Rise Developments

Proposed Residential Development

Lot 2 Phillip Drive, South West Rocks

Preliminary Geotechnical Assessment

Report No. RGS32813.1 – AB 16 September 2021

REGIONAL GEOTECHNICAL SOLUTIONS



RGS32813.1 - AB

16 September 2021

Rise Developments C/O De Groot and Benson PO Box 1908 Coffs Harbour NSW 2450

Attention: Daniel Pszczonka

Dear Daniel

RE: Proposed Residential Development – Lot 2 Phillip Drive, South West Rocks Preliminary Geotechnical Assessment

Regional Geotechnical Solutions Pty Ltd (RGS) has completed geotechnical investigations and assessment for a proposed residential development located at Lot 2 Phillip Drive, South West Rocks.

The investigation encountered a deep soil profile mainly comprising medium dense to very dense sand to more than 30m depth with some localised interbedded units of soft to stiff clay. Recommendations and advice on foundation conditions and earthworks are presented in the attached report. If you have any questions regarding this project, or require any further assistance, please do not hesitate to contact the undersigned.

For and on behalf of

Regional Geotechnical Solutions Pty Ltd

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Appendices

- Appendix A Results of Field Investigations
- Appendix B Laboratory Test Results



1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd have undertaken a geotechnical assessment for a proposed residential development at Lot 2 Phillip Drive, South West Rocks. Based on the drawings provided, it is proposed to:

- Develop the elevated southern parts of the site with townhouses and dual occupancy flats and
- Develop the lower lying northern parts of the site with medium density residential buildings.

As part of the development it is anticipated that the lower lying northern parts of the site will require filling to raise the area above flood levels.

The site is located in an area of gently undulating topography, the Coastal Quaternary Geology map of Kempsey indicates the site is underlain by Holocene age inter-barrier creek deposits (northern low lying are) and pleistocene dune deposits (southern elevated area). Reference to the South West Rocks ASS Risk Map (DLWC, 2000) indicates the southern area of the site is located in an area of "no known occurrence of ASS" and the northern area of the site is located in an area of "high probability" at or within 1m of the ground surface.

The purpose of the geotechnical investigations was to obtain information on site and subsurface conditions as the basis for providing comments and recommendations on the following:

- A description of the subsurface conditions encountered, including soil / rock profile, groundwater.
- Preliminary advice on foundation options and foundation design parameters including appropriate geotechnical strength reduction factors and founding materials for both shallow and piled footings as appropriate.
- Youngs modulus values for the assessment of settlements.
- Aggressivity assessment of the soils to buried structural elements in accordance with AS2159 -2009.
- Recommendations on excavatability and earthworks recommendations including trafficability, stripping, earthworks compaction control.
- Retaining wall design parameters.
- Preliminary advice on dewatering of excavations.
- Assessment of acid sulfate soils.
- Recommendations on subgrade design parameters for pavements.
- Geotechnical issues that are found to be relevant during the investigations.

The work was commissioned by Daniel Pszczonka and was undertaken in accordance with proposal number RGS32813.1-AA dated 2 August 2021.



2 METHODOLOGY

Field work for the assessment was undertaken between 26th June and 2nd August 2021 and included:

- A site walkover and mapping of the relevant site and surrounding surface features.
- Excavation of 18 test pits across the site. The test pits were excavated to depths of up to 2.2m. Perth Sand Penetrometer (PSP) testing was undertaken adjacent to each of the test pit.
- Drillikng of 4 boreholes using a combination of drilling methods including, auger and wash boring appropriate to the site conditions. The boreholes were drilled to between 10.26m and 30.0m to assess subsurface conditions. Standard Penetration Tests (SPT) were undertaken at approximately 1.5m intervals in the upper 15m of the boreholes and extended to approximately 3m intervals below 15m.
- Installation of three piezometers to assess groundwater levels; and
- Collection of samples for laboratory analysis.

3 LABORATORY TESTING

Samples retrieved during field work were returned to NATA accredited laboratories for testing which included the following:

- 60 Acid Sulfate Soil (ASS) screening;
- 15 Chromium reducible sulphur analysis for Potential ASS; and
- Soil aggressivity testing.

The results are presented in Appendix B.

4 SITE CONDITIONS

4.1 Surface Conditions

The site is located in an area of gently undulating topography with surface elevations of less than 10m AHD and is situated on the northern side of Phillip Drive approximately 200m west of the Big 4 Caravan Park.

The eastern parts of the site have not been affected by earthworks, the north western part of the site appears to have had some minor modification of the surface soils comprising minor cut to fill works up to 0.3m. The northern half of the site has been affected by clearing with the southern area comprising open coastal bushland. Heading north from Philip Drive the ground surface comprises an elevated terrace of sand dune deposits. Approximately 80m north of Phillip Drive the ground surface drops in elevation by about 1m to 2m onto a low lying alluvial deposits.



Drainage of the site is via a combination of overland flow to the north and surface infiltration into the sand soils. An area of surface seepage was observed along the boundary of the dune and alluvial deposits.

A satellite image that shows the location of the site and the site setting is reproduced in Plate 1.



Plate 1: Aerial Image of Site

Typical site photographs are presented below.



Plate 2: View of the elevated open bushland in the south of the site



Plate 3: View to the north east across the low lying area

4.2 Subsurface Conditions

The Kempsey 1:25,000 Coastal Quaternary Geology Map indicates the site is underlain by Holocene age interbarrier creek deposits comprising marine sand, silt, clay and peat (northern low lying are) and pleistocene dune deposits comprising aeolian and marine sand and indurated sand (southern elevated area).

The subsurface conditions can be separated into two areas being:

- The elevated sand dune areas; and
- The low lying alluvial sand areas.

Subsurface Conditions Below the Elevated Sand Dune Areas

The elevated areas generally encountered the following subsurface conditions:

- Topsoil: Comprising Silty SAND, fine to medium grained, dark brown / grey to 0.2m; overlying
- Aeolian Sand: fine to medium grained, pale grey / white, loose to medium dense root affected to 0.9m; overlying
- Aeolian Sand: fine to medium grained, pale grey / white, medium dense to 2.4m; overlying

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• Marine Sand: fine to medium grained, dark brown, very dense (indurated) to at least 10m.

Table 1 provides a summary of the conditions encountered. Further details are presented below and on the Engineering Logs in Appendix A.

Groundwater was encountered between 0.8m and 2.2m depth and appears to be perched above the dense (indurated) sand layer.

Table 1: Summary of Subsurface Conditions in the Southern Elevated Areas

11	Material	Material Description	Depth to Base of Unit Below Ground Level												
Unit	Name	Material Description	TP1	TP2	TP7	TP8	TP9	TP10	TP11	TP12	TP13	TP16	TP17	TP18	BH4
1	Topsoil	Silty Sand, fine to medium grained, dark brown, some organics	0.3	0.15	0.15	0.2	0.2	0.2	0.2	0.15	0.15	0.15	0.2	0.15	0.2
2	Aeolian Sand	Sand, fine to medium grained, pale grey / white, loose to medium dense	≥1.8*	≥1.9*	≥2.2*	≥2.2*	≥2.0*	≥1.75*	≥2.0*	≥2.0*	≥2.0*	≥2.2*	≥1.8*	2.2*	2.4
3	Marine Sand	Fine to medium grained, dark brown, very dense (indurated)		1	1	1	1	1		1				-	≥10.26
	Water Level			0.8						1.1	1.3	1.4		1.5	2.2

Notes:

-- Material unit not encountered.

 \geq Base of the material layer was not encountered.

* Hole collapsing due to sands.



Subsurface Conditions Below the Low Lying Areas

The low lying areas generally encountered the following subsurface conditions:

- Topsoil: Comprising Silty SAND, fine to medium grained, grey and root affected to 0.2m; overlying
- Marine / Aeolian Sand: fine to medium grained, pale grey, dark grey and orange/brown, medium to very dense to about 11m and 16m; overlying
- Marine Sandy Clay: high plasticity, pale grey, firm to stiff (about 1m to 2m in thickness); overlying
- Marine Sand: fine to medium grained, pale grey, medium dense to very dense to about 28m; overlying
- Estuarine Clay: high plasticity, dark grey, stiff to 30m.

Groundwater was encountered at about 0.5 to 1.0m depth.

Table 2 provides a summary of the conditions encountered. Further details are presented below and on the Engineering Logs in Appendix A.

Unit	Material	Material			Depth i	o Base o	f Unit Belo	ow Groun	d Level		
Unif	Name	Description	TP3	TP4	TP5	TP6	TP14	TP15	BH1	BH2	внз
1	Topsoil	Silty Sand, fine to medium grained, dark brown, some organics	0.2	0.15	0.2	0.15	0.2	0.2	0.2	0.1	0.2
2	Aeolian Sand	Sand, fine to medium grained, pale grey / white, loose to medium dense	0.7*	≥2.0*	0.6	0.7*	2.0*	0.6	1.6	2.0	2.0
3	Marine Sand	Fine to medium grained, dark brown, medium dense to very dense (indurated)	≥1.8		≥2.0*	≥2.2		≥2.2*	12.8	11.6	14.4
4	Marine Clay	High plasticity, pale grey, firm to stiff							14.0	12.2	16.0
5	Marine Sand	Fine to medium grained, dark brown grey, medium dense to very dense (indurated)							≥22.0	≥28.0	≥17.95
6	Estuarine Clay	High plasticity, dark grey, stiff								30.0	

Table 2:	Summary of Subsurface	Conditions in the Southern Elevated Areas
	Julinary of Jubsonace	



Unit	Material Name	Material Description		Depth to Base of Unit Below Ground Level									
			TP3	TP4	TP5	TP6	TP14	TP15	BH1	BH2	BH3		
	Water Level			0.7	0.7	0.6	0.7	0.7	0.9	0.5	1.0		

Notes:

-- Material unit not encountered.

≥ Base of the material layer was not encountered.

* Hole collapsing due to sands.

The field work was undertaken during a period of prolonged dry weather. It is anticipated that groundwater levels will rise during periods of wet weather.

5 GEOTECHNICAL CONSTRAINTS AND CONSIDERATION

The key geotechnical issues identified that require consideration during the planning, design, construction include:

- 1. Earthworks (site preparation etc.). Planning of earthworks will need to address the treatment of loose sands and shallow groundwater;
- 2. Excavation conditions in sand soils and areas of shallow water table;
- 3. Dewatering of Excavations;
- 4. Presence of ASS;
- 5. Consideration of vibration induced damage to nearby structures.
- 6. Presence of soft to firm clays beneath the at depth and the potential affect on settlement to heavily loaded structures.

Provided the comments and recommendations within this report are adhered to the site is considered suitable for the proposed residential development from a geotechnical perspective.

6 FOUNDATIONS

Depending on the final design of the development, options considered appropriate for the foundations for the proposed structures forming the development at the site include:

- Shallow footings founded within the Unit 2 loose to medium dense sand and silty sand materials which are encountered up to about 2.4m depth;
- Pile foundations within the Unit 2, Unit 3 and Unit 5 sand materials; or
- A combination of shallow footings and pile foundations (e.g. piled raft).

The decision as to the adopted foundation systems will depend on the applied loads and the settlement that can be tolerated by each structure. It is possible that the options indicated above may be adopted at different locations and for different structures at the site. Preliminary design parameters for the relevant geotechnical units are provided in the following sections.



6.1 Shallow Foundations

The profile encountered in the elevated dune areas comprised up to 0.2m of sand topsoil / fill and up to 1m of loose to medium dense root affected sand. Once the site is stripped and grubbed of roots, the upper profile is expected to be loose and therefore unsuitable for support of high level footings. The preferred option on sites containing loose sand is to extend structural foundations through the fill to found on a suitable underlying founding stratum such as the medium dense to dense sand. Alternatively, the loose sand fill can be removed and then replaced under Level One supervision and testing as defined in AS3798- 2007. High level footings may then be founded on the replaced sand fill material. Recommendations for site preparation and placement and compaction of the sand fill are provided in Section 7.

For shallow footings founded, the allowable bearing pressure may be assessed using the equation below, depending on the minimum dimension of the footing.

ABP = 100B + 80kPa ≤250kPa

Where:

ABP = Allowable Bearing Pressure

B = Minimum Footing Width

Note: Assumes minimum footing depth of 0.3m

For the assessment of settlements, a Youngs Modulus value of 20MPa should be adopted.

Detailed footing excavations should be undertaken using a sand or mud bucket to minimise disturbance of the sand profile. Shallow footings must be founded outside or below the zone of influence of existing or proposed service trenches. At least the initial stages of footing excavation should be observed by a suitably experienced Geotechnical Engineer to assess that the recommended founding material has been reached and to check initial assumptions about foundation conditions and possible variations between investigation locations.

6.2 Piled Foundations

Where footing loads are higher than can be supported by shallow footings, or settlements under shallow footings are excessive, pile foundations could be adopted.

Options for piles include grout injected continuous flyte auger (CFA) piles which may be designed based on the design parameters presented in Tables 3 and 4. Open bored piles are not recommended due to problems associated with groundwater inflows and collapsing sand soils. Driven piles could also be adopted however consideration would need to be given to the relatively high noise and vibration during installation which may affect nearby developments. Driven pile options would require dilapidation studies for adjacent structures and vibration monitoring during construction.



Idble 3:	Preliminary	y Plie Design i	arameters for	Elevated Arec	as
Material Name	Ultimate End Bearing Pressure, fb	Serviceability End Bearing Pressure	Ultimate Skin Friction (Compression), fm,s	Effective Vertical Young's Modulus, E'v	Effective Horizontal Young's Modulus, E'h
Unit 2 - Loose to Medium Dense Sand			15kPa	20MPa	15MPa
Unit - 3 Medium Dense to Very Dense Marine Sand	7MPa	3MPa	90kPa	70MPa	55MPa

Table 2. Proliminary Pilo Dosign Paramotors for Floyated Aroas

Table 4:

Preliminary Pile Design Parameters for Low Lying Areas

Material Name	Ultimate End Bearing Pressure, fb	Serviceability End Bearing Pressure	Ultimate Skin Friction (Compression), fm,s	Effective Vertical Young's Modulus, E'v	Effective Horizontal Young's Modulus, E'h
Unit 2 - Loose to Medium Dense Sand			15kPa	20MPa	15MPa
Unit - 3 Medium Dense to Very Dense Marine Sand	7MPa	3MPa	90kPa	70MPa	55MPa
Unit 4 - Marine Clay		0.15MPa	50kPa	8MPa	6MPa
Unit 5 - Very Dense Marine Sand	9MPa	4MPa	100kPa	80MPa	60MPa

Piles founded in the Unit 3 sand layers should be founded into the sand at a depth of 3 times the diameter of the pile. The piles must be terminated not less than five pile diameters above the base of the sand layer. For more heavily loaded structures of 2 storeys or greater there is the potential for greater load transferred from the piles into the Unit 4 or Unit 6 Clay. Therefore, it is recommended that a settlement analysis be undertaken as part of the design process.

The following points are noted in relation to the parameters provided in Tables 3 and 4:

- Loading a pile to the ultimate capacities provided will incur large settlements, typically of • the order of 5% of pile diameter;
- Limit state design requires the piles to be designed for an acceptable level of serviceability, which typically assumes a maximum settlement of not more than 1% of pile diameter. If the structure is more sensitive or less sensitive to settlement than this value assumes, serviceability criteria should be re-assessed;
- If CFA piles are adopted, effective diameter assumed in shaft adhesion should be reduced by 50mm to allow for the disturbed or smeared zone at the edge of the pile;



• It is recommended that a geotechnical engineer be on site at least during the initial stages of pile installations to assess the founding materials encountered and confirm required founding depths.

In accordance with AS2159-2009 Piling Design and Installation, a geotechnical reduction factor (Φ g) should be applied to the ultimate values shown in Tables 3 and 4 to derive ultimate geotechnical strengths (Rd,g) for limit state design. This factor is dependent on assignment of an Average Risk Rating (ARR) which requires some assumptions to be made regarding the design and construction methodology. To derive a geotechnical strength reduction factor for this project the following assumptions are considered reasonable:

- Design of piles and pile groups will be undertaken in accordance with the recommendations presented in this report:
- Investigation comprised boreholes with limited in situ testing;
- Limited geotechnical involvement will occur during pile installation;
- Some performance monitoring of the supported structure during or after construction;
- No static testing of the piles will be undertaken;
- The foundations will be designed by a designer of at least moderate experience in similar geotechnical profiles and pile design; and
- Well established pile design methods will be adopted.

Assuming the pile configuration will have low redundancy a Geotechnical Strength Reduction Factor of Φ g=0.5 would be appropriate for the site.

6.3 Soil Aggressivity

The aggressivity test results presented in Table 5 were compared to the exposure classifications provided in Australian Standard AS2159-2009, *Piling Design and Installation*.

Sample Location	Sample Depth (m)	Sample Type	рН	Soluble Sulfate (mg/kg)	Chloride (mg/kg)	Resistivity (ohm.cm)
TP1	1.5 to 1.75	Sand	4.96	57	30	44,803
BH1	5.5 to 5.6	Sand	5.16	83	33	11,514
ВНЗ	7.0 to 7.45	Sand	5.46	160	34	14,691

Table 5:Results of Soil Aggressivity Testing

In accordance with AS2159-2009 the site soils are considered to be moderate towards concrete elements above and below the water table.



7 EARTHWORKS

7.1 Site Preparation

The site is currently vegetated with grass and scattered trees. Areas of the site that are to support foundations or pavements should be stripped to remove all topsoil, root affected, ground disturbed by removal of trees, heavily root affected or other potentially deleterious material which can be retained on site for re-use in landscaping, or, removed from the site. Uncontrolled sand fill and areas disturbed by tree removal should be stripped and stockpiled for potential reuse following geotechnical assessment.

7.2 Shallow Excavations

The depth of groundwater varies across the site but is typically 0.5m below ground level in the low lying northern areas and within 0.8 to 2m depth in the elevated southern areas. Battering of excavations that extend more than 0.5m into the natural profile within the low lying areas is not feasible due to the likelihood of the profile collapsing from loose sand or groundwater inflows, and such excavations will therefore require dewatering and shoring.

Battering of excavations within fill that is to be placed above the groundwater table would be feasible, pending the use appropriate materials and good engineering construction practices. Excavations in Controlled Fill above the water table can be battered at 1V:1H or flatter for temporary excavations, or 1V:2H for permanent batters.

Temporary batters should be trimmed smooth to reduce erosion. Permanent cut or fill batter slopes should be protected against erosion by rapidly establishing vegetation cover or covering with a proprietary product such as Enviromat, Jute Mesh, Grassroots, Trinter or other similar products.

7.3 Deep Excavations for Basements and Services

Where deeper excavations of up to 3m are required for the development then excavations could be conducted using backhoes and hydraulic excavators to at least the depth of groundwater. Excavations beneath the groundwater level would require dewatering with the use of spear points around the perimeter of the excavations. If dewatering is required for the site then a geotechnical assessment should be undertaken to assess the potential impact dewatering may have on adjacent infrastructure and stability of excavations.

7.4 Retaining Wall Design Parameters

Temporary or permanent retaining walls are likely to require the use of cantilevered wall arrangements. Cantilevered retaining walls founded up to 10m depth may be designed on the basis of a triangular stress distribution using the following parameters:

٠	Unit W	/eight	t, γ			=	20kN/m3

- Effective Friction Angle, \emptyset' = 29°
- Effective Cohesion, C' = 0kPa



Design of the walls must take into account any surcharge from loadings behind the wall. Drainage measures as described above, if properly maintained, should reduce pore pressures at the back of the wall to zero, however, pore pressures may still be generated at other points behind the wall. The design should incorporate an allowance for such pressures. A typical allowance of potential water pressure build-up equivalent to one-third the wall height is considered to be reasonable with such drainage measures installed.

7.5 Reuse of Site Won Materials

The site won Unit 2 sand is likely to be suitable for use as engineering fill provided it is free from coarse root materials and is placed in accordance with the recommendations presented in this report.

7.6 Fill Placement and Compaction Control

All fill placed for the support of structures or pavements should be placed and compacted as outlined below:

- After unsuitable material (including topsoil and tree roots) have been stripped the exposed natural sand subgrade should be assessed by a suitably experienced geotechnical practitioner to highlight any loose, soft, wet or excessively deflecting areas which are to be removed and replaced with compacted fill. Based on the subsurface conditions encountered, it is expected that the upper 0.6m of the loose sand will need to be removed and recompacted.
- Stripped sand fill should be assessed for suitability prior to reuse as engineering fill by a suitably experienced geotechnical practitioner. Use of cohesive soils in the fill platform is not recommended.
- Where surface slopes are more than 7° the existing surface should be benched prior to placement of fill to provide a level surface suitable for compaction. Each bench will require a minimum width of 3m to allow access for compaction equipment.
- Where filling is required beneath structures, approved sand fill should be placed in layers not exceeding 200mm loose thickness and compacted to a minimum 75% Density Index with a smooth drum vibratory roller and addition of water to assist compaction.
- All fill for the support of structures should be placed and compacted in accordance with the recommendations outlined in AS3798-2007 Guidelines on Earthworks for Residential and Commercial Developments, under Level 1 supervision. Areas of the site that are filled to support pavements should be filled under Level 2 supervision and testing.



7.7 Effect of Vibrations on Nearby Developments

Due to the deep profile of sand at the site careful consideration should be given to the use of plant and equipment which generate vibrations which can cause damage to nearby structures. Activities which generate vibrations which could cause damage include:

- Installing driven or vibrated piles; and
- Roller compactors using heavy vibration near existing buildings.

Should these activities be planned as part of the works then it is recommended that dilapidation studies of adjacent structures be undertaken and that vibration monitoring be undertaken during construction.

7.8 Considerations for Earthworks in Low Lying Areas

The site investigation was undertaken following a period of dry weather and encountered sand underlain by firm clays and silts at depth, and a shallow water table. Should the earthworks be undertaken during a period of normal weather conditions or wet weather then the subsurface conditions may be more problematic and could require the use of ground improvement techniques (rockfill bridging layers) to provide suitable working platforms.

Raising of the site levels across the zone of seepage will require the use of rockfill bridging layers. Long term management of seepage will also require the construction of rockfill drains.

7.9 Site Trafficability

As the site is underlain by granular soils, site trafficability could be problematic for wheeled plant once vegetation is cleared. Trafficability is expected to be good for tracked plant. In the areas of surface seepage and following wet weather the site trafficability conditions in the low lying areas is expected to be poor. To manage this localised area of the site, the area could require a working platform comprising a 300mm crushed concrete layer or a granular high strength rock fill with a low percentage of fines (i.e. less than 5% passing 75 micron sieve), or similar.

7.10 Preliminary Pavement Design Parameters

The majority of the site is underlain by sand with a groundwater table at a depth of 0.4m to 2.2m below ground level. Based on the presence of the sand materials, a preliminary design subgrade CBR value of 8% should be adopted for the design of pavements. In areas of seepage site specific advice will need to be provided at the time of construction.



8 ACID SULFATE SOILS (ASS)

8.1 Presence of ASS

Presence of ASS Acid Sulfate Soils (ASS) produce sulphuric acid when exposed to oxygen from iron sulphides in the form of pyrite within the soil matrix. These soils form when iron-rich sediments are deposited in saltwater or brackish water environments. Prior to oxidation, these pyritic soils are referred to as Potential ASS. ASS that have produced acid as a result of oxidation are referred to as Actual ASS. They typically occur in natural, low-lying coastal depositional environments below approximately 5m AHD. In the field ASS are generally identified as saline sediments such as alluvial or estuarine soils or bottom sediments in creeks and estuaries.

8.2 Sampling

18 test pits and 4 boreholes were undertaken within the proposed development area. Excavations of up to 2.5m deep are proposed for services and deeper excavations for piled excavations or basement car parks. As such, sampling was extended to depths of 13.45m below the ground surface. The attached test pit and borehole logs indicate the soil profiles encountered at the sampled locations. Figure 1 illustrates the approximate test pit and borehole locations.

8.3 Laboratory Analysis

Samples collected from the test pits and boreholes were transported to a NATA registered laboratory for analysis. ASS screening tests were undertaken on 60 samples. The findings from the screening tests are discussed below.

- The samples revealed pH_F values between 3.92 and 6.47 in distilled water. pH_F less than 4 is an indicator of Actual ASS;
- The samples revealed pH_{FOX} values between 1.47 and 6.11 in hydrogen peroxide. Values less than 3 can be an indicator of Potential ASS (PASS) but can also be the result of high organic content in the soil;
- A pH change of more than 1 unit was recorded between pH_F and pH_{FOX} in 39 samples. A pH change of more than 1 unit is an indicator of PASS.

To provide a more comprehensive assessment, fifteen (15) samples were submitted for Chromium Reducible Sulphur (CRS) analysis. A summary of the test results is presented in Table 6.



Table 6: Summary of CRS Results									
Location	Depth	Texture	Net Acidicy (mol H+/t)	Lime Calculation (kg CaCO ₃ /t DW)					
TP3	1.0 to 1.2	Coarse	34	3					
TP3	1.5 to 1.7	Coarse	28	2					
TP4	1.0 to 1.2	Coarse	4	0					
TP4	2.0 to 2.2	Coarse	3	0					
TP5	0.5 to 0.7	Coarse	52	4					
TP5	1.5 to 1.7	Coarse	62	5					
TP6	2.0 to 2.2	Coarse	58	4					
TP14	1.5 to 1.7	Coarse	10	1					
TP18	2.0 to 2.2	Coarse	5	0					
BH1	4.0 to 4.45	Coarse	48	4					
BH1	5.5 to 5.6	Coarse	130	10					
BH1	7.0 to 7.07	Coarse	170	13					
ВНЗ	5.5 to 5.95	Coarse	107	8					
ВНЗ	7.0 to 7.45	Coarse	59	4					
ВНЗ	11.5 to 11.95	Coarse	34	3					

Table 4 mmany of CPS Posults

8.4 **ASS Assessment Summary**

An appraisal of the laboratory test results presented in Table 6 is provided below:

• The net acidity concentration's exceeded the ASS Assessment Guidelines Action Criteria of 18 moles H+/ tonne for both the test pits and boreholes undertaken in the low lying areas of the site.



- On the basis of the laboratory testing results summarised in Table 6, all of the materials within the low lying areas are considered ASS. The low lying areas are identified as areas where TP3 to TP6, TP14 and TP15 and BH1 to BH3 are located. An ASS Management Plan would therefore be required for works such as services installations and pile excavations that disturb the alluvial sand soils in this area at a rate of 10 kg/m³ in the soils within 2m of the ground surface and at a rate of 26 kg/m³ in soils below 2m from ground level.
- Based on site features and the lab testing, the upper aeolian sand profiles are not considered to be ASS.

The purpose of an ASS Management Plan is to consider both the potential on-site and off-site impacts of the disturbance of the soils present, with any potential acid leachate being managed appropriately. The preferred option for management of ASS is treatment and reuse on site. Off site disposal of ASS will require neutralisation to pH 7 prior to disposal at an appropriate licensed landfill facility in accordance with NSW EPA requirements.

9 FURTHER INVESTIGATION WORKS

Based on the presence of the deep sand soils with interbedded layers of soft to stiff clay to at least 30m depth and the proposal to construct medium density residential structures in this area. It is recommended that additional investigations be undertaken to assess the lateral extend and depth of the potentially compressible soil materials. This data can then be used to further assess the design of piles and potential settlements to structures.

10 LIMITATIONS

This report comprises the results of an investigation carried out for a specific purpose and client as defined in the document. The report should not be used by other parties or for purposes or projects other than those assumed and stated within the report, as it may not contain adequate or appropriate information for applications other than those assumed or advised at the time of its preparation. The contents of the report are for the sole use of the client and no responsibility or liability will be accepted to any third party. The report should not be reproduced either in part or in full, without the express permission of Regional Geotechnical Solutions Pty Ltd.

Geotechnical site investigation is based on data collection, judgment, experience, and opinion. By its nature, it is less exact than other engineering disciplines. The findings presented in this report and used as the basis for the recommendations presented herein were obtained using normal, industry accepted geotechnical design practises and standards. To our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

The recommended depth and properties of any soil, rock, groundwater, or other material referred to in this report is an engineering estimate based on the information available at the time of its writing. The estimate is influenced and limited by the fieldwork method and testing carried out in the site investigation, and other relevant information as has been made available. In cases where information has been provided to Regional Geotechnical Solutions for the purposes of preparing this report it has been assumed that the information is accurate and appropriate for such use. No responsibility is accepted by Regional Geotechnical Solutions for inaccuracies within any data supplied by others.



If site conditions encountered during construction vary significantly from those discussed in this report, Regional Geotechnical Solutions Pty Ltd should be contacted for further advice.

This report alone should not be used by contractors as the basis for preparation of tender documents or project estimates. Contractors using this report as a basis for preparation of tender documents should avail themselves of all relevant background information regarding the site before deciding on selection of construction materials and equipment.

If you have any questions regarding this acid sulfate soil management plan, or require any additional consultations, please contact the undersigned.

If you have any questions regarding this project, or require any additional consultations, please contact the undersigned.

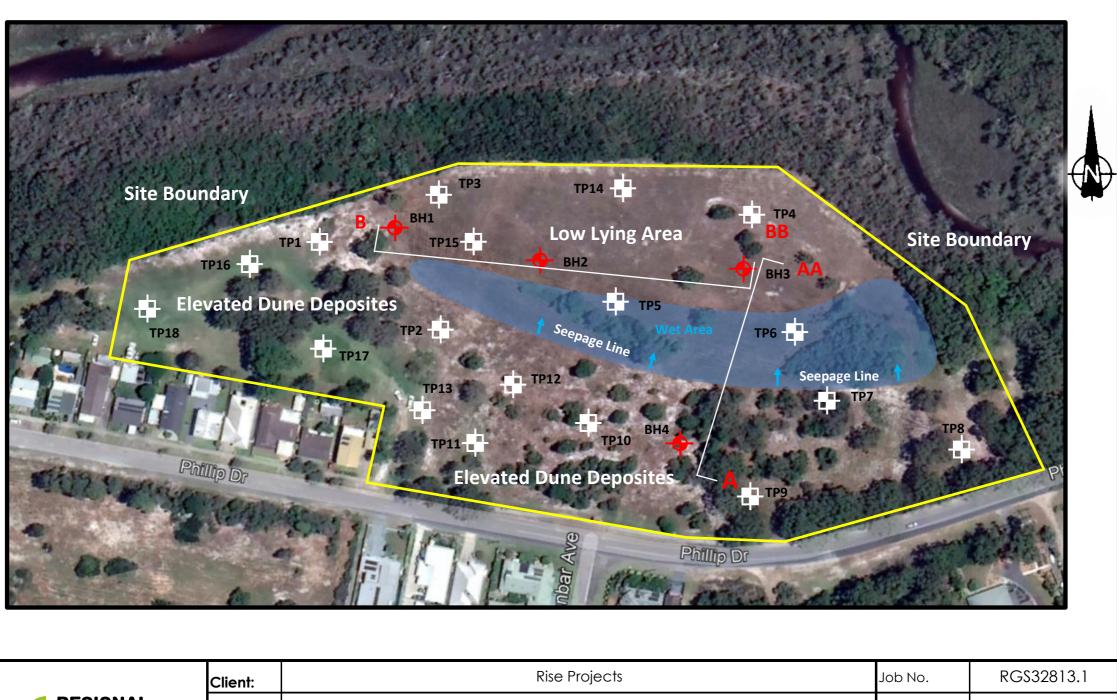
For and on behalf of

Regional Geotechnical Solutions Pty Ltd

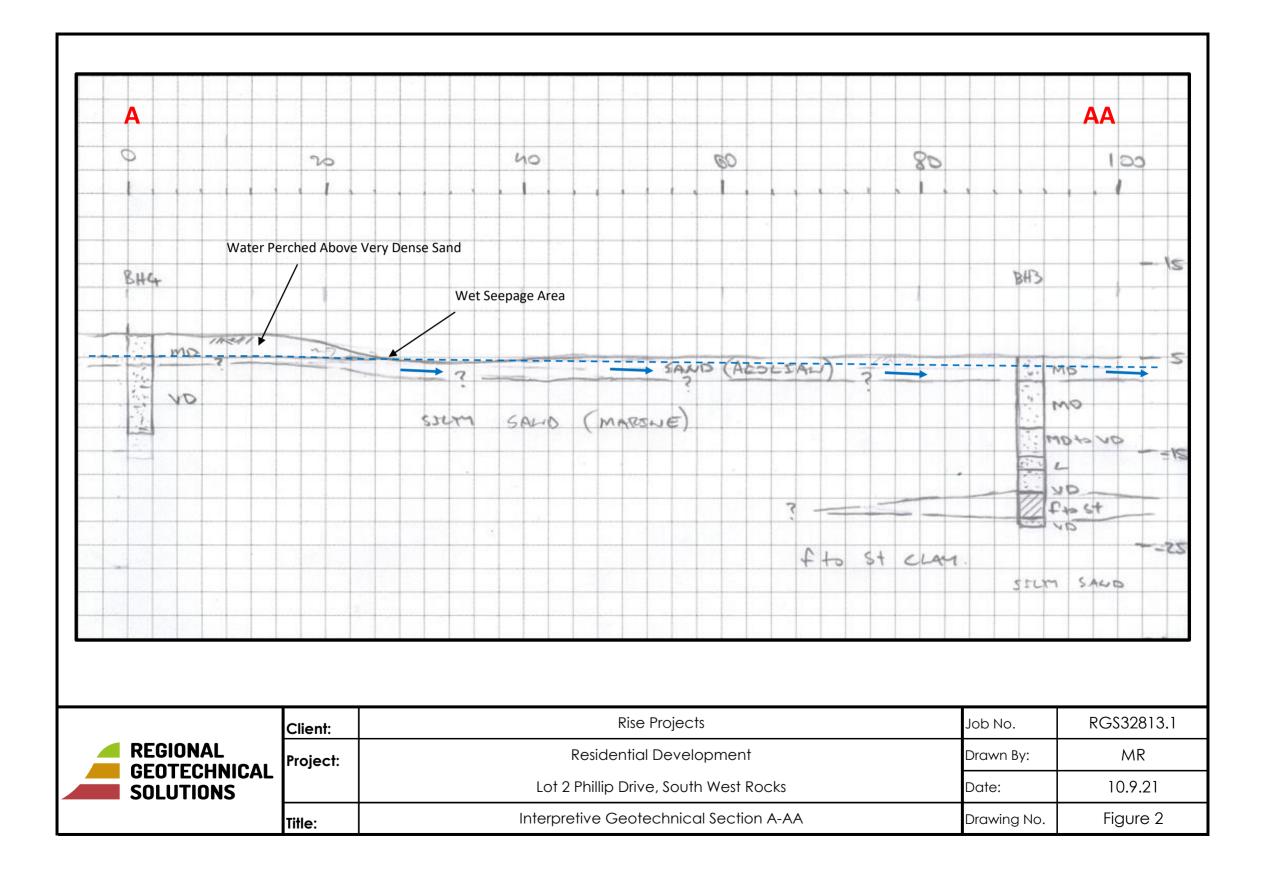
Matt Rowbotham Associate Engineering Geologist

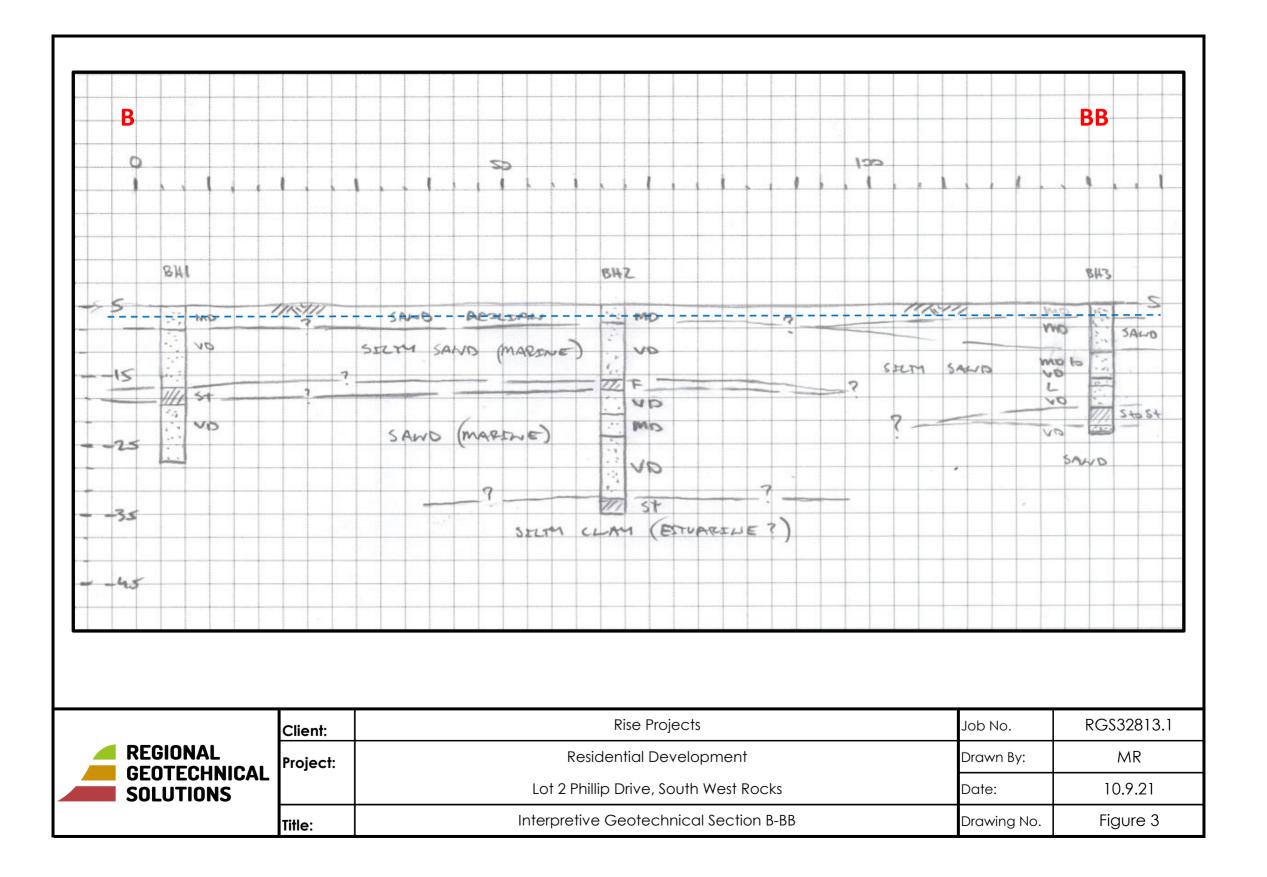


Figures



	Client:		300 110.	10002010.1
REGIONAL GEOTECHNICAL	Project:	Residential Development	Drawn By:	MR
SOLUTIONS		Lot 2 Phillip Drive, South West Rocks	Date:	10.9.21
	Title:	Borehole and Test Pit Locations	Drawing No.	Figure 1







Appendix A

Results of Field Investigations

		REGIOI GEOTE SOLUT	CHNIC	CAL	ENGI CLIENT PROJE	:	RING LOG - TEST PIT De Groot and Benson ME: Proposed Development			F	EST PAGI		IO: TP1 1 of 1 RGS32813.1	
		00101	10110		SITE LOCATION: Lot 2 Phillip Drive, South West Rocks							GED E		
					TEST L	OCAT	ION: Refer to Site Plan			0	DATE	:	26/7/21	
EQ	UIPN	IENT TYP	E:	5 Tor	nne Exc	avato	r EASTING:	50562	29 m 🕄	SURF	ACE	RL:		
TE	ST P	T LENGTI	H:		W	IDTH:	0.5 m NORTHING:	658253	31 m l	DATU	M :		AHD	
	Drill	ing and San	npling				Material description and profile information				Fie	ld Test	-	
METHOD	WATER	SAMPLES	RL (m)	DEPTI (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations	
ш						SM	Silty SAND: fine to medium grained, grey, affected.	root		MD	(0-1.6m)	1	TOPSOIL	
		В				•					0-1	1		
		0.30m					0.30m				DCP	2		
						SP	SAND: fine to medium grained, pale grey/v	/hite.	W	1		2		
		0.50m		0.5	5							2		
					7							2		
												2	-	
	21	B&E			-							2	-	
	26/07/2021	0.90m			-	•						2	-	
				1.0								2		
	<u> </u>	1.00m		1.9	<u>-</u>	•	Colour change to brown/dark brown, some	silt.				3	COLLAPSING PIT WALLS	
					-							5	1.0M	
		В			-							4		
					-							2		
		1.40m			-							3		
		1.50m		1.5	5							3	SULFUR SMELL	
					-								-	
		B&E			-	•								
	-	1.80m		-			1.80m Due to Collapsing Pit Walls		_					
					-		Hole Terminated at 1.80 m							
				2.0	<u>)</u>									
					_									
					_									
					_									
				1										
				2.5	5									
				1										
				1										
				1										
LEC Wat	SEND:			Notes, S	amples a	nd Tes	<u>ts</u>	Consist VS	tency Very Sof			CS (kP 25	a) Moisture Condition D Dry	
	Wat	er Level		U₅₀ CBR			ter tube sample for CBR testing	S F	Soft Firm		2	5 - 50 0 - 100	M Moist W Wet	
►	•	e and time sl er Inflow	hown)	E ASS	Enviro	onmenta	al sample Soil Sample	St VSt	Stiff	;	1	00 - 100 00 - 200 00 - 400) W _p Plastic Limit	
-	Wat	er Outflow		ASS B		Sample	on oanpe	н	Very Stiff Hard			00 - 400 400) W _L Liquid Limit	
<u>Stra</u>	ata Cha G	anges radational or		Field Te				Fb Density			/ery L	oose	Density Index <15%	
	tra	ansitional stra efinitive or dis	ata	PID DCP(x-y			on detector reading (ppm) etrometer test (test depth interval shown)		L		.oose 1ediur	m Dens	Density Index 15 - 35% e Density Index 35 - 65%	
		rata change		HP			ometer test (UCS kPa)		D VE)ense /ery D		Density Index 65 - 85% Density Index 85 - 100%	

		REGIOI GEOTE SOLUT	CHNIC	CAL C		:	RING LOG - TEST PIT De Groot and Benson ME: Proposed Development			P	PAGE	PIT N E: NO:	IO: TP2 1 of 1 RGS32813.1	
		00201	iono		ITE LC			ks				GED B		
				т	EST LO	CAT	ION: Refer to Site Plan			D	DATE	E:	26/7/21	
		IENT TYP		5 Toni		avato IDTH:		50566 658247		SURF. DATU		CE RL: I: AHD		
	Dril	ing and San	npling		Material description and profile information						Fiel	ld Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity characteristics,colour,minor component		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations	
ш		E				SM	Silty SAND: fine to medium grained, dark brown/dark grey.			MD	(0-1.7m)	1	TOPSOIL	
		0.15m		-		SP	0.15m SAND: fine to medium grained, pale grey/w	 ⁄hite.	M		DCP (0-1	1	AEOLIAN	
				-								2		
		0.50m		0.5								1		
	26/07/2021			-								2		
	⊲ 26/0	В		-								3		
	-	0.90m		-					W			3	COLLAPSING PIT WALLS 0.8M	
		1.00m		1. <u>0</u>								3		
				-								3		
		В		-								3		
		1.40m		-								4		
		1.50m		1. <u>5</u>								3		
				-								3		
		B&E		-										
	-	1.90m		2.0			1.90m Due to Collapsing Pit Walls Hole Terminated at 1.90 m							
				2.0										
				-	-									
				-	-									
				- 2. <u>5</u>										
				-	-									
				-										
				-										
I FO	GEND:			Notes, Sa	mples a	nd Tee	S	Consis	tency		 	ICS (kPa	a) Moisture Condition	
	Mater ▼ Water Level (Date and time shown)			U₅₀ CBR E ASS B	50mm Bulk s Enviro Acid S	Diame ample t nmenta	ter tube sample or CBR testing al sample Soil Sample	VS S F St VSt H Fb	Very Soft Soft Firm Stiff Very Stiff Hard Friable		<: 2: 5: 1: 2:	25 5 - 50 0 - 100 00 - 200 00 - 400 400	D Dry M Moist W Wet W _p Plastic Limit	
	trata Changes Gradational or transitional strata Definitive or distict strata change				Photoi Dynan	nic pen	on detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)	Density		L N D	'ery Lo oose lediur)ense 'ery D	m Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	

				E	NGI	NEE	RING LOG - TEST PIT			т	EST	PIT N	IO: TP3	
		REGIO GEOTE			LIENT	:	De Groot and Benson			P	PAGE	E:	1 of 1	
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	ов	NO:	RGS32813.1	
				S		CATI	ON: Lot 2 Phillip Drive, South West Roo	ks		L	.OG(GED B	Y: MR	
				т	EST LO	OCAT	ION: Refer to Site Plan			D	DATE: 26/7/21			
		MENT TYP		5 Toni	nne Excavator EASTING: 505660 m SU WIDTH: 0.5 m NORTHING: 6582535 m DA							RL:	AHD	
		ling and Sar			Material description and profile information						1	d Test		
_						NO				λ				
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations	
ш				_		SM	Silty SAND: fine to medium grained, grey, affected.	root		MD	(0-1.8m)	0	TOPSOIL	
		E&B 0.20m				•	0.20m				0-1	1		
			1			SP	SAND: fine to medium grained, grey.		М		DCP	1	MARINE/AEOLIAN	
				-		•						2		
	21	0.50m		0.5								1		
	26/07/2021	0.0011	1	0.5								2		
		В		-								2		
	-⊻-	0.70m		-		SM	0.70m Silty SAND: fine to medium grained, browr	— — — — 1.	w			3	COLLAPSING PIT WALLS	
				-								4	0.7M	
				-								4		
		1.00m	-	1. <u>0</u>								4	SULFUR SMELL	
				-										
		в		-								6		
		B										3		
		1.40m										4		
		1.50m	1	1.5								3		
												4		
		B		-								4		
		1.70m		-		•						4		
							1.80m Hole Terminated at 1.80 m							
				2.0										
				2.5										
LEC	SEND:			- - Notes, Sa	mples a	nd Tes	<u>s</u>	Consist	tency			CS (kPa	a) Moisture Condition	
<u>Wat</u> ▼	i er Wat (Dat - Wat	ter Level te and time s ter Inflow ter Outflow	hown)	U₅₀ CBR E ASS B	50mm Bulk s Enviro Acid S	n Diame ample f	ter tube sample or CBR testing al sample Soil Sample	VS S F St VSt H	Very Soft Soft Firm Stiff Very Stiff Hard		<: 2: 50 10 20	25 5 - 50 0 - 100 00 - 200 00 - 400 400	D Dry M Moist W Wet W _p Plastic Limit	
<u>Stra</u>	Strata Changes Field Gradational or transitional strata FIL Definitive or distict DCP			Field Test PID DCP(x-y) HP	Photo Dynar	nic pen	on detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)	Fb Density	Friable V L M D V	La D M D	ery Lo oose lediur ense ery D	n Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	

				E	NGI	NEE	RING LOG - TEST PIT			т	EST		10: TP4		
		REGIO GEOTE					De Groot and Benson			P	PAGE	Ξ:	1 of 1		
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	ОВ	NO:	RGS32813.1		
				S	ITE LC	CATI	DN: Lot 2 Phillip Drive, South West Roo	cks		L	.OGG	GED B	SY: MR		
				т	TEST LOCATION: Refer to Site Plan							ATE: 26/7/21			
		IENT TYP		5 Tonr	5 Tonne Excavator EASTING: 505801 m SURFACE WIDTH: 0.5 m NORTHING: 6582532 m DATUM:								.: AHD		
	Dril	ling and Sar	npling		Material description and profile information						Fiel	ld Test			
					0	NOI				ς					
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations		
ш		E 0.15m		-		SM	Silty SAND: fine to medium grained, grey, affected.	root	М	MD	(0-1.6m)	1	TOPSOIL		
1		0.1511		-		SP	SAND: fine to medium grained, pale grey to some silt.	o grey,	M	1	DCP (0	2	MARINE/AEOLIAN		
				-			SUME SIL.				ă	3			
				-											
	2021	0.50m		0.5								3			
	26/07/2021	B 0.60m										3			
	56 			_								3			
				_					W			3	COLLAPSING PIT WALLS @ 0.7M		
				_								3			
		1.00m		1.0								4			
												3			
				-								4			
		B&E		-								4	SULFUR SMELL		
		1.40m		-								4			
		1.50m		1.5								5			
		1.00111										4			
				-											
		В		-											
		1.00		-											
		1.90m		-											
		2.00m		2.0	····		Due to Collapsing Pit Walls								
				-	1		Hole Terminated at 2.00 m								
		В		-	1										
		0.45		-	1										
		2.40m		-	-										
				2.5_	+										
				-	-										
				-	-										
				-	-										
				-	-										
LEG	END:			Notes, Sa	mples a	n <u>d T</u> es	<u>s</u>	Consis	stency	1		CS (kPa	a) Moisture Condition		
Wat	er			U ₅₀			≖ er tube sample	VS S	Very Soft	ť	<	25 5 - 50	D Dry M Moist		
T		ter Level te and time s	hown)	CBR	Bulk s	ample f	or CBR testing	F	Firm		5	0 - 100	W Wet		
►	Wa	ter Inflow	<i>`</i>	E ASS	Acid S	Sulfate S	l sample ioil Sample	St VSt	Stiff Very Stif	f	2	00 - 200 00 - 400	F		
Stra		ter Outflow anges		В	Bulk S	ample		H Fb	Hard Friable		>	400			
	G	ansitional stra		Field Test PID	_	ionisatio	n detector reading (ppm)	<u>Densit</u>	yy ∨ L		′ery Lo oose	oose	Density Index <15% Density Index 15 - 35%		
	D	efinitive or di		DCP(x-y) HP	Dynan	nic pen	etrometer test (test depth interval shown) meter test (UCS kPa)		M D	D N		n Dense	-		
	st	trata change			. ising				VI		ery D		Density Index 85 - 100%		

		REGIO	NAL				RING LOG - TEST PIT					ST PIT NO: TP5			
		GEOTE	CHNIC	AL	LIENT		De Groot and Benson				PAGI		1 of 1		
-		SOLUT	IONS		ROJE						ЮB		RGS32813.1		
					SITE LOCATION:Lot 2 Phillip Drive, South West RocksTEST LOCATION:Refer to Site Plan							GED B			
				Т	EST LO	DCAT	ON: Refer to Site Plan				DATE	:	26/7/21		
		ient typi T lengti		5 Ton	ne Exc W	avato IDTH:	0.5 m EASTING:		34 m 609 m	SURF DATU		RL:	AHD		
	Drilli	ing and San	npling			1	Material description and profile information				Fie	ld Test			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations		
ш		E		-		SM	Silty SAND: fine to medium grained, grey, affected.	root	М	MD	(0-1.3m)	1	TOPSOIL		
		0.20m		-		SP	0.20m		_	-	DCP (0	2	MARINE/AEOLIAN		
				-			GAND. The to medium grained, grey.					2			
				-	ļ							3			
	2021	0.50m		0.5								3			
	26/07/2021	B 0.60m		-		SM	0.60m Silty SAND : fine to medium grained, brown					3			
				-		SIVI	Sity SAND. The to meaturn grained, Drown	1.	w	-		3			
				-		·			vv			4			
				-								4			
		1.00m		1. <u>0</u>									SULFUR SMELL		
		545		-								7	SULFOR SIVIELL		
		B&E 1.20m		-								7			
				-								7			
				-											
				1.5											
				-			Becoming brown/grey								
				_		,									
				_											
				-]										
				2.0			2.00m								
							Hole Terminated at 2.00 m				1				
				-	1										
				-	1										
				-	1										
				- 2.5	1										
				2.5	1										
				-	1										
				-	1										
				-	1										
				-	1										
LEG	SEND:		<u>N</u>	lotes, Sa	imples a	nd Tes	<u>s</u>		stency			CS (kPa	-		
Wate		er Level		U ₅₀			ter tube sample	VS S	Very Sof Soft	t	2	25 5 - 50	D Dry M Moist		
-	(Dat	e and time sl		BR E			or CBR testing I sample	F St	Firm Stiff			0 - 100 00 - 200	W Wet W _p Plastic Limit		
► _		er Inflow er Outflow	A	LSS B	Acid S		Soil Sample	VSt H	Very Stif	f	2	00 - 400 400			
	ita Cha	anges		ield Tes		Junpio		Fb	Friable				Density Index <15%		
		adational or	ita –	PID	Photo		on detector reading (ppm)	Densi	- L	L	/ery Li .oose		Density Index 15 - 35%		
		efinitive or dis	I Г	CP(x-y)	Dynar	nic nen	etrometer test (test depth interval shown)	1	M) N	/lediur	n Dense	e Density Index 35 - 65%		

				E	ENGII	NEE	RING LOG - TEST PIT			т	EST	PIT N	10: TP6		
		REGIO		CAL C	LIENT		De Groot and Benson			Ρ	AGE	Ξ:	1 of 1		
-		SOLUT	IONS	F	ROJE	CT NA	ME: Proposed Development			J	OB	NO:	RGS32813.1		
					SITE LOCATION: Lot 2 Phillip Drive, South West Rocks					L	OG	GED E	BY: MR		
				Т	TEST LOCATION: Refer to Site Plan							DATE: 26/7/21			
		IENT TYPI		5 Ton	ne Exc	avato I DTH:	0.5 m EASTING:	505822		SURF.		RL:	AHD		
	-	ing and Sam					Material description and profile information	0302407	111 1	JATU	1	ld Test			
			iping			z				~			-		
MEIHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations		
Ш		E 0.15m			-	SM	Silty SAND: fine to medium grained, grey, affected.	root		MD	(0-1.6m)	1	TOPSOIL		
		0.1511				SM	SAND: fine to medium grained, grey.		М		DCP (0	2	MARINE/AEOLIAN		
											Ď	3	-		
	2021											4	-		
	26/07/2021	0.50m		0.5								4	-		
	~ 	в		.					W			3	-		
		0.70m		.		<u> </u>	0.70m					6	-		
							Sity SAND. The to meaturn graned, brown					6	-		
												7	1		
		1.00m		1. <u>0</u>			Becoming brown/orange					5	SULFUR SMELL		
							becoming brown/orange					6			
		B&E										7	-		
		1.30m										7	-		
												7	-		
		1.50m		1.5			Becoming grey/brown					7	COLLAPSING PIT WALLS		
		В					Decoming grey, brown								
		1.70m													
		2.00m		2.0											
		В													
		2.20m					2.20m Hole Terminated at 2.20 m				-				
				.	-										
					-										
				2.5	-										
					-										
					-										
					-										
				.	-										
.EG	SEND:			Notes, Sa	mples a	nd Test	<u>s</u>	Consiste				CS (kPa			
Nat		er Level		U ₅₀	50mm	Diame	ter tube sample	S S	/ery Soft Soft			25 5 - 50	D Dry M Moist		
-	(Dat	te and time sh	hown)	CBR E	Enviro	nmenta	or CBR testing I sample		Firm Stiff			0 - 100 00 - 200	W Wet W _p Plastic Limit		
		er Inflow er Outflow		ASS B	Acid S		oil Sample	VSt V	/ery Stiff l ard		2	00 - 400 400			
Stra	ta Cha	anges		Field Tes		, -			riable V	V	ery Lo		Density Index <15%		
	tra	radational or ansitional stra	ata	PID DCP(x-y)	Photo		n detector reading (ppm) etrometer test (test depth interval shown)		L ME	Lo	oose	n Dens	Density Index 15 - 35%		
		efinitive or dis rata change	stict	HP			meter test (UCS kPa)		D		ense		Density Index 55 - 65%		

				E	NGI	NEE	RING LOG - TEST PIT			т	EST		10: TP7	
	-	REGIOI GEOTE			LIENT	:	De Groot and Benson			P	PAGE	≣:	1 of 1	
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	ов	NO:	RGS32813.1	
				s	SITE LOCATION: Lot 2 Phillip Drive, South West Rocks						LOGGED BY: MR			
				т	EST LO	OCAT	ION: Refer to Site Plan			0	DATE: 26/7/21			
				5 Ton	ne Exc			5058		SURF. DATU		RL:		
IE:		IT LENGT			WIDTH: 0.5 m NORTHING: 6582450 m Material description and profile information						1	d Test	AHD	
		5				N				7				
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticil characteristics,colour,minor componer		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations	
0.45m Tooth	Encountered	E				SM	Silty SAND: fine to medium grained, grey, affected.	root		VL	(0-1.8m)	0	TOPSOIL	
.45m	ncoun	0.15m				SP	0.15m SAND: fine to medium grained, pale grey/v root affected to 0.6m.	 vhite,	M	L	DCP (0-	1	AEOLIAN	
0	Not E			-							ă	1		
				-								1		
		0.50m		0.5								1		
		В		-								1		
		0.70m										1		
												2		
										MD	-	2		
		1.00m		1.0								2		
		в		-								3		
				-								2	COLLAPSING PIT WALLS	
		1.30m		-								3		
				-								2		
		1.50m		1.5								3	-	
		В		-								3		
		1.70m		-								3		
				-										
		0.00		-										
		2.00m		2.0_										
		В		-										
		2.20m			·····.		2.20m Due to Collapsing Pit Hole Terminated at 2.20 m				$\left \right $			
]									
				2.5	-									
				-										
				-										
				-										
	END:			Notes, Sa	mples a	nd Tes	<u>s</u>	Consis VS	stency Very Sol	i i		1 CS (kPa 25	a) Moisture Condition D Dry	
Wat		ter Level					ter tube sample	S F	Soft	•	2	5 - 50	M Moist	
_	(Da	te and time sl	hown)	CBR E	Enviro	nmenta	or CBR testing Il sample	St	Firm Stiff	<i>.</i>	1(0 - 100 00 - 200		
		ter Inflow ter Outflow		ASS B		Sulfate S Sample	Soil Sample	VSt H	Very Stif Hard	t		00 - 400 400) W _L Liquid Limit	
<u>Stra</u>		anges radational or		Field Tes	ts			Fb Densit	Friable y V	V	ery Lo	oose	Density Index <15%	
	 tra	ansitional stra efinitive or dis	ata	PID DCP(x-y)	Photo		n detector reading (ppm) etrometer test (test depth interval shown)		L M	Ŀ	oose	n Dense	Density Index 15 - 35%	
		trata change		HP	-		meter test (UCS kPa)		D VI	D	ense ery D		Density Index 65 - 85% Density Index 85 - 100%	

		REGIO					RING LOG - TEST PIT			Т	EST	PIT N	IO: TP8		
		GEOTE	CHNIC	JAL	LIENT		De Groot and Benson			F	PAGE	Ξ:	1 of 1		
-		SOLUT	IONS		ROJE					J	OB	NO:	RGS32813.1		
					ITE LC		• •	cks				GED B			
				Т	TEST LOCATION: Refer to Site Plan							DATE: 26/7/21			
		MENT TYP		5 Toni		avato IDTH:	0.5 m EASTING:	50589 658243		SURF DATU		RL:	AHD		
	Drill	ling and Sar	npling			1	Material description and profile information		I		Fiel	ld Test			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plastici characteristics,colour,minor componer		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations		
ш	Encountered	E 0.15m		-		SM	Silty SAND: fine to medium grained, grey, roots.	some	М	MD	(0-1.6m)	1	TOPSOIL		
	ncou	0.1011		-		SP	0.20m				DCP (0	1	AEOLIAN		
	Not E			-			root affected to 0.9m.					1			
				-								2			
		0.50m		0.5		•						1			
		B		-								1			
		<u>0.70m</u>		-		•						1			
				-								2			
		1.00m		1.0								2			
												2			
		B&E										2			
		1.30m		_		•						3			
				-								3			
		1.50m		1.5								3			
		в		-								3			
		1.70m		-											
				-		•									
				-		•									
		2.00m		2. <u>0</u>											
		В		-											
		2.20m					2.20m Hole Terminated at 2.20 m			-	+				
				-	-										
				2.5											
					1										
				-											
LEG <u>Wat</u>	END: er			Notes, Sa			_	Consis VS	Very Sol	ť	<	CS (kPa 25	D Dry		
	Wat	ter Level	hown	U₅₀ CBR	Bulk s	ample f	ter tube sample or CBR testing	S F	Soft Firm		5	5 - 50 0 - 100	M Moist W Wet		
►	Wat	te and time s ter Inflow	· ·	E ASS			al sample Soil Sample	St VSt	Stiff Very Stif	f	2	00 - 200 00 - 400			
		ter Outflow <u>anges</u>		В		Sample		H Fb	Hard Friable			400			
	G	radational or ansitional stra		Field Test PID		ionisatio	on detector reading (ppm)	<u>Densit</u>	Y V L		/ery Lo .oose	oose	Density Index <15% Density Index 15 - 35%		
	_ D	efinitive or dia trata change		DCP(x-y) HP			etrometer test (test depth interval shown) meter test (UCS kPa)		M D		/lediur)ense	m Dense	e Density Index 35 - 65% Density Index 65 - 85%		
	st	ata unange				-			VI		/ery D		Density Index 85 - 100%		

			HNICAL	CLIEN		RING LOG - TEST PIT De Groot and Benson ME: Proposed Development			F	EST PAGI		IO: TP9 1 of 1 RGS32813.1
		SOLUTIO	JN2				rks				NO: GED E	
						ION: Refer to Site Plan						26/7/21
E0		IENT TYPE:	5 T	onne E	(covot	or EASTING:	50580	1 m (SURF			
		T LENGTH:							DATU		. NL.	AHD
	Drill	ing and Samp	ling			Material description and profile information				Fie	ld Test	
					NO				λ			-
METHOD	WATER	SAMPLES	RL DEP (m) (m		CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations
Ш	tered	Е			SM	Silty SAND: fine to medium grained, grey, affected.	root		L	(0-1.6m)	0	TOPSOIL
	count	0.20m			·:	0.20m				o d	1	
	Not Encountered				SP	SAND: fine to medium grained, pale grey/w root affected (tree roots) to 0.9m.	vhite,	М	L to MD	DCP	1	AEOLIAN
	z										2	_
		0.50m	(0.5							1	-
		в									2	
		ы 0.70m									1	
											1	_
					•						2	-
		1.00m		1.0					MD		2	
					•						2	-
		E									2	
		1.30m									3	COLLAPSING PIT WALLS
											3	
		1.50m		1.5	· 						3	
		_		7							4	
		B 1.70m]							
				2.0 · · · ·	•	2.00m						
					,	Due to Collapsing Walls Hole Terminated at 2.00 m				1		
				1								
				1								
				1								
				2.5								
				1								
				1								
				1								
				1								
				1								
	END:	<u> </u>	Notes	Sample	and Te	its	Consist VS	tency Very Soft			I CS (kP) 25	a) Moisture Condition D Dry
Wat		er Level	U₅₀ CBR			eter tube sample for CBR testing	S F	Soft Firm		2	5 - 50 0 - 100	M Moist W Wet
•	•	te and time show er Inflow	^{wn)} E	Env	ironmen	al sample	St	Stiff	:	1	00 - 200	W _p Plastic Limit
	Wat	er Outflow	ASS B		d Sulfate < Sample	Soil Sample	VSt H	Very Stiff Hard			00 - 400 400) W _L Liquid Limit
<u>Stra</u>	i <u>ta Ch</u> a G	anges radational or	Field	<u>Fests</u>			Fb Density		v	/ery L	oose	Density Index <15%
	 tra	ansitional strata efinitive or distic	PID	Pho		on detector reading (ppm) netrometer test (test depth interval shown)		L ME	L	oose		Density Index 15 - 35%
		rata change	HP	• ·		ometer test (UCS kPa)		D	D)ense /ery D		Density Index 65 - 85% Density Index 85 - 100%

		_		E	ENGI	NEE	RING LOG - TEST PIT			т	EST		10: TP10
	-	REGIO			LIENT		De Groot and Benson			P	PAGE	Ξ:	1 of 1
		SOLUT	IONS		ROJE	CT NA	ME: Proposed Development			J	OB	NO:	RGS32813.1
				5	SITE LO	CATI	DN: Lot 2 Phillip Drive, South West Roo	cks		L	.OGG	GED E	BY: MR
				T	EST L	OCAT	ON: Refer to Site Plan			C	DATE	:	26/7/21
		MENT TYP		5 Ton	ne Exc W	avato IDTH:	EASTING: 0.5 m NORTHING:	50573 658244		SURF. DATU		RL:	AHD
	Dril	lling and Sar	mpling				Material description and profile information				Fiel	ld Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componer		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
ш	Encountered	Е				SM	Silty SAND: fine to medium grained, grey, roots.	some		MD	(0-1.6m)	0	TOPSOIL
	ncon	0.20m	-			SP	0.20m SAND: fine to medium grained, pale grey/v		M	-	DCP (0	3	
	Not E					55	SAND. The to medium grained, pale greyn	white.	IVI		Ď	1	-
					-								-
		0.50m	-	0. <u>5</u>		1						1	
		В											
		0.70m	-									1	
												1	-
												2	-
		1.00m		1.0								1	
												2	COLLAPSING PIT WALLS
		в										3	
		1.30m										2	
			1									2	
		1.50m		1.5								3	
												3	
		B&E 1.70m											-
		1.70					1.75m Due to Collapsing Pit				-		
							Hole Terminated at 1.75 m						
				2. <u>0</u>									
				2.5									
150	END:		 	Notos S		nd Terr	e	Consist				CS (kPa	a) Moisture Condition
<u>Wat</u>				Notes, Sa			_		Very Sof	t	<	25	D Dry
ᆂ		ter Level	hown)	U₅₀ CBR	Bulk s	ample f	er tube sample or CBR testing	F	Soft Firm		5	5 - 50 0 - 100	M Moist W Wet
▶	•	ite and time s ter Inflow	nown)	E ASS			l sample ioil Sample		Stiff Very Stif	f		00 - 200 00 - 400	F
		ter Outflow		В		Sample		н	Hard Friable			400	
<u></u>	G tr D	Gradational or ansitional stra Definitive or di	ata	Field Tes PID DCP(x-y)	Photo Dynar	nic pene	n detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS k/Do)	Density	L N	L D M		n Dens	,
	 ata Changes Gradational or transitional strata Definitive or distict strata change 			DCP(x-y) HP			etrometer test (test depth interval shown) meter test (UCS kPa)		MI D VE	D	lediur ense ′ery D		e Density Index 35 - 6 Density Index 65 - Density Index 85 - 1

				E	ENGI	NEE	RING LOG - TEST PIT			т	EST	PIT N	IO: TP11
		REGIO			LIENT	:	De Groot and Benson			P	AGE	Ξ:	1 of 1
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	ОВ	NO:	RGS32813.1
				s	SITE LO	CATI	DN: Lot 2 Phillip Drive, South West Roo	ks		L	.OG(GED B	Y: MR
				т	EST L	OCAT	ON: Refer to Site Plan			C	ATE	:	26/7/21
		IENT TYP T LENGT		5 Ton	ne Exc	avatoi IDTH:	EASTING: 0.5 m NORTHING:	50567		SURF. DATU		RL:	AHD
		ing and Sar					Material description and profile information	000240	52 111		1	ld Test	
						Z	·····			~			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
0.45m Tooth Bucket	Encountered					SM	Silty SAND: fine to medium grained, grey, affected.	root	М	L	(0-1.9m)	0	TOPSOIL
Tooth	Encol			-		SP	0.20m SAND: fine to medium grained, pale grey/v		M	-	DCP (1	
15m .	Not			-			root affected to 0.6m (tree roots).					1	
°.				-								2	
				0.5								1	
				.								1	
				-									
												1	
				-								1	
				1.0						MD		2	
												2	COLLAPSING PIT WALLS
]							2	
				-	1							2	
				-								3	
				1.5								3	
				1.5								4	
				-								4	
				-								3	
				-								4	
				-									
				2.0			2.00m Hole Terminated at 2.00 m						
				-	-		nois reminated at 2.00 III						
				-									
				2.5	1								
LEG	END:			Notes, Sa	mples a	nd Test	S	Consis	tency		 	CS (kPa	a) Moisture Condition
<u>Wat</u>	er			U ₅₀			<u>∽</u> er tube sample	VS S	Very Sof Soft	t	<	25 5 - 50	D Dry M Moist
Ŧ		er Level e and time s	hown	CBR	Bulk s	ample f	or CBR testing	F	Firm		5	0 - 100	W Wet
▶	(Date and time shown) Water Inflow			E ASS			l sample oil Sample	St VSt	Stiff Very Stif	f	2	00 - 200 00 - 400	F
Stra	Wat Tatatata	er Outflow		В	Bulk S	Sample		H Fb	Hard Friable		>	400	
<u></u>	G	radational or		Field Tes PID		ionieatia	n detector reading (ppm)	Density			ery Lo	oose	Density Index <15% Density Index 15 - 35%
		ansitional stra efinitive or di		DCP(x-y)	Dynar	nic pene	trometer test (test depth interval shown)		M	D N	lediur	n Dense	e Density Index 35 - 65%
	st	rata change		HP	Hand	renetro	meter test (UCS kPa)		D VE		ense ery D		Density Index 65 - 85% Density Index 85 - 100%

		REGIOI GEOTE SOLUT	CHNIC	CAL C F	LIENT ROJE	: CT NA DCATI	RING LOG - TEST PIT De Groot and Benson ME: Proposed Development ON: Lot 2 Phillip Drive, South West Roc ION: Refer to Site Plan	ks		F J L	Pagi Iob	NO: GED B	1 of 1 RGS32813.1
		IENT TYP T LENGTI		5 Ton	ne Exc W	avato /IDTH:		50569 658245		SURF. DATU		RL:	AHD
	Drill	ing and San	npling				Material description and profile information				Fie	ld Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity characteristics,colour,minor component		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
Ш		E 0.15m				SM	Silty SAND: fine to medium grained, grey, r affected. 0.15m	root		MD	(0-1.7m)	1	TOPSOIL
	Id 26/07/2021	0.50m B 0.80m 1.00m B 1.30m 1.50m B 1.80m		0.5 0.5		SP	SAND: fine to medium grained, pale grey/w	hite.	W		DCP (1 2 1 2 3 4 4 4 4 4 4 5	AEOLIAN COLLAPSING PIT WALLS (1.1M
				2.5	-		Hole Terminated at 2.00 m						
	. Wat (Dat - Wat ∎ Wat ata Ch: ata Ch: tra G	er Level e and time sl er Inflow er Outflow anges radational or ansitional stra efinitive or dis rata change	hown) (/ / / /	Notes, Sa U ₅₀ CBR E ASS B Field Tes PID DCP(x-y) HP	50mm Bulk s Envire Acid s Bulk s Bulk s Photo Dynai	n Diame sample conment Sulfate Sample sionisati mic pen	ts ter tube sample for CBR testing al sample Soil Sample on detector reading (ppm) etrometer test (test depth interval shown) ometer test (UCS kPa)	S F St VSt H	Very Soft Soft Firm Stiff Very Stiff Hard Friable	V Li D M	< 2: 5: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2: 2:	n Dense	D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35%

		PROV		E	NGI	NEE	RING LOG - TEST PIT			Т	EST	PIT N	io: TP13
				CAL C	LIENT		De Groot and Benson			F	PAGE	≣:	1 of 1
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	OB	NO:	RGS32813.1
					ITE LC		•	cks		L	.OGG	GED B	BY: MR
L	_			т	EST LO	CAT	ION: Refer to Site Plan				DATE		26/7/21
		MENT TYP		5 Tonr		avato IDTH:	eASTING: 0.5 m NORTHING:	5056 65824		SURF DATU		RL:	AHD
	Drill	ling and Sar	npling				Material description and profile information				Fiel	d Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
ш		E				ਹ SM	Silty SAND: fine to medium grained, dark	grey/dark		MD	(m)	1	TOPSOIL
		0.15m	1	-		SP -	<u>0.15m</u> SAND: fine to medium grained, pale grey/v				(0-1.6m)	2	AEOLIAN
				-		J	SAND. The to medium grained, pale greyw	vinte.			DCP	2	
				-								2	
		0.50m		0.5								1	
		0.0011	1	0.5								2	
		B&E		-								2	
		0.70m		-								1	
				-								2	
				-								2	
	-			1.0_								2	
	26/07/2021											3	
	26/07			-								2	
	<u> </u>								W	-		2	COLLAPSING PIT WALLS @
				-					vv			2	1.3M
		1.50m	-	1.5								3	
		В		-									
		1.70m	-	-									
				-									
				_									
				2.0			2.00m						
				_			Hole Terminated at 2.00 m						
				-									
				-									
				2.5									
				-									
LEC Wat				-									
				Note: 0	marcher			0	40		<u> </u>		
LEG Wat	BEND: Ber			Notes, Sa			_	VS	Very So	ft	<	CS (kPa 25	D Dry
Ŧ		ter Level	ho::::-)	U₅₀ CBR	Bulk s	ample f	ter tube sample or CBR testing	S F	Soft Firm		5	5 - 50 0 - 100	M Moist W Wet
▶	•	te and time s ter Inflow	ŕ	E ASS			l sample Soil Sample	St VSt	Stiff Very Sti	ff		00 - 200 00 - 400	F
		ter Outflow		В		ample		H Fb	Hard Friable			400	
<u>stra</u>		radational or		Field Test		onia-t'	an detector reading (nom)	Densit	y v		ery Lo	oose	Density Index <15%
		ansitional stra efinitive or di		PID DCP(x-y)	Dynar	nic pen	on detector reading (ppm) etrometer test (test depth interval shown)		L	D N		n Dense	•
	st	rata change		HP	Hand	Penetro	meter test (UCS kPa)		D V)ense ′ery D	ense	Density Index 65 - 85% Density Index 85 - 100%

		DEOLO		E	NGI	NEE	RING LOG - TEST PIT			Т	EST	PIT N	io: TP14
		REGIOI		AL C	LIENT	:	De Groot and Benson			F	PAGE	:	1 of 1
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	OB	NO:	RGS32813.1
				S	ITE LC	CATI	ON: Lot 2 Phillip Drive, South West Roo	ks		L	.OGG	GED B	SY: MR
				Т	EST LO	OCAT	ION: Refer to Site Plan			0	DATE	:	26/7/21
		IENT TYPI T LENGTH		5 Toni		avato IDTH:			44 m 🖇 43 m I	SURF DATU		RL:	AHD
	Drill	ing and San	npling				Material description and profile information				Fiel	ld Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
ш		E&B		-		SM	Silty SAND: fine to medium grained, grey, affected.	root	М	MD	(0-1.8m)	1	TOPSOIL
		0.20m		-		SP	0.20m SAND: fine to medium grained, pale grey a orange mottle.	 ind	M		DCP (1	MARINE/AEOLIAN
				-								2	
	/2021	0.50m		0.5								2	
	26/07/2021	B&E		-								2	
	<u> </u>	0.70m		-					w	-		2	COLLAPSING PIT WALLS 0.7M
				-								3	
		1.00m		1. <u>0</u>								2	
		В		-								3	
		1.20m		-								3	
				-								3	
		1.50m		1.5								3	
		В		-								3	
		1.70m		-								3	
				-									
				2.0			2.00m						
				-	-		Hole Terminated at 2.00 m						
				-	-								
				-	-								
				- 2.5	-								
				-	-								
				-	-								
				-									
Wat	Wat (Dat	er Level re and time sh er Inflow er Outflow	nown)	I Notes, Sa U₅₀ CBR E ASS B	50mm Bulk s Enviro Acid S	Diame ample f onmenta Sulfate S	ter tube sample or CBR testing al sample Soil Sample	VS S F St VSt	stency Very Soft Soft Firm Stiff Very Stiff Hard		<: 2: 5: 1: 2:	I CS (kPa 25 5 - 50 0 - 100 00 - 200 00 - 400 400	D Dry M Moist W Wet W _p Plastic Limit
	ata Cha		ita	Field Test PID	t <u>s</u> Photoi		on detector reading (ppm)	H Fb Densit	L	L	/ery Lo .oose	oose	Density Index <15% Density Index 15 - 35%
	D	efinitive or dis rata change		DCP(x-y) HP			etrometer test (test depth interval shown) meter test (UCS kPa)		ME D VE	D	/lediur)ense /ery D		e Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

					ENGI	NEE	RING LOG - TEST PIT			1	TEST		10: TP15
	1			ICAL (Г:	De Groot and Benson			I	PAG	E:	1 of 1
		SOLUT			PROJE		ME: Proposed Development				JOB	NO:	RGS32813.1
				\$	SITE LO	OCATI	DN: Lot 2 Phillip Drive, South West Roc	ks		I	OG	GED B	BY: MR
				٦	TEST L	OCAT	ON: Refer to Site Plan			I	DATE	:	26/7/21
		MENT TYP		5 Tor	ine Exc N	cavato /IDTH:	EASTING: 0.5 m NORTHING:		687 m 521 m	SURF		RL:	AHD
	Drill	ling and San	npling				Material description and profile information				Fie	ld Test	
						Z				7	+		
METHOD	WATER	SAMPLES	RL (m)		GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
Ш		E/B			-	SM	Silty SAND: fine to medium grained, grey, affected.	root	N	MD	(0-1.6m)	0	TOPSOIL
		0.20m				SP	SAND: fine to medium grained, grey.		-+	-	DCP (1	MARINE/AEOLIAN
					-							2	
												3	
	26/07/2021	0.50m		0.5								3	
	(20/9	в											
	~	0.70m				SM	Silty SAND fine to medium grained, brown			_		5	SULFUR SMELL
									N			4	SOLI UN SIVIELL
												3	
		1.00m		1.0								3	
												3	
		B/E 1.20m				.]						3	
					1	.]						1	
						.]						2	
		4.50			1							5	-
		1.50m		1.5			Organics (roots etc throughout)					6	
		В					- · ·						
		1.70m				·							
					-								
						•							
		2.00m		2.0		:							
		в											
		2.20m				•	2.20m						
							Hole Terminated at 2.20 m						
				2.5									
					1								
					1								
					1								
					-								
					-								
LEG	END:			Notes, S	amples a	and Tes	<u>s</u>	Consi	istency		L	ICS (kPa	a) Moisture Condition
Wate	_			U ₅₀			– er tube sample	VS S	Very S Soft	oft	<	25 5 - 50	D Dry M Moist
T		ter Level te and time sl	hown)	CBR	Bulk	sample f	or CBR testing	F	Firm		5	0 - 100	W Wet
►	Wat	ter Inflow		E ASS	Acid	Sulfate S	l sample ioil Sample	St VSt	Stiff Very S	tiff	2	00 - 200 00 - 400	
Stra		ter Outflow anges		В	Bulk	Sample		H Fb	Hard Friable		>	400	
<u></u>	G	radational or		Field Tes PID		nionieati	n detector reading (ppm)	Densi	ty	/ \	/ery L Loose	oose	Density Index <15% Density Index 15 - 35%
		ansitional stra efinitive or dis		DCP(x-y)	Dyna	mic pen	etrometer test (test depth interval shown)			MD N	Nediu	m Dense	e Density Index 35 - 65%
	st	rata change		HP	Hand	Penetro	meter test (UCS kPa)				Dense /ery D		Density Index 65 - 85% Density Index 85 - 100%

		REGION GEOTEO SOLUTI	CHNIC	CAL C P S	ROJE	: CT NA DCATI	RING LOG - TEST PIT De Groot and Benson ME: Proposed Development ON: Lot 2 Phillip Drive, South West Roc ION: Refer to Site Plan	ks		P J L	Page Iob	NO: GED B	1 of 1 RGS32813.1
		IENT TYPE T LENGTH		5 Ton		avato IDTH:		50558 658251		SURF.		RL:	AHD
	-	ing and Sam					Material description and profile information	000201			1	d Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
Ш		E&B				SM	Silty SAND: fine to medium grained, dark gaffected.	grey, root	М	L	2.5m)	1	TOPSOIL
	I <\ 26/07/2021	E&B 0.15m 0.50m B 0.70m 1.00m 1.20m 1.50m 1.50m 2.00m		- - - - - - - - - - - - - - - - - - -		SP	SAND: fine to medium grained, pale grey/w		- M	MD	DCP (0-2.	1 1 2 2 2 2 1 1 2 2 1 1 1 1 1 1 2 2 2 2 2 1 1 1 2 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2	AEOLIAN COLLAPSING PIT WALLS 1.2M SULFUR SMELL
	GEND:	B 2.20m	!	- 2.5 - - - - - - - - - - - - - - - - - - -	mples a	nd Tes	2.20m Hole Terminated at 2.20 m	Consist VS	ency Very Soft			5 4 5 5 <u>CS (kPe</u> 25	1) <u>Moisture Condition</u> D Dry
	- Wat (Dat - Wat ■ Wat ■ Wat ata Cha ata Cha ata Cha ata Cha	er Level e and time sh er Inflow er Outflow anges radational or ansitional strat efinitive or dis rata change	iown)	U₅₀ CBR E ASS B Field Tes PID DCP(x-y) HP	Bulk s Enviro Acid S Bulk S ts Photo Dynar	ample f onmenta Sulfate S Sample ionisatio nic pen	ter tube sample for CBR testing al sample Soil Sample on detector reading (ppm) etrometer test (test depth interval shown) ymeter test (UCS kPa)	S F St VSt H	Soft Firm Stiff Very Stiff Hard Friable	V Li D M	2: 5(2(2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2) 2(2(2) 2) 2() 2(5 - 50 0 - 100 00 - 200 00 - 400 400 pose n Dense	M Moist W Wet W _p Plastic Limit W _L Liquid Limit Density Index <15% Density Index 15 - 35%

				E	INGI	NEE	RING LOG - TEST PIT			Т	EST		IO: TP17
	-			~	LIENT		De Groot and Benson			F	PAGE	E:	1 of 1
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	IOB	NO:	RGS32813.1
				S	ITE LC	CATI	DN: Lot 2 Phillip Drive, South West Roo	cks		L	.OG(GED E	Y: MR
L				Т	EST LO	CAT	ON: Refer to Site Plan				DATE	:	26/7/21
		MENT TYP		5 Ton	ne Exc w	avato IDTH:	• EASTING: 0.5 m NORTHING:	5056		SURF DATU		RL:	AHD
		ling and Sar				חוטו:	0.5 m NOR I HING: Material description and profile information	. 00024	10111	DAIU	1	ld Test	
					0	NOI				ζ			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componer		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
ш	Encountered	540				SM	Silty SAND: fine to medium grained, dark brown/dark grey, root affected.			MD	(0-1.7m)	1	TOPSOIL
	unoor	E&B 0.20m	1				0.20m			_	DCP (0-	3	AEOLIAN
	Not Er					SP	Silty SAND: fine to medium grained, pale	grey.	M		B	3	AEOLIAN
	2											3	
		0.50m		0.5								3	
												2	
		B 0.70m										2	
												2	
				-]							2	
		1.00m		1.0								2	
			1									2	
		B 1.20m		-								3	
		1.2011		-								4	
				-								3	
												4	
þ		1.50m		1.5_								3	COLLAPSING PIT WALLS @
		B&E										4	1.5M
		1.70m		-									
							1.80m Due to Collapsing Pit Walls						
					-		Hole Terminated at 1.80 m						
				2. <u>0</u>	-								
					-								
				-	-								
				2.5									
				-]								
					1								
LEC Wat					1								
LEG	END:			Notes, Sa	mples a	nd Test	<u>s</u>	Consis VS	stency Very So	ft		1 ICS (kPa 25	a) Moisture Condition D Dry
Wat		er Level					ter tube sample	s	Soft		2	5 - 50	M Moist
	(Date and time shown) Water Inflow			CBR E	Enviro	nmenta	or CBR testing I sample	F St	Firm Stiff		1	0 - 100 00 - 200	
				ASS B		Sulfate S Sample	oil Sample	VSt H	Very Sti Hard	ff		00 - 400 400	
Stra	ta Ch	anges	Field Tes				Fb Densit	Friable		/ery Lo		Density Index <15%	
		radational or ansitional stra	ata	PID	Photo		n detector reading (ppm)	Densit	- L	L	.oose		Density Index 15 - 35%
		efinitive or di: rata change	stict	DCP(x-y) HP	-		etrometer test (test depth interval shown) meter test (UCS kPa)		M D	D	Dense		Density Index 65 - 85%
	5	5.1.61190							V	D V	/ery D	ense	Density Index 85 - 100%

	4	REGIO		~			RING LOG - TEST PIT De Groot and Benson				EST	PIT N	IO: TP18
		GEOTE SOLUT		JAL	ROJE						OB		RGS32813.1
					ITE LC			cks				GED B	
				т	EST LO	OCAT	ION: Refer to Site Plan			0	DATE	:	26/7/21
		IENT TYP		5 Tonr		avato IDTH:		50553 658249		SURF DATU		RL:	AHD
	Dril	ling and San	npling				Material description and profile information				Fiel	ld Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
Ш		E&B		_		SM	Silty SAND: fine to medium grained, dark to root affected.	orown,	М	MD	(0-1.6m)	2	TOPSOIL
		0.15m		_		SP	0.15m SAND: fine to medium grained, pale grey/v	 vhite.	- <u> </u>	-	P (0-1	2	AEOLIAN
				-							DCP	2	
				-								4	
		0.50m		0.5_								4	
		В		-								3	
		0.70m		-		-						2	
				-								3	
		1.00m		1.0								3	-
		В										4	
		ь 1.20m		-								3	
	2021			-								4	COLLAPSING PIT WALLS @
	26/07/2021			-								4	1.3M
	<u> </u>	1.50m		1.5_								4	SULFUR SMELL
		В		-									
		1.70m		-									
				-									
		2.00m		2.0									
		B 2.20m					2.20m			<u> </u>			
				-			Hole Terminated at 2.20 m						
				-									
				2.5									
				-									
				-									
				-									
LEG Wat	END:			Notes, Sa	mples a	nd Tes	<u> </u>	Consis VS	Very Sof	ť	<	CS (kPa 25	D Dry
Ţ		ter Level te and time sl	hown	U₅₀ CBR	Bulk s	ample f	ter tube sample or CBR testing	S F	Soft Firm		5	5 - 50 0 - 100	M Moist W Wet
•	Wa	ter Inflow	· ·	E ASS	Acid S	Sulfate S	al sample Soil Sample	St VSt	Stiff Very Stif	f	2	00 - 200 00 - 400	
		ter Outflow anges		В		Sample		H Fb	Hard Friable			400	
	tr	iradational or ansitional stra	ata	PID	Photo		on detector reading (ppm)	Densit	L	L	'ery Lo oose Iodiur		Density Index <15% Density Index 15 - 35%
		efinitive or dis trata change	stict	DCP(x-y) HP	-		etrometer test (test depth interval shown) ometer test (UCS kPa)		M D VI	D	lediur Iense lery D		e Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

				E	NGI	NEE	RING LOG - BOREHO	LE			В	ORE	HOLI	E NO:	BH1
		REGION	CHNIC	AL	LIENT		De Groot and Benson					AGE			1 of 5
-		SOLUT		P	ROJE						J	OB I	NO:		RGS32813.1
					ITE LO		•	h West Rocks					GED B	SY:	MR
				T	EST LO	CAT	ION: See Figure				D	ATE	:		29/7/21
		YPE:	P160 I ETER :	100 m	ım	IN		ASTING: 505 IORTHING: 6582	5651 r 2533 r		SURF/		RL:	AH	D
	Drill	ing and Sam	npling				Material description and profile	information				Fiel	d Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil characteristics,colour,min	type, plasticity/partic or components	cle	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Struc	cture and additional observations
AD/T				_		SM	Silty SAND fine to mwsium gr	rained, grey, root		М	L			TOPSO	IL
4				- 0.5		SM	0.20m allected. Silty SAND fine to medium gr	ained, grey.						AEOLIA	<u>N</u> — — — — — — — — — — — — — — — — — — —
	<u> </u>	1.00m		- - 1. <u>0</u>						w	MD	-			
		SPT 3,4,5 N=9 1.45m		- - 1. <u>5</u>			1.60m								
WB	-			2.0		ЪГ		, μαι ς gr c y.						MARINE	<u></u>
		2.50m SPT		- 2. <u>5</u> -											
		2,6,7 N=13 2.95m		- 3. <u>0</u> -											
				-			3.40m								
				3. <u>5</u> - -		SM	Silty SAND fine to medium gr	ained, dark brown.			VD				
		4.08µम N=R		4.0 4.5											
LEG	SEND:			- Notes, Sa	mples a	nd Tee	5.00m	Con	sistend	v			CS (kPa	a) Moiet	ture Condition
<u>Wat</u> ▼	t er Wat (Dat - Wat	er Level te and time sh er Inflow er Outflow anges	nown)	U ₅₀ CBR E ASS B	50mm Bulk s Enviro	Diame ample nment	ts ter tube sample for CBR testing al sample Soil Sample	VS S St VSt H Fb	Ver Sof Firr Stif Ver Har	ry Soft it m f ry Stiff rd		<2 25 50 10 20		D M W W	Dry Moist Wet Plastic Limit Liquid Limit
	G tra D	radational or ansitional stra efinitive or dis rata change	ita 🔤	Field Test PID DCP(x-y) HP	Photoi Dynan	nic pen	on detector reading (ppm) etrometer test (test depth interval shown ometer test (UCS kPa)	n)		V L MD D VD	Lo M D	ery Lo bose lediun ense ery De	n Dense	Dens e Dens Dens	ity Index <15% ity Index 15 - 35% ity Index 35 - 65% ity Index 65 - 85% ity Index 85 - 100%

					ENGI	NEE	RING LOG - BOREHO	DLE			В	OR	EHOLE	E NO:	BH1
	1	REGIC		CAL	CLIENT	:	De Groot and Benson				Ρ	AGE	:		2 of 5
		SOLU			PROJE	CT NA	ME: Proposed Developmer	nt			J	OB I	NO:		RGS32813.1
				;	SITE LO	CATI	ON: Lot 2 Phillip Drive, Sou	th West Roc	ks		L	OGC	GED B	Y:	MR
					TEST LO	OCAT	ION: See Figure				D	ATE	:		29/7/21
		TYPE: HOLE DIA	P160	. 100		INI			50565		SURF		RL:	AH	D
В	-	rilling and Sa		c: 100	mm	IN	CLINATION: 90° Material description and profil	NORTHING: e information	008203	53 m L	JATU		d Test	АП	U
						NO					۲				
METHOD	WATER	SAMPLES	RL (m)	DEPTI (m)	ERAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: So characteristics,colour,mi	il type, plasticity nor component	/particle s	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Stru	cture and additional observations
WB		5.59,рят N=R		5.5 6.0 6.5		SM	Silty Sand fine to medium g (weakly cemented)	rained, dark bro	own .	W	VD			MARIN	E
>		7.09дит N=R		7.(7. <u>{</u> 8.(· · · · ·									
		8.59дит N=R		9.9 9.9			Becoming Silty SAND, fine to indurated)	o medium grain	ed (not						
	GENE	10.00m D:	<u> </u>	Notes, S	amples a	nd Test	s		Consis	tency		U	CS (kPa	a) Mois	ture Condition
Wa	ater						_		VS S	Very Soft Soft		<2	25 5 - 50	D	Dry Moist
	-	ater Level	shown	U ₅₀ CBR	Bulk s	ample f	ter tube sample or CBR testing		F	Firm		50	0 - 100	W	Wet
►		ate and time	snow(1)	E ASS			Il sample Soil Sample		St VSt	Stiff Very Stiff			00 - 200 00 - 400	-	Plastic Limit Liquid Limit
		ater Outflow		В		Sample			н	Hard			400		
<u>Sti</u> —		thanges Gradational o transitional st Definitive or o strata change	rata distict	Field Te PID DCP(x-y HP	Photo) Dynar	nic pene	on detector reading (ppm) etrometer test (test depth interval show meter test (UCS kPa)	<i>i</i> n)	Fb Density	Friable V L ME D VD) M D	ery Lo bose lediun ense ery Di	n Dense	Dens e Dens Dens	ity Index <15% ity Index 15 - 35% ity Index 35 - 65% ity Index 65 - 85% ity Index 85 - 100%

		REGIO		~			RING LOG - BOREHOLE De Groot and Benson					BORE		e no:	BH1 3 of 5
		GEOTE SOLUT		SAL P S	ROJE	CT NA	ME: Proposed Development ON: Lot 2 Phillip Drive, South West Roc	cks			J L	ob I .og(NO: GED E	SY:	RGS32813.1 MR
				Т	ESTLO	JCAT	ON: See Figure					DATE			29/7/21
		YPE: OLE DIAN	P160 IETER :	: 100 r	nm	IN	EASTING: CLINATION: 90° NORTHING:		5651 2533		SURF. DATU		RL:	AH	D
	Drilli	ing and San	npling				Material description and profile information					Fiel	d Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		le	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Stru	cture and additional observations
WB	20 N	SPT ,29,15/50m =44/200mr 10.35m	m n			SM	Silty Sand fine to medium grained, dark br (weakly cemented) <i>(continued)</i>	rown		W	VD			MARIN	E
		11.50m SPT 9,12,11 N=23 11.95m		11. <u>5</u> 12.0		SC	<u>Sandy Clay/Clayey SAND</u> interbedded, fin medium grained, high plasticity pale grey								
		13.00m SPT 3,4,7 N=11 13.45m		12.5 12.5 13.0 13.0 13.5 13.5						M > Wp	St	HP	100		
		14.50m SPT 9,14,17 N=31		14. <u>0</u> 							VD	-			
<u>Wat</u> ▲	Wata (Dat Wata Wata I Wata I Wata I Gr Gr tra De	er Level e and time sl er Inflow er Outflow inges radational or insitional stra- sfinitive or disi rata change	hown)	Notes, Sa U ₅₀ CBR E ASS B Field Tes PID DCP(x-y) HP	50mm Bulk s Enviro Acid S Bulk S Bulk S Photoi Dynan	Diame ample f onmenta Sulfate S cample conisationic pend	s ter tube sample or CBR testing I sample oil Sample n detector reading (ppm) trometer test (test depth interval shown) meter test (UCS kPa)	Con VS S St VSt H Fb Den	So Fii St Ve Ha Fr	ery Soft oft rm	V Li D M	2: 5(1(2(>/ /ery Lo oose	CS (kPr 25 5 - 50 0 - 100 00 - 200 00 - 400 400 	D M W W W W U D Ense Dense Dense	ture Condition Dry Moist Wet Plastic Limit Liquid Limit sity Index <15% sity Index 15 - 35% sity Index 35 - 65% sity Index 65 - 85%

				E	NGI	NEE	RING LOG - BOREHOLE			В	ORE	EHOLE	E NO:	BH1
		REGION GEOTE				:	De Groot and Benson			P	AGE	:		4 of 5
		SOLUT			ROJE		ME: Proposed Development			J	овι	NO:		RGS32813.1
				S	ITE LC	CATI	DN: Lot 2 Phillip Drive, South West Roo	cks		L	OGO	GED B	Y:	MR
				т	EST LO	OCATI	ON: See Figure				ATE			29/7/21
DR	ILL T	YPE:	P160				EASTING:	50565	51 m 🖇	SURF	ACE	RL:		
BO				100 n	nm	IN	CLINATION: 90° NORTHING:	658253	33 m I	DATU	1		AH	D
	Drill	ling and San	npling			Z	Material description and profile information					d Test		
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Stru	cture and additional observations
WB		14.95m		- - 15.5_ - -		SC	Sandy Clay/Clayey SAND interbedded, fir medium grained, high plasticity pale grey (Becoming SAND, fine to medium grained, some silt.	continued)) W > W	VD			MARIN	E
		16.00m		16.0					W	-				
		SPT 12,20,20 N=40 16.45m		- - - 16. <u>5</u>										
				- - 17.0_ -			Becoming Silty SAND, dark brown.							
		17.50m		- 17. <u>5</u>										
		SPT 3,3,6 N=9		-										
		17.95m		18. <u>0</u> - -										
				- 18.5_ - - -										
		19. 5;βл N=R		19.0_ - - 19.5_ - - - -										
LEG	BEND:		1	Notes, Sa	mples a	nd Test	<u>s</u>	Consis				CS (kPa		ture Condition
Wat	Wat (Dat Wat	ter Level te and time sh ter Inflow ter Outflow anges	hown)	U₅₀ CBR E ASS B	50mm Bulk s Enviro Acid S	i Diamel ample fi onmenta	er tube sample or CBR testing I sample ioil Sample	VS S St VSt H Fb	Very Soft Soft Firm Stiff Very Stiff Hard Friable		25 50 10 20	25 5 - 50 0 - 100 00 - 200 00 - 400 400	D M W W _p	Dry Moist Wet Plastic Limit Liquid Limit
<u></u>	Gi tra De	radational or ansitional stra efinitive or dis rata change	ata	Field Test PID DCP(x-y) HP	Photoi Dynan	nic pene	n detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)	Density		La D M D	ery Lo bose lediun ense ery D	n Dense	Dens Dens Dens	ity Index <15% ity Index 15 - 35% ity Index 35 - 65% ity Index 65 - 85% ity Index 85 - 100%

					ENG	NEE	RING LOG - BOREHOLE			В	ORE	HOLE	E NO: BH1
		REGIO GEOTE	NAL	ICAL		ſ:	De Groot and Benson			P	AGE		5 of 5
		SOLUT	IONS	j	PROJE		ME: Proposed Development			J	ов і	NO:	RGS32813.1
					SITE LO	OCATI	ON: Lot 2 Phillip Drive, South West Roc	ks		Ŀ	OGC	GED B	Y: MR
					TEST L	.OCAT	ION: See Figure			D	ATE	:	29/7/21
D	RILL 1	TYPE:	P160				EASTING:	505651	m s	SURF	ACE	RL:	
В	OREH	IOLE DIAN	IETEI	R: 100) mm	IN	ICLINATION: 90° NORTHING:	6582533	m I	DATU	M:		AHD
	Dril	lling and Sar	mpling				Material description and profile information		1		Fiel	d Test	
	~				U	NOIT -			щZ	, Ž	e		Structure and additional
METHOD	WATER	SAMPLES	RL (m)	DEPT (m)		IFICA MBOI	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor component		MOISTURE CONDITION	ISTE	Test Type	Result	observations
ME	Ň			(,	GR	CLASSIFICATION SYMBOL		13	UN CON	CONSISTENCY DENSITY	Tes	R	
WB						. SC	Sandy Clay/Clayey SAND interbedded, fin	ie to	w	VD			MARINE
5							medium grained, high plasticity pale grey (d						
				20	.5								
				21	.0								
				21	.5								
	-			22			Hole Terminated at 22.00 m						
					-								
				22	.5								
					-								
				23	.0								
					-								
				23	.5								
					-								
þ					1								
				24	.0								
					-								
					-								
				24	_								
				24	2								
					-								
LE	EGEND:	:	L	Notes,	Samples a	and Tes	<u> </u>	Consister	ncy		<u>U</u>	CS (kPa	a) Moisture Condition
w	ater			U ₅₀				VS V	ery Soft		<2		D Dry M Moist
-	_	ter Level Ite and time s	hown)	CBR	Bulk	sample f	for CBR testing	FF	ïrm		50) - 100	W Wet
►	— Wat	ter Inflow	,	E ASS	Acid	Sulfate S	al sample Soil Sample	VSt V	tiff 'ery Stiff		20)0 - 200)0 - 400	P
0	- √ Wat trata Ch	ter Outflow anges		В	Bulk	Sample		1	lard riable		>4	400	
_	G	Gradational or		Field To PID		oionisati	on detector reading (ppm)	<u>Density</u>	V L		ery Lo bose	ose	Density Index <15% Density Index 15 - 35%
_	D	ansitional stra Definitive or di		DCP(x-	y) Dyna	amic pen	etrometer test (test depth interval shown)		ME	D M	lediun	n Dense	e Density Index 35 - 65%
	st	trata change		HP	Hand	Penetro	ometer test (UCS kPa)		D VD		ense erv De	ense	Density Index 65 - 85% Density Index 85 - 100%

				Ε	NGI	NEE	RING LOG - BOREHOLE			В	OR	eholi	E NO: BH2
		REGIONA	INICAL		IENT:		De Groot and Benson			Ρ	AGE	Ε:	1 of 6
-		SOLUTIO		PF	ROJEC	T NA				J	OB	NO:	RGS32813.1
				SI	TE LO	CATI	ON: Lot 2 Phillip Drive, South West Roc	ks		L	OGO	GED E	BY: MR
				TE	EST LO	CAT	ION: See Figure			D	ATE	:	29/7/21
		TYPE: P1 OLE DIAME	60 TER: 10	00 m	m	IN	EASTING: CLINATION: 90° NORTHING:	505715 6582516		SURF.		RL:	AHD
	Drill	ling and Sampli	ing				Material description and profile information		1		Fiel	ld Test	
METHOD	WATER		RL DEF (m) (r	PTH n)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity characteristics,colour,minor component	y/particle ts	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations
AD/T						SM SP	0.10m Silty SAND fine to medium grained, grey, c brown root affected		М	MD			TOPSOIL
		1.00m SPT 6,6,6 N=12		1.0		 SP	<u>Silty SAND</u> fine to medium grained, grey, c		W				
WB		1.45m 2.50m SPT 11,15,30 N=45 2.95m		2.0		SM	2.00m Silty SAND medium to coarse grained, gre some gravel, fine grained, subrounded.	y, brown,		VD	-		
	1	4.00m SPT 23,33,2 I=35/225mm 4.38m		4.0			Becoming fine to medium grained, dark bro	wn/black					
<u>Wat</u>	Wat (Dat - Wat Wat ta Cha	ter Level te and time show ter Inflow ter Outflow anges	vn) U₅₀ CBR E ASS B		Bulk sa Enviro Acid S Bulk S	Diame ample nmenta ulfate :	ts eter tube sample for CBR testing al sample Soil Sample	S So F Fi St St VSt Vo H Ha Fb Fr	ery Soft oft rm iff ery Stiff ard iable		<: 2! 50 10 20 >4	CS (kPa 25 5 - 50 0 - 100 00 - 200 00 - 400 400	D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit
	tra D	radational or ansitional strata efinitive or distic rata change	t Tield PID DCP(i HP)	Photoi Dynam	nic pen	on detector reading (ppm) etrometer test (test depth interval shown) ometer test (UCS kPa)	<u>Density</u>	V L ME D VD	La D M D	ery Lo bose lediur ense ery D	n Dense	Density Index <15% Density Index 15 - 35% e Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

		REGIONAL GEOTECH SOLUTION	NICAL	ENG CLIEN PROJI	T:	ERING LOG - BOREHOLE De Groot and Benson AME: Proposed Development			P	BORI PAGE OB	E:	E NO: BH2 2 of 6 RGS32813.1
	****	30101101	15	SITE L		· ·	cks				GED E	
						FION: See Figure				ATE		29/7/21
סח		YPE: P16	20			EASTING:	50571	5 m (SURF			
				0 mm	IN	ICLINATION: 90° NORTHING:			DATU			AHD
	Drill	ing and Samplin	g			Material description and profile information				Fiel	ld Test	
			_		Z				≻			-
MEIHOU	WATER	SAMPLES R (n			CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plastici characteristics,colour,minor componer		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations
WB				-	SM	Silty SAND medium to coarse grained, gravel, fine grained, subrounded. (co		W	VD			MARINE
		5.58)m T N=R		5.5		Becoming indurated, weakly cemented.						
		7.099000T N=R	7	1.5 								
	•	8.50m SPT 18,29,20 ⊫49/230mm 8.88m	ε	3.0 - - - 3.5 - - - - - - - - - - - - - - - - - - -		Becoming medium to coarse grained, (not	indurated)					
Vat	Wat (Dat	10.00m er Level te and time showr er Inflow er Outflow anges	U ₅₀ CBR	Bulł Env Acio	im Diam sample ironment	eter tube sample for CBR testing al sample Soil Sample	S F St VSt H	ency Very Soft Firm Stiff Very Stiff Hard Friable		<: 2: 5: 1: 2:	CS (kP 25 5 - 50 0 - 100 00 - 200 00 - 400 400	D Dry M Moist W Wet O W _p Plastic Limit
	G	radational or	Field T PID		toionisat	ion detector reading (ppm)	Density			ery Lo	oose	Density Index <15% Density Index 15 - 35%
		ansitional strata efinitive or distict	DCP(x	-y) Dyn	amic per	netrometer test (test depth interval shown)		ME	D N	lediur	n Dens	e Density Index 35 - 65%
	st	rata change	HP	Har	u rene(r	ometer test (UCS kPa)	1	D VD		ense ery D		Density Index 65 - 85% Density Index 85 - 100%

		REGION/ GEOTEC Solutio	HNICA	AL ^{CI} PI SI	LIENT: ROJEC TE LO	CT NA	DN: Lot 2 Phillip Drive, South West Roo	cks		P J L	AGE OB I OGC	e: NO: Bed e	
DR	ILL T	YPE: P [.]	160	TI	EST LO		ON: See Figure EASTING:	5057	15 m	C SURF	ATE		29/7/21
во		OLE DIAME		100 m	ım	IN	CLINATION: 90° NORTHING:	65825	16 m I	DATU	-		AHD
	Drill	ing and Samp	ling			z	Material description and profile information				Fiel	d Test	
METHOD	WATER	SAMPLES	RL [(m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations
WB		SPT N=R 10.35m				SM	Silty SAND medium to coarse grained, gre some gravel, fine grained, subrounded. (co			VD			MARINE
		11.50m SPT 7,2,2 N=4 11.95m		- - - 11.5 - - - - - - - - - - - - - - - - - - -		СН	11.60m Sandy Clay high plasticity pale grey.		M > Wp	F	HP	70	
		13.00m SPT 17,25,29 N=54 13.45m		12.5 		SP	SAND fine to medium grained, pale grey			VD			
	Wat (Dat	er Level e and time show er Inflow er Outflow anges	L CE		50mm Bulk sa Enviro	Diame ample f nmenta ulfate S	∑ er tube sample or CBR testing I sample oil Sample	Consis VS S F St VSt H Fb	stency Very Soft Firm Stiff Very Stiff Hard Friable		<2 25 50 10 20	CS (kP 25 5 - 50 00 - 200 00 - 200 00 - 400 400	D Dry M Moist W Wet W _p Plastic Limit
	Gi tra De	radational or ansitional strata efinitive or distic rata change		eld Test: PID CP(x-y) HP	Photoi Dynan	nic pen	n detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)	<u>Densit</u>		L D N D	ery Lo bose lediun ense ery D	n Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

		REGION GEOTE SOLUT	CHNI	CAL C Pi S	LIENT: ROJEC ITE LC	CT NA		cks		P J L	OREHOL AGE: OB NO: OGGED ATE:	4 of 6 RGS32813.1
		YPE:	P160	• 100 m	nm	IN	EASTING: CLINATION: 90° NORTHING:	505715		SURF	ACE RL:	AHD
		ing and Sam					Material description and profile information	0002010			Field Test	1
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen	y/particle ts	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type Result	Structure and additiona observations
WB						SP	SAND fine to medium grained, pale grey (continued)		M > Wp	VD		MARINE
		16.00m SPT 7,8,12 N=20 16.45m		16.0_ 			Medium to coarse grained, with some to a clay	trace of		MD		
		19.00m SPT N=R 19.45m		18.5 - - 19.0 - - - - - - - - - - - - - - - - - - -			Becoming fine to medium grained			VD		
<u>Wat</u> ▼	Wat (Da Wat Wat Wat	er Level te and time sh er Inflow er Outflow anges radational or	nown)	Notes, Sar U₅ CBR E ASS B Field Test	50mm Bulk s Enviro Acid S Bulk S	Diamel ample f nmenta ulfate S ample	er tube sample or CBR testing I sample ioil Sample	S S F F St S VSt V H H	/ery Soft soft irm diff /ery Stiff lard riable V	V	UCS (kF <25 25 - 50 50 - 100 100 - 20 200 - 40 >400	D Dry M Moist W Wet 0 W _p Plastic Limit 0 W _L Liquid Limit Density Index <15%
	D	ansitional stra efinitive or dis rata change		PID DCP(x-y) HP	Dynan	nic pene	n detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)		L ME D VD	D M	oose ledium Dens ense ery Dense	Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

GEOTECHNICAL SOLUTIONS PROJECT NAME: Proposed Development JOB NO: Report of the second	of 6 GS32813.1 IR 9/7/21 e and additional servations
SOLUTIONS PROJECT NAME: Proposed Development JOB NO: Ref SITE LOCATION: Lot 2 Phillip Drive, South West Rocks LOGGED BY: M TEST LOCATION: See Figure DATE: 25 DRILL TYPE: P160 EASTING: 505715 m SURFACE RL: BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 6582516 m DATUM: AHD Drilling and Sampling Material description and profile information Field Test AHD OHLUS VOID SAMPLES RL DEPTH VI MATERIAL DESCRIPTION: Soil type, plasticity/particle WILLING VOID Structure obs W SAMPLES RL DEPTH VI SP SAND fine to medium grained, pale grey VD MARINE W I I I I I I MARINE Image: Sampling SP SAND fine to medium grained, pale grey VD I MARINE	IR 9/7/21 e and additional
TEST LOCATION: See Figure DATE: 29 DRILL TYPE: P160 Inclination EASTING: 505715 m SURFACE RL: AHD BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 6582516 m DATUM: AHD Drilling and Sampling Material description and profile information Field Test Field Test OP Material description and profile information Field Test Material description and profile information VD AHD OP Material description and profile information Field Test Material description and profile information Material description and profile information Field Test OP Material description Material description: Soil type, plasticity/particle Molified of the field test Material description and profile information Field Test OP Material description Material description: Soil type, plasticity/particle Molified of test Molified of test Material description OP Material description Material description: Soil type, plasticity/particle Molified of test Material description Material description OP Material description SP SAND fine to medium gra	9/7/21
DRILL TYPE: P160 BOREHOLE DIAMETER: 100 mm INCLINATION: 90° EASTING: 505715 m SURFACE RL: DATUM: AHD Drilling and Sampling Material description and profile information Field Test Field Test AHD OP H VD VD VD VD Structure obstruction MARINE SAMPLES RL DEPTH SP SAND fine to medium grained, pale grey SAMPLES VD MARINE	e and additional
BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 6582516 m DATUM: AHD Drilling and Sampling Material description and profile information Field Test Field Test Field Test Field Test Field Test Structure Structure Structure Structure Structure Structure Structure Structure MATERIAL DESCRIPTION: Soil type, plasticity/particle WOLLSON WOLLSON Structure Structure Structure Material description SP SAMPLES RL DEPTH SP SAND fine to medium grained, pale grey Structure VD Image: Structure MARINE Material Image: Sampling Image: Sampling SP SAND fine to medium grained, pale grey Sr VD Image: Sampling Image: Sampling VD Image: Sampling Sampling Image: Sampling Image: Sampling Sampling Image: Sampling Image: Sampling Image: Sampling Image: Sampling Sampling Image: Sampling	
BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 6582516 m DATUM: AHD Drilling and Sampling Material description and profile information Field Test Field Test Field Test Field Test Field Test Structure obs ON ON ON ON Field Test Field Test Structure obs Structure obs ON ON ON Structure obs ON ON Structure obs Structure obs ON ON Structure obs ON Structure obs ON ON Structure obs ON Structure obs ON ON Structure obs ON ON Structure obs ON Structure obs ON Structure obs Structure obs	
OPHLIN SAMPLES RL (m) DEPTH (m) OPHCO BW MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components Matrix Matrix <th></th>	
Image: Second system Second system Second system Markine Second system	
Image: Continue of the second seco	servations
$\underline{\nabla}$ 22.00m 22.0 $\underline{\nabla}$	
SPT - SPT - SPT	
22.45m 22.5	
23.5	
24.5	
25.00m 25.00m	
LEGEND: Notes, Samples and Tests Consistency UCS (kPa) Moisture	Condition
	Dry Moist
Water Level CBR Bulk sample for CBR testing F Firm 50 - 100 W W	Vet Plastic Limit
▶ Water Inflow ASS Acid Sulfate Soil Sample St Sulfate No P VSt Very Stiff 200 - 400 W _L Li	iquid Limit
→ Water Outflow B Bulk Sample H Hard >400 Strata Changes Fb Friable	
Gradational or Field Tests Density In Density Density In Lease Density In	ndex <15%
Gradational or transitional strata Field Tests Density V Very Loose Density In PID Photoionisation detector reading (ppm) L Loose Density In	ndex <15% ndex 15 - 35% ndex 35 - 65%

		REGION GEOTEC SOLUTI	CHNIC	AL C F	LIENT ROJE	: CT NA DCATI		ks		PAGE: 6 of JOB NO: RGS3 LOGGED BY: MR			6 of 6 RGS32813
			2160				EASTING: CLINATION: 90° NORTHING:	505715			ACE		AHD
00		ing and Sam		1001			Material description and profile information	0002010			1	d Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity characteristics,colour,minor components		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additions
		SPT N=R 28.00m D 28.70m		25.5 26.0 26.5 27.0 27.5 28.0 27.5 28.0 29.0 29.0		SP	SAND fine to medium grained, pale grey (continued)		$M > w_p$	VD St			TESTUARINE
	Wat (Da Wat	er Level te and time sho er Inflow er Outflow anges	own)	U₅ BR E SS B B	50mm Bulk s Enviro Acid S Bulk S	n Diame ample f	30.00m E Hole Terminated at 30.00 m er tube sample or CBR testing sample pil Sample	S So F Fii St St VSt Ve H Ha Fb Fr	ery Soff oft iff ery Stiff ard iable		<2 25 50 10 20 >4	CS (kPa 25 5 - 50 0 - 100 00 - 200 00 - 200 400	D Dry M Moist W Wet D W _p Plastic Limit D W _L Liquid Limit
	tra D	radational or ansitional strat efinitive or dist rata change	a	Field Tes PID DCP(x-y) HP	Photo Dynar	nic pen	n detector reading (ppm) trometer test (test depth interval shown) neter test (UCS kPa)	<u>Density</u>	V L ME D VE	La D M D	ery Lo bose lediun ense ery D	n Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 35 - 85 Density Index 85 - 100

AGE: PB NO: PGGED I TE: CE RL: : Field Test Hard A	29/7/21 AHD
DGGED I ATE: CE RL: I: Field Test	BY: MR 29/7/21 AHD t Structure and additional observations
ATE: CE RL: I: Field Test	29/7/21 AHD t Structure and additional observations TOPSOIL
CE RL: I: Field Test	AHD t Structure and additional observations TOPSOIL
l: Field Test	t Structure and additional observations TOPSOIL
l: Field Test	t Structure and additional observations TOPSOIL
	Structure and additional observations
Test Type Result	observations
	 MARINE
UCS (kP	Pa) Moisture Condition
<25	D Dry M Moist
50 - 100	W Wet
200 - 40	P C C C C C C C C C C C C C C C C C C C
>400	
se dium Dens	Density Index <15% Density Index 15 - 35% Se Density Index 35 - 65% Density Index 65 - 85%
))	25 - 50 50 - 100 100 - 20 200 - 40

		REGION GEOTEC SOLUTIO	HNICA				RING LOG - BOREHOLE De Groot and Benson ME: Proposed Development			I	BOR PAGI JOB	E:	E NO: BH3 2 of 4 RGS32813.1
	****	3020110	0115		TE LO			cks				GED E	
							I ON: See Figure				DATE		29/7/21
DR	ILL 1	YPE : P	160				EASTING:	5057	795 m	SURF	ACE	RL:	
вО	REH	OLE DIAME	ETER:	100 m	ım	IN	CLINATION: 90° NORTHING:	6582	513 m	DATU	JM:		AHD
	Dril	ing and Samp	oling				Material description and profile information				Fie	ld Test	-
METHOD	WATER	SAMPLES	RL [(m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE	CONSISTENCY	Test Type	Result	Structure and additiona observations
MB				-		SP	SAND fine to medium grained, grey, some (continued)	silt	w	MD			MARINE
				-			(continued)						
		5.50m		5.5									
		SPT		 									
		3,5,7 N=12		-									
		5.90m		6.0									
				-									
				6.5									
							Becoming dark brown						
				-									
		7.00m		7.0									
		SPT		-						MD to VD	C		
		6,7,6 N=13		_									
		7.37m		7.5									
				-									
				-									
				8.0									
				-									
				-									
		8.50m		8.5									
		SPT		-									
		6,8,9 N=17		-									
		8.95m		9.0									
				-									
				-									
				9.5									
				-									
				-									
		10.00m		-			-						
LEC Wat	GEND: ter			otes, Sar			_	VS	istency Very S	oft	<	1 CS (kP 25	D Dry
T		er Level te and time sho	CE		Bulk sa	ample f	ter tube sample or CBR testing	S F	Soft Firm		5	5 - 50 0 - 100	M Moist W Wet
•	- Wat	er Inflow	AS	SS	Acid S	ulfate S	il sample Soil Sample	St VSt	Stiff Very S	tiff	2	00 - 200 00 - 400	P
Stra	Watata Cha	er Outflow anges	E	3	Bulk S	ample		H Fb	Hard Friable		>	400	
	G	radational or ansitional strata		eld Tests PID	_	onisatio	on detector reading (ppm)	Densi			/ery L .oose	oose	Density Index <15% Density Index 15 - 35%
	D	efinitive or disti	ct DC	CP(x-y) HP	Dynam	nic pen	etrometer test (test depth interval shown) meter test (UCS kPa)		I	MD N		m Dens	
	st	rata change					v "7				/ery D		Density Index 85 - 100%

		REGION	AL				RING LOG - BOREHOLE						e no:	BH3
		GEOTEC	HNICA	AL.			De Groot and Benson				PAGE			3 of 4
-		SOLUTIO	DNS		ROJEC						OB			RGS32813.1
					TE LO			CKS				GED B	BY:	MR
				TE	-ST LO	JCAT	ION: See Figure			D	DATE			29/7/21
		YPE: P	160 TER :	100 m	ım	IN	EASTING: CLINATION: 90° NORTHING:	50579 658257		SURF.		RL:	AHI	0
	Drill	ing and Samp	oling				Material description and profile information			[Fiel	d Test	-	
METHOD	WATER	SAMPLES	RL [(m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticii characteristics,colour,minor componer		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result		ture and additiona observations
WB		SPT		-		SP	SAND fine to medium grained, grey, some (continued)	silt	W	MD to VD			MARINE	
		5,5,6 N=11		-										
		10.45m		10.5										
				-										
				11.0										
				-										
				-										
		11.50m		11.5										
				-						L	1			
		SPT 1,0,5												
		N=5		12.0									Iron Indu	urated
		11.95m		12.0										
				-										
				12.5						VD	1			
		13.00m		13.0							HP	100		
		SPT												
		N=R		4										
		13.45m		13.5										
				-										
				-										
				14.0										
				-										
		14.50m		14.5	//X//		<u>Silty CLAY medium plasticity, grey.</u>			S-F	-			
									> ~ ×					
		SPT 0,0,0		-										
		N=0												
	END:	<u> </u>	No	otes, Sar	nples ar	nd Test	<u>'s</u>	Consis VS	tency Very Soft	L		 CS (kPa 25	a) <u>Moist</u> D	ure Condition Dry
Wate		er Level		J ₅₀			ter tube sample	s	Soft		2	5 - 50	м	Moist
_	(Dat	te and time sho	´ ⊑	Ξ	Enviro	nmenta	or CBR testing al sample	F St	Firm Stiff		1(0 - 100 00 - 200	P	Wet Plastic Limit
		er Inflow er Outflow	AS		Acid S Bulk S		Soil Sample	VSt H	Very Stiff Hard			00 - 400 400		Liquid Limit
	ta Cha	anges		eld Tests				Fb Density	Friable	14	ery Lo		Densi	ty Index <15%
		radational or ansitional strata	, F	PID	Photoi		on detector reading (ppm)	Density	L	Lo	oose		Densi	ty Index 15 - 35%
	D	efinitive or distio rata change		CP(x-y) HP			etrometer test (test depth interval shown) ometer test (UCS kPa)	1	MD D		lediur Iense	n Dense		ty Index 35 - 65% ty Index 65 - 85%

				E	NGI	NEE	RING LOG - BOREHOLE			E	BORE	EHOLI	ENO: BH3
	-	REGIO	NAL		LIENT		De Groot and Benson			F	PAGE	:	4 of 4
		SOLUT			ROJE	CT NA	ME: Proposed Development			J	OB	NO:	RGS32813.1
				s	ITE LC	CATI	ON: Lot 2 Phillip Drive, South West Re	ocks		L	.OGG	GED B	SY: MR
				т	EST LO	OCAT	ION: See Figure			[DATE	:	29/7/21
DR	NLL 1	YPE:	P160				EASTING:	5057	95 m	SURF	ACE	RL:	
BC		OLE DIAN		100 r	nm	IN	CLINATION: 90° NORTHING		13 m	DATU	-		AHD
-	Dril	ling and Sar	npling			z	Material description and profile information	1		Τ.	Fiel	d Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plastic characteristics,colour,minor compone	city/particle ents	MOISTURE	CONSISTENCY	Test Type	Result	Structure and additional observations
WB		14.95m		- - 15.5_ - -			Silty CLAY medium plasticity, grey. <i>(con</i>	tinued)	M > Wp	S - F			MARINE
		16.00m SPT 5,5,5 N=10 16.45m		16. <u>0</u> - - - - - - - - - - - - -		SC	16.00m Sandy Clay/Clayey SAND interbedded, medium grained, medium plasticity, grey brown.		 e	St	-		
		17.50m SPT 6,7,2 N=9		17. <u>0</u> 			17.50m SAND fine to medium grained, brown.			VD			
		17.95m		18. <u>0</u> -			Hole Terminated at 17.95 m						
LEC Wat				18. <u>5</u> 	-								
				- 									
LEC	GEND:		!	Notes, Sa	mples a	nd Test	<u>is</u>		stency			CS (kPa 25	
	Wa (Da Wa Wa	ter Level te and time s ter Inflow ter Outflow <u>anges</u>	hown)	U₅0 CBR E ASS B	Bulk s Envirc	ample f nmenta Sulfate S	ter tube sample or CBR testing al sample Soil Sample	VS S St VSt H Fb	Very So Soft Firm Stiff Very St Hard Friable		25 50 10 20	25 5 - 50 0 - 100 00 - 200 00 - 400 400	
	G tr D	iradational or ansitional stra efinitive or di trata change	ata	Field Tes PID DCP(x-y) HP	Photo Dynar	nic pene	on detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)	<u>Densit</u>	έ γ ν Γ	ID N	'ery Lo oose 1ediur 0ense 'ery D	n Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%

					ENGI	NEE	RING LOG - BOREHOLE			E	OR	EHOLE	E NO: BH4
				CAL	CLIENT	:	De Groot and Benson			P	AGE	≣:	1 of 3
		SOLUT			PROJE	CT NA	ME: Proposed Development			J	ОΒ	NO:	RGS32813.1
				5	SITE LO	CATI	ON: Lot 2 Phillip Drive, South West Roc	ks		L	OGO	GED B	Y: MR
				٦	FEST L	OCAT	ION: See Figure			۵	ATE		2/8/21
			P160				EASTING:	50576		SURF		RL:	
во		OLE DIAN		: 100	mm	IN	CLINATION: 90° NORTHING: Material description and profile information	658243	31 m I	DATU	1	d Test	AHD
		ing and out				NO				5			
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen	y/particle ts	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T						SM	Silty SAND fine to mwsium grained, grey, r 0.20m affected.		M	MD			
				0.5	=	SP	SAND fine to medium grained, pale grey/w	hite					
		1.00m SPT		1.0									
		2,3,3 N=6											
		1.45m		1.5									
				2.0									
									W				
WB		2.50m		2.5		SM	2.40m Silty SAND fine to medium grained, dark b indurated (weakly cemented).	 rown,	- <u>M</u>	VD	-		Perched water above indurated sand
		SPT 30/40mm N>50											
		2.94m		3.0	└┤╴ . [- · · - · ·								
				3. <u>5</u>	-	SM SM	3.50m Silty SAND fine to medium grained, dark b Silty SAND medium to coarse grained, dar						
							some gravel, fine grained, white.	,					
	17	4.00m SPT ,30,30/100n	h	4.0									
		N>50 4.38m		4.5									
LFG	END:			Notes, S	amples a	nd Tee	5.00m	Consis	tency		 	CS (kPa	a) Moisture Condition
Wat								VS S	Very Soft Soft	t	<	25	D Dry M Moist
Ŧ		er Level e and time sl	hown	U₅₀ CBR	Bulk s	ample f	ter tube sample or CBR testing	F	Firm		50	5 - 50 D - 100	W Wet
►		e and time sl er Inflow	nown)	E ASS			al sample Soil Sample	St VSt	Stiff Very Stiff	Ŧ		00 - 200 00 - 400	F
		er Outflow		В		Sample		H Fb	Hard Friable			400	
<u>stra</u>	tra D(anges radational or ansitional stra efinitive or dis rata change		Field Tes PID DCP(x-y) HP	Photo Dynar	nic pen	on detector reading (ppm) etrometer test (test depth interval shown) meter test (UCS kPa)	Density		L D N	ery Lo bose lediur ense	oose n Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85%

		REGIONA GEOTECH SOLUTION	NICAL	CLIENT PROJEC SITE LC	: CT NA DCATI	ON: Lot 2 Phillip Drive, South West Roc	ks		P J L	OB I	i: NO: Ged B	e no: By:	BH4 2 of 3 RGS32813.1 MR
				TEST L	OCAT	ION: See Figure				DATE			2/8/21
		YPE: P16 OLE DIAMET		0 mm	IN	EASTING: ICLINATION: 90° NORTHING:			SURF. DATU		RL:	AH	D
	Drill	ing and Samplir	ng			Material description and profile information				Fiel	d Test		
METHOD	WATER		RL DEP m) (m		CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit, characteristics,colour,minor componen		MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Stru	cture and additiona observations
WB		5.50m SPT 7,30/140mm N>50 5.85m	6		. SM	Silty SAND medium to coarse grained, dar some gravel, fine grained, white. <i>(continued</i>		М	VD			MARIN	E
	1	7.00m SPT 4,30/130mm N>50 7.40m	7										
		8.50m SPT 30/140mm N>50 8.94m	S	3.5 	SM	8.50m Silty SAND fine to medium grained, dark orange/dark brown.							
	Wat (Dat Wat	10.00m er Level e and time shown er Inflow er Outflow	Notes, U₅₀ CBR	Bulk s Enviro Acid S	n Diame ample onment	ts eter tube sample for CBR testing al sample Soil Sample	Consis VS S F St VSt H C	Very Soft Soft Firm Stiff Very Stiff Hard		<2 25 50 10 20	CS (kPa 25 5 - 50 0 - 100 00 - 200 00 - 400 400	D M W W	<u>ture Condition</u> Dry Moist Wet Plastic Limit Liquid Limit
<u>Stra</u>	tra De	anges radational or ansitional strata efinitive or distict rata change	Field 1 PID DCP(x HP	Photo -y) Dynar	nic pen	on detector reading (ppm) etrometer test (test depth interval shown) ometer test (UCS kPa)	Fb Densit	Friable V L ME D VD	L N D	ery Lo oose lediun ense ery De	n Dense	Dens e Dens Dens	ity Index <15% ity Index 15 - 35% ity Index 35 - 65% ity Index 65 - 85% ity Index 85 - 100%

		REGIOI GEOTE SOLUT	CHNIC	CAL C P	LIENT ROJEC ITE LC	: CT N/ DCAT		ob Ob	NO: GED B	3 of 3 RGS32813.1			
		YPE: OLE DIAN	P160 IETER:	: 100 m	۱m	IN	EASTING: CLINATION: 90° NORTHING:	50576 658243		SURF. DATU		RL:	AHD
	Drill	ing and San	npling				Material description and profile information			1	Fiel	d Test	
METHOD	WATER	SAMPLES	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticit characteristics,colour,minor componen		MOISTURE	CONSISTENCY DENSITY	Test Type	Result	Structure and additiona observations
WB	3	SPT 0,30/110mr N>50	n	-		SM	Silty SAND fine to medium grained, dark orange/dark brown. <i>(continued)</i>		М	VD			MARINE
		10.31m		10.5			Hole Terminated at 10.26 m						
				-									
				 11.0									
				-									
				11.5									
				-									
				12.0									
				-									
				12.5									
				-									
				13.0							HP	100	
				-									
				13.5									
				14.0									
				14.5									
<u>Wat</u> ▼	Wat (Dat Wat	er Level e and time sl er Inflow er Outflow	hown)	U₅₀ CBR E ASS B	50mm Bulk s Envirc Acid S	Diame ample nment	ts eter tube sample for CBR testing al sample Soil Sample	S F St VSt H	Very Soft Soft Firm Stiff Very Stiff Hard		<: 2: 5: 1: 2:	CS (kPa 25 5 - 50 0 - 100 00 - 200 00 - 400 400	D Dry M Moist W Wet W _p Plastic Limit
<u>Stra</u>	tra D	anges radational or ansitional stra efinitive or dis rata change	ata	Field Test PID DCP(x-y) HP	Photoi Dynan	nic per	on detector reading (ppm) etrometer test (test depth interval shown) ometer test (UCS kPa)	Fb Density	Friable V L ME D VD	La D M D	ense	n Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%



Appendix B

Laboratory Test Results

RESULTS OF ACID SULFATE SOIL ANALYSIS Jab Job No. M0509

blied by Regional Geotechnical Solutions Pty Lt

Analysis requested by Matt Rov 1/21 Cook Drive COFFS HARBOUR NSV		000.110021	510.1.														Non-tre	ated soil	Non-tre	eated soil
Sample Identification	EAL Lab	Texture	Moistur	e Content		pH _F an	d pH _{FOX}		KCI-extrac	table sulfur	Potential Sul	fidic Acidity		Actual Acidity	Retaine	d Acidity	Acid Neutrali		Net Acidity	Lime Calculation
	Code									S _{NCI})	(Chromium Red	ucible Sulfur -		(Titratable Actual			(ANC _{nt})			
			(% moisture	(g moisture /			pH			(equiv.		s)		Acidity - TAA)		1		1		
			of total wet weight)	g of oven dry soil)	pH ₇	pHrox	change	Reaction	(% S _{RCI})	mol H ⁺ /t)	(% S _{cr})	(mol H*/t)	pH _{KCI}	(mol H*/t)	(%S _{NAS})	(mol H*/t)	(% CaCO ₃)	(mol H*/t)	(mol H*/t)	(kg CaCO ₃ /t DW)
Method Info.		**		*		(In-house r	nethod S21)	1		**	(In-house m	ethod S20)	(In-hou	se method 16b)		**	(In-house r	nethod S14)	**	**
TP1 0.5-0.7	M0509/1	Coarse	13.8	0.16	5.77	4.83	-0.94	Low												
TP1 1.5-1.7	M0509/2	Coarse	17.0	0.20	4.60	4.21	-0.39	Low												
TP2 0.5-0.7	M0509/3	Coarse	18.2	0.22	5.10	3.34	-1.76	Low												
TP2 1.5-1.7	M0509/4	Coarse	18.4	0.23	5.19	4.25	-0.94	Low												
TP3 0.5-0.7	M0509/5	Coarse	21.4	0.27	4.63	3.51	-1.12	Low			0.007				.0.001					
TP3 1.0-1.2	M0509/6 M0509/7	Coarse Coarse	19.4 17.0	0.24 0.20	4.62 5.64	2.04 4.93	-2.58 -0.71	Medium	0.003	2	0.007	5	4.31	29	<0.001	0			34	3
TP4 0.5-0.7 TP4 1.5-1.7	M0509/7 M0509/8	Coarse	17.0	0.20	5.36	4.93	-2.27	Low Low												
TP4 1.5-1.7 TP5 0.5-0.7	M0509/9	Coarse	20.6	0.24	4.38	2.50	-1.88	Medium	0.004	3	0.012		4.31	44	<0.001	0			52	4
TP5 1.0-1.2	M0509/10	Coarse	20.0	0.25	4.66	3.55	-1.11	Low	0.004	5	0.012	, in the second se	4.51		-0.001				52	-
TP6 0.5-0.7	M0509/11	Coarse	18.7	0.23	4.55	3.02	-1.53	Low												
TP6 2.0-2.2	M0509/12	Coarse	18.2	0.22	3.92	1.65	-2.27	Medium	0.024	15	0.043	27	4.64	31					58	4
TP7 0.5-0.2	M0509/13	Coarse	4.4	0.05	4.94	4.49	-0.45	Low												
TP7 2.0-2.2	M0509/14	Coarse	17.5	0.21	5.44	5.02	-0.42	Low												
TP8 0.5-0.7	M0509/15	Coarse	4.1	0.04	4.74	4.36	-0.38	Low												
TP8 1.5-1.7	M0509/16	Coarse	4.1	0.04	5.11	4.74	-0.37	Low												
TP9 0.5-0.7	M0509/17	Coarse	2.9	0.03	5.19	4.88	-0.31	Low												
TP9 1.5-1.7	M0509/18	Coarse	3.9	0.04	4.92	4.43	-0.49	Low												
TP10 1.5-1.7	M0509/19	Coarse	5.2	0.05	5.18	4.92	-0.26	Low												
TP10 0.5-0.7	M0509/20	Coarse	15.7	0.19	4.92	4.32	-0.60	Low												
TP10 1.0-1.2	M0509/21	Coarse	5.4	0.06	5.08	5.08	0.00	Low												
TP12 0.5-0.7 TP12 1.0-1.2	M0509/22 M0509/23	Coarse Coarse	9.8 16.7	0.11 0.20	4.90 5.38	4.64 4.87	-0.26 -0.51	Low Low												
TP12 1.0-1.2 TP12 1.5-1.7	M0509/23 M0509/24	Coarse	10.7	0.20	5.67	4.67	-0.51	Low												
TP13 0.5-0.7	M0509/25	Coarse	4.4	0.05	5.37	4.71	-0.66	Low												
TP14 0.5-0.7	M0509/26	Coarse	15.6	0.03	5.65	5.08	-0.57	Low												
TP14 1.0-1.2	M0509/27	Coarse	18.0	0.22	5.82	5.11	-0.71	Low												-
TP14 1.5-1.7	M0509/28	Coarse	17.9	0.22	5.58	4.71	-0.87	Low	0.002	1	< 0.005	0	5.30	10					10	1
TP15 0.5-0.7	M0509/29	Coarse	18.7	0.23	4.55	2.90	-1.65	Low												
TP15 1.0-1.2	M0509/30	Coarse	35.2	0.54	4.38	2.54	-1.84	Low												
TP15 1.5-1.7	M0509/31	Coarse	19.9	0.25	4.60	3.10	-1.50	Low												
TP15 2.0-2.2	M0509/32	Coarse	24.2	0.32	4.69	2.25	-2.44	Low												
TP16 0.5-0.7	M0509/33	Coarse	8.7	0.09	5.41	4.27	-1.14	Low												
TP16 1.0-1.2	M0509/34	Coarse	15.9	0.19	5.33	3.90	-1.43	Low												
TP16 1.5-1.7	M0509/35	Coarse	18.5	0.23	5.35	3.48	-1.87	Low												
TP16 2.0-2.2	M0509/36	Coarse	18.7	0.23	5.15	4.11	-1.04	Low												
TP17 0.5-0.7	M0509/37	Coarse	14.9	0.18	5.75	4.60	-1.15	Low												
TP17 1.0-1.2	M0509/38	Coarse	17.0	0.20	5.86	4.70	-1.16	Low												
TP17 1.5-1.7	M0509/39 M0509/40	Coarse Coarse	12.7 13.8	0.15 0.16	5.72 6.12	4.86 5.10	-0.86 -1.02	Low Low												
TP18 0.5-0.7 TP18 1.0-1.2	M0509/40 M0509/41	Coarse	13.8	0.16	6.02	5.10 4.30	-1.02	Low												
TP18 1.0-1.2 TP18 1.5-1.7	M0509/41 M0509/42	Coarse	10.5	0.19	6.02	4.30 5.00	-1.73	Low												
TP18 2.0-2.2	M0509/42	Coarse	16.8	0.12	5.86	2.90	-2.96	Medium	0.002	1	< 0.005	0	5.70	5					5	0
TP1 1.0-1.2	M0509/44	Coarse	20.6	0.26	5.82	2.10	-3.72	Low		1	5.000	, i							, , , , , , , , , , , , , , , , , , ,	, .
TP5 1.5-1.7	M0509/45	Coarse	19.3	0.24	5.17	1.47	-3.70	High	0.012	8	0.030	19	5.17	43					62	5
TP4 2.0-2.2	M0509/46	Coarse	17.4	0.21	5.99	3.29	-2.70	Medium	0.003	2	< 0.005	0	6.03	3					3	ō
TP4 1.0-1.2	M0509/47	Coarse	18.1	0.22	5.82	4.27	-1.55	Medium	0.002	1	< 0.005	0	6.05	4					4	0
TP3 1.5-1.7	M0509/48	Coarse	18.8	0.23	5.40	1.82	-3.58	Medium	0.003	2	0.008	5	5.53	23					28	2
TP6 1.5-1.7	M0509/49	Coarse	19.7	0.25	4.04	1.52	-2.52	Low												
TP6 1.0-1.2	M0509/50	Coarse	19.2	0.24	4.72	1.52	-3.21	Low												
TP2 1.0-1.2	M0509/51	Coarse	18.2	0.22	5.09	2.57	-2.52	Low												
TP8 2.0-2.2	M0509/52	Coarse	12.7	0.15	6.06	3.37	-2.69	Low												
BH1 77.07	M0509/53 M0509/54	Coarse	20.1	0.25	4.85	2.28	-2.57	Medium Medium	0.006	4	0.015	9	4.28	158	0.005	2			170 130	13
BH1 5.5-5.6	M0509/54 M0509/55	Coarse Coarse	18.3 22.1	0.22	5.07 5.11	2.94 3.72	-2.13 -1.39	Medium	0.005	3	0.014	-	4.67	121					130	10 4
BH1 4.0-4.45	M0509/55 M0509/56			0.28		3.72	-1.39	Low	0.003		0.013	8	5.07	40					48	4
BH1 13.0-13.45 BH3 8.5-8.95	M0509/56 M0509/57	Coarse Coarse	16.3 20.9	0.20	5.79 5.61	4.16	-1.63	Low												
BH3 11.5-11.95	M0509/58	Coarse	20.9	0.20	6.47	2.10	-4.37	Medium	0.005	3	0.041	25	6.01							3
BH3 5.5-5.95	M0509/59	Coarse	20.9	0.26	5.95	2.75	-3.20	Volcanic	0.007	5	0.160	100	5.70	7				1	107	8
BH3 7.0-7.45	M0509/60	Coarse	20.9	0.26	5.03	2.72	-2.31	Extreme	0.007	5	0.082	51	5.83	7					59	4

NOTES:

All analysis is reported on a dry weight (DW) basis, unless wet weight (WW) is specified.

2. Samples are dried and ground immediately upon arrival (unless supplied dried and ground). 3. Analytical procedures are sourced from Sullivan L, Ward N, Toppler N and Lancaster G. 2018. National acid sulfate soils guidance: national acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT. CC BY 4.0.

4. The Acid Base Accounting Equation, where Acid Neutralising Capacity has not been corroborated by other data, is Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity + Retained Acidity (Eq. 3.2; Sullivan et al. 2018 - full reference above). 5. The Acid Base Accounting Equation for post-limed soil materials is Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - (post treatment Acid Neutralising Capacity - initial Acid Neutralising Capacity) (Eq. 3.3; Sullivan et al. 2018 - full reference above).

While the Acid Neutralising Capacity of a soil material may not be included in the Net Acidity calculation (Note 4), it must be measured to give an Initial Acid Neutralising Capacity if verification testing is planned post-liming. The Initial Acid Neutralising Capacity must be provided by the client to enable EAL to produce Verification Net Acidity and Liming calculations for post-limed soil materials.

6. The Acid Base Accounting Equation, where Acid Neutralising Capacity has been corroborated by other data, is Net Acidity = Potential Acidity + Actual Acidity + Retained Acidity - Acid Neutralising Capacity (Eq. 3.1; Sullivan et al. 2018 - full reference above). 7. The lime calculation includes a Safety Factor of 1.5 as a safety margin for acid neutralisation (Sullivan et al. 2018). This is only applied to positive values. An increased Safety Factor may be required in some cases.

8. Retained Acidity is required when the pHKCl < 4.5 or where jarosite has been visually observed.

9. A negative Net Acidity result indicates an excess acid neutralising capacity.

10. If insufficient mixing occurs during intial sampling, or during post-liming, or both: the Potential Sulfidic Acidity may be greater in the post-limed sample than in the intial sample; the post-liming Acid Neutralising Capacity may be lower in the post-limed sample than in the intial sample; 11. An acid sulfate soil management plan is triggered by Net Acidity results greater than the texture dependent criterion: coarse texture > 0.03% S or 18 mol H+/r; medium texture > 0.0% S or 36 mol H+/r; fine texture > 0.1% S or 62 mol H+/r) (Table 1.1; Sullivan et al. 2018 - full reference above)

12. For projects that disturb > 1000 t of soil material, the coarse trigger of ≥ 0.03% S or ≥ 18 mol H+/t must be applied in accordance with Sullivan et al. (2018) (full reference above).

13. Acid sulfate soil texture triggers can be related to NCST (2009) textures: coarse and peats = sands to loamy sands; medium = clayey sand to light clays; fine = light medium to heavy clays (Sullivan et al. 2018 - full reference above).

14. Bulk density is required to convert liming rates to soil volume based results. Field bulk density rings can be submitted to EAL for bulk density determined to EAL for bulk density determined by the source of the source of

15. A negative Net Acidity result indicates an excess acid neutralising capacity.

16. 😳 is reported where a test is either not requested or not required. Where pHKCl is < 4.5 or > 6.5, zero is reported for SNAS and ANC in Net Acidity calculations, respectively

17. Results refer to samples as received at the laboratory. This report is not to be reproduced except in full.

** NATA accreditation does not cover the performance of this service
 Analysis conducted between sample arrival date and reporting date.

20. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer SCU.edu.au/eal/t&cs or on request).

Results relate to the samples tested.
 This report was issued on 02/09/2021.





RESULTS OF SOIL ANALYSIS

60(3) samples supplied by Regional Geotechnical Solutions Pty Ltd on 20/08/2021 - Lab Job No. M0509 Analysis requested by Matt Rowbotham. - **Your Project: RGS21813.1**

1/21 Cook Drive COFFS HARBOUR NSW 2450

		Sample 1	Sample 2	Sample 3
	Method	TP1 1.5-1.7	BH1 5.5-5.6	BH3 7.0-7.45
	EAL job No.	M0509/2	M0509/54	M0509/60
Moisture (%) Texture pH Conductivity (dS/m) Resistivity (ohm.mm) Resistivity (ohm.cm)	inhouse See note 2 below. Rayment & Lyons 2011 - 4A1 (1:5 Water) Rayment & Lyons 2011 - 3A1 (1:5 Water) ** Calculation ** Calculation (ohm.mm / 10)	16 COARSE 4.96 0.022 448,029 44,803	17 MEDIUM 5.16 0.087 115,141 11,514	21 COARSE 5.46 0.068 146,908 14,691
Chloride (mg/kg) Chloride (as %) Sulfate (mg/kg) Sulfate (as % SO4)	** Water Extract - ISE (1:5 Water) ** Calculation ** Water Extract-APHA 3120 ICPOES ** Calculation	30.3 0.003 57 0.006	32.9 0.003 83 0.008	33.7 0.003 160 0.016
Chloride / Sulfate Ratio	** Calculation	0.5	0.4	0.2

Notes:

1. ppm = mg/kg dried soil

2. For Texture: coarse = sands to loamy sands; medium = sandy loams to light clays; fine = medium to heavy clays and silty clays

3. All results as dry weight DW - soils were dried at 60°C for 48hrs prior to crushing and analysis.

4. For conductivity 1 dS/m = 1 mS/cm = 1000 µS/cm

5. Methods from Rayment and Lyons, 2011. Soil Chemical Methods - Australasia.CSIRO Publishing: Collingwood.

6. Based on Australian Standard AS: 2159-2009

7. Methods from Ahern, CR, McElnea AE, Sullivan LA (2004). Acid Sulfate Soils Laboratory Methods Guidelines . QLD DNRME.

8. Analysis conducted between sample arrival date and reporting date.

9. ** NATA accreditation does not cover the performance of this service.

10. .. Denotes not requested.

11. This report is not to be reproduced except in full.

12. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions (refer scu.edu.au/eal or on request).

13. Results relate only to the samples tested.

14. This report was issued on 27/8/2021.



Environmental Analysis Laboratory, Southern Cross University, Tel. 02 6620 3678, website: scu.edu.au/eal checked: Graham Lancaster Laboratory Manager