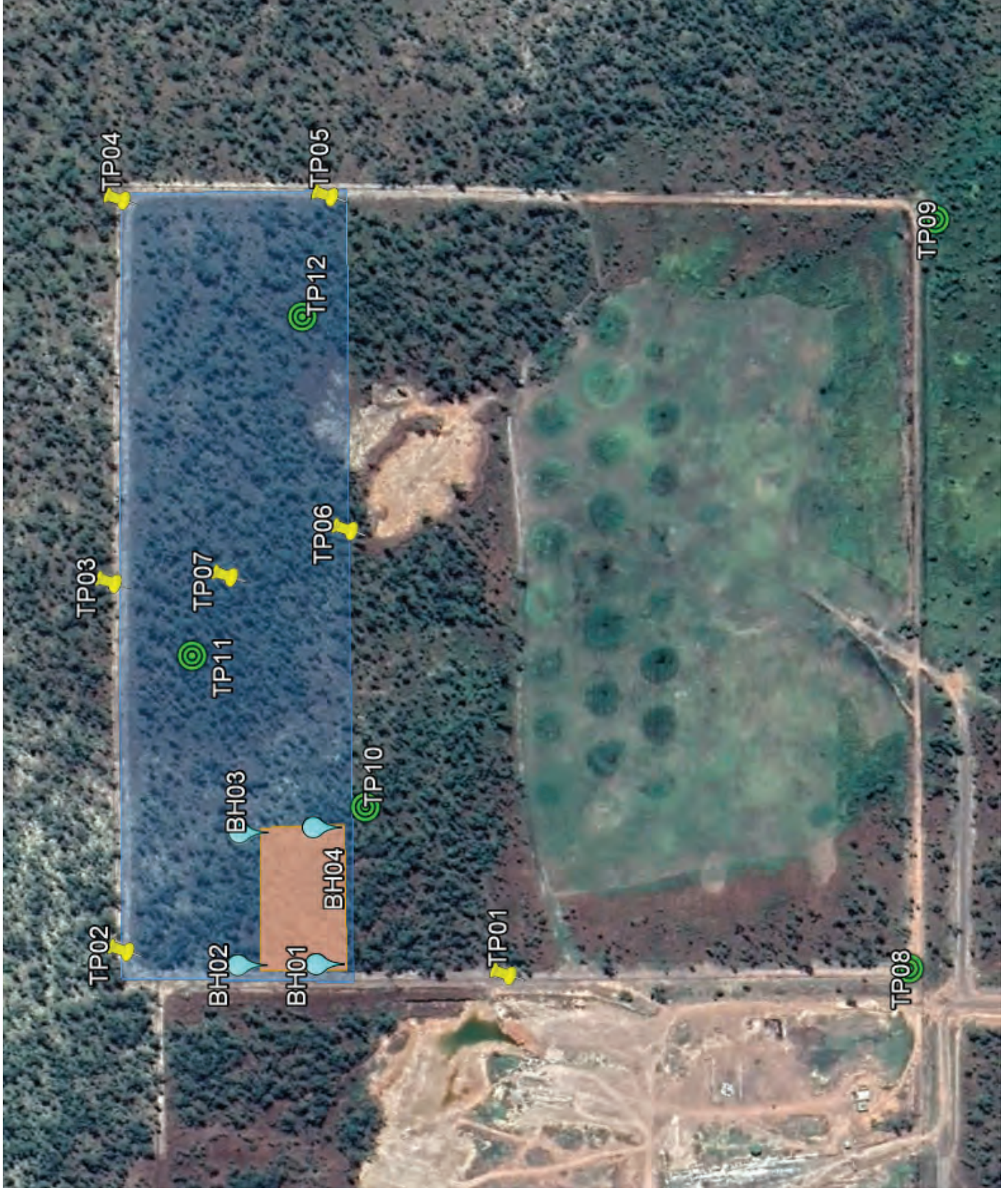
Thermal generation
fuel storage and
connection point



Solar panel
Array footprint



Approximate Scale



APPENDIX

B

BOREHOLE AND TEST PIT LOGS



**Construction
Sciences**

Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method

Test Pitting: excavation/trench

BH	Backhoe bucket
EX	Excavator bucket
R	Ripper
H	Hydraulic Hammer
X	Existing excavation
N	Natural exposure

Manual drilling: hand operated tools

HA	Hand Auger
----	------------

Continuous sample drilling

PT	Push tube
PS	Percussion sampling
SON	Sonic drilling

Hammer drilling

AH	Air hammer
AT	Air track

Spiral flight auger drilling

AS	Auger screwing
AD/V	Continuous flight auger: V-bit
AD/T	Continuous spiral flight auger: TC-Bit
HFA	Continuous hollow flight auger

Rotary non-core drilling

WB	Washbore drilling
RR	Rock roller

Rotary core drilling

PQ	85mm core (wire line core barrel)
HQ	63.5mm core (wire line core barrel)
NMLC	51.94mm core (conventional core barrel)
NQ	47.6mm core (wire line core barrel)
DT	Diatube (concrete coring)

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method

Soil sampling

B	Bulk disturbed sample
D	Disturbed sample
C	Core sample
ES	Environmental soil sample
SPT	Standard Penetration Test sample
U	Thin wall tube 'undisturbed' sample

Water sampling

WS	Environmental water sample
----	----------------------------

Field testing may be conducted as a means of assessment of the in situ conditions of materials.

Field testing

SPT	Standard Penetration Test
HP/PP	Hand/Pocket Penetrometer
Dynamic Penetrometers (blows per noted increment)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
VS	Vane Shear
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Photo Ionization Detector

If encountered, refusal (R), virtual refusal (VR) or hammer bouncing (HB) of penetrometers may be noted.

The quality of the rock can be assessed by the degree of natural defects/fractures and the following.

Rock quality description

TCR	Total Core Recovery (%) (length of core recovered divided by the length of core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100mm long divided by the length of core run)

Notes on groundwater conditions encountered may include.

Groundwater

Not Encountered	Excavation is dry in the short term
Not Observed	Water level observation not possible
Seepage	Water seeping into hole
Inflow	Water flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions

Stable	No obvious/gross short term instability noted
Spalling	Material falling into excavation (minor/major)
Unstable	Collapse of the majority, or one or more face of the excavation

Explanatory Notes: General Soil Description

The methods of description and classification of soils used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, a material is described as a soil if it can be remoulded by hand in its field condition or in water. The dominant component is shown in upper case, with secondary components in lower case. In general descriptions cover: soil type, plasticity or particle size/shape, colour, strength or density, moisture and inclusions.

In general, soil types are classified according to the dominant particle on the basis of the following particle sizes.

Soil Classification		Particle Size (mm)
CLAY		< 0.002
SILT		0.002 to 0.075
SAND	fine	0.075 to 0.21
	medium	0.21 to 0.6
	coarse	0.6 to 2.36
GRAVEL	fine	2.36 to 6.7
	medium	6.7 to 19
	coarse	19 to 63
COBBLES		63 to 200
BOULDERS		> 200

Soil types may be qualified by the presence of minor components on the basis of field examination methods and/or the soil grading.

Terminology	In coarse grained soils		In fine soils
	% fines	% coarse	% coarse
Trace	≤5	≤15	≤15
With	>5, ≤12	>15, ≤30	>15, ≤30

The strength of cohesive soils is classified by engineering assessment or field/lab testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	≤12kPa
Soft	S	12kPa to ≤25kPa
Firm	F	25kPa to ≤50kPa
Stiff	St	50kPa to ≤100kPa
Very Stiff	VSt	100kPa to ≤200kPa
Hard	H	>200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	<15%
Loose	L	15% to ≤35%
Medium Dense	MD	35% to ≤65%
Dense	D	65% to ≤85%
Very Dense	VD	>85%

The plasticity of cohesive soils is defined by the Liquid Limit (LL) as follows.

Plasticity	Silt LL	Clay LL
Low plasticity	≤ 35%	≤ 35%
Medium plasticity	N/A	> 35% ≤ 50%
High plasticity	> 50%	> 50%

The moisture condition of soil (w) is described by appearance and feel and may be described in relation to the Plastic Limit (PL), Liquid Limit (LL) or Optimum Moisture Content (OMC).

Moisture condition and description	
Dry	Cohesive soils: hard, friable, dry of plastic limit. Granular soils: cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure of soil layers may include: defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin and description	
Fill	Anthropogenic deposits or disturbed material
Topsoil	Zone of soil affected by roots and root fibres
Peat	Significantly organic soils
Colluvial	Transported down slopes by gravity/water
Aeolian	Transported and deposited by wind
Alluvial	Deposited by rivers
Estuarine	Deposited in coastal estuaries
Lacustrine	Deposited in freshwater lakes
Marine	Deposits in marine environments
Residual soil	Soil formed by in situ weathering of rock, with no structure/fabric of parent rock evident
Extremely weathered material	Formed by in situ weathering of geological formations, with the structure/fabric of parent rock intact but with soil strength properties

The origin of the soil generally cannot be deduced solely on the appearance of the material and the inference may be supplemented by further geological evidence or other field observation. Where there is doubt, the terms 'possibly' or 'probably' may be used

Explanatory Notes: General Rock Description

The methods of description and classification of rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, if a material cannot be remoulded by hand in its field condition or in water, it is described as a rock. In general, descriptions cover: rock type, grain size, structure, colour, degree of weathering, strength, minor components or inclusions, and where applicable, the defect types, shape, roughness and coating/infill.

Rock types are generally described according to the predominant grain or crystal size, and in groups for each rock type as follows.

Rock type	Groups
Sedimentary	Deposited, carbonate (porous or non), volcanic ejection
Igneous	Felsic (much quartz, pale), Intermediate, or mafic (little quartz, dark)
Metamorphic	Foliated or non-foliated
Duricrust	Cementing mineralogy (iron oxides or hydroxides, silica, calcium carbonate, gypsum)

Reference should be made to AS1726 for details of the rock types and methods of classification.

The classification of rock weathering is described based on definitions in AS1726 and summarised as follows.

Term and symbol	Definition
Residual Soil RS	Soil developed on rock with the mass structure and substance of the parent rock no longer evident
Extremely weathered XW	Weathered to such an extent that the rock has 'soil-like' properties. Mass structure and substance still evident
Distinctly weathered DW	The strength is usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores. May be distinguished into MW (Moderately Weathered) and HW (Highly Weathered).
Slightly weathered SW	Slightly discoloured; little or no change of strength from fresh rock
Fresh Rock FR	The rock shows no sign of decomposition or staining

The rock material strength can be defined based on the point load index as follows.

Term and symbol	Point Load Index I_{s50} (MPa)
Very Low VL	0.03 to 0.1
Low L	0.1 to 0.3
Medium M	0.3 to 1.0
High H	1.0 to 3
Very High VH	3 to 10
Extremely High EH	> 10

It is important to note that the rock material strength as above is distinct from the rock mass strength which can be significantly weaker due to the effect of defects.

A preliminary assessment of rock strength may be made using the field guide detailed in AS1726, and this is conducted in the absence of point load testing.

The defect spacing measured normal to defects of the same set or bedding, is described as follows.

Definition	Defect Spacing (mm)
Thinly laminated	< 6
Laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	> 2000

Terms for describing rock and defects are as follows.

Defect Terms			
Joint	JT	Sheared zone	SZ
Bedding Parting	BP	Seam	SM
Foliation	FL	Vein	VN
Cleavage	CL	Drill Lift	DL
Crushed Seam	CS	Handling Break	HB
Fracture Zone	FZ	Drilling Break	DB

The shape and roughness of defects in the rock mass are described using the following terms.

Planarity	Roughness
Planar PR	Very Rough VR
Curved CU	Rough RF
Undulose UN	Smooth S
Irregular IR	Slickensided SL
Stepped ST	Polished POL
Discontinuous DIS	

The coating or infill associated with defects in the rock mass are described as follows.

Infill and Coating		
Clean	CN	
Stained	SN	
Carbonaceous	X	
Minerals	MU	Unidentified mineral
	MS	Secondary mineral
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
Veneer	VNR	Thin or patchy coating
Coating	CT	Infill up to 1mm

Graphic Symbols Index

	CLAY		SILT		SAND		GRAVEL
	Silty CLAY		Clayey SILT		Clayey SAND		Clayey GRAVEL
	Sandy CLAY		Sandy SILT		Silty SAND		Silty GRAVEL
	Gravelly CLAY		Gravelly SILT		Gravelly SAND		Sandy GRAVEL
	Silty Gravelly CLAY		Clayey Sandy SILT		Clayey Silty SAND		Clayey Silty GRAVEL
	Silty Sandy CLAY		Clayey Gravelly SILT		Clayey Gravelly SAND		Clayey Sandy GRAVEL
	Sandy Gravelly CLAY		Sandy Gravelly SILT		Silty Gravelly SAND		Silty Sandy GRAVEL
	COBBLES & BOULDERS		Sedimentary rock: fine, mostly clay (CLAYSTONE)		Igneous rock: Felsic, fine (RHYOLITE)		
	PEAT, highly organic soil		Sedimentary rock: fine, mostly silt (SILTSTONE)		Igneous rock: Felsic, coarse (GRANITE)		
	TOPSOIL		Sedimentary rock: fine, silt and clay (MUDSTONE, SHALE, LAMINITE)		Igneous rock: Mafic, fine to medium (BASALT, DOLERITE)		
	FILL		Sedimentary rock: medium (SANDSTONE, GREYWACKE)		Igneous rock: Mafic, coarse (GABBRO)		
	FILL: Asphalt or Bituminous Seal		Sedimentary rock: fine to coarse, angular (BRECCIA)		Metamorphic rock: Foliated, fine to medium (SLATE, PHYLLITE, SHIST)		
	FILL: Ballast		Sedimentary rock: coarse, rounded (CONGLOMERATE)		Metamorphic rock: Foliated, coarse (GNEISS)		
	FILL: Concrete		Sedimentary rock: Organic (COAL)		Metamorphic rock: Non-foliated (QUARTZITE, HORNFELS, MARBLE)		
	FILL: Roadbase		Sedimentary rock: Carbonate (LIMESTONE, DOLOMITE)				
			Sedimentary rock: Volcanic (TUFF, VOLCANIC BRECCIA, AGGLOMERATE)				

Client: NT Government Project: Jabiru Redevelopment GI Location: Jabiru - NT	Job No: 027	Sheet: 1 of 2
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Position: E266806.000 N8600106.000 53L MGA94	Angle from Horizontal: 90°	Surface Elevation:
---	-----------------------------------	---------------------------

Machine Type: 2.5 tn Excavator Kubota	Excavation Method: Test pit
--	------------------------------------

Excavation Dimensions: 3.00m LONG AND 0.50m WIDE	Contractor: Arjays
---	---------------------------

Date Excavated: 3/6/20	Logged By: RH	Checked By: Jb
-------------------------------	----------------------	-----------------------

Excavation			Water	Sampling & Testing		Depth (m)	Material Description											
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations						
Stable	Not Encountered	Stable	Not Encountered	ES 0.00 - 1.00 m ES 0.00 - 0.50 m ES 0.00 - 1.00 m	4		SP	Gravelly SAND: fine to medium, grey-brown, subrounded, fine to medium gravel, trace silt, trace roots and organics	D	MD	TOPSOIL							
					3													
					3													
				B 0.30 - 0.90 m	8		GP	GRAVEL: fine to medium, rounded to sub-rounded, yellow, pale brown with some white, with fine to coarse sand, with low plasticity clay, roots and organics	D	D	RESIDUAL SOIL							
					10													
				B 0.50 - 2.00 m ES 0.50 - 1.00 m	12							0.5						
					15													
					12													
					12													
					12													
				B 0.90 - 1.50 m	7							1.0						
				ES 1.00 - 2.00 m ES 1.00 - 1.50 m ES 1.00 - 2.00 m	8													
					6													
					5													
					7													
				8														
				B 1.50 - 2.00 m ES 1.50 - 2.00 m	10	1.5		GW-GC	Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, white, yellow, pink-red, fine to coarse sand, with low plasticity clay, (Extremely Weathered material)	D	D	EXTREMELY WEATHERED ROCK						
					15													
					10													
					5													
					6													
					10	2.0			Becoming hard to excavate									
					11													
8																		
					10			TERMINATED AT 2.00 m Target depth										
					11													
					8													

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample S - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Hole No: TP01PS

Client: NT Government
Project: Jabiru Redevelopment GI
Location: Jabiru - NT

Job No: 027

Sheet: 2 of 2

Position: E266806.000 N8600106.000 53L MGA94

Angle from Horizontal: 90°

Surface Elevation:

Machine Type: 2.5 tn Excavator Kubota

Excavation Method: Test pit

Excavation Dimensions: 3.00m LONG AND 0.50m WIDE

Contractor: Arjays

Date Excavated: 3/6/20

Logged By: RH

Checked By: Jb

Excavation				Sampling & Testing		Depth (m)	Material Description							
Method	Resistance	Stability	Water	Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations		
					7	2.5								
					15									
					13									
					15									
					15									
					9	3.0								
					6									
					9									
					5									
					5									
					6	3.5								
					14									
					13									
					11									
					11									
						4.0								
METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller				PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow			FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)			SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content			SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	
Refer to explanatory notes for details of abbreviations and basis of descriptions														
CONSTRUCTION SCIENCES PTY LTD														



Client:	NT Government	Test Pit No:	TP01
Project:	Jabiru Power Station	Date:	3/06/2020
Location:	Jabiru, NT	Termination Depth:	2.00m
Job No:	5057P027.20		

Client: NT Government
 Project: Jabiru Redevelopment GI
 Location: Jabiru - NT

Job No: 027

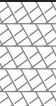
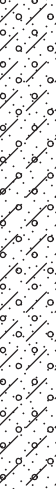
Sheet: 1 of 1

Position: E266823.000 N8600375.000 53L MGA94
 Angle from Horizontal: 90°
 Surface Elevation:

Machine Type: 2.5 tn Excavator Kubota
 Excavation Method: Test pit

Excavation Dimensions: 3.00m LONG AND 0.50m WIDE
 Contractor: Arjays

Date Excavated: 3/6/20
 Logged By: RH
 Checked By: Jb

Excavation			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Stability	Water	Sample or Field Test		DCP	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density
		Stable	Not Encountered	ES 0.00 - 1.00 m	4		SP	SAND: medium to coarse, grey, with roots and organics	D	MD	TOPSOIL
				ES 0.00 - 0.50 m	5			0.18m			
				ES 0.00 - 1.00 m	3						
					2		SW		SAND: fine to coarse, grey, pale brown, with silt, trace roots and organics	D	L
					2						
					2						
					2						
					2						
				ES 0.50 - 1.00 m	5		GW	GRAVEL: fine to coarse, rounded to sub-rounded, yellow, pale brown, with fine to coarse sand, trace low plasticity clay	D	MD	RESIDUAL SOIL
				7							
				5							
				9							
				B 0.90 - 1.75 m	10		GW-GC	Clayey Sandy GRAVEL: fine to coarse, sub-angular, yellow, brown-red, fine to coarse sand, low plasticity clay, trace quartzitic gravel	D	D	EXTREMELY WEATHERED ROCK
				ES 1.00 - 1.75 m ES 1.00 - 1.50 m ES 1.00 - 1.75 m	15			XW rock (laterite) excavated as sandy gravel / cavities within fragments filled with chert-quartz			
					24						
					20						
					25						
				ES 1.50 - 1.75 m				1.5			
		1.75m									
								TERMINATED AT 1.75 m Bucket refusal			



<i>Client:</i>	NT Government	<i>Test Pit No:</i>	TP02
<i>Project:</i>	Jabiru Power Station	<i>Date:</i>	3/06/2020
<i>Location:</i>	Jabiru, NT	<i>Termination Depth:</i>	1.75m (R)
<i>Job No:</i>	5057P027.20		

Client: NT Government		Job No: 027		Sheet: 1 of 1	
Project: Jabiru Redevelopment GI		Angle from Horizontal: 90°		Surface Elevation:	
Location: Jabiru - NT		Excavation Method: Test pit			
Position: E267088.000 N8600385.000 53L MGA94		Excavation Dimensions: 3.00m LONG AND 0.50m WIDE		Contractor: Arjays	
Machine Type: 2.5 tn Excavator Kubota		Logged By: RH		Checked By: Jb	
Date Excavated: 3/6/20					

Excavation			Water	Sampling & Testing		Depth (m)	Material Description						
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations	
		Stable	Not Encountered	B 0.00 - 1.00 m	6		SP	SAND: fine to medium, grey, with roots and organics	D		TOPSOIL		
					5		0.10m				SAND: fine to coarse, pale brown, orange, with fine subrounded gravel	D	ALLUVIUM
					4		0.20m	Sandy GRAVEL: fine to coarse, rounded to sub-rounded, yellow, pale brown, fine to coarse sand, trace silt	D				RESIDUAL SOIL
					4		GW			1.00m	D		
					6								
					5							0.5	
					5								
					7								
					13								
					14								
				25	1.0	GP		GRAVEL: medium to coarse, sub-rounded to sub-angular, yellow, white, with fine to coarse sand, fragments of XW laterite	D				
	1.5	GW-GC	Sandy GRAVEL: fine to medium, sub-rounded to sub-angular, yellow-white, pink-red, fine to medium sand, with low plasticity clay, trace quartz fragments	D	EXTREMELY WEATHERED ROCK								
	2.0												

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions



Client:	NT Government	Test Pit No:	TP03
Project:	Jabiru Power Station	Date:	3/06/2020
Location:	Jabiru, NT	Termination Depth:	2.10m
Job No:	5057P027.20		

Hole No: TP04PS

Client: NT Government
Project: Jabiru Redevelopment GI
Location: Jabiru - NT

Job No: 027

Sheet: 1 of 1

Position: E267363.000 N8600382.000 53L MGA94

Angle from Horizontal: 90°

Surface Elevation:

Machine Type: 2.5 tn Excavator Kubota

Excavation Method: Test pit

Excavation Dimensions: 3.00m LONG AND 0.50m WIDE

Contractor: Arjays

Date Excavated: 3/6/20

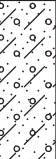
Logged By: RH

Checked By: Jb

Excavation			Water	Sampling & Testing		Depth (m)	Material Description												
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations							
		Stable	Not Encountered	ES 0.00 - 1.00 m ES 0.00 - 0.50 m	3		GP	0.10m	Sandy GRAVEL: fine to medium, rounded, grey, fine to coarse sand, with roots and organics	D	L	TOPSOIL							
					2							GW	0.80m	Sandy GRAVEL: fine to coarse, rounded to sub-rounded, pale brown, pale grey, fine to coarse sand, with low plasticity clay	D	MD	RESIDUAL SOIL		
					1														
					5														
					8														
				ES 0.50 - 1.00 m	10	0.5		GW	D	D									
					25														
				B 0.80 - 2.00 m		1.0		GW-GC	D	VD	EXTREMELY WEATHERED ROCK								
												ES 1.00 m ES 1.00 - 2.00 m ES 1.00 - 1.50 m ES 1.00 - 2.00 m							
													ES 1.50 - 2.00 m						
TERMINATED AT 2.00 m Target depth																			
METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller				PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow				FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)				SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content				SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense			
Refer to explanatory notes for details of abbreviations and basis of descriptions																			
CONSTRUCTION SCIENCES PTY LTD																			

 Construction Sciences Construction Sciences Test Pit Excavation  Construction Sciences		Client: Project: Location: Job No: NT Government Jabiru Power Station Jabiru, NT 5057P027.20 Test Pit No: Date: Termination Depth: TP04 3/06/2020 2.00m
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Client: NT Government		Job No: 027		Sheet: 1 of 1	
Project: Jabiru Redevelopment GI		Angle from Horizontal: 90°		Surface Elevation:	
Location: Jabiru - NT		Machine Type: 2.5 tn Excavator Kubota		Excavation Method: Test pit	
Position: E267367.000 N8600236.000 53L MGA94		Excavation Dimensions: 3.00m LONG AND 0.50m WIDE		Contractor: Arjays	
Date Excavated: 3/6/20		Logged By: RH		Checked By: Jb	

Excavation			Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Stability	Water	Sample or Field Test		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
			Not Encountered	ES 0.00 - 1.00 m ES 0.00 - 0.50 m ES 0.00 - 1.00 m	5		SP	Gravelly SAND: fine to medium, grey, rounded medium gravel, with roots and organics	D		TOPSOIL
					5						
					4						
				B 0.25 - 0.90 m	7		GW	GRAVEL: fine to coarse, rounded to sub-rounded, pale grey, with fine to coarse sand, with silt, trace of cobbles	D	MD	RESIDUAL SOIL
					9						
				ES 0.50 - 1.00 m	9						
					8						
					25						
				B 0.90 - 2.00 m			GW-GC	Clayey Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, pale brown-orange, fine to coarse sand, low plasticity clay, trace laterite XW cobbles	D	VD	EXTREMELY WEATHERED ROCK
				ES 1.00 - 2.00 m ES 1.00 - 1.50 m	1.0						
				ES 1.50 - 2.00 m	1.5						
					2.0			TERMINATED AT 2.00 m Target depth			

METHOD

EX Excavator bucket
R Ripper
HA Hand auger
PT Push tube
SON Sonic drilling
AH Air hammer
PS Percussion sampler
AS Short spiral auger
AD/V Solid flight auger: V-Bit
AD/T Solid flight auger: TC-Bit
HFA Hollow flight auger
WB Washbore drilling
RR Rock roller

PENETRATION

VE Very Easy (No Resistance)
E Easy
F Firm
H Hard
VH Very Hard (Refusal)

WATER

 Water Level on Date shown
 water inflow
 water outflow

FIELD TESTS

SPT - Standard Penetration Test
PP - Hand/Pocket Penetrometer
DCP - Dynamic Cone Penetrometer
PSP - Perth Sand Penetrometer
MC - Moisture Content
PBT - Plate Bearing Test
IMP - Borehole Impression Test
PID - Photoionisation Detector
VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)

SAMPLES

B - Bulk disturbed sample
D - Disturbed sample
ES - Environmental sample
U - Thin wall tube 'undisturbed'

MOISTURE

D - Dry
M - Moist
W - Wet
PL - Plastic limit
LL - Liquid limit
w - Moisture content

SOIL CONSISTENCY

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY

VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

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<i>Client:</i>	NT Government	Test Pit No:	TP05
<i>Project:</i>	Jabiru Power Station	<i>Date:</i>	3/06/2020
<i>Location:</i>	Jabiru, NT	<i>Termination Depth:</i>	2.00m
<i>Job No:</i>	5057P027.20		

Client: NT Government		Job No: 027		Sheet: 1 of 1	
Project: Jabiru Redevelopment GI		Angle from Horizontal: 90°		Surface Elevation:	
Location: Jabiru - NT		Excavation Method: Test pit			
Position: E267127.000 N8600220.000 53L MGA94		Excavation Dimensions: 3.00m LONG AND 0.50m WIDE		Contractor: Arjays	
Machine Type: 2.5 tn Excavator Kubota		Logged By: RH		Checked By: Jb	
Date Excavated: 4/6/20					

Excavation			Water	Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
		Stable	Not Encountered	B 0.00 - 0.10 m	25		GP	GRAVEL: fine to medium, rounded to sub-rounded, yellow-brown, with fine to coarse sand	D	VD	RESIDUAL SOIL	
				B 0.10 - 0.50 m								0.20m
					0.50m		TERMINATED AT 0.50 m Bucket refusal					

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions



<i>Client:</i>	NT Government	Test Pit No:	TP06
<i>Project:</i>	Jabiru Power Station	<i>Date:</i>	4/06/2020
<i>Location:</i>	Jabiru, NT	<i>Termination Depth:</i>	0.50m (R)
<i>Job No:</i>	5057P027.20		

Client: NT Government	Job No: 027	Sheet: 1 of 1
Project: Jabiru Redevelopment GI		
Location: Jabiru - NT	Angle from Horizontal: 90°	Surface Elevation:
Position: E267093.000 N8600304.000 53L MGA94	Excavation Method: Test pit	
Machine Type: 2.5 tn Excavator Kubota	Contractor: Arjays	
Excavation Dimensions: 3.00m LONG AND 0.50m WIDE	Logged By: RH	Checked By: Jb
Date Excavated: 4/6/20		

Excavation			Sampling & Testing				Material Description								
Method	Resistance	Stability	Water	Sample or Field Test	DCP	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations			
		Stable	Not Encountered	B 0.00 - 0.15 m	1	0.5		SW	Gravelly SAND: fine to coarse, grey, rounded medium to coarse gravel, with roots and organics	D	L	TOPSOIL			
				ES 0.00 - 1.00 m	2				0.15m			Sandy GRAVEL: fine to coarse, rounded to sub-rounded, brown-orange, fine to coarse sand, trace subrounded cobbles, trace organics	RESIDUAL SOIL		
				ES 0.00 - 0.50 m	2			D		D					
				ES 0.00 - 1.25 m	1				D						
					24							D			
					25									D	
															D
								D							
									D						
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METHOD

EX Excavator bucket
R Ripper
HA Hand auger
PT Push tube
SON Sonic drilling
AH Air hammer
PS Percussion sampler
AS Short spiral auger
AD/V Solid flight auger: V-Bit
AD/T Solid flight auger: TC-Bit
HFA Hollow flight auger
WB Washbore drilling
RR Rock roller

PENETRATION

VE Very Easy (No Resistance)
E Easy
F Firm
H Hard
VH Very Hard (Refusal)

WATER

 Water Level on Date shown
 water inflow
 water outflow

FIELD TESTS

SPT - Standard Penetration Test
PP - Hand/Pocket Penetrometer
DCP - Dynamic Cone Penetrometer
PSP - Perth Sand Penetrometer
MC - Moisture Content
PBT - Plate Bearing Test
IMP - Borehole Impression Test
PID - Photoionisation Detector
VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)

SAMPLES

B - Bulk disturbed sample
D - Disturbed sample
ES - Environmental sample
U - Thin wall tube 'undisturbed'

MOISTURE

D - Dry
M - Moist
W - Wet
PL - Plastic limit
LL - Liquid limit
w - Moisture content

SOIL CONSISTENCY

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY

VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

		
<i>Client:</i>	NT Government	Test Pit No: TP07
<i>Project:</i>	Jabiru Power Station	Date: 4/06/2020
<i>Location:</i>	Jabiru, NT	Termination Depth: 1.25m (R)
<i>Job No:</i>	5057P027.20	

Client: NT Government		Job No: 027		Sheet: 1 of 1	
Project: Jabiru Redevelopment GI		Angle from Horizontal: 90°		Surface Elevation:	
Location: Jabiru - NT		Excavation Method: Test pit			
Position: E266813.620 N8599831.960 53L MGA94		Excavation Dimensions: 3.00m LONG AND 0.50m WIDE		Contractor: Arjays	
Machine Type: 2.5 tn Excavator Kubota		Logged By: RH		Checked By: Jb	
Date Excavated: 4/6/20					

Excavation			Water	Sampling & Testing		Depth (m)	Material Description					
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
		Stable	Not Encountered	B 0.00 - 0.20 m ES 0.00 - 1.00 m ES 0.00 - 0.50 m	25		SP	Gravelly SAND: fine to medium, grey, fine to medium subrounded gravel, with roots and organics, trace cobbles	D		TOPSOIL	
				B 0.20 - 0.70 m			0.20m	GRAVEL: fine to coarse, rounded to sub-rounded, yellow-brown, with fine to coarse sand, with low plasticity clay	D to M		RESIDUAL SOIL	
				ES 0.50 - 1.00 m	0.5		GW					
				B 0.70 - 1.75 m			0.70m	Sandy GRAVEL: sub-rounded to sub-angular, brown, white-reddish, fine to coarse sand, with low plasticity clay, quartz subangular fragments		EXTREMELY WEATHERED ROCK		
				ES 1.00 - 1.75 m ES 1.00 - 1.50 m	1.0		GW-GC		D to M			
				ES 1.50 - 1.75 m	1.5			1.75m	TERMINATED AT 1.75 m Bucket refusal			

METHOD

EX Excavator bucket
R Ripper
HA Hand auger
PT Push tube
SON Sonic drilling
AH Air hammer
PS Percussion sampler
AS Short spiral auger
AD/V Solid flight auger: V-Bit
AD/T Solid flight auger: TC-Bit
HFA Hollow flight auger
WB Washbore drilling
RR Rock roller

PENETRATION

VE Very Easy (No Resistance)
E Easy
F Firm
H Hard
VH Very Hard (Refusal)

WATER

 Water Level on Date shown
 water inflow
 water outflow

FIELD TESTS

SPT - Standard Penetration Test
PP - Hand/Pocket Penetrometer
DCP - Dynamic Cone Penetrometer
PSP - Perth Sand Penetrometer
MC - Moisture Content
PBT - Plate Bearing Test
IMP - Borehole Impression Test
PID - Photoionisation Detector
VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)

SAMPLES

B - Bulk disturbed sample
D - Disturbed sample
ES - Environmental sample
U - Thin wall tube 'undisturbed'

MOISTURE

D - Dry
M - Moist
W - Wet
PL - Plastic limit
LL - Liquid limit
w - Moisture content

SOIL CONSISTENCY

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY

VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES PTY LTD



Client:	NT Government	Test Pit No:	TP08
Project:	Jabiru Power Station	Date:	4/06/2020
Location:	Jabiru, NT	Termination Depth:	1.75m (R)
Job No:	5057P027.20		

Client: NT Government Project: Jabiru Redevelopment GI Location: Jabiru - NT	Job No: 027	Sheet: 1 of 2
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Position: E267362.030 N8599813.450 53L MGA94	Angle from Horizontal: 90°	Surface Elevation:
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Machine Type: 2.5 tn Excavator Kubota	Excavation Method: Test pit
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Excavation Dimensions: 3.00m LONG AND 0.50m WIDE	Contractor: Arjays
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Date Excavated: 4/6/20	Logged By: RH	Checked By: Jb
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Excavation			Water	Sampling & Testing		Depth (m)	Material Description									
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations				
		Stable	Groundwater at 1.85 m	B 0.00 - 0.20 m ES 0.00 - 1.00 m ES 0.00 - 0.50 m	2			mix of filling materials; coarse sands with angular to subangular coarse gravels and organics with fragments of cement	D		TOPSOIL					
					5											
				B 0.20 - 1.00 m	7		SW	SAND: fine to coarse, yellow-brown-green, with clay, trace fine rounded gravel	M		ALLUVIUM					
					4											
				3												
				ES 0.50 - 1.00 m	2				0.5				M			
					1											
				1												
				5												
				7	1.0							Sandy GRAVEL: fine to medium, sub-rounded to sub-angular, brown, red-white, fine to coarse sand, with low plasticity clay	M		RESIDUAL SOIL	
				B 1.00 - 1.80 m ES 1.00 - 2.00 m ES 1.00 - 1.50 m												8
																7
				4												
				2												
				4												
				ES 1.50 - 2.00 m	3	1.5										
					1											
					3											
				B 1.80 - 2.00 m	4			Ground water encountered								
					5											
5																
	5	2.0														
							2.10m				TERMINATED AT 2.10 m Target depth					
					3											
					4											

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Hole No: TP09PS

Sheet: 2 of 2

Surface Elevation:

Excavation Method: Test pit

Contractor: Ariays

Checked By: Jb

Excavation			Water	Sampling & Testing		Depth (m)	Material Description				
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density
					4	2.5					
					2						
					3						
					4						
					5						
					5	3.0					
					7						
					14						
					14						
					13						
					8	3.5					
					8						
					10						
					11						
					18						
						4.0					

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES PTY LTD



<i>Client:</i>	NT Government	<i>Test Pit No:</i>	TP09
<i>Project:</i>	Jabiru Power Station	<i>Date:</i>	4/06/2020
<i>Location:</i>	Jabiru, NT	<i>Termination Depth:</i>	2.10m
<i>Job No:</i>	5057P027.20		

Client: NT Government		Job No: 027		Sheet: 1 of 1	
Project: Jabiru Redevelopment GI		Angle from Horizontal: 90°		Surface Elevation:	
Location: Jabiru - NT		Machine Type: 2.5 tn Excavator Kubota		Excavation Method: Test pit	
Position: E266931.850 N8600219.580 53L MGA94		Excavation Dimensions: 3.00m LONG AND 0.50m WIDE		Contractor: Arjays	
Date Excavated: 4/6/20		Logged By: RH		Checked By: Jb	

Excavation			Water	Sampling & Testing		Depth (m)	Material Description										
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations					
		Stable	Not Encountered	B 0.00 - 0.15 m ES 0.00 - 0.60 m	1		SP	Gravelly SAND: fine to medium, grey, fine rounded gravel, with roots and organics	D	VL	TOPSOIL						
					1												
				B 0.15 - 0.25 m	1		GW-GM	GRAVEL: fine to coarse, rounded to sub-rounded, yellow-brown, with fine to coarse sand, trace cobbles increased sand content from 0.15 m to 0.2 m	D	L	RESIDUAL SOIL						
					B 0.25 - 0.60 m							24					
				25								0.5		GW-GC	Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, yellow-brown-red, fine to coarse sand, with low plasticity clay, pisolitic fragments, Quartz in matrix	D	VD

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions



<i>Client:</i>	NT Government	Test Pit No:	TP10
<i>Project:</i>	Jabiru Power Station	<i>Date:</i>	4/06/2020
<i>Location:</i>	Jabiru, NT	<i>Termination Depth:</i>	0.60m (R)
<i>Job No:</i>	5057P027.20		

Hole No: TP11PS

Client: NT Government
Project: Jabiru Redevelopment GI
Location: Jabiru - NT

Job No: 027

Sheet: 1 of 1

Position: E267040.020 N8600341.980 53L MGA94

Angle from Horizontal: 90°

Surface Elevation:

Machine Type: 2.5 tn Excavator Kubota

Excavation Method: Test pit

Excavation Dimensions: 3.00m LONG AND 0.50m WIDE

Contractor: Arjays

Date Excavated: 4/6/20

Logged By: RH

Checked By: Jb

Excavation			Sampling & Testing		Material Description												
Method	Resistance	Stability	Water	Sample or Field Test	DCP	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations					
		Stable	Not Encountered	B 0.00 - 0.20 m ES 0.00 - 1.00 m ES 0.00 - 0.50 m ES 0.00 - 1.00 m	1	0.20m		SP	Gravelly SAND: fine to medium, grey, fine rounded gravel, with roots and organics	D	VL	TOPSOIL					
					3												
				B 0.20 - 1.00 m	3	0.20m		GW	GRAVEL: fine to coarse, rounded to sub-rounded, brown, orange, with fine to coarse sand, with low plasticity clay fine to medium gravel size from 0.2 m to 0.4 m increase in size from 0.4 m	D	L to MD	RESIDUAL SOIL					
					3												
					6												
				ES 0.50 - 1.00 m	8	0.5		GW	Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, pale brown-orange and white, fine to coarse sand, with low plasticity clay, with angular fragments of laterite increasingly harder to excavate	D	MD	EXTREMELY WEATHERED ROCK					
					9												
					12												
					9												
				B 1.00 - 2.00 m ES 1.00 - 2.00 m ES 1.00 - 1.50 m ES 1.00 - 2.00 m	20	1.0		GW	TERMINATED AT 2.00 m Target depth	D							
					18												
					17												
					14												
					20												
				ES 1.50 - 2.00 m	25	1.5		GW									
										2.0							
				METHOD				PENETRATION			FIELD TESTS			SAMPLES		SOIL CONSISTENCY	
				EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller				VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER Water Level on Date shown water inflow water outflow			SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)			B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content		VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	
				Refer to explanatory notes for details of abbreviations and basis of descriptions													CONSTRUCTION SCIENCES PTY LTD



<i>Client:</i>	NT Government	Test Pit No:	TP11
<i>Project:</i>	Jabiru Power Station	<i>Date:</i>	4/06/2020
<i>Location:</i>	Jabiru, NT	<i>Termination Depth:</i>	2.00m
<i>Job No:</i>	5057P027.20		

Client: NT Government		Job No: 027		Sheet: 1 of 1	
Project: Jabiru Redevelopment GI		Angle from Horizontal: 90°		Surface Elevation:	
Location: Jabiru - NT		Machine Type: 2.5 tn Excavator Kubota		Excavation Method: Test pit	
Excavation Dimensions: 3.00m LONG AND 0.50m WIDE		Contractor: Arjays			
Date Excavated: 4/6/20		Logged By: RH		Checked By: Jb	

Excavation			Water	Sampling & Testing		Depth (m)	Material Description							
Method	Resistance	Stability		Sample or Field Test	DCP		Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations		
		Stable	Not Encountered	B 0.00 - 0.20 m	1		SP	Gravelly SAND: fine to medium, grey, fine to coarse rounded gravel, with roots and organics			TOPSOIL			
				ES 0.00 - 1.00 m	3									
				ES 0.00 - 0.50 m										
				ES 0.00 - 1.00 m										
				B 0.20 - 0.80 m	3		GW	GRAVEL: fine to coarse, sub-rounded, pale grey-orange, with fine to coarse sand, with low plasticity clay, trace roots and organics			RESIDUAL SOIL			
					7									
					8									
				ES 0.50 - 1.00 m	9									
					10									
					11									
				B 0.80 - 2.00 m	10							GW-GC	Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, pale brown, yellow and white, fine to coarse sand, with low plasticity clay, quartzitic fragments	EXTREMELY WEATHERED ROCK
					10									
				ES 1.00 - 2.00 m	10									
				ES 1.00 - 1.50 m	9									
				ES 1.00 - 2.00 m	25									
							GW-GC	becoming harder to excavate from 1.5 m						
				ES 1.50 - 2.00 m										
					2.0			2.00m						
								TERMINATED AT 2.00 m Target depth						

METHOD

EX Excavator bucket
R Ripper
HA Hand auger
PT Push tube
SON Sonic drilling
AH Air hammer
PS Percussion sampler
AS Short spiral auger
AD/V Solid flight auger: V-Bit
AD/T Solid flight auger: TC-Bit
HFA Hollow flight auger
WB Washbore drilling
RR Rock roller

PENETRATION

VE Very Easy (No Resistance)
E Easy
F Firm
H Hard
VH Very Hard (Refusal)

WATER

 Water Level on Date shown
 water inflow
 water outflow

FIELD TESTS

SPT - Standard Penetration Test
PP - Hand/Pocket Penetrometer
DCP - Dynamic Cone Penetrometer
PSP - Perth Sand Penetrometer
MC - Moisture Content
PBT - Plate Bearing Test
IMP - Borehole Impression Test
PID - Photoionisation Detector
VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)

SAMPLES

B - Bulk disturbed sample
D - Disturbed sample
ES - Environmental sample
U - Thin wall tube 'undisturbed'

MOISTURE

D - Dry
M - Moist
W - Wet
PL - Plastic limit
LL - Liquid limit
w - Moisture content

SOIL CONSISTENCY

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY

VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

CONSTRUCTION SCIENCES PTY LTD

 Construction Sciences Construction Sciences Test Pit Excavation  Construction Sciences		Client: Project: Location: Job No: NT Government Jabiru Power Station Jabiru, NT 5057P027.20 Test Pit No: Date: Termination Depth: TP12 4/06/2020 2.00m
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Client: NT Government		Hole No: BH01PS	
Project: Jabiru Redevelopment GI		Sheet: 1 of 2	
Location: Jabiru - NT		Job No: 027	Surface Elevation: 31.000 m AHD
Position: E266818.000 N8600233.000 53L MGA94		Angle from Horizontal: 90°	Driller: MW
Rig Type: Geoprobe 7720DT		Mounting: Track	Contractor: Proactive Drilling
Hole Diameter:		Date Started: 21/6/20	Checked By: RH
Date Completed: 21/6/20		Logged By: JB	

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description																										
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations																					
			Groundwater at 4.0 m		4	30.5	0.5		SP	0.10m	SAND: fine to medium, grey, trace low plasticity silt, trace organics	D	L	ALLUVIUM																				
					GP				0.80m		Sandy GRAVEL: fine to medium, rounded to sub-rounded, pale brown-orange (pisolites), fine to coarse sand	D to M	MD	RESIDUAL SOIL																				
										GW					Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, red-yellow-orange, fine to medium sand, with low plasticity clay, strongly cemented (Laterite)	D to M	VD	EXTREMELY WEATHERED ROCK																
																			SPT 1.00 - 1.25 m 12, 30/95mm N*=R REC=0.15 m	10	30.0	1.0												
																				10														
																				7														
																				7														
																						Groundwater at 4.0 m		7	29.5	1.5								
																								7										
																								7										
																								6										
																								3										
																								2										
																								4										
																								7										
					SPT 2.00 - 2.29 m 24, 30/140mm N*=R REC=0.29 m				7		29.0	2.0																						
				7																														
				5																														
				4																														
							Groundwater at 4.0 m		4	28.5	2.5																							
									13																									
									4																									
									4																									
									7																									
									9																									

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: NT Government
Project: Jabiru Redevelopment GI
Location: Jabiru - NT

Job No: 027

Sheet: 2 of 2

Position: E266818.000 N8600233.000 53L MGA94

Angle from Horizontal: 90°

Surface Elevation: 31.000 m AHD

Rig Type: Geoprobe 7720DT

Mounting: Track

Driller: MW

Hole Diameter:

Contractor: Proactive Drilling

Date Started: 21/6/20

Date Completed: 21/6/20

Logged By: JB

Checked By: RH

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description						
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations	
			Groundwater at 4.0 m	SPT 3.00 - 3.28 m 29, 30/130mm N*=R REC=0.28 m					GW	Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, red-yellow-orange, fine to medium sand, with low plasticity clay, strongly cemented (Laterite) (continued)	D to M	VD	EXTREMELY WEATHERED ROCK	
							27.5	3.5		CL	Sandy Silty CLAY: medium plasticity, red-white-orange and yellow, fine sand, with fine to medium subangular gravel, strongly cemented			H
				SPT 4.00 - 4.45 m 6, 14, 15 N*=29 REC=0.45 m		27.0	4.0	becoming very stiff from 4.0 m GWL @ 4.0 m			M (<PL)	VSt		
				SPT 5.00 - 5.45 m 11, 21, 24 N*=45 REC=0.45 m		26.0	5.0				H			
						25.5	5.5			TERMINATED AT 5.45 m Target depth				
METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller				PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow			FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)			SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content			SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense	
Refer to explanatory notes for details of abbreviations and basis of descriptions														

CONSTRUCTION SCIENCES PTY LTD

Client: NT Government		Hole No: BH02PS	
Project: Jabiru Redevelopment GI		Sheet: 1 of 3	
Location: Jabiru - NT		Job No: 027	Surface Elevation: 31.700 m AHD
Position: E266817.000 N8600288.000 53L MGA94		Angle from Horizontal: 90°	Driller: MW
Rig Type: Geoprobe 7720DT		Mounting: Track	Contractor: Proactive Drilling
Hole Diameter:		Date Started: 20/6/20	Checked By: RH
Date Completed: 21/6/20		Logged By: JB	

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
			Groundwater at 3.2 m		1	31.5		SP	Silty SAND: fine to medium, grey, low plasticity silt, with roots and organics	D	L	ALLUVIUM	
					3			0.20m					
					2			0.5			GP	Sandy GRAVEL: fine to medium, rounded to sub-rounded, pale brown-orange (pisolites), fine to coarse sand	D to M
					2								
					3								
					5								
					7								
					25	31.0	0.70m			EXTREMELY WEATHERED ROCK			
					SPT 1.00 - 1.10 m 30/100mm N*=R REC=140 m		GW				Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, red-yellow-orange, fine to coarse sand, with low plasticity clay, (Laterite)	D to M	VD
								1.0					
				30.5				1.5					
				30.0				2.0					
				29.5				2.5					
				29.0									
				SPT 2.00 - 2.25 m 18, 30/100mm N*=R REC=250 m					CL	Sandy Silty CLAY: medium plasticity, red-white-orange and yellow, fine sand, with fine to medium subangular gravel, strongly cemented			

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

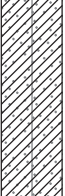
Client: NT Government		Hole No: BH02PS	
Project: Jabiru Redevelopment GI		Sheet: 2 of 3	
Location: Jabiru - NT		Job No: 027	
Position: E266817.000 N8600288.000 53L MGA94		Angle from Horizontal: 90°	Surface Elevation: 31.700 m AHD
Rig Type: Geoprobe 7720DT		Mounting: Track	Driller: MW
Hole Diameter:		Contractor: Proactive Drilling	
Date Started: 20/6/20		Date Completed: 21/6/20	Logged By: JB
		Checked By: RH	

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description							
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations		
			Groundwater at 3.2 m	SPT 3.00 - 3.45 m 9, 8, 4 N*=12 REC=150 m			28.5		CL	Sandy Silty CLAY: medium plasticity, red-white-orange and yellow, fine sand, with fine to medium subangular gravel, strongly cemented (continued) becoming moist to wet. Potential GWL @ 3.2 m	M (<PL)	S	EXTREMELY WEATHERED ROCK		
											3.5				
											28.0				
											4.0				
						SPT 4.00 - 4.45 m 3, 3, 3 N*=6 REC=120 m					27.5				
											4.5				
						27.0				easy drilling from 4.5 m to 5.0 m	M (<PL) to M (LL)	S to F			
						5.0									
				SPT 5.00 - 5.45 m 0, 0, 4 N*=4 REC=120 m		26.5									
						5.5						S			
						26.0				Noted increase in drilling resistance					

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: NT Government Project: Jabiru Redevelopment GI Location: Jabiru - NT				Job No: 027 Sheet: 3 of 3			
Position: E266817.000 N8600288.000 53L MGA94				Angle from Horizontal: 90°		Surface Elevation: 31.700 m AHD	
Rig Type: Geoprobe 7720DT				Mounting: Track		Driller: MW	
Hole Diameter:				Contractor: Proactive Drilling			
Date Started: 20/6/20		Date Completed: 21/6/20		Logged By: JB		Checked By: RH	

Drilling				Sampling & Testing			Material Description						
Method	Resistance	Casing	Water	Sample or Field Test	DCP	RL (m AHD)	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
			Groundwater at 3.2 m	SPT 6.00 - 6.45 m 9, 15, 30 N*=45 REC=0.45 m		25.5			CL	Sandy Silty CLAY: medium plasticity, red-white-orange and yellow, fine sand, with fine to medium subangular gravel, strongly cemented (continued)	M (<PL) to M (LL)	H	EXTREMELY WEATHERED ROCK
						6.5				6.45m Competent XW material			6.45 m: XW competent
						25.0				TERMINATED AT 6.45 m Target depth			
						7.0							
						24.5							
						7.5							
						24.0							
						8.0							
						23.5							
						8.5							
						23.0							

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: NT Government		Hole No: BH03PS	
Project: Jabiru Redevelopment GI		Sheet: 1 of 2	
Location: Jabiru - NT		Job No: 027	Surface Elevation: 30.700 m AHD
Position: E266912.000 N8600288.000 53L MGA94		Angle from Horizontal: 90°	Driller: MW
Rig Type: Geoprobe 7720DT		Mounting: Track	Contractor: Proactive Drilling
Hole Diameter:		Date Started: 20/6/20	Checked By: RH
Date Completed: 20/6/20		Logged By: JB	

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
			Groundwater at 4.5 m		1	30.5		SP	Silty SAND: fine to medium, grey, low plasticity silt, with roots and organics	D	L	ALLUVIUM	
					3								0.20m
					2								
					3	0.50m	GP	Sandy GRAVEL: fine to medium, rounded to sub-rounded, pale brown-orange (pisolites), fine to coarse sand	D to M	L to MD	RESIDUAL SOIL		
					2								
					3								
					6	30.0		GW	Sandy GRAVEL: fine to coarse, sub-rounded to sub-angular, red, white, yellow, orange, fine to coarse sand, with low plasticity clay	D to M	MD to D	EXTREMELY WEATHERED ROCK	
					3								
					5								
					9								
					10								
					14	29.5		GW	Reduction in drilling resistance noted @ 1.7 m becoming moist @ 1.7 m	M	MD		
					18								
					19								
					25	29.0		GW	Notable fine grained sand lenses with XW matrix	M	MD		
				SPT 2.00 - 2.45 m 12, 10, 11 N*=21 REC=0.45 m	28.5		CL	Sandy Silty CLAY: medium plasticity, white mottled red-orange, low plasticity silt, fine sand, trace fine subangular (quartz) gravel	M (≡PL)	VSt			
	28.0												

METHOD

EX Excavator bucket
R Ripper
HA Hand auger
PT Push tube
SON Sonic drilling
AH Air hammer
PS Percussion sampler
AS Short spiral auger
AD/V Solid flight auger: V-Bit
AD/T Solid flight auger: TC-Bit
HFA Hollow flight auger
WB Washbore drilling
RR Rock roller

PENETRATION

VE Very Easy (No Resistance)
E Easy
F Firm
H Hard
VH Very Hard (Refusal)

WATER

Water Level on Date shown
water inflow
water outflow

FIELD TESTS

SPT - Standard Penetration Test
PP - Hand/Pocket Penetrometer
DCP - Dynamic Cone Penetrometer
PSP - Perth Sand Penetrometer
MC - Moisture Content
PBT - Plate Bearing Test
IMP - Borehole Impression Test
PID - Photoionisation Detector
VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)

SAMPLES

B - Bulk disturbed sample
D - Disturbed sample
ES - Environmental sample
U - Thin wall tube 'undisturbed'

MOISTURE

D - Dry
M - Moist
W - Wet
PL - Plastic limit
LL - Liquid limit
w - Moisture content

SOIL CONSISTENCY

VS - Very Soft
S - Soft
F - Firm
St - Stiff
VSt - Very Stiff
H - Hard

RELATIVE DENSITY

VL - Very Loose
L - Loose
MD - Medium Dense
D - Dense
VD - Very Dense

Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: NT Government		Hole No: BH03PS	
Project: Jabiru Redevelopment GI		Sheet: 2 of 2	
Location: Jabiru - NT		Job No: 027	Surface Elevation: 30.700 m AHD
Position: E266912.000 N8600288.000 53L MGA94		Angle from Horizontal: 90°	Driller: MW
Rig Type: Geoprobe 7720DT		Mounting: Track	Contractor: Proactive Drilling
Hole Diameter:		Date Started: 20/6/20	Checked By: RH
Date Completed: 20/6/20		Logged By: JB	

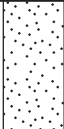
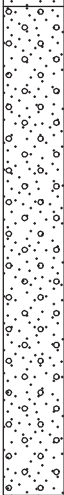
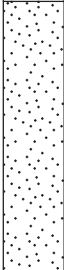
Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description							
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations		
			Groundwater at 4.5 m	SPT 3.00 - 3.45 m 11, 13, 13 N*=26 REC=0.45 m		27.5		CL	Sandy Silty CLAY: medium plasticity, white mottled red-orange, low plasticity silt, fine sand, trace fine subangular (quartz) gravel <i>(continued)</i>		Vst	EXTREMELY WEATHERED ROCK			
						27.0									
				SPT 4.00 - 4.40 m 19, 35, 30/100mm N*=R REC=0.4 m		4.0			4.00m				Silty CLAY: medium plasticity, white mottle red orange, with fine sand, with fine subangular (quartz) gravel	M (■PL)	H
						26.5							Ground water encountered @ 4.5 m		
				SPT 5.00 - 5.27 m 22, 30/120mm N*=R REC=0.27 m		4.5	CL								
						26.0									
						5.0									
						25.5			5.27m						
									TERMINATED AT 5.27 m Target depth						
						5.5									
						25.0									

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: NT Government Project: Jabiru Redevelopment GI Location: Jabiru - NT	Job No: 027	Hole No: BH04PS Sheet: 1 of 2
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Position: E266916.000 N8600236.000 53L MGA94	Angle from Horizontal: 90°	Surface Elevation: 30.700 m AHD
Rig Type: Geoprobe 7720DT	Mounting: Track	Driller: MW
Hole Diameter:		Contractor: Proactive Drilling
Date Started: 20/6/20	Date Completed: 20/6/20	Logged By: JB
		Checked By: RH

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description											
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations						
			Groundwater at 4.0 m		1	30.5		SP	SAND: fine to medium, brown-grey, trace low plasticity silt, with roots and organics	D	L	ALLUVIUM							
					2														
					1														
					2		0.30m	GP	Sandy SAND: fine to medium, rounded to sub-rounded, pale brown-orange (pisolites), fine to coarse sand	D to M	D to MD	RESIDUAL SOIL							
					6														
					14														
					21														
					25														
					SPT 1.00 - 1.20 m 31, 30/50mm N*=R REC=0.1 m								29.5		GW	Sandy GRAVEL: fine to coarse, sub-angular, red-orange-yellow mottled, fine to coarse sand, with low plasticity clay	D	D to VD	EXTREMELY WEATHERED ROCK
				SPT 2.00 - 2.45 m 12, 16, 17 N*=33 REC=0.45 m	28.5		SP	SAND: fine to medium, white-red-orange mottled, with fine to medium subangular (some quartz) gravel, with low plasticity clay, patchy, nodular (Laterite) becoming very hard augering @ 1.5 m Noted decrease in drilling resistance @ 1.8 m drill arisings had no change	M	D									
				SPT 2.80 - 3.25 m 15, 18, 21 N*=39 REC=0.45 m	28.0		SP				H								
				</															

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: NT Government		Hole No: BH04PS	
Project: Jabiru Redevelopment GI		Sheet: 2 of 2	
Location: Jabiru - NT		Job No: 027	Surface Elevation: 30.700 m AHD
Position: E266916.000 N8600236.000 53L MGA94		Angle from Horizontal: 90°	Driller: MW
Rig Type: Geoprobe 7720DT		Mounting: Track	Contractor: Proactive Drilling
Hole Diameter:		Date Started: 20/6/20	Checked By: RH
Date Completed: 20/6/20		Logged By: JB	

Drilling			Water	Sampling & Testing		RL (m AHD)	Depth (m)	Material Description							
Method	Resistance	Casing		Sample or Field Test	DCP			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations		
			Groundwater at 4.0 m	SPT 2.80 - 3.25 m 15, 18, 21 N*=39 REC=0.45 m		27.5		CL	Silty CLAY: medium plasticity, white mottled, red-orange, with fine sand, with fine subangular quartz gravel, (Laterite)			EXTREMELY WEATHERED ROCK			
						3.5									
						27.0									
				SPT 3.90 - 4.35 m 11, 16, 23 N*=39 REC=0.45 m		4.0							GW measured at 4.0 m below ground level after completion of hole	M (■LL)	H
						26.5									
					4.5										
					26.0										
					5.0										
				SPT 5.00 - 5.18 m 31, 30/30mm N*=R REC=0.18 m		5.18m			5.18m						
						25.5			TERMINATED AT 5.18 m Target depth						
						5.5									
						25.0									

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

APPENDIX

C

LONGITUDINAL SECTIONS



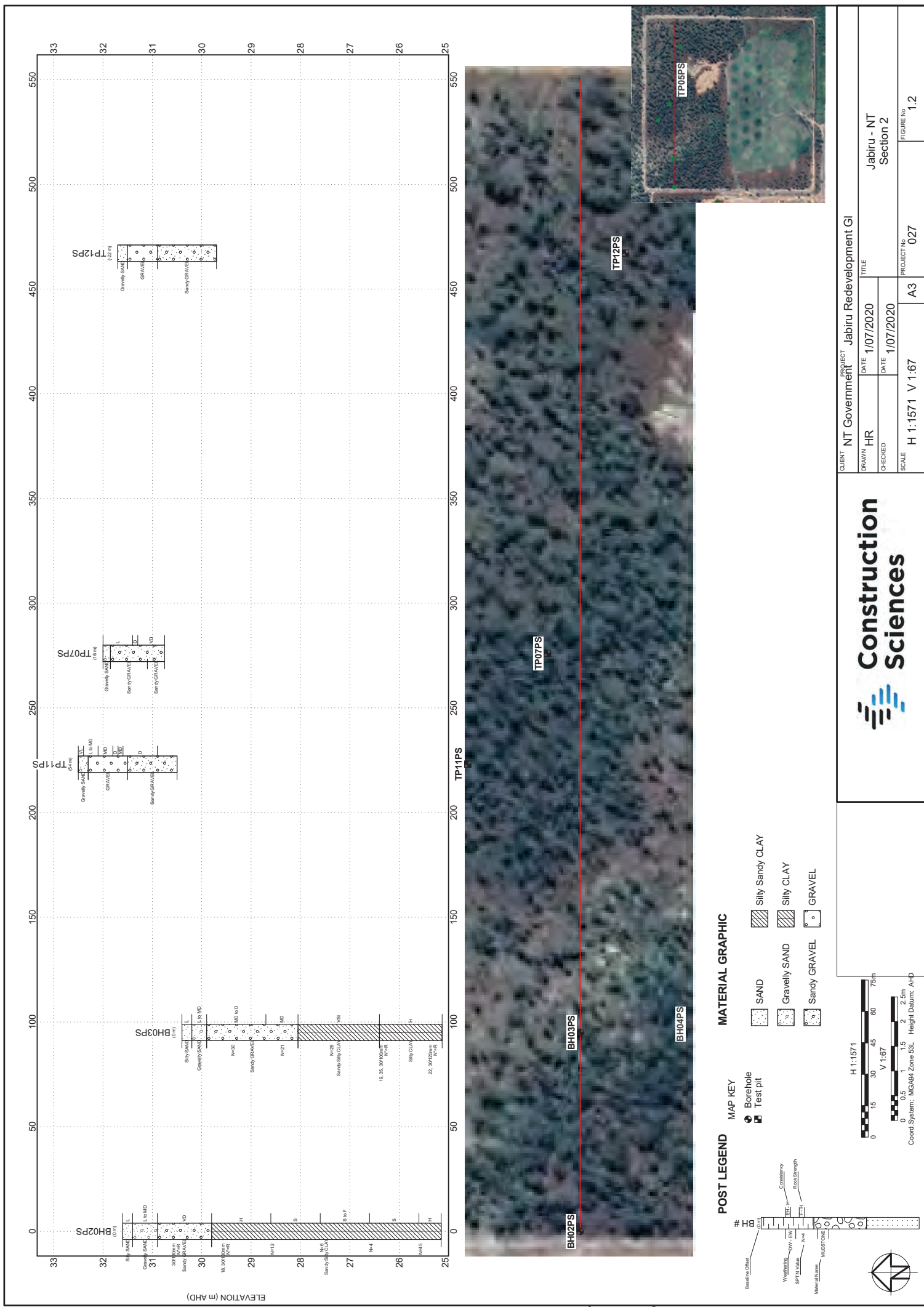
MAP KEY
Borehole
Test pit

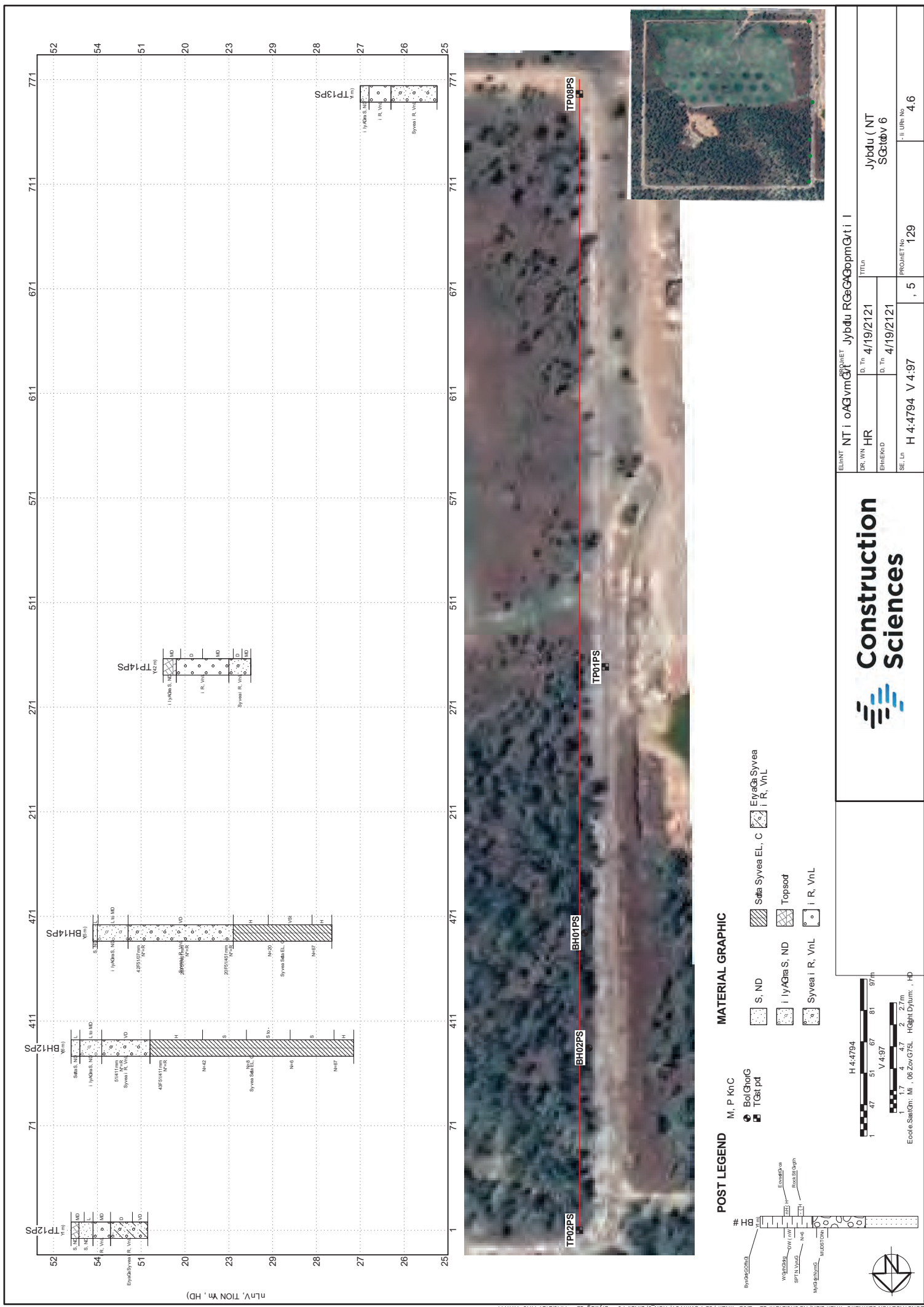
CLIENT NT Government PROJECT Jabiru Redevelopment GI

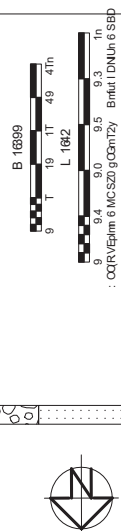
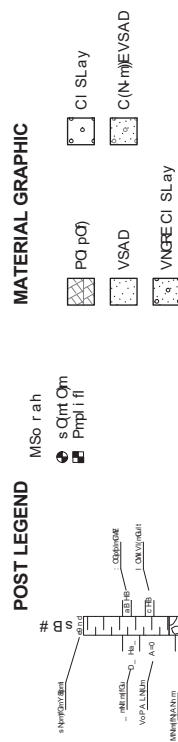
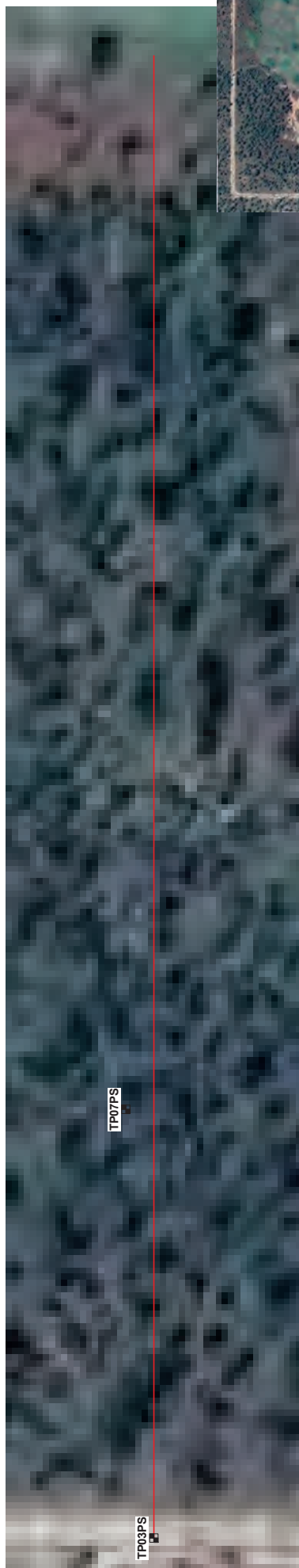
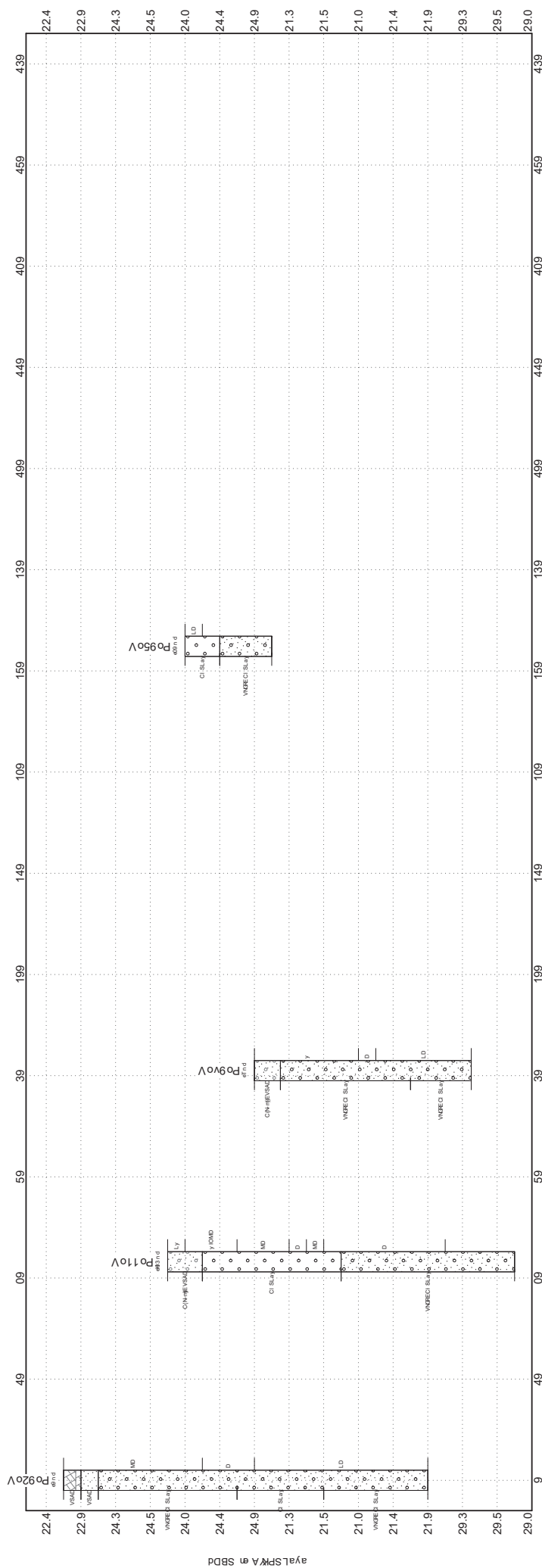
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CHECKED		24/06/2020		FIGURE No. Figure 1	
SCALE		1:3000		PROJECT No. 027	



Construction Sciences

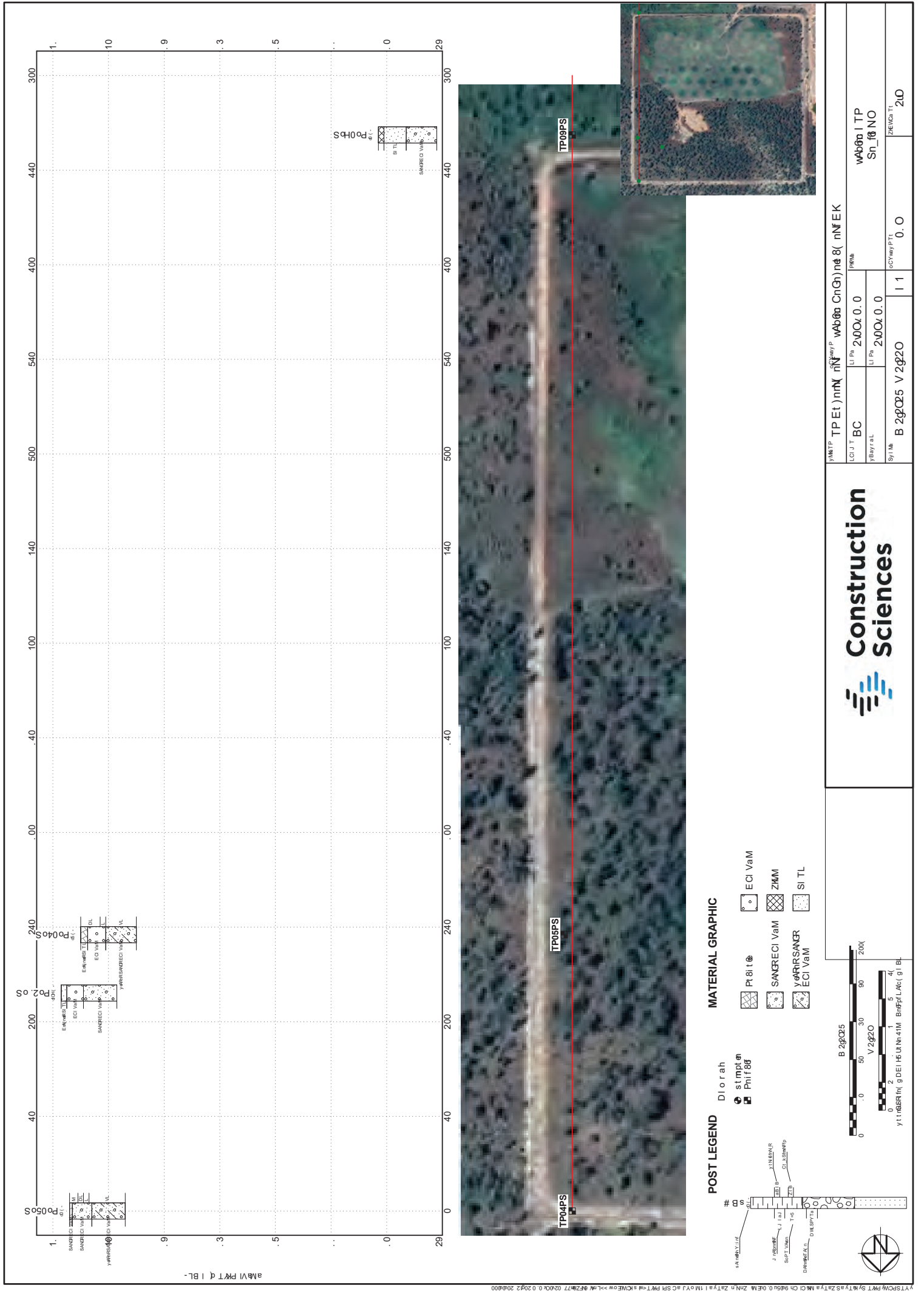






YMA67	AP CO ₂ -m(Gd)	<Nf(U) mRmQ n mG CK
OS S _A	B1	OSPa
Ba r d O		OSPa
V: S _{9A}	B 16399 L 1642	S2
		gl Y-ai PAO 94v

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APPENDIX

D

GEOTECHNICAL TEST RESULTS



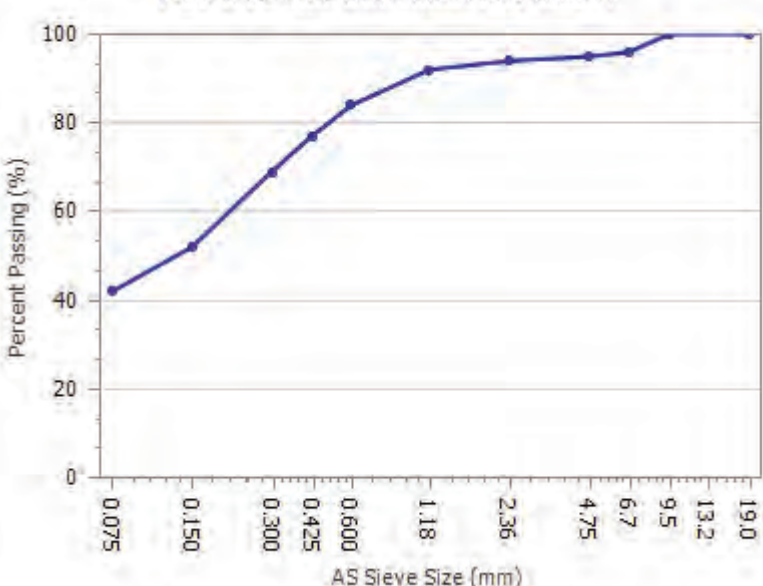
**Construction
Sciences**

QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38570-2
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	Jabiru Redevelopment - Geotechnical Investigation	Lot Number:	BH04
Location:	NT	Internal Test Request:	21791/T/16880
Supplied To:	Construction Sciences NT Engineering	Client Reference/s:	Jabiru Redevelopment Investigation
Area Description:	Jabiru Redevelopment	Report Date / Page:	27/06/2020 Page 1 of 1

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/92337	Location 1	BH04
Sampling Method	Tested As Received	Location 2	2.8m - 3.25m
Date Sampled	20/06/2020	Location 3	
Sampled By	Johnathon Brisk	Location 4	
Date Tested	24/06/2020	Material Source	-
Att. Drying Method	Air Dried	Material Type	-
Atterberg Preparation	Dry Sieved	Material Description	Clayey Sand, trace of gravel

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
19.0		100	
9.5		100	
6.7		96	
4.75		95	
2.36		94	
1.18		92	
0.600		84	
0.425		77	
0.300		69	
0.150		52	
0.075		42	

PARTICLE SIZE DISTRIBUTION GRAPH


Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		40		0.075/0.425 Fines Ratio		0.55	
Plastic Limit (%)		24		PI x 0.425 Ratio (%)		1238.4	
Plastic Index (%)		16		LS x 0.425 Ratio (%)		696.6	
Linear Shrinkage (%)		9.0		Particle Size Dist. Moisture Content (%)		14.6	
Linear Shrinkage Defects	Crack						

Remarks Re-Issued Report Replaces Report No 21791/R/38570-1 (reason: test method variation as per remarks). Results apply to the sample/s as received. Variation to test method. Inadequate sample mass in accordance with AS1289.1.1 section 5.7 table 1.



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Accreditation Number: 1986

Corporate Site Number: 21791



Approved Signatory: Nathan Kellaway

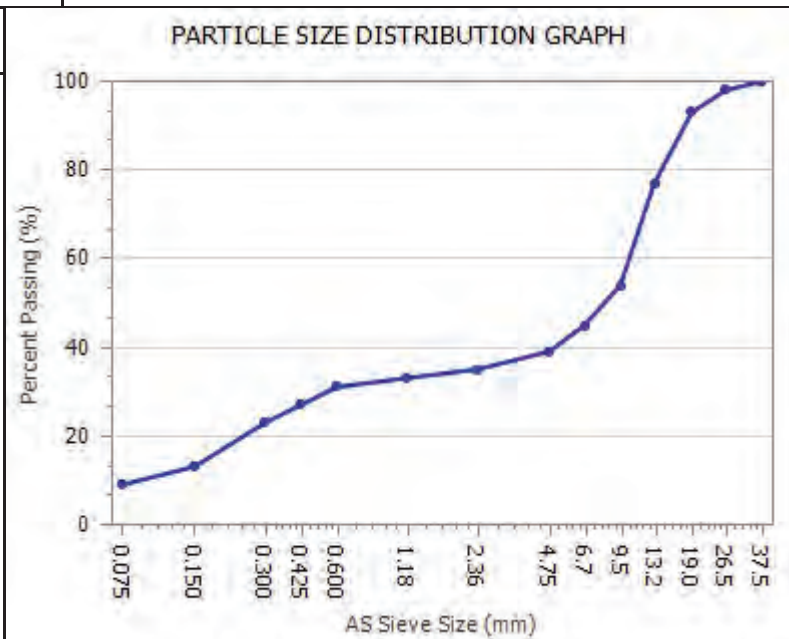
Form ID: W85MCRRep Rev 2

QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38443-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP01
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	18/06/2020 Page 1 of 6

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/91868	Test Pit	TP01 - 001
Sampling Method	Tested As Received	Depth	M 0.3 - 0.9
Date Sampled	1/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	11/06/2020	Material Source	Insitu
Att. Drying Method	Air Dried	Material Type	Existing
Atterberg Preparation	Dry Sieved	Material Description	Sandy Gravel with clay

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
37.5		100	
26.5		98	
19.0		93	
13.2		77	
9.5		54	
6.7		45	
4.75		39	
2.36		35	
1.18		33	
0.600		31	
0.425		27	
0.300		23	
0.150		13	
0.075		9	



Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		22		0.075/0.425 Fines Ratio		0.34	
Plastic Limit (%)		14		PI x 0.425 Ratio (%)		219.8	
Plastic Index (%)		8		LS x 0.425 Ratio (%)		109.9	
Linear Shrinkage (%)		4.0		Particle Size Dist. Moisture Content (%)		5.6	
Linear Shrinkage Defects	Crack / Curl						

Remarks	Results apply to the sample/s as received.
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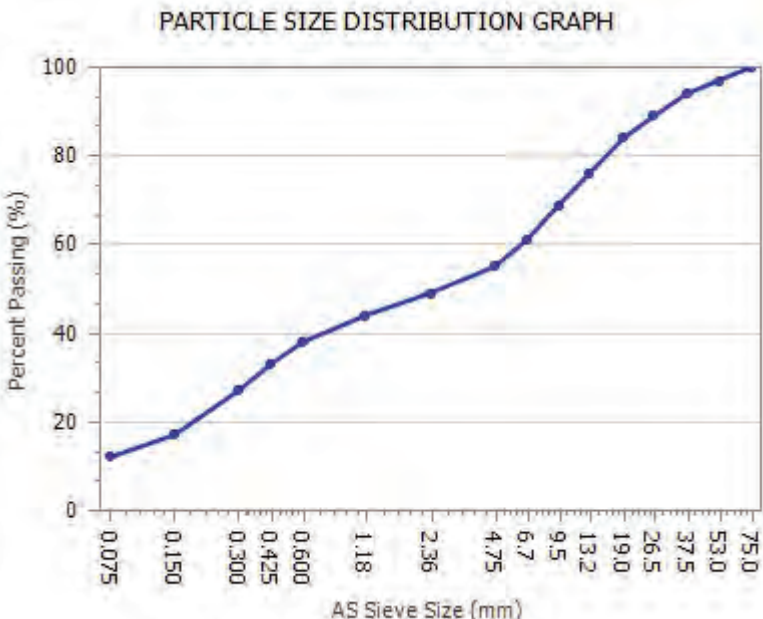
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QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38443-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP02
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	18/06/2020 Page 2 of 6

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/91869	Test Pit	TP02 - 001
Sampling Method	Tested As Received	Depth	M 0.9 - 1.75
Date Sampled	1/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	11/06/2020	Material Source	Insitu
Att. Drying Method	Air Dried	Material Type	Existing
Atterberg Preparation	Dry Sieved	Material Description	Sandy Silty Gravel,Brown

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
75.0		100	
53.0		97	
37.5		94	
26.5		89	
19.0		84	
13.2		76	
9.5		69	
6.7		61	
4.75		55	
2.36		49	
1.18		44	
0.600		38	
0.425		33	
0.300		27	
0.150		17	



Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		25		0.075/0.425 Fines Ratio		0.36	
Plastic Limit (%)		20		PI x 0.425 Ratio (%)		165.0	
Plastic Index (%)		5		LS x 0.425 Ratio (%)		66.0	
Linear Shrinkage (%)		2.0		Particle Size Dist. Moisture Content (%)		10.2	

Linear Shrinkage Defects	Crack / Crumble
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Remarks	Results apply to the sample/s as received.
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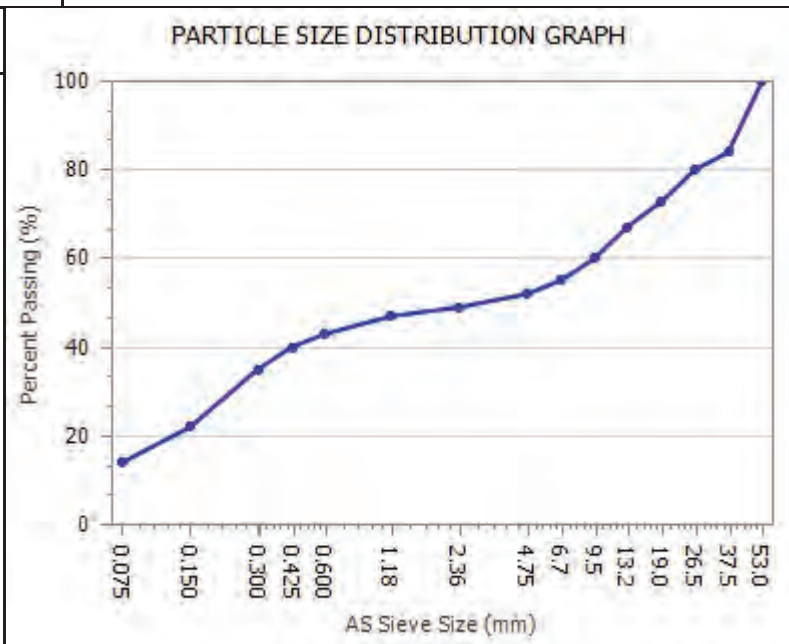
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	Approved Signatory: Nathan Kellaway		Form ID: W85MCRP Rev 2

QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38443-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP05
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	18/06/2020 Page 3 of 6

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/91870	Test Pit	TP05 - 003
Sampling Method	Tested As Received	Depth	M 0.9 - 2.0
Date Sampled	1/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	11/06/2020	Material Source	Insitu
Att. Drying Method	Air Dried	Material Type	Existing
Atterberg Preparation	Dry Sieved	Material Description	clayey Sandy Gravel

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
53.0		100	
37.5		84	
26.5		80	
19.0		73	
13.2		67	
9.5		60	
6.7		55	
4.75		52	
2.36		49	
1.18		47	
0.600		43	
0.425		40	
0.300		35	
0.150		22	
0.075		14	



Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		28		0.075/0.425 Fines Ratio		0.36	
Plastic Limit (%)		21		PI x 0.425 Ratio (%)		277.0	
Plastic Index (%)		7		LS x 0.425 Ratio (%)		118.7	
Linear Shrinkage (%)		3.0		Particle Size Dist. Moisture Content (%)		9.9	
Linear Shrinkage Defects	Crack						

Remarks	Results apply to the sample/s as received.
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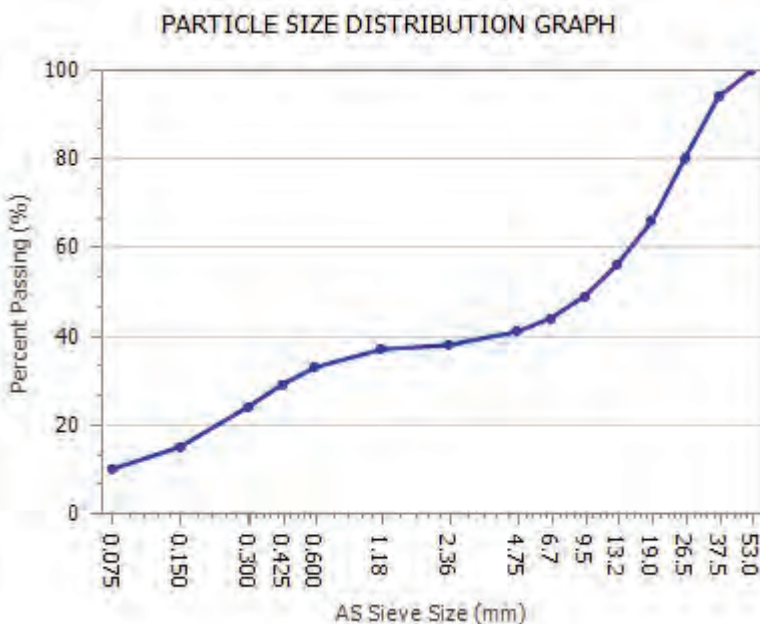
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	Corporate Site Number:	21791	
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QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38443-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP03
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	18/06/2020 Page 4 of 6

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/91871	Test Pit	TP03 - 003
Sampling Method	Tested As Received	Depth	M 1.0 - 1.5
Date Sampled	1/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	11/06/2020	Material Source	Insitu
Att. Drying Method	Air Dried	Material Type	Existing
Atterberg Preparation	Dry Sieved	Material Description	Sandy Gravel with clay

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
53.0		100	
37.5		94	
26.5		80	
19.0		66	
13.2		56	
9.5		49	
6.7		44	
4.75		41	
2.36		38	
1.18		37	
0.600		33	
0.425		29	
0.300		24	
0.150		15	
0.075		10	



Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		25		0.075/0.425 Fines Ratio		0.34	
Plastic Limit (%)		18		PI x 0.425 Ratio (%)		201.7	
Plastic Index (%)		7		LS x 0.425 Ratio (%)		86.4	
Linear Shrinkage (%)		3.0		Particle Size Dist. Moisture Content (%)		8.4	
Linear Shrinkage Defects	Crack						

Remarks	Results apply to the sample/s as received.
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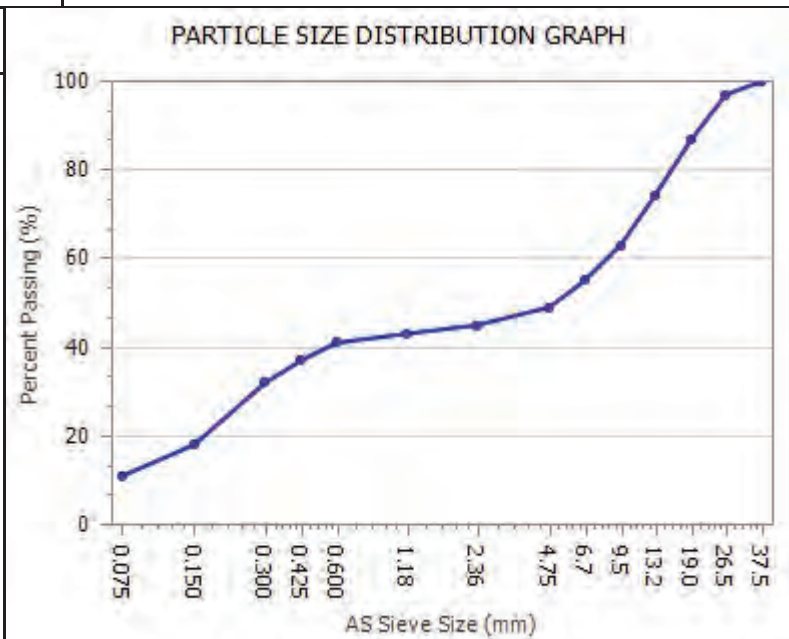
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QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38443-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP12
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	18/06/2020 Page 5 of 6

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/91872	Test Pit	TP12 - PS 002
Sampling Method	Tested As Received	Depth	M 0.2 - .8
Date Sampled	1/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	11/06/2020	Material Source	Insitu
Att. Drying Method	Air Dried	Material Type	Existing
Atterberg Preparation	Dry Sieved	Material Description	Sandy Gravel with silt

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
37.5		100	
26.5		97	
19.0		87	
13.2		74	
9.5		63	
6.7		55	
4.75		49	
2.36		45	
1.18		43	
0.600		41	
0.425		37	
0.300		32	
0.150		18	
0.075		11	



Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		20		0.075/0.425 Fines Ratio		0.30	
Plastic Limit (%)		16		PI x 0.425 Ratio (%)		149.9	
Plastic Index (%)		4		LS x 0.425 Ratio (%)		74.9	
Linear Shrinkage (%)		2.0		Particle Size Dist. Moisture Content (%)		4.9	
Linear Shrinkage Defects	Crack						

Remarks	Results apply to the sample/s as received.
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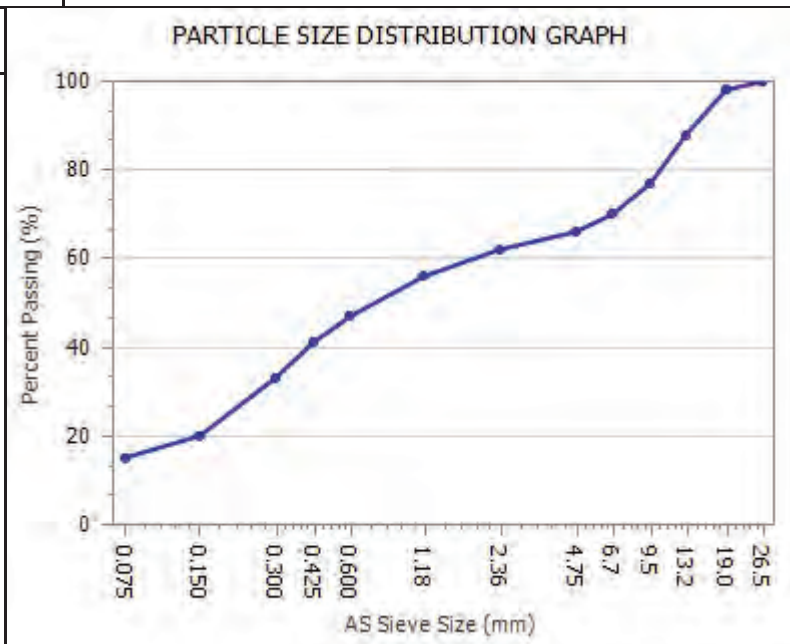
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	Corporate Site Number:	21791	
	Approved Signatory: Nathan Kellaway		Form ID: W85MCRep Rev 2

QUALITY OF MATERIALS REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38443-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP09
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	18/06/2020 Page 6 of 6

Test Procedures	AS1289.3.6.1, AS1289.3.1.2, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1, AS 1289.3.3.1		
Sample Number	21791/S/91873	Test Pit	TP09 - PS 03
Sampling Method	Tested As Received	Depth	M 1.0 - 2.10
Date Sampled	1/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	11/06/2020	Material Source	Insitu
Att. Drying Method	Air Dried	Material Type	Existing
Atterberg Preparation	Dry Sieved	Material Description	Clayey Gravelly Sand

AS Sieve (mm)	Specification Minimum (%)	Percent Passing (%)	Specification Maximum (%)
26.5		100	
19.0		98	
13.2		88	
9.5		77	
6.7		70	
4.75		66	
2.36		62	
1.18		56	
0.600		47	
0.425		41	
0.300		33	
0.150		20	
0.075		15	



Test Result	Specification Minimum (%)	Result	Specification Maximum (%)	Test Result	Specification Minimum (%)	Result (%)	Specification Maximum (%)
Liquid Limit (%)		26		0.075/0.425 Fines Ratio		0.37	
Plastic Limit (%)		13		PI x 0.425 Ratio (%)		527.9	
Plastic Index (%)		13		LS x 0.425 Ratio (%)		142.1	
Linear Shrinkage (%)		3.5		Particle Size Dist. Moisture Content (%)		11.2	
Linear Shrinkage Defects	Crack / Curl						

Remarks	Results apply to the sample/s as received.
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	Corporate Site Number:	21791	
	Approved Signatory: Nathan Kellaway		Form ID: W85MCRP Rev 2

EMERSON CLASS NUMBER REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38409-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	Various
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	17/06/2020 Page 1 of 3

Test Procedures:	AS1289.3.8.1
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Sample Number	21791/S/91938	21791/S/91939	21791/S/91940	21791/S/91941
ID / Client ID	-	-	-	-
Lot Number	TP01 PS07 0.0-1.0m	TP04 PS07 0.0-1.0m	TP05 PS07 0.0-1.0m	TP07 PS07 0.0-1.75m
Date / Time Sampled	4/06/2020	4/06/2020	4/06/2020	4/06/2020
Date Tested	16/06/2020	16/06/2020	16/06/2020	16/06/2020
Material Source	Insitu	Insitu	Insitu	Insitu
Material Type	Existing	Existing	Existing	Existing
Sampling Method	Tested As Received	Tested As Received	Tested As Received	Tested As Received
Water Type	Distilled	Distilled	Distilled	Distilled
Water Temperature (C°)	27	27	27	27
Test Pit	01	04	05	07
Depth	0.0-1.0m	0.0-1.0m	0.0-1.0m	0.0-1.75m
Soil Description	-	-	-	-
Emerson Class Number	5	5	5	5

Remarks	Results apply to the sample/s as received.
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EMERSON CLASS NUMBER REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38409-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	Various
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	17/06/2020 Page 2 of 3

Test Procedures:	AS1289.3.8.1
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Sample Number	21791/S/91942	21791/S/91943	21791/S/91944	21791/S/91945
ID / Client ID	-	-	-	-
Lot Number	TP08 PS07 0.0-1.0m	TP09 PS07 0.0-1.0m	TP10 PS03 0.0-1.0m	TP11 PS07 0.0-1.0m
Date / Time Sampled	4/06/2020	4/06/2020	4/06/2020	4/06/2020
Date Tested	16/06/2020	15/06/2020	15/06/2020	15/06/2020
Material Source	Insitu	Insitu	Insitu	Insitu
Material Type	Existing	Existing	Existing	Existing
Sampling Method	Tested As Received	Tested As Received	Tested As Received	Tested As Received
Water Type	Distilled	Distilled	Distilled	Distilled
Water Temperature (C°)	27	27	27	27
Test Pit	08	09	10	11
Depth	0.0-1.0m	0.0-1.0m	0.0-1.0m	0.0-1.0m
Soil Description	-	-	-	-
Emerson Class Number	5	5	5	5

Remarks	Results apply to the sample/s as received.
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EMERSON CLASS NUMBER REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38409-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	Various
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	17/06/2020 Page 3 of 3

Test Procedures:	AS1289.3.8.1
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Sample Number	21791/S/91946			
ID / Client ID	-			
Lot Number	TP12 PS07 0.0-1.0m			
Date / Time Sampled	4/06/2020			
Date Tested	15/06/2020			
Material Source	Insitu			
Material Type	Existing			
Sampling Method	Tested As Received			
Water Type	Distilled			
Water Temperature (C°)	27			
Test Pit	12			
Depth	0.0-1.0m			
Soil Description	-			
Emerson Class Number	5			

Remarks	Results apply to the sample/s as received.
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	Form ID: W34Rep Rev 2		

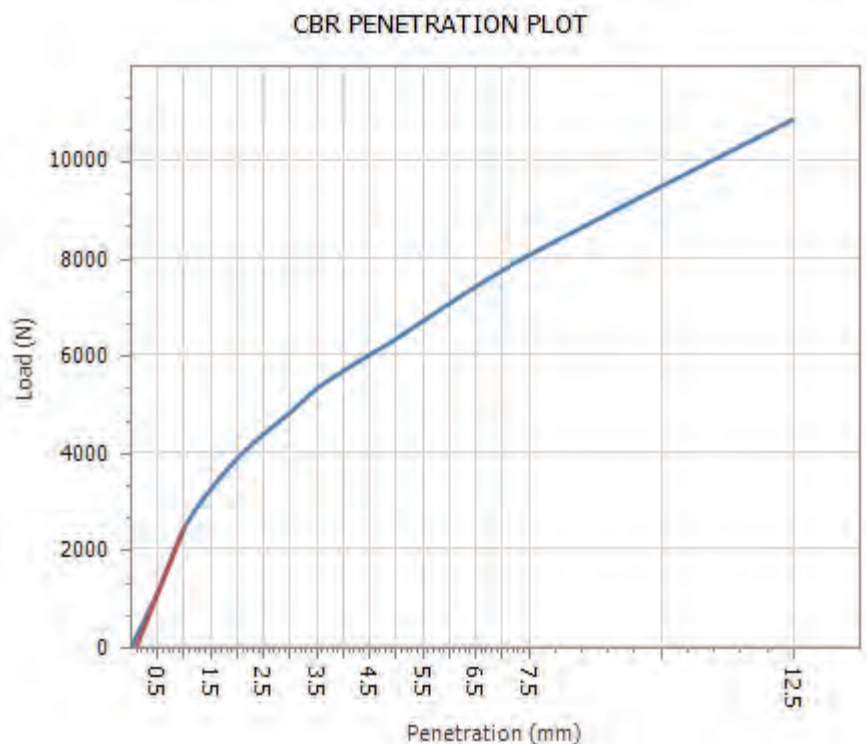
CALIFORNIA BEARING RATIO REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38385-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP03
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	16/06/2020 Page 1 of 2

Test Procedures	AS1289.6.1.1, AS1289.5.2.1, AS1289.2.1.1		
Sample Number	21791/S/91866	Sample Location	
Sampling Method	Tested As Received	Test Pit	TP03 - PS 001
Date Sampled	1/06/2020	Depth	M 0.2 - 1.0
Sampled By	Client/Subbie Tested		
Date Tested	15/06/2020		
Material Source	Insitu	Material Limit Start	-
Material Type	Existing	Material Limit End	-
Client Reference	-	Compactive Effort	Modified

Material Description silty, sandy gravel light brown

Maximum Dry Density (t/m³):	2.15
Optimum Moisture Content (%):	7.0
Field Moisture Content (%):	6.1
Sample Percent Oversize (%)	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	95
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	2.04
Placement Dry Density Ratio (%):	95.0
Placement Moisture Content (%):	6.8
Placement Moisture Ratio (%):	98.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	2.03
Total Curing Time (hrs)	40
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	12.8
Moisture (remainder) After Soak (%)	11.0
CBR Swell (%):	0.0
Minimum CBR Specification (%):	-
CBR Value @ 2.5mm (%):	35



Remarks	Results apply to the sample/s as received.
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	Accreditation Number:	1986
	Corporate Site Number:	21791
	 Approved Signatory: Nathan Kellaway Form ID: W2ASRep Rev2	

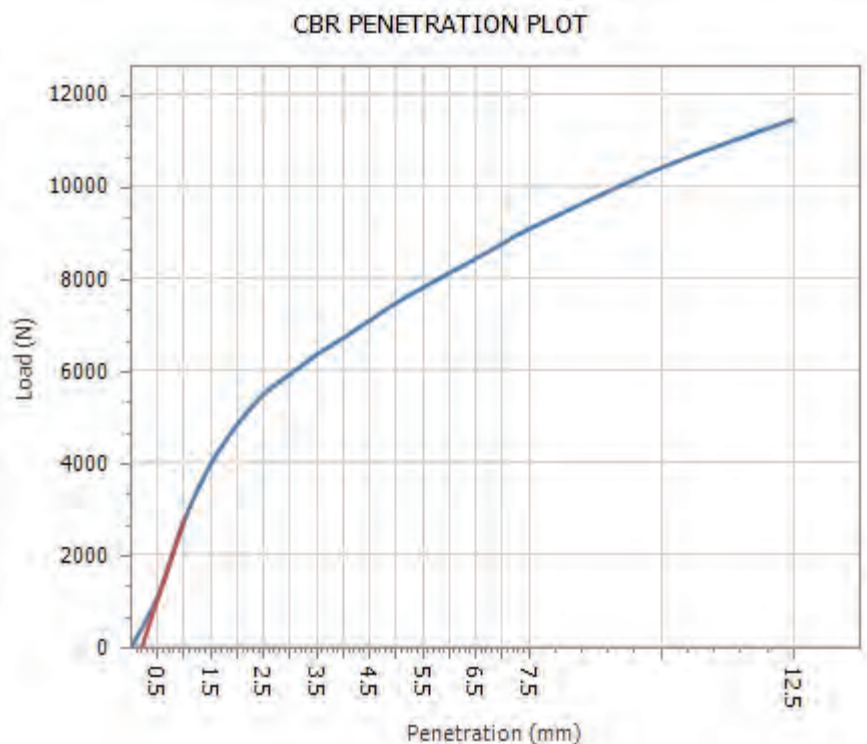
CALIFORNIA BEARING RATIO REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38385-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP05
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	16/06/2020 Page 2 of 2

Test Procedures	AS1289.6.1.1, AS1289.5.2.1, AS1289.2.1.1		
Sample Number	21791/S/91867	Sample Location	
Sampling Method	Tested As Received	Test Pit	TP05 - PS 001
Date Sampled	1/06/2020	Depth	M 0.25 - 0.9
Sampled By	Client/Subbie Tested		
Date Tested	15/06/2020		
Material Source	Insitu	Material Limit Start	-
Material Type	Existing	Material Limit End	-
Client Reference	-	Compactive Effort	Modified

Material Description silty, sandy gravel light brown

Maximum Dry Density (t/m³):	2.05
Optimum Moisture Content (%):	7.5
Field Moisture Content (%):	24.7
Sample Percent Oversize (%):	0.0
Oversize Included / Excluded	Excluded
Target Density Ratio (%):	95
Target Moisture Ratio (%):	100
Placement Dry Density (t/m³):	1.94
Placement Dry Density Ratio (%):	95.0
Placement Moisture Content (%):	7.8
Placement Moisture Ratio (%):	102.5
Test Condition / Soaking Period:	Soaked / 4 Days
CBR Surcharge (kg)	4.5
Dry Density After Soak (t/m³):	1.94
Total Curing Time (hrs)	52
Liquid Limit Method	Estimation
Moisture (top 30mm) After Soak (%)	12.3
Moisture (remainder) After Soak (%)	11.1
CBR Swell (%):	0.0
Minimum CBR Specification (%):	-
CBR Value @ 2.5mm (%):	45



Remarks	Results apply to the sample/s as received.
---------	--



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Accreditation Number: 1986
Corporate Site Number: 21791

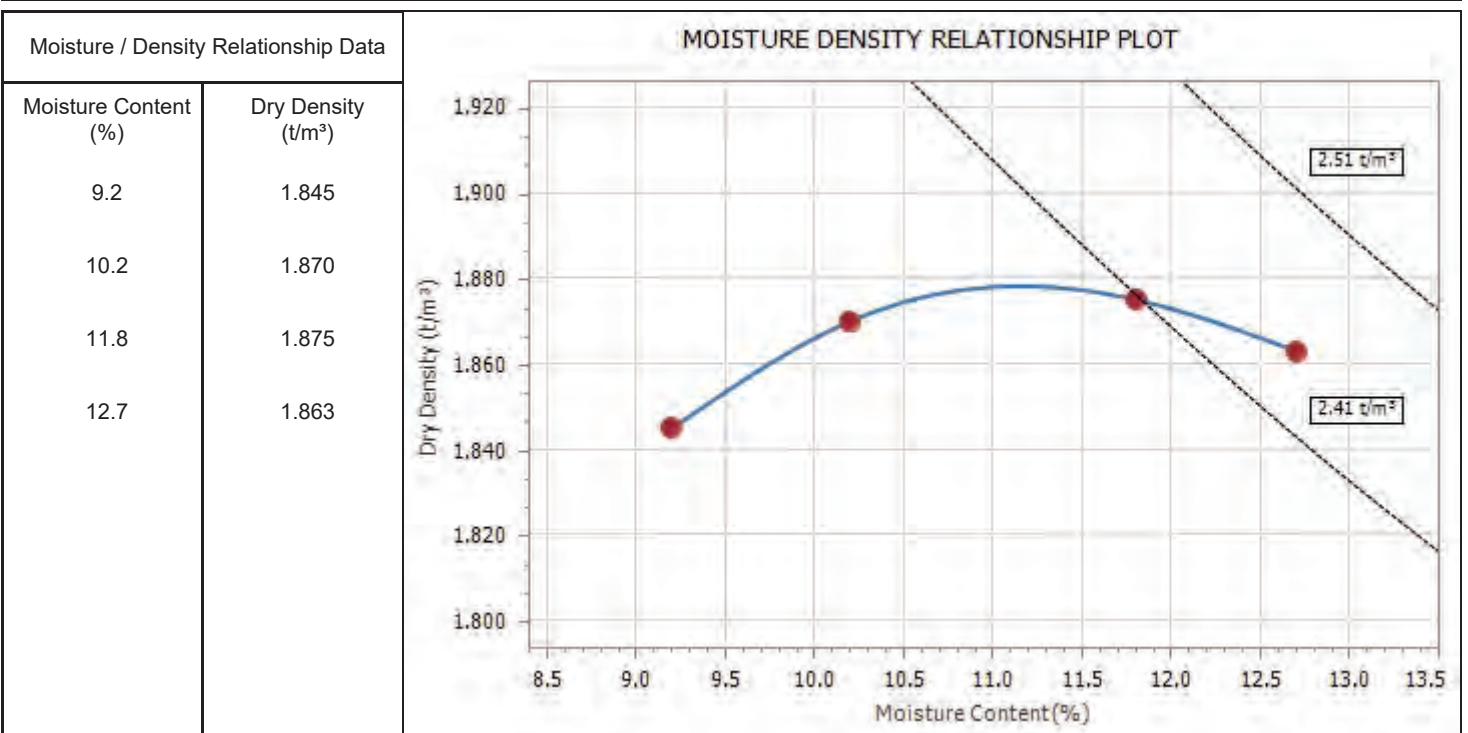


Approved Signatory: Nathan Kellaway
Form ID: W2ASRep Rev2

MOISTURE DENSITY RELATIONSHIP REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38334-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP01
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	11/06/2020 Page 1 of 4

Test Procedures	AS1289.5.1.1, AS1289.2.1.1	Sample Location	
Sample Number	21791/S/91874	Test Pit	TP01 - PS 006
Sampling Method	Tested As Received	Depth	M 1.5 - 2.0
Date Sampled	5/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	10/06/2020	Compactive Effort	Standard
Material Source	Insitu	Fraction Tested (mm)	< 19.0mm
Material Type	Existing	Percent Oversize (%)	0.0
Liquid Limit Method	Estimation	Total Curing Time (hrs)	76.7
Material Description	silty, sandy gravel light brown		



Maximum Dry Density (t/m³):	1.88	Optimum Moisture Content (%):	11.0
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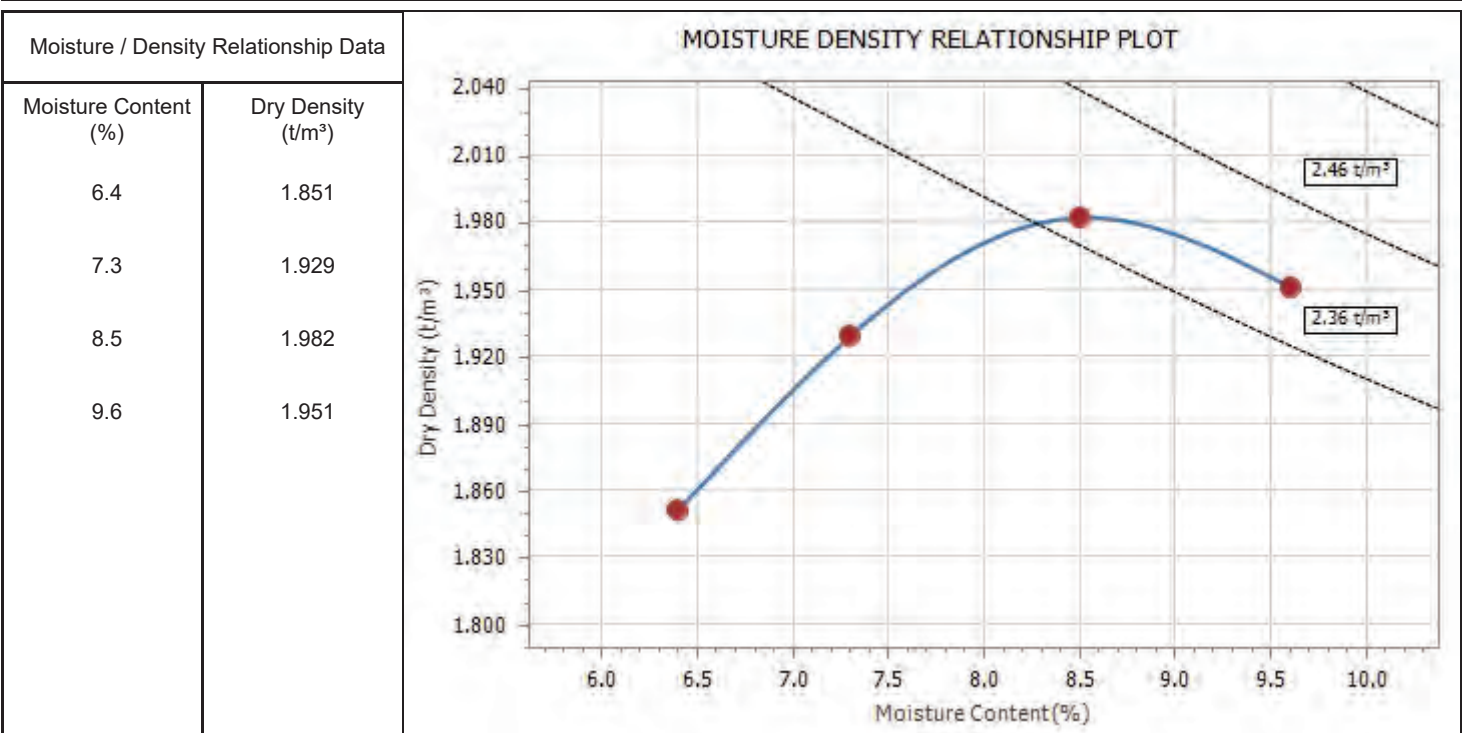
Remarks	Results apply to the sample/s as received.
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MOISTURE DENSITY RELATIONSHIP REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38334-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP03
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	11/06/2020 Page 2 of 4

Test Procedures	AS1289.5.1.1, AS1289.2.1.1	Sample Location	
Sample Number	21791/S/91875	Test Pit	TP03 - PS 002
Sampling Method	Tested As Received	Depth	M 0.2 - 1.0
Date Sampled	5/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	10/06/2020	Compactive Effort	Standard
Material Source	Insitu	Fraction Tested (mm)	< 19.0mm
Material Type	Existing	Percent Oversize (%)	0.0
Liquid Limit Method	Estimation	Total Curing Time (hrs)	76.5
Material Description	silty, sandy gravel light brown		



Maximum Dry Density (t/m³):	1.98	Optimum Moisture Content (%):	8.5
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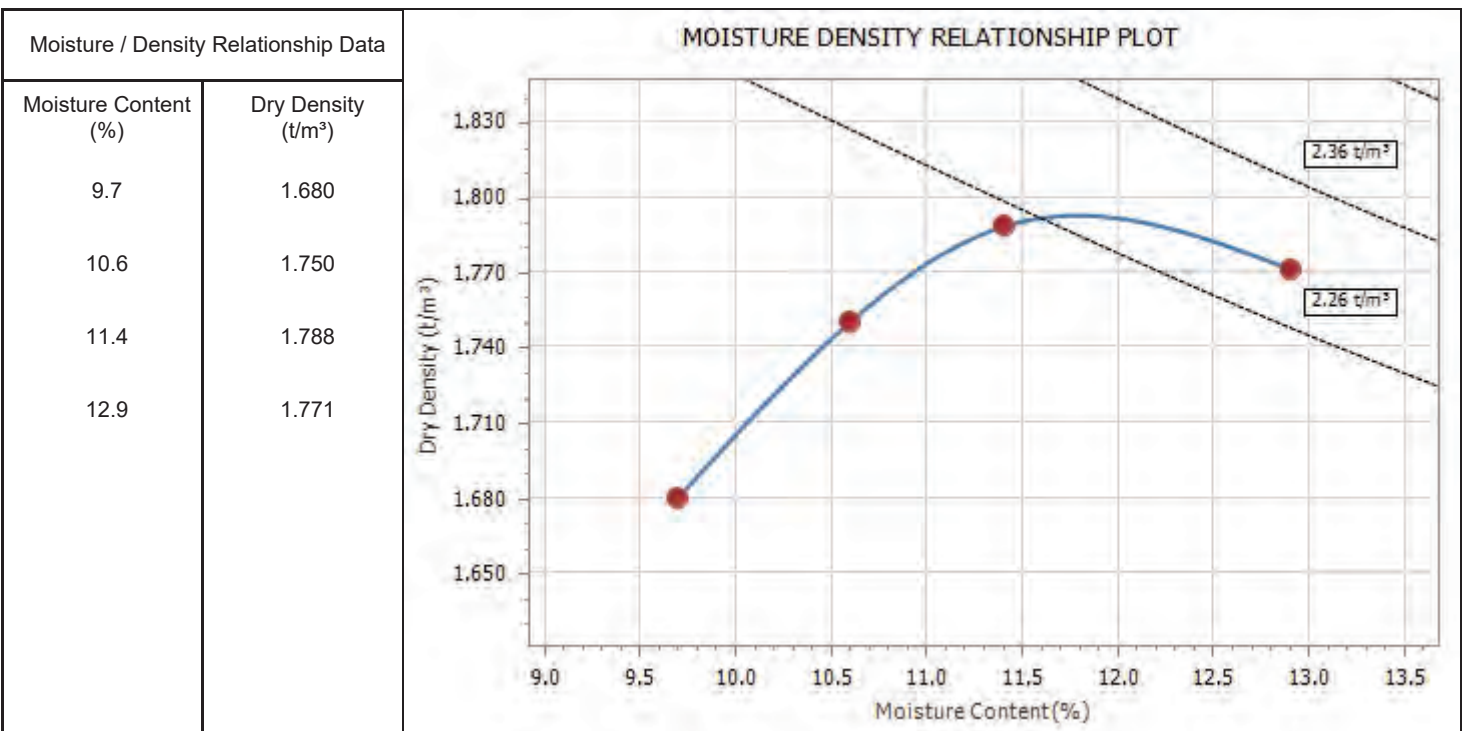
Remarks	Results apply to the sample/s as received.
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	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025 - Testing	 Approved Signatory: Nathan Kellaway Form ID: W4Rev Rev2
	Accreditation Number: 1986 Corporate Site Number: 21791	

MOISTURE DENSITY RELATIONSHIP REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38334-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP04
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	11/06/2020 Page 3 of 4

Test Procedures	AS1289.5.1.1, AS1289.2.1.1	Sample Location	
Sample Number	21791/S/91876	Test Pit	TP04 - PS 002
Sampling Method	Tested As Received	Depth	M 0.8 - 2.0
Date Sampled	5/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	10/06/2020	Compactive Effort	Standard
Material Source	Insitu	Fraction Tested (mm)	< 19.0mm
Material Type	Existing	Percent Oversize (%)	0.0
Liquid Limit Method	Estimation	Total Curing Time (hrs)	77.0
Material Description	silty, sandy gravel light brown		



Maximum Dry Density (t/m³):	1.79	Optimum Moisture Content (%):	12.0
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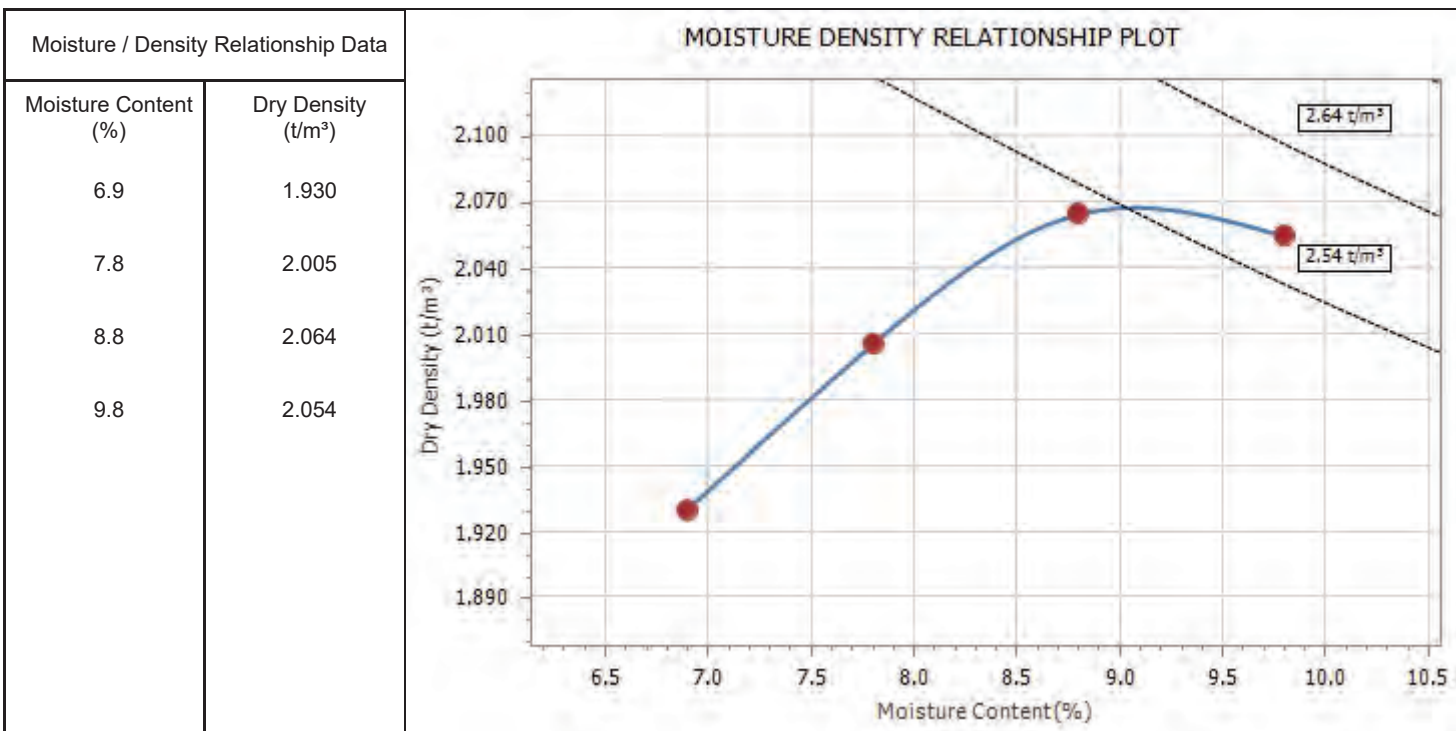
Remarks	Results apply to the sample/s as received.
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	The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. Accredited for compliance with ISO/IEC 17025 - Testing	 Approved Signatory: Nathan Kellaway Form ID: W4Rev Rev2
	Accreditation Number: 1986 Corporate Site Number: 21791	

MOISTURE DENSITY RELATIONSHIP REPORT

Client:	Construction Sciences NT Engineering	Report Number:	21791/R/38334-1
Client Address:	Unit 3, 53 Export Drive, East Arm	Project Number:	21791/P/889
Project:	NT Laboratory Support	Lot Number:	TP05
Location:	NT	Internal Test Request:	21791/T/16783
Component:	Material Qualities	Client Reference/s:	Jabiru - Power Station
Area Description:	Test Pits	Report Date / Page:	11/06/2020 Page 4 of 4

Test Procedures	AS1289.5.1.1, AS1289.2.1.1	Sample Location	
Sample Number	21791/S/91877	Test Pit	TP05 - PS 002
Sampling Method	Tested As Received	Depth	M 0.25 - 0.9
Date Sampled	5/06/2020		
Sampled By	Client/Subbie Tested		
Date Tested	10/06/2020	Compactive Effort	Standard
Material Source	Insitu	Fraction Tested (mm)	< 19.0mm
Material Type	Existing	Percent Oversize (%)	0.0
Liquid Limit Method	Estimation	Total Curing Time (hrs)	77.0
Material Description	silty, sandy gravel light brown		



Maximum Dry Density (t/m ³):	2.07	Optimum Moisture Content (%):	9.0
--	------	-------------------------------	-----

Remarks	Results apply to the sample/s as received.
---------	--

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Thermal Resistivity - 4 Point Density Comparison ASTM D5334-14 AS1289.2.1.1, Standard Compactive Effort

Report Number : 3190277-1
Project: Soil QA2020
Client: Construction Sciences (Berrimah)
Address: Unit 2 53 Export Drive East Arm NT 0828
Sample Location: TP01PS006
Sample Number: 203-5789A
Sample Date: 15-06-2020
Material Description: SAND, CLAYEY with GRAVEL
Test hole notes: Pre-drilled and sleeved
Sampling Method: Not known - Sampled by Client (Tested as Received)
Dates Tested: 17-Jun-20 to 25-Jun-20

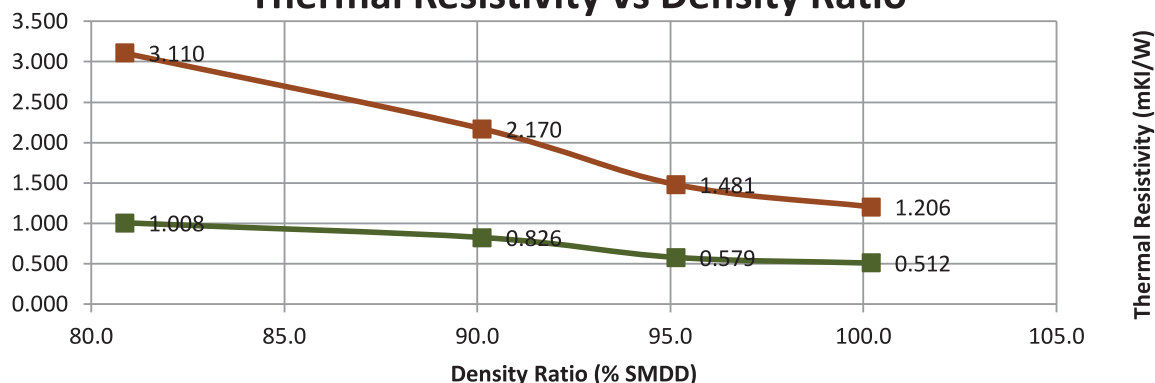
26-06-2020
Page 1 of 4

Initial Specimens Details

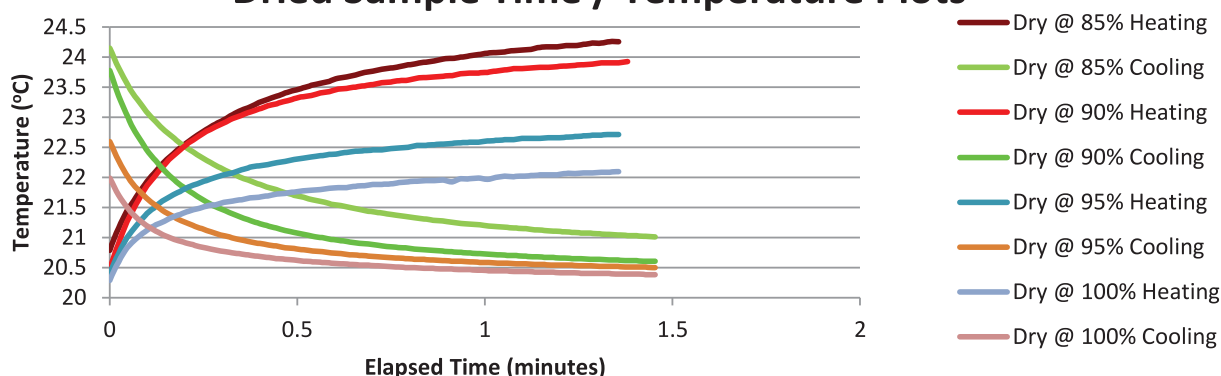
Average Height: 115.96mm
Average Diameter: 104.31mm
Average Wet Mass: 1900.58g
Type Tested: Remoulded

SMDD:	1.88 t/M3	OMC:	11.2 %	Field MC:	9.6 %	
Density Ratio	Moisture	Resistivity *	Temperature	Moisture	Resistivity *	Temperature
80.9%	10.9%	1.008 mK/W	18.57 C	0.1%	3.110 mK/W	20.79 C
90.1%	10.9%	0.826 mK/W	19.09 C	0.2%	2.170 mK/W	20.47 C
95.1%	11.1%	0.579 mK/W	19.48 C	0.2%	1.481 mK/W	20.40 C
100.2%	10.9%	0.512 mK/W	19.32 C	0.1%	1.206 mK/W	20.28 C

Thermal Resistivity vs Density Ratio



Dried Sample Time / Temperature Plots



* Calibration (C Factor) Applied

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CIV5.04.R - 4 Point TR vs DR ASTM D5334-14 (Issue 1)

National Projects Manager
Michael Bate



Thermal Resistivity - 4 Point Density Comparison ASTM D5334-14 AS1289.2.1.1, Standard Compactive Effort

Report Number : 3190277-1
Project: Soil QA2020
Client: Construction Sciences (Berrimah)
Address: Unit 2 53 Export Drive East Arm NT 0828
Sample Location: TP03PS002
Sample Number: 203-5789B
Sample Date: 15-06-2020
Material Description: SAND, GRAVEL with CLAY
Test hole notes: Pre-drilled and sleeved
Sampling Method: Not known - Sampled by Client (Tested as Received)
Dates Tested: 18-Jun-20 to 25-Jun-20

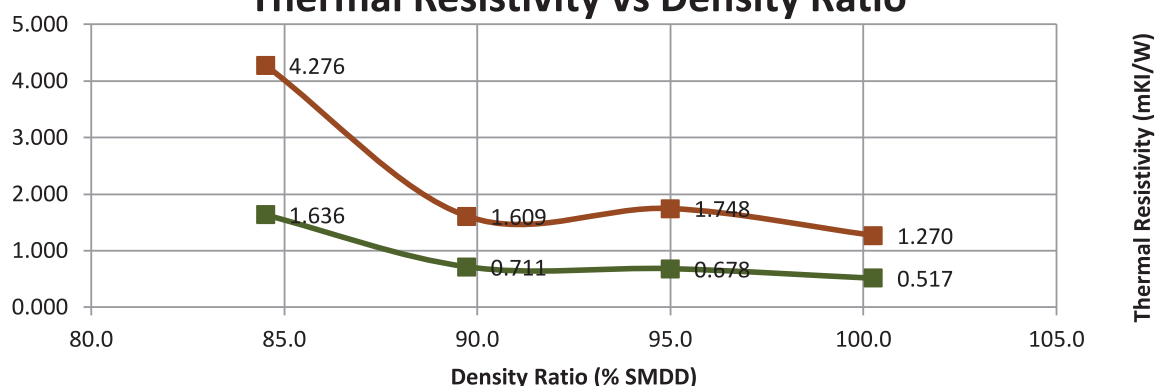
26-06-2020
Page 2 of 4

Initial Specimens Details

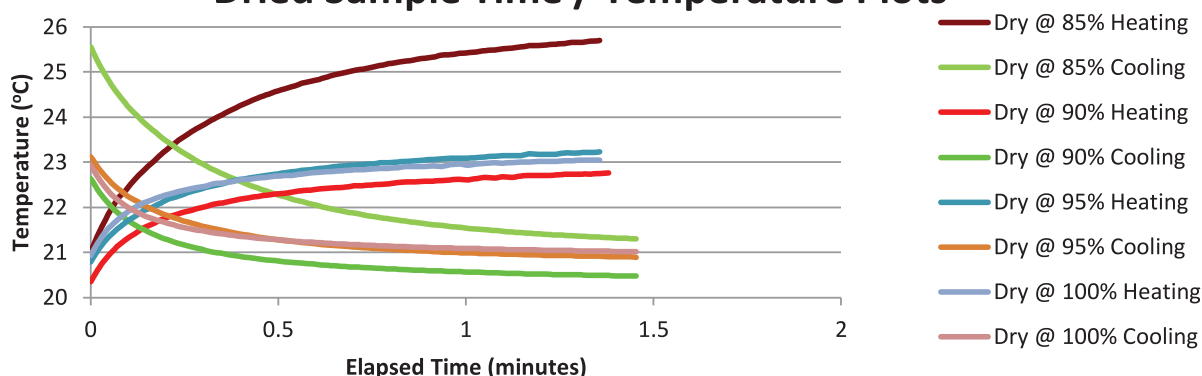
Average Height: 116.99mm
Average Diameter: 103.42mm
Average Wet Mass: 1976.72g
Type Tested: Remoulded

SMDD:	1.98 t/M3	OMC:	8.6 %	Field MC:	6.2 %	
Density Ratio	Moisture	Resistivity *	Temperature	Moisture	Resistivity *	Temperature
84.5%	8.3%	1.636 mK/W	19.16 C	0.0%	4.276 mK/W	21.01 C
89.7%	8.6%	0.711 mK/W	19.57 C	0.2%	1.609 mK/W	20.34 C
95.0%	8.5%	0.678 mK/W	19.44 C	0.2%	1.748 mK/W	20.79 C
100.3%	8.2%	0.517 mK/W	19.29 C	0.2%	1.270 mK/W	20.93 C

Thermal Resistivity vs Density Ratio



Dried Sample Time / Temperature Plots



* Calibration (C Factor) Applied

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CIV5.04.R - 4 Point TR vs DR ASTM D5334-14 (Issue 1)

National Projects Manager
Michael Bate



Thermal Resistivity - 4 Point Density Comparison ASTM D5334-14 AS1289.2.1.1, Standard Compactive Effort

Report Number : 3190277-1
Project: Soil QA2020
Client: Construction Sciences (Berrimah)
Address: Unit 2 53 Export Drive East Arm NT 0828
Sample Location: TP04PS002
Sample Number: 203-5789C
Sample Date: 15-06-2020
Material Description: SAND, CLAYEY with GRAVEL
Test hole notes: Pre-drilled and sleeved
Sampling Method: Not known - Sampled by Client (Tested as Received)
Dates Tested: 18-Jun-20 to 25-Jun-20

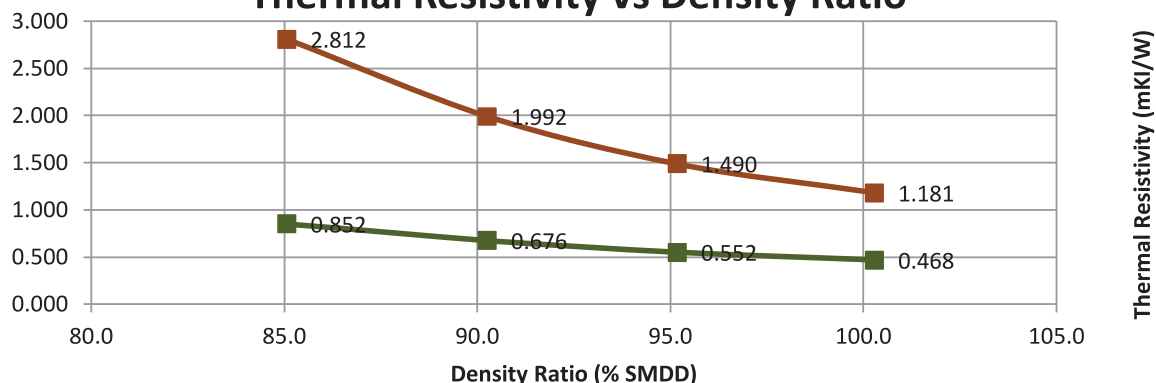
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Page 3 of 4

Initial Specimens Details

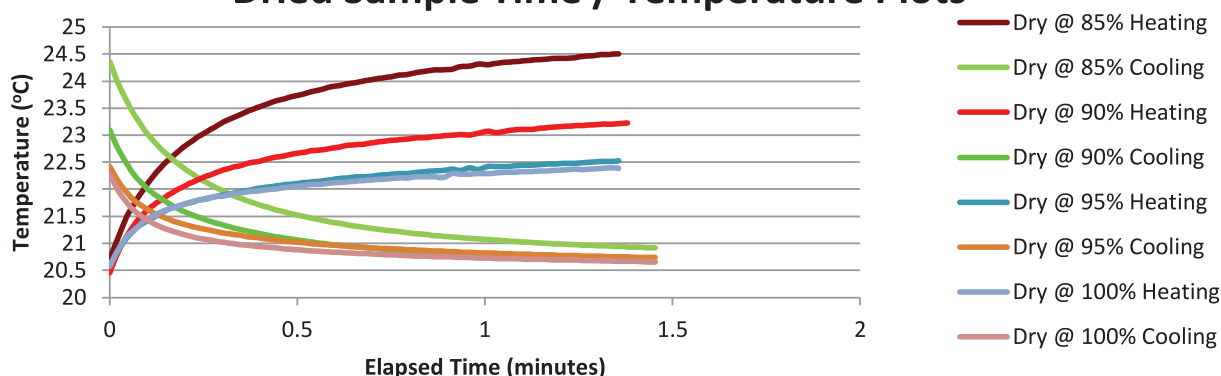
Average Height: 116.08mm
Average Diameter: 104.8mm
Average Wet Mass: 1844.88g
Type Tested: Remoulded

SMDD:	1.79 t/M3	OMC:	11.8 %	Field MC:	11.2 %	
Density Ratio	Moisture	Resistivity *	Temperature	Moisture	Resistivity *	Temperature
85.1%	11.5%	0.852 mK/W	19.19 C	0.2%	2.812 mK/W	20.70 C
90.3%	11.5%	0.676 mK/W	19.40 C	0.2%	1.992 mK/W	20.45 C
95.2%	11.5%	0.552 mK/W	19.43 C	0.2%	1.490 mK/W	20.59 C
100.3%	11.5%	0.468 mK/W	19.03 C	0.2%	1.181 mK/W	20.58 C

Thermal Resistivity vs Density Ratio



Dried Sample Time / Temperature Plots



* Calibration (C Factor) Applied

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CIV5.04.R - 4 Point TR vs DR ASTM D5334-14 (Issue 1)

Michael Bate

National Projects Manager
Michael Bate



Thermal Resistivity - 4 Point Density Comparison ASTM D5334-14 AS1289.2.1.1, Standard Compactive Effort

Report Number : 3190277-1
Project: Soil QA2020
Client: Construction Sciences (Berrimah)
Address: Unit 2 53 Export Drive East Arm NT 0828
Sample Location: TP05PS002
Sample Number: 203-5789D
Sample Date: 15-06-2020
Material Description: SAND, GRAVEL with CLAY
Test hole notes: Pre-drilled and sleeved
Sampling Method: Not known - Sampled by Client (Tested as Received)
Dates Tested: 19-Jun-20 to 25-Jun-20

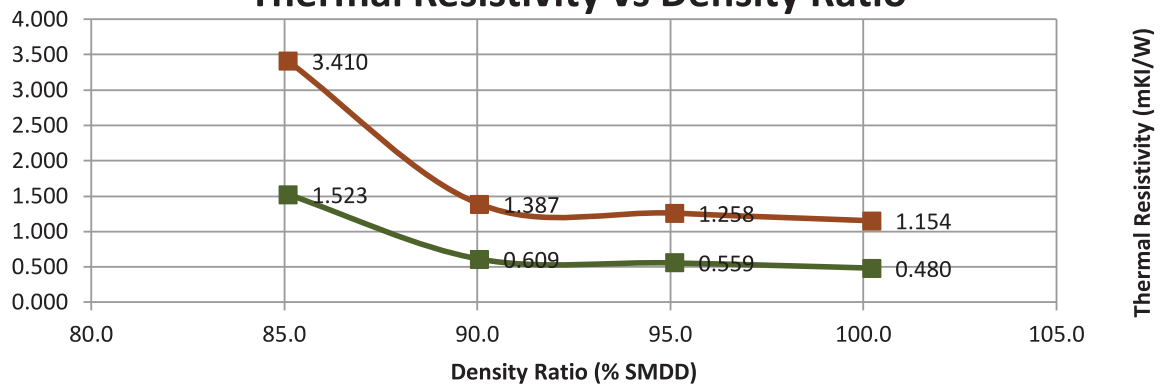
26-06-2020
Page 4 of 4

Initial Specimens Details

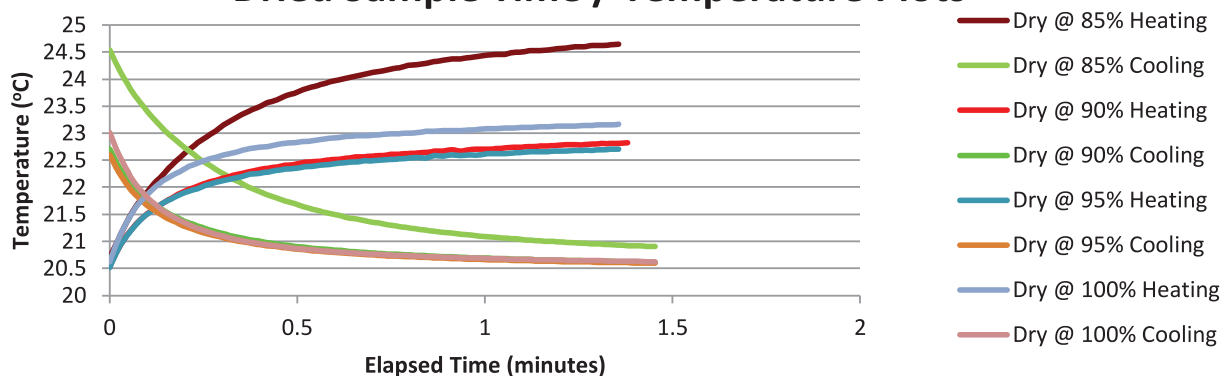
Average Height: 116.29mm
Average Diameter: 104.3mm
Average Wet Mass: 2074.41g
Type Tested: Remoulded

SMDD:	2.07 t/M3	OMC:	9 %	Field MC:	5.6 %	
Density Ratio	Moisture	Resistivity *	Temperature	Moisture	Resistivity *	Temperature
85.1%	8.7%	1.523 mK/W	19.42 C	0.1%	3.410 mK/W	20.69 C
90.1%	8.8%	0.609 mK/W	19.13 C	0.3%	1.387 mK/W	20.53 C
95.1%	8.9%	0.559 mK/W	19.60 C	0.3%	1.258 mK/W	20.52 C
100.2%	8.7%	0.480 mK/W	17.85 C	0.2%	1.154 mK/W	20.62 C

Thermal Resistivity vs Density Ratio



Dried Sample Time / Temperature Plots



* Calibration (C Factor) Applied

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CIV5.04.R - 4 Point TR vs DR ASTM D5334-14 (Issue 1)

National Projects Manager
Michael Bate



APPENDIX

E

ENVIRONMENTAL/CHEMICAL TEST
RESULTS



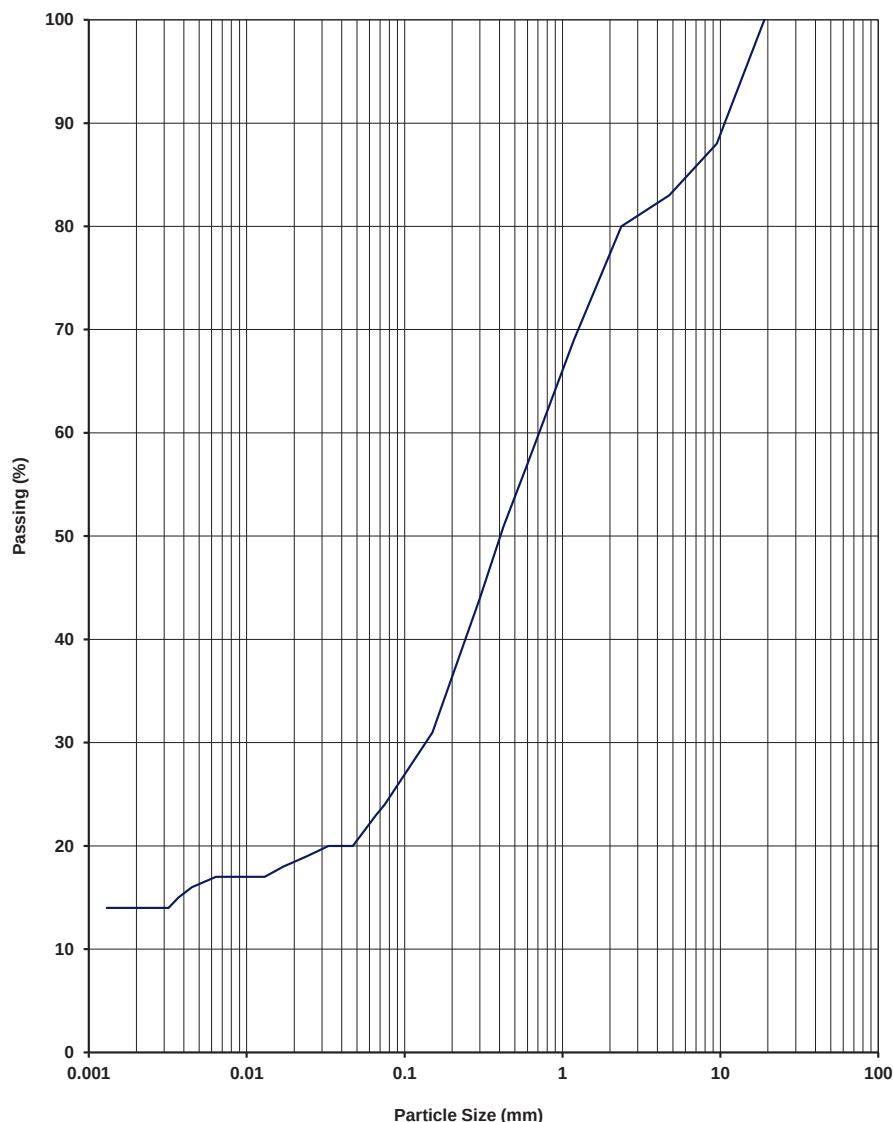
**Construction
Sciences**

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Construction Sciences Professional Services	Report No.	P20060034-G
		Workorder No.	0020237
Address	3/4/53 Export Dr, East Arm NT 0822	Test Date	17/6/2020
		Report Date	24/6/2020
Project	P27 Jabiru - Power Station		
Client ID	TP01PS TP01PS005	Depth (m)	1.50-2.00

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
13.2	94
9.5	88
6.7	86
4.75	83
2.36	80
1.18	69
0.600	57
0.425	51
0.300	44
0.150	31
0.075	24
0.066	23
0.047	20
0.033	20
0.024	19
0.017	18
0.013	17
0.009	17
0.0064	17
0.0045	16
0.0037	15
0.0032	14
0.0026	14
0.0023	14
0.0013	14



NOTES/REMARKS:

-
Moisture Content 8.9% -2.36mm Soil Particle Density(t/m³) 2.63
Sample/s supplied by the client

Page 1 of 1 REP03904

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Authorised Signatory


G. Creely



Laboratory No. 9926

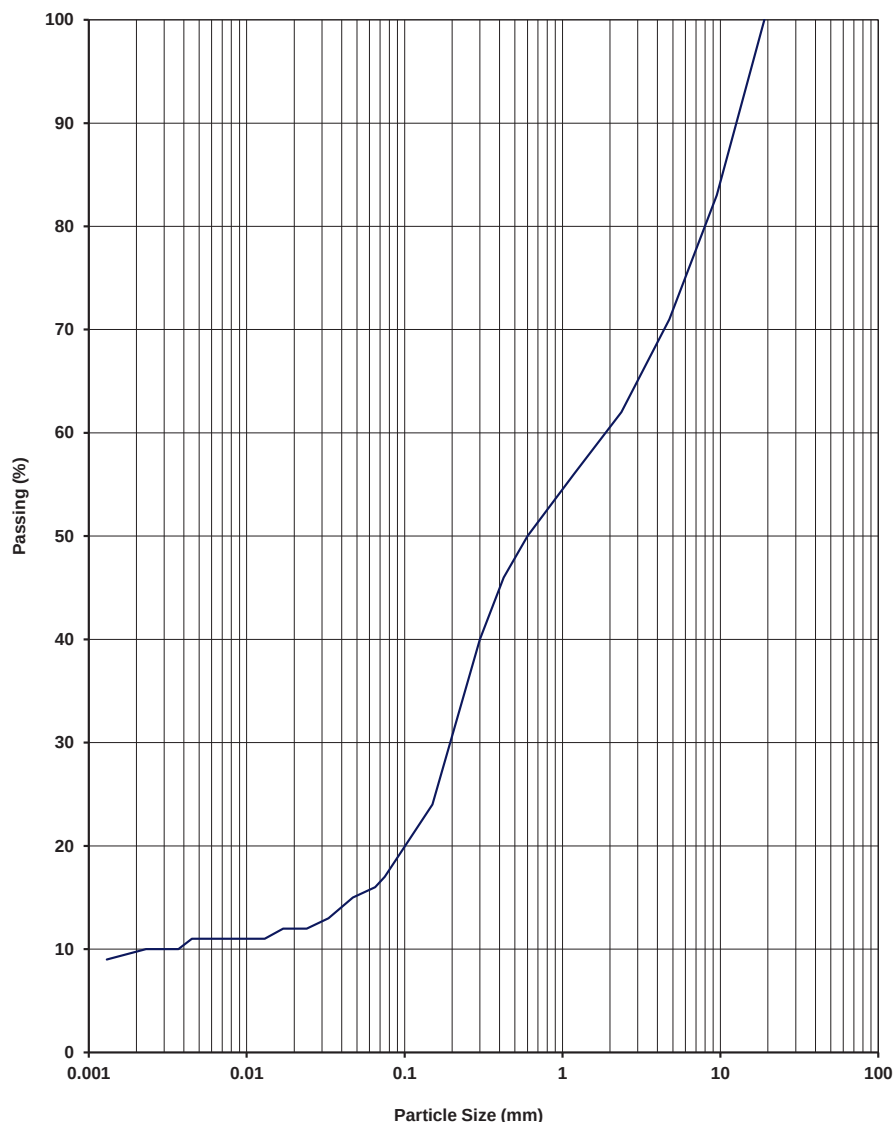
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Construction Sciences Professional Services	Report No.	P20060035-G
		Workorder No.	0020237
Address	3/4/53 Export Dr, East Arm NT 0822	Test Date	17/6/2020
		Report Date	24/6/2020
Project	P27 Jabiru - Power Station		
Client ID	TP08PS TP08PS002	Depth (m)	0.20-0.70

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
13.2	92
9.5	83
6.7	77
4.75	71
2.36	62
1.18	56
0.600	50
0.425	46
0.300	40
0.150	24
0.075	17
0.065	16
0.047	15
0.033	13
0.024	12
0.017	12
0.013	11
0.009	11
0.0063	11
0.0045	11
0.0037	10
0.0032	10
0.0026	10
0.0023	10
0.0013	9



NOTES/REMARKS:

-
Moisture Content 0% -2.36mm Soil Particle Density(t/m^3) 2.67
Sample/s supplied by the client

Page 1 of 1 REP03904

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Laboratory No. 9926

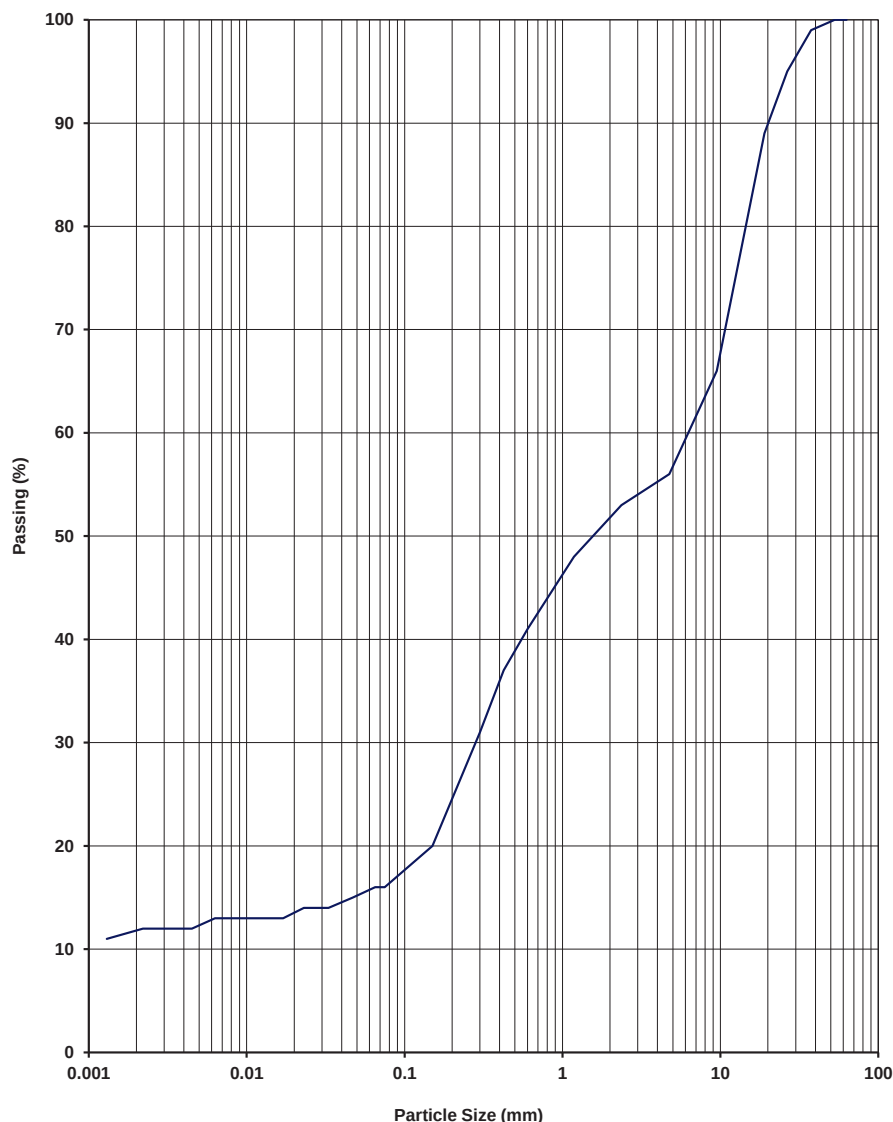
The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.
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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Construction Sciences Professional Services	Report No.	P20060036-G
		Workorder No.	0020237
Address	3/4/53 Export Dr, East Arm NT 0822	Test Date	17/6/2020
		Report Date	24/6/2020
Project	P27 Jabiru - Power Station		
Client ID	TP09PS TP09PS004	Depth (m)	1.00-1.80

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	100
37.5	99
26.5	95
19.0	89
13.2	75
9.5	66
6.7	59
4.75	56
2.36	53
1.18	48
0.600	41
0.425	37
0.300	31
0.150	20
0.075	16
0.065	16
0.047	15
0.033	14
0.023	14
0.017	13
0.013	13
0.0089	13
0.0063	13
0.0045	12
0.0037	12
0.0032	12
0.0026	12
0.0022	12
0.0013	11



NOTES/REMARKS:

-
Moisture Content 12.7% -2.36mm Soil Particle Density(t/m^3) 2.64
Sample/s supplied by the client

Page 1 of 1 REP03904

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Authorised Signatory


G. Creely

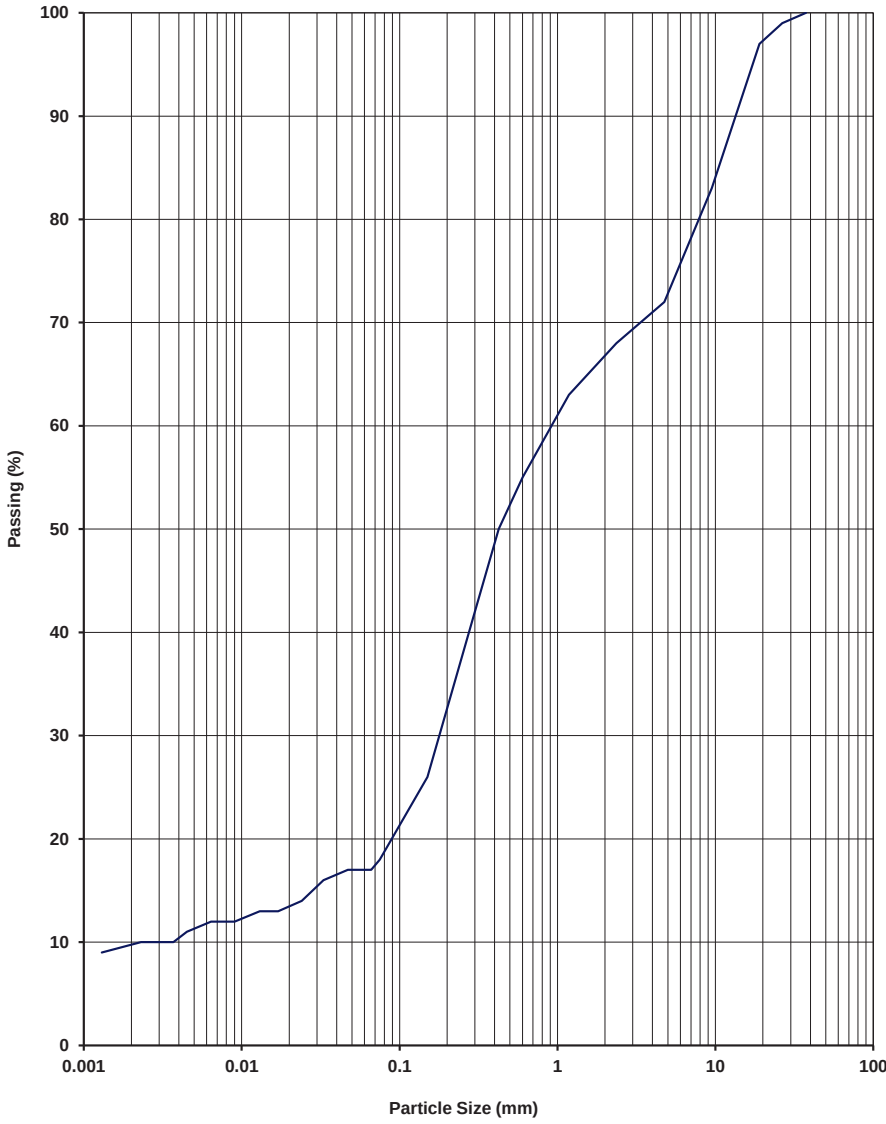


Laboratory No. 9926

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PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Construction Sciences Professional Services	Report No.	P20060037-G
Address	3/4/53 Export Dr, East Arm NT 0822	Workorder No.	0020237
Project	P27 Jabiru - Power Station	Test Date	17/6/2020
Client ID	TP10PS TP10PS002	Report Date	24/6/2020
Depth (m)	0.15-0.40		
Sieve Size (mm)	Passing %	 The graph shows the particle size distribution curve. The x-axis is Particle Size (mm) on a logarithmic scale from 0.001 to 100. The y-axis is Passing (%) from 0 to 100. The curve starts at approximately 9% passing for 0.001 mm, remains relatively flat until 0.01 mm, then rises steadily, passing 50% at approximately 0.425 mm, and reaches 100% passing at 0.075 mm.	
150.0			
75.0			
63.0			
53.0			
37.5	100		
26.5	99		
19.0	97		
13.2	91		
9.5	83		
6.7	76		
4.75	72		
2.36	68		
1.18	63		
0.600	55		
0.425	50		
0.300	42		
0.150	26		
0.075	18		
0.066	17		
0.047	17		
0.033	16		
0.024	14		
0.017	13		
0.013	13		
0.009	12		
0.0064	12		
0.0045	11		
0.0037	10		
0.0032	10		
0.0026	10		
0.0023	10		
0.0013	9		

NOTES/REMARKS:

-
Moisture Content 5.5% -2.36mm Soil Particle Density(t/m³) 2.66
Sample/s supplied by the client

Page 1 of 1 REP03904

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G. Creely



Laboratory No. 9926

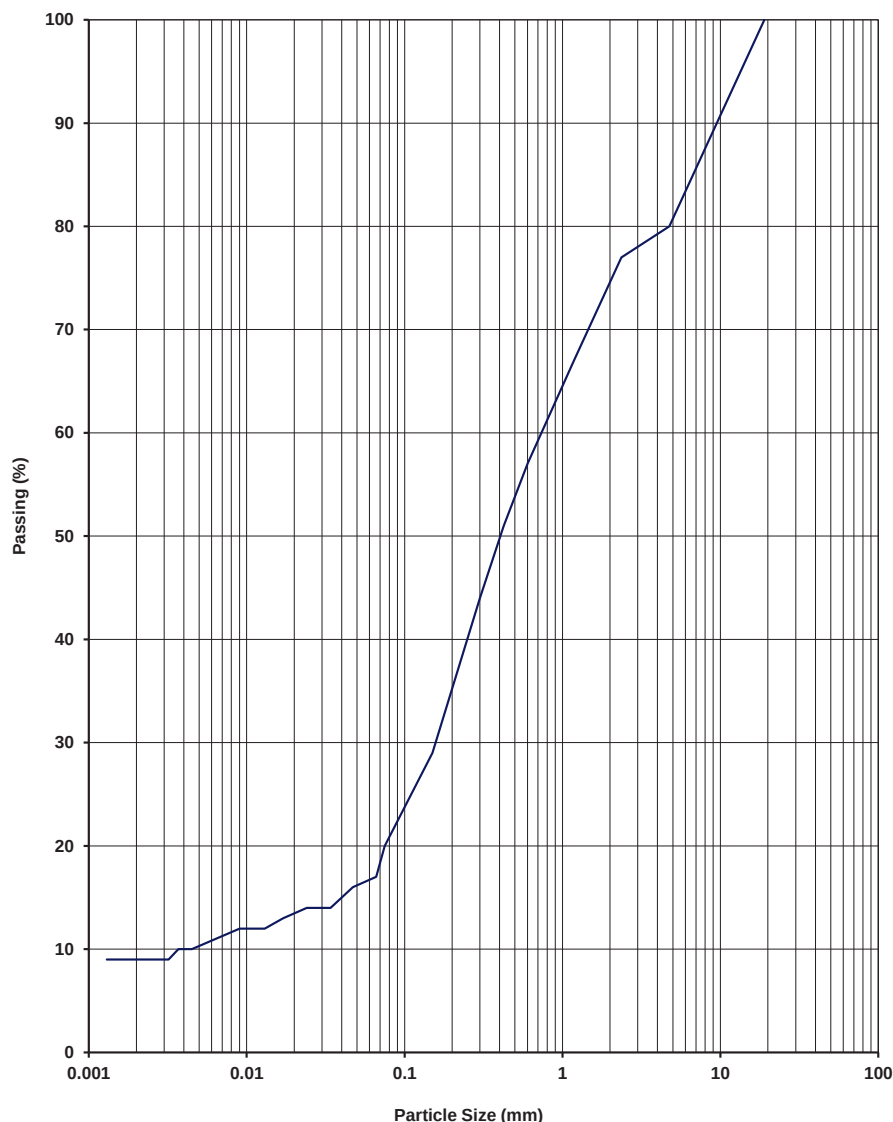
The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.
Trilab Pty Ltd ABN 25 065 630 506

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Construction Sciences Professional Services	Report No.	P20060038-G
		Workorder No.	0020237
Address	3/4/53 Export Dr, East Arm NT 0822	Test Date	17/6/2020
		Report Date	24/6/2020
Project	P27 Jabiru - Power Station		
Client ID	TP11PS TP11PS003	Depth (m)	1.00-2.00

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
13.2	96
9.5	90
6.7	84
4.75	80
2.36	77
1.18	67
0.600	57
0.425	51
0.300	44
0.150	29
0.075	20
0.066	17
0.047	16
0.034	14
0.024	14
0.017	13
0.013	12
0.009	12
0.0064	11
0.0045	10
0.0037	10
0.0032	9
0.0026	9
0.0023	9
0.0013	9



NOTES/REMARKS:

-
Moisture Content 9.6% -2.36mm Soil Particle Density(t/m³) 2.66
Sample/s supplied by the client

Page 1 of 1 REP03904

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in
this document are traceable to Australian/National Standards.

Tested at Trilab Perth Laboratory

Authorised Signatory


G. Creely



Laboratory No. 9926

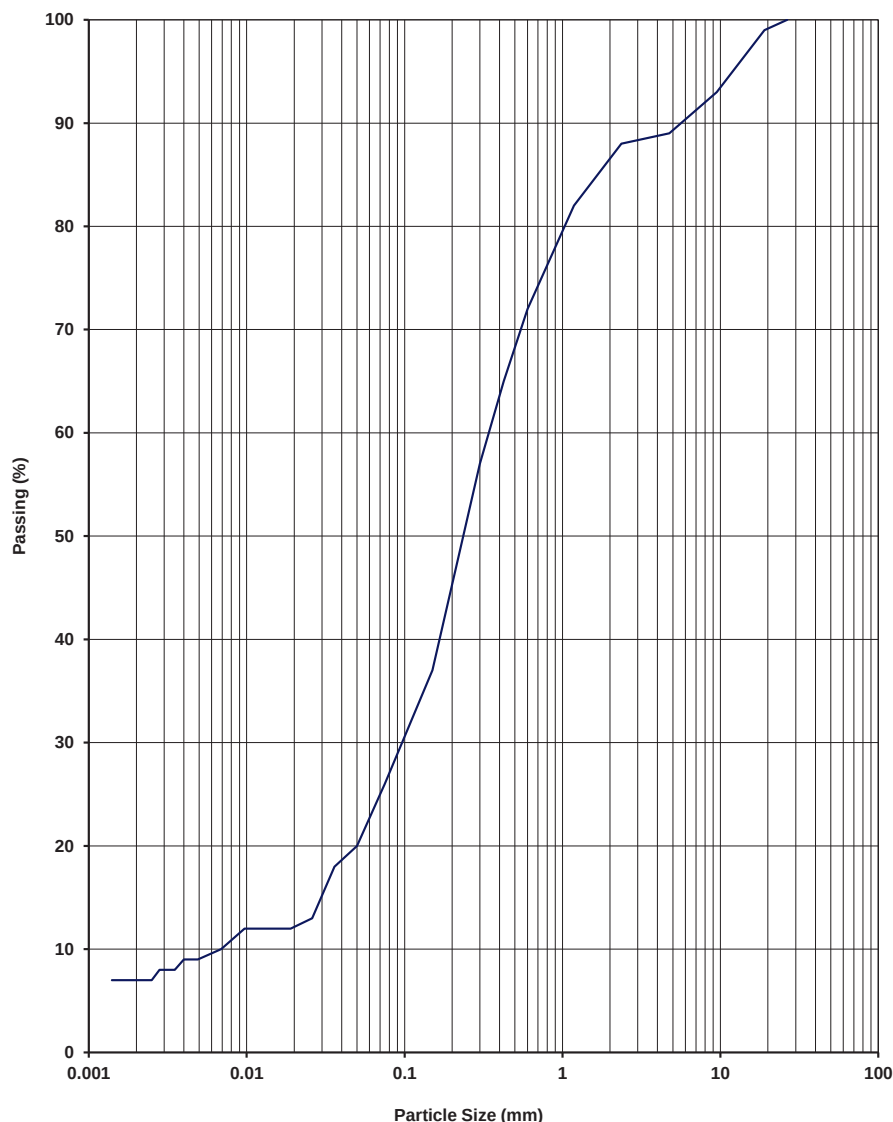
The results of calibrations and tests performed apply only to the specific instrument or sample at the time of test unless otherwise clearly stated.
Reference should be made to Trilab's "Standard Terms and Conditions of Business" for further details.
Trilab Pty Ltd ABN 25 065 630 506

PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Construction Sciences Professional Services	Report No.	P20060039-G
Address	3/4/53 Export Dr, East Arm NT 0822	Workorder No.	0020237
Project	P27 Jabiru - Power Station	Test Date	17/6/2020
Client ID	TP12PS TP12PS003	Report Date	24/6/2020
Depth (m)	0.80-2.00		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	100
19.0	99
13.2	96
9.5	93
6.7	91
4.75	89
2.36	88
1.18	82
0.600	72
0.425	65
0.300	57
0.150	37
0.075	26
0.07	25
0.05	20
0.036	18
0.026	13
0.019	12
0.014	12
0.0097	12
0.0069	10
0.0049	9
0.004	9
0.0035	8
0.0028	8
0.0025	7
0.0014	7



NOTES/REMARKS:

-
Moisture Content 9.9% -2.36mm Soil Particle Density(t/m^3) 2.63
Sample/s supplied by the client

Page 1 of 1 REP03904

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations, and/or measurements included in
this document are traceable to Australian/National Standards.

Tested at Trilab Perth Laboratory

Authorised Signatory


G. Creely



Laboratory No. 9926

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Trilab Pty Ltd ABN 25 065 630 506



Environmental

CERTIFICATE OF ANALYSIS

Work Order

: **ES2019722**

Client

: **CONSTRUCTION SCIENCES PTY LTD**

Contact

: **MR DAVID DETHLEFS**

Address

: **UNIT 3/53 EXPORT DRIVE**

EAST ARM 0822

Telephone

: **+61 07 3865 3212**

Project

: **5057P027.20**

Order number

: **5057P027.20**

C-O-C number

: **4**

Sampler

: **RICARDO HERRAEZ**

Site

: **-----**

Quote number

: **EN/024/18**

No. of samples received

: **74**

No. of samples analysed

: **65**

Page

: 1 of 15

Laboratory

: Environmental Division Sydney

Contact

: Brenda Hong

Address

: 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone

: +61 2 8784 8555

Date Samples Received

: 11-Jun-2020 09:30

Date Analysis Commenced

: 11-Jun-2020

Issue Date

: 18-Jun-2020 14:51



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. 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
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD



Page : 2 of 15
Work Order : ES2019722
Client : CONSTRUCTION SCIENCES PTY LTD
Project : 5057P027.20

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 Contact 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.

- ASS: EA033 (CRS Suite); Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite); ANC not required because pH KCl less than 6.5
- ASS: EA037 (Rapid Field and F(ox) screening); pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ASS: EA033 (CRS Suite); Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO₃) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m³ in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m³'.
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP01PSE01	TP01PSE02	TP01PSE03	TP01PSE04	TP01PSE05
				03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00
				ES2019722-001	ES2019722-002	ES2019722-003	ES2019722-004	ES2019722-005
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit	5.5			5.3	
Titratable Actual Acidity (23F)		2	mole H+ / t	5			8	
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02			<0.02	
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.005	% S	0.008			0.012	
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10			<10	
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5	-	1.5			1.5	
Net Acidity (sulfur units)		0.02	% S	<0.02			0.02	
Net Acidity (acidity units)		10	mole H+ / t	<10			16	
Liming Rate		1	kg CaCO3/t	<1			1	
Net Acidity excluding ANC (sulfur units)		0.02	% S	<0.02			0.02	
Net Acidity excluding ANC (acidity units)		10	mole H+ / t	<10			16	
Liming Rate excluding ANC		1	kg CaCO3/t	<1			1	
EA037: Ass Field Screening Analysis								
ø pH (F)		0.1	pH Unit		6.6	6.3		6.0
ø pH (Fox)		0.1	pH Unit		4.9	4.8		4.6
ø Reaction Rate		1	-		2	2		2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP01PSE06	TP01PSE07	TP02PSE01	TP02PSE02	TP02PSE03
				03-Jun-2020 00:00 ES2019722-006	03-Jun-2020 00:00 ES2019722-007	03-Jun-2020 00:00 ES2019722-009	03-Jun-2020 00:00 ES2019722-010	03-Jun-2020 00:00 ES2019722-011
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit		6.1			
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C		1	µS/cm		9			
EA014 Total Soluble Salts								
Total Soluble Salts		5	mg/kg		30			
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit			5.5		
Titratable Actual Acidity (23F)		2	mole H+ / t			6		
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S			<0.02		
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.005	% S			0.013		
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t			<10		
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5	-			1.5		
Net Acidity (sulfur units)		0.02	% S			0.02		
Net Acidity (acidity units)		10	mole H+ / t			14		
Liming Rate		1	kg CaCO3/t			1		
Net Acidity excluding ANC (sulfur units)		0.02	% S			0.02		
Net Acidity excluding ANC (acidity units)		10	mole H+ / t			14		
Liming Rate excluding ANC		1	kg CaCO3/t			1		
EA037: Ass Field Screening Analysis								
ø pH (F)		0.1	pH Unit	5.9			6.2	6.5
ø pH (Fox)		0.1	pH Unit	4.4			4.1	4.8
ø Reaction Rate		1	-	2			2	2
EP004: Organic Matter								
Organic Matter		0.5	%		<0.5			



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				
Compound	CAS Number	Client sampling date / time		TP02PSE04		TP04PSE01
		LOR	Unit	TP02PSE05	TP02PSE06	
				03-Jun-2020 00:00 ES2019722-012	03-Jun-2020 00:00 ES2019722-014	03-Jun-2020 00:00 ES2019722-017
				Result	Result	Result
EA002: pH 1:5 (Soils)						
pH Value		0.1	pH Unit		6.2	
EA010: Conductivity (1:5)						
Electrical Conductivity @ 25°C		1	µS/cm		11	
EA014 Total Soluble Salts						
Total Soluble Salts		5	mg/kg		35	
EA033-A: Actual Acidity						
pH KCl (23A)		0.1	pH Unit	5.4		5.2
Titratable Actual Acidity (23F)		2	mole H+ / t	7		8
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02		<0.02
EA033-B: Potential Acidity						
Chromium Reducible Sulfur (22B)		0.005	% S	0.011		0.007
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10		<10
EA033-E: Acid Base Accounting						
ANC Fineness Factor		0.5	-	1.5		1.5
Net Acidity (sulfur units)		0.02	% S	0.02		<0.02
Net Acidity (acidity units)		10	mole H+ / t	14		12
Limiting Rate		1	kg CaCO3/t	1		<1
Net Acidity excluding ANC (sulfur units)		0.02	% S	0.02		<0.02
Net Acidity excluding ANC (acidity units)		10	mole H+ / t	14		12
Limiting Rate excluding ANC		1	kg CaCO3/t	1		<1
EA037: Ass Field Screening Analysis						
ø pH (F)		0.1	pH Unit	6.2	6.2	
ø pH (Fox)		0.1	pH Unit	4.6	4.7	
ø Reaction Rate		1	-	2	2	
EP004: Organic Matter						
Organic Matter		0.5	%		1.0	

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID		TP04PSE02	TP04PSE03	TP04PSE04	TP04PSE05	TP04PSE06
Compound	CAS Number	Client sampling date / time		03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00
		LOR	Unit	ES2019722-018	ES2019722-019	ES2019722-020	ES2019722-021	ES2019722-022
				Result	Result	Result	Result	Result
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit			5.2		
Titratable Actual Acidity (23F)		2	mole H+ / t			10		
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S			<0.02		
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.005	% S			0.008		
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t			<10		
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5	-			1.5		
Net Acidity (sulfur units)		0.02	% S			0.02		
Net Acidity (acidity units)		10	mole H+ / t			14		
Liming Rate		1	kg CaCO3/t			1		
Net Acidity excluding ANC (sulfur units)		0.02	% S			0.02		
Net Acidity excluding ANC (acidity units)		10	mole H+ / t			14		
Liming Rate excluding ANC		1	kg CaCO3/t			1		
EA037: Ass Field Screening Analysis								
ø pH (F)		0.1	pH Unit		6.2		6.1	6.0
ø pH (Fox)		0.1	pH Unit		3.9		4.2	4.3
ø Reaction Rate		1	-		2		2	2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID									
Compound	CAS Number	Client sampling date / time		TP04PSE07	TP05PSE01	TP05PSE02	TP05PSE03	TP05PSE04			
		LOR	Unit	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00	03-Jun-2020 00:00			
				ES2019722-023	ES2019722-025	ES2019722-026	ES2019722-027	ES2019722-028			
				Result	Result	Result	Result	Result			
EA002: pH 1:5 (Soils)											
pH Value		0.1	pH Unit	6.1							
EA010: Conductivity (1:5)											
Electrical Conductivity @ 25°C		1	µS/cm	6							
EA014 Total Soluble Salts											
Total Soluble Salts		5	mg/kg	21							
EA033-A: Actual Acidity											
pH KCl (23A)		0.1	pH Unit	5.3				5.3			
Titratable Actual Acidity (23F)		2	mole H+ / t	7				7			
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02				<0.02			
EA033-B: Potential Acidity											
Chromium Reducible Sulfur (22B)		0.005	% S	0.007				0.009			
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10				<10			
EA033-E: Acid Base Accounting											
ANC Fineness Factor		0.5	-	1.5				1.5			
Net Acidity (sulfur units)		0.02	% S	<0.02				0.02			
Net Acidity (acidity units)		10	mole H+ / t	11				13			
Limiting Rate		1	kg CaCO3/t	<1				<1			
Net Acidity excluding ANC (sulfur units)		0.02	% S	<0.02				0.02			
Net Acidity excluding ANC (acidity units)		10	mole H+ / t	11				13			
Limiting Rate excluding ANC		1	kg CaCO3/t	<1				<1			
EA037: Ass Field Screening Analysis											
ø pH (F)		0.1	pH Unit	6.2			6.1				
ø pH (Fox)		0.1	pH Unit	4.2			4.1				
ø Reaction Rate		1	-	2			2				
EP004: Organic Matter											
Organic Matter		0.5	%	<0.5							



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP05PSE05	TP05PSE06	TP05PSE07	TP06PSE01	TP07PSE01
				03-Jun-2020 00:00 ES2019722-029	03-Jun-2020 00:00 ES2019722-030	03-Jun-2020 00:00 ES2019722-031	04-Jun-2020 00:00 ES2019722-033	04-Jun-2020 00:00 ES2019722-034
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Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID						
		Client sampling date / time						
Compound	CAS Number	LOR	Unit	TP07PSE02	TP07PSE03	TP07PSE04	TP07PSE05	TP08PSE01
				04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00
				ES2019722-035	ES2019722-036	ES2019722-037	ES2019722-038	ES2019722-039
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit				6.4	
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C		1	µS/cm				7	
EA014 Total Soluble Salts								
Total Soluble Salts		5	mg/kg				23	
EA033-A: Actual Acidity								
pH KCl (23A)		0.1	pH Unit					5.2
Titratable Actual Acidity (23F)		2	mole H+ / t					8
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S					<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)		0.005	% S					0.014
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t					<10
EA033-E: Acid Base Accounting								
ANC Fineness Factor		0.5	-					1.5
Net Acidity (sulfur units)		0.02	% S					0.03
Net Acidity (acidity units)		10	mole H+ / t					17
Limiting Rate		1	kg CaCO3/t					1
Net Acidity excluding ANC (sulfur units)		0.02	% S					0.03
Net Acidity excluding ANC (acidity units)		10	mole H+ / t					17
Limiting Rate excluding ANC		1	kg CaCO3/t					1
EA037: Ass Field Screening Analysis								
ø pH (F)		0.1	pH Unit	6.2	6.3			
ø pH (Fox)		0.1	pH Unit	4.5	4.7			
ø Reaction Rate		1	-	2	2			

Sub-Matrix: SOIL
(Matrix: SOIL)

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID								
Compound	Client sampling date / time		CAS Number	LOR	Unit	TP08PSE02	TP08PSE03	TP08PSE04	TP08PSE05	TP08PSE06
						04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00
						ES2019722-040	ES2019722-041	ES2019722-042	ES2019722-043	ES2019722-044
Result										
EA033-A: Actual Acidity										
pH KCl (23A)			0.1		pH Unit			5.1		
Titratable Actual Acidity (23F)			2		mole H+ / t			10		
sulfidic - Titratable Actual Acidity (s-23F)			0.02		% pyrite S			<0.02		
EA033-B: Potential Acidity										
Chromium Reducible Sulfur (22B)			0.005		% S			0.013		
acidity - Chromium Reducible Sulfur (a-22B)			10		mole H+ / t			<10		
EA033-E: Acid Base Accounting										
ANC Fineness Factor			0.5		-			1.5		
Net Acidity (sulfur units)			0.02		% S			0.03		
Net Acidity (acidity units)			10		mole H+ / t			18		
Liming Rate			1		kg CaCO3/t			1		
Net Acidity excluding ANC (sulfur units)			0.02		% S			0.03		
Net Acidity excluding ANC (acidity units)			10		mole H+ / t			18		
Liming Rate excluding ANC			1		kg CaCO3/t			1		
EA037: Ass Field Screening Analysis										
ø pH (F)			0.1		pH Unit		5.7		5.6	5.6
ø pH (Fox)			0.1		pH Unit		4.5		4.4	4.6
ø Reaction Rate			1		-		2		2	2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID											
Compound	CAS Number	Client sampling date / time		TP08PSE07	TP09PSE01	TP09PSE02	TP09PSE03	TP09PSE04					
		LOR	Unit										
		Result	Result						Result	Result	Result		
EA002: pH 1:5 (Soils)													
pH Value		0.1	pH Unit	6.0									
EA010: Conductivity (1:5)													
Electrical Conductivity @ 25°C		1	µS/cm	74									
EA014 Total Soluble Salts													
Total Soluble Salts		5	mg/kg	242									
EA033-A: Actual Acidity													
pH KCl (23A)		0.1	pH Unit		5.6			5.4					
Titratable Actual Acidity (23F)		2	mole H+ / t		5			7					
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S		<0.02			<0.02					
EA033-B: Potential Acidity													
Chromium Reducible Sulfur (22B)		0.005	% S		0.011			0.012					
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		<10			<10					
EA033-E: Acid Base Accounting													
ANC Fineness Factor		0.5	-		1.5			1.5					
Net Acidity (sulfur units)		0.02	% S		<0.02			0.02					
Net Acidity (acidity units)		10	mole H+ / t		12			15					
Liming Rate		1	kg CaCO3/t		<1			1					
Net Acidity excluding ANC (sulfur units)		0.02	% S		<0.02			0.02					
Net Acidity excluding ANC (acidity units)		10	mole H+ / t		12			15					
Liming Rate excluding ANC		1	kg CaCO3/t		<1			1					
EA037: Ass Field Screening Analysis													
ø pH (F)		0.1	pH Unit			6.6		7.0					
ø pH (Fox)		0.1	pH Unit			5.1		5.2					
ø Reaction Rate		1	-			2		2					
EP004: Organic Matter													
Organic Matter		0.5	%										



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				
		Client sampling date / time				
Compound	CAS Number	LOR	Unit	TP09PSE05	TP10PSE01	TP10PSE02
				04-Jun-2020 00:00 ES2019722-051 Result	04-Jun-2020 00:00 ES2019722-055 Result	04-Jun-2020 00:00 ES2019722-056 Result
EA002: pH 1:5 (Soils)						
pH Value		0.1	pH Unit		7.3	
EA010: Conductivity (1:5)						
Electrical Conductivity @ 25°C		1	µS/cm		16	
EA014 Total Soluble Salts						
Total Soluble Salts		5	mg/kg		53	
EA033-A: Actual Acidity						
pH KCl (23A)		0.1	pH Unit		5.5	
Titratable Actual Acidity (23F)		2	mole H+ / t		8	
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S		<0.02	
EA033-B: Potential Acidity						
Chromium Reducible Sulfur (22B)		0.005	% S		0.010	
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t		<10	
EA033-E: Acid Base Accounting						
ANC Fineness Factor		0.5	-		1.5	
Net Acidity (sulfur units)		0.02	% S		0.02	
Net Acidity (acidity units)		10	mole H+ / t		14	
Limiting Rate		1	kg CaCO3/t		1	
Net Acidity excluding ANC (sulfur units)		0.02	% S		0.02	
Net Acidity excluding ANC (acidity units)		10	mole H+ / t		14	
Limiting Rate excluding ANC		1	kg CaCO3/t		1	
EA037: Ass Field Screening Analysis						
ø pH (F)		0.1	pH Unit	7.0		6.8
ø pH (Fox)		0.1	pH Unit	5.2		4.4
ø Reaction Rate		1	-	2		2
EP004: Organic Matter						
Organic Matter		0.5	%		<0.5	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID															
		Client sampling date / time						TP10PSE03		TP11PSE01		TP11PSE02		TP11PSE03		TP11PSE04	
Compound	CAS Number	LOR	Unit	04-Jun-2020 00:00				ES2019722-057		ES2019722-058		ES2019722-059		ES2019722-060		ES2019722-061	
				Result				Result				Result				Result	
EA002: pH 1:5 (Soils)																	
pH Value		0.1	pH Unit	6.3													
EA010: Conductivity (1:5)																	
Electrical Conductivity @ 25°C		1	µS/cm	6													
EA014 Total Soluble Salts																	
Total Soluble Salts		5	mg/kg	21													
EA033-A: Actual Acidity																	
pH KCl (23A)		0.1	pH Unit			5.4										5.5	
Titratable Actual Acidity (23F)		2	mole H+ / t			8										6	
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S			<0.02										<0.02	
EA033-B: Potential Acidity																	
Chromium Reducible Sulfur (22B)		0.005	% S			0.009										0.008	
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t			<10										<10	
EA033-E: Acid Base Accounting																	
ANC Fineness Factor		0.5	-			1.5										1.5	
Net Acidity (sulfur units)		0.02	% S			0.02										<0.02	
Net Acidity (acidity units)		10	mole H+ / t			13										11	
Liming Rate		1	kg CaCO3/t			<1										<1	
Net Acidity excluding ANC (sulfur units)		0.02	% S			0.02										<0.02	
Net Acidity excluding ANC (acidity units)		10	mole H+ / t			13										11	
Liming Rate excluding ANC		1	kg CaCO3/t			<1										<1	
EA037: Ass Field Screening Analysis																	
ø pH (F)		0.1	pH Unit			6.4								6.3			
ø pH (Fox)		0.1	pH Unit			4.4								4.5			
ø Reaction Rate		1	-			2								2			
EP004: Organic Matter																	
Organic Matter		0.5	%			<0.5											



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				
Compound	CAS Number	Client sampling date / time		TP11PSE05		TP12PSE02
		LOR	Unit	TP11PSE06	TP11PSE07	
				04-Jun-2020 00:00 ES2019722-062	04-Jun-2020 00:00 ES2019722-064	04-Jun-2020 00:00 ES2019722-067
				Result	Result	Result
EA002: pH 1:5 (Soils)						
pH Value		0.1	pH Unit		6.2	
EA010: Conductivity (1:5)						
Electrical Conductivity @ 25°C		1	µS/cm		6	
EA014 Total Soluble Salts						
Total Soluble Salts		5	mg/kg		21	
EA033-A: Actual Acidity						
pH KCl (23A)		0.1	pH Unit			5.5
Titratable Actual Acidity (23F)		2	mole H+ / t			7
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S			<0.02
EA033-B: Potential Acidity						
Chromium Reducible Sulfur (22B)		0.005	% S			0.010
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t			<10
EA033-E: Acid Base Accounting						
ANC Fineness Factor		0.5	-			1.5
Net Acidity (sulfur units)		0.02	% S			0.02
Net Acidity (acidity units)		10	mole H+ / t			13
Limiting Rate		1	kg CaCO3/t			1
Net Acidity excluding ANC (sulfur units)		0.02	% S			0.02
Net Acidity excluding ANC (acidity units)		10	mole H+ / t			13
Limiting Rate excluding ANC		1	kg CaCO3/t			1
EA037: Ass Field Screening Analysis						
ø pH (F)		0.1	pH Unit	6.2		6.1
ø pH (Fox)		0.1	pH Unit	4.6		4.6
ø Reaction Rate		1	-	2		2
EP004: Organic Matter						
Organic Matter		0.5	%		0.7	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)		Client sample ID				
Compound	CAS Number	Client sampling date / time		TP12PSE03		TP12PSE07
		LOR	Unit	TP12PSE04	TP12PSE05	
				04-Jun-2020 00:00	04-Jun-2020 00:00	04-Jun-2020 00:00
				ES2019722-068	ES2019722-070	ES2019722-072
				Result	Result	Result
EA002: pH 1:5 (Soils)						
pH Value		0.1	pH Unit			6.2
EA010: Conductivity (1:5)						
Electrical Conductivity @ 25°C		1	µS/cm			8
EA014 Total Soluble Salts						
Total Soluble Salts		5	mg/kg			27
EA033-A: Actual Acidity						
pH KCl (23A)		0.1	pH Unit	5.3		
Titratable Actual Acidity (23F)		2	mole H+ / t	6		
sulfidic - Titratable Actual Acidity (s-23F)		0.02	% pyrite S	<0.02		
EA033-B: Potential Acidity						
Chromium Reducible Sulfur (22B)		0.005	% S	0.015		
acidity - Chromium Reducible Sulfur (a-22B)		10	mole H+ / t	<10		
EA033-E: Acid Base Accounting						
ANC Fineness Factor		0.5	-	1.5		
Net Acidity (sulfur units)		0.02	% S	0.02		
Net Acidity (acidity units)		10	mole H+ / t	16		
Limiting Rate		1	kg CaCO3/t	1		
Net Acidity excluding ANC (sulfur units)		0.02	% S	0.02		
Net Acidity excluding ANC (acidity units)		10	mole H+ / t	16		
Limiting Rate excluding ANC		1	kg CaCO3/t	1		
EA037: Ass Field Screening Analysis						
ø pH (F)		0.1	pH Unit	6.2	6.0	6.1
ø pH (Fox)		0.1	pH Unit	4.6	4.6	4.5
ø Reaction Rate		1	-	2	2	2
EP004: Organic Matter						
Organic Matter		0.5	%			0.9

APPENDIX

F

GROUND RESISTIVITY TESTING

Soil Resistivity Worksheet (25KV)



Reading	Spacing (Test Depth)		
	3.0m	6.0m	9.0m
Meter Readings (Ω)			
1	119	41.20	21.80
2	119	41.10	21.80
3	118	41.00	21.80
4	118	41.10	21.80
5	118	41.00	21.80
AVG Reading (Ω)	118.4	41.08	21.8
Probe Depth (m)	0.15	0.15	0.15

Soil Resistivity Calculation

$$\rho_E = \frac{4 \cdot \pi \cdot a \cdot R_W}{1 + \frac{2 \cdot a}{\sqrt{a^2 + 4 \cdot b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Rw= Measured Resistivity (Meter Reading)

a = Probe Spacing

b = Probe Depth

AVG Resistivity (Ωm)	2242	1550	1233
Test Completed By:	RH	Proposed Tower	
Date:	12/06/2020	Monopole / Guyed Mast	
Site Location:	Jabiru - PS - BH02	Site Sketch	
Direction	N S		
Ground Resistance Tester			
Model:	Megger		
S/N:	DET4TD2		
Soil Description:			
gravelly sand			
Ambient Conditions			
Temperature:	30		
Weather:	sunny		
Date of last rainfall:	NA		

Soil Resistivity Worksheet (25KV)



Reading	Spacing (Test Depth)		
	3.0m	6.0m	9.0m
Meter Readings (Ω)			
1	159	34.70	11.40
2	159	34.80	10.90
3	159	34.90	10.90
4	159	35.00	10.80
5	159	35.00	10.90
AVG Reading (Ω)	159	34.88	10.98
Probe Depth (m)	0.15	0.15	0.15

Soil Resistivity Calculation

$$\rho_E = \frac{4 \cdot \pi \cdot a \cdot R_W}{1 + \frac{2 \cdot a}{\sqrt{a^2 + 4 \cdot b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Rw= Measured Resistivity (Meter Reading)

a = Probe Spacing

b = Probe Depth

AVG Resistivity (Ωm)	3010	1316	621
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Test Completed By:	RH	Proposed Tower
Date:	12/06/2020	Monopole / Guyed Mast
Site Location:	Jabiru - PS - BH02	Site Sketch
Direction	E W	

Ground Resistance Tester	
Model:	Megger
S/N:	DET4TD2
Soil Description:	gravelly sand
Ambient Conditions	
Temperature:	30
Weather:	sunny
Date of last rainfall:	NA

Soil Resistivity Worksheet (25KV)



Reading	Spacing (Test Depth)		
	3.0m	6.0m	9.0m
Meter Readings (Ω)			
1	291	76.70	23.90
2	291	76.40	24.40
3	291	76.30	24.90
4	291	76.00	24.80
5	291	76.80	24.80
AVG Reading (Ω)	291	76.44	24.56
Probe Depth (m)	0.15	0.15	0.15

Soil Resistivity Calculation

$$\rho_E = \frac{4 \cdot \pi \cdot a \cdot R_W}{1 + \frac{2 \cdot a}{\sqrt{a^2 + 4 \cdot b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Rw= Measured Resistivity (Meter Reading)

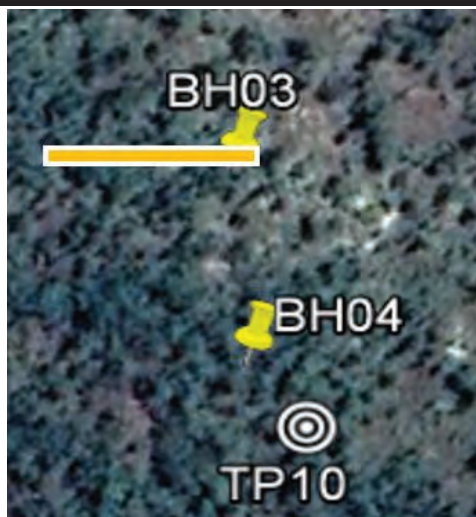
a = Probe Spacing

b = Probe Depth

AVG Resistivity (Ωm)	5509	2885	1390
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Test Completed By:	RH	Proposed Tower
Date:	12/06/2020	Monopole / Guyed Mast
Site Location:	Jabiru - PS - BH03	Site Sketch
Direction	E W	

Ground Resistance Tester	
Model:	Megger
S/N:	DET4TD2
Soil Description:	SAND
Ambient Conditions	
Temperature:	30
Weather:	sunny
Date of last rainfall:	NA



Soil Resistivity Worksheet (25KV)



Reading	Spacing (Test Depth)		
	3.0m	6.0m	9.0m
Meter Readings (Ω)			
1	129	ES error	S-ES-E error
2	128	ES error	S-ES-E error
3	126	ES error	S-ES-E error
4	127	ES error	S-ES-E error
5	126	ES error	S-ES-E error
AVG Reading (Ω)	127.2	#DIV/0!	#DIV/0!
Probe Depth (m)	0.15	0.15	0.15

Soil Resistivity Calculation

$$\rho_E = \frac{4 \cdot \pi \cdot a \cdot R_W}{1 + \frac{2 \cdot a}{\sqrt{a^2 + 4 \cdot b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Rw= Measured Resistivity (Meter Reading)

a = Probe Spacing

b = Probe Depth

AVG Resistivity (Ωm)	2408	#DIV/0!	#DIV/0!
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Test Completed By:	RH	Proposed Tower
Date:	12/06/2020	Monopole / Guyed Mast
Site Location:	Jabiru - PS - TP04	Site Sketch
Direction	E W	

Ground Resistance Tester	
Model:	Megger
S/N:	DET4TD2
Soil Description:	SAND
Ambient Conditions	
Temperature:	30
Weather:	sunny
Date of last rainfall:	NA

Soil Resistivity Worksheet (25KV)



Reading	Spacing (Test Depth)		
	3.0m	6.0m	9.0m
Meter Readings (Ω)			
1	156	50.20	33.50
2	158	50.00	34.10
3	156	50.03	34.00
4	156	50.30	33.90
5	157	50.00	34.00
AVG Reading (Ω)	156.6	50.106	33.9
Probe Depth (m)	2964.70	1891.02	1917.93

Soil Resistivity Calculation

$$\rho_E = \frac{4 \cdot \pi \cdot a \cdot R_W}{1 + \frac{2 \cdot a}{\sqrt{a^2 + 4 \cdot b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Rw= Measured Resistivity (Meter Reading)

a = Probe Spacing

b = Probe Depth

AVG Resistivity (Ωm)	2965	1891	1918
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Test Completed By:	RH	Proposed Tower
Date:	12/06/2020	Monopole / Guyed Mast
Site Location:	Jabiru - PS - TP04	Site Sketch
Direction	N S	

Ground Resistance Tester	
Model:	Megger
S/N:	DET4TD2
Soil Description:	gravelly sand
Ambient Conditions	
Temperature:	30
Weather:	sunny
Date of last rainfall:	NA

APPENDIX

G

IMPORTANT INFORMATION ABOUT
THIS REPORT

Important Information about this Geotechnical Report

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The purpose of this report and any associated documentation is expressly stated in the document. This document does not form a complete assessment of the site, and no implicit determinations about Construction Sciences scope can be taken if not specifically referenced. Whilst this report is intended to reduce geotechnical risk, no level of detail or scope of work can entirely eliminate risk.

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