Lands Advisory Services Pty Ltd

Proposed Caravan Park

Lot 2 DP 1015609 (288) Mungo Brush Road Hawks Nest

Geotechnical Assessment

Report No. RGS50057.1 – AB Rev.1

16 June 2023

REGIONAL GEOTECHNICAL SOLUTIONS

REGIONAL GEOTECHNICAL SOLUTIONS

Manning-Great Lakes
Port Macquarie
Coffs Harbour

RGS50057.1 – AB Rev.1

16 June 2023

Lands Advisory Services Pty Ltd
PO Box 2317
DANGAR NSW 2309

Attention: Brett Phillips

Dear Brett,

RE: Proposed Caravan Park – Lot 2 DP 1015609 (288) Mungo Brush Road Hawks Nest
Geotechnical Assessment

Regional Geotechnical Solutions Pty Ltd (RGS) has completed geotechnical investigations and assessment for the proposed caravan park to be constructed at Lot 2 DP 1015609 (288) Mungo Brush Road Hawks Nest.

The development will involve multiple caravan sites, internal roads, a sewer pump station, and infiltration basins. It is understood that the development will comprise minor earthworks with the natural topography utilised for stormwater detention.

Presented herein are comments and recommendations regarding site and subsurface conditions, groundwater conditions, preliminary site classification, preliminary pavement design, earth retention, and soil aggressivity.

A preliminary site contamination assessment was also undertaken for the project with results presented in report RGS50057.1 – AC dated 21 March 2023.

If you have any questions regarding this report, please contact the undersigned.

For and on behalf of **Regional Geotechnical Solutions Pty Ltd**

Prepared by

Louis Davison

Senior Geotechnical Engineer

Reviewed by

Adam Holzhauser

Principal Geotechnical Engineer

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1 INTRODUCTION

This report presents the results of the preliminary geotechnical assessment undertaken by Regional Geotechnical Solutions Pty Ltd (RGS) at the site of a proposed caravan park to be constructed at Lot 2 DP 1015609 (288) Mungo Brush Road Hawks Nest.

The purpose of the work as presented herein was to provide:

- Subsurface profile, including the presence of fill and the depth to groundwater (if encountered);
- Presence of Acid Sulfate Soils and the need for an ASS Management plan;
- Soil aggressivity;
- Groundwater observations;
- Comments on dewatering requirements;
- Site classification for future building footing design in accordance with AS2870-2011; and
- Preliminary pavement thickness design.

2 PROPOSED DEVELOPMENT

The development will involve multiple caravan sites, internal roads, and biofiltration and primary and secondary infiltration areas. It is understood that the natural topography is to be utilised for the infiltration and detention systems and minor earthworks of less than 1m are expected to be required to achieve finished levels.

Diagram 1: *Proposed caravan park layout.*

3 METHODOLOGY

Field work involved a site walkover assessment and intrusive investigations. The site walkover involved the mapping of relevant site surface features, measurement of slope angles and assessment of the topographic setting.

Intrusive investigations included:

- The excavation of fifteen boreholes with a truck mounted and 4WD ute mounted drill rig to depths of up to 7.5m Standard Penetrometer Tests (SPTs) were undertaken at 1.5m intervals to assist in assessing the strength of the materials;
- Falling head permeability testing; and
- Collection of samples from the boreholes, and at various locations around the site for laboratory analysis.

The investigation was completed by a Senior Geotechnical Engineer from RGS. Engineering logs are presented in Appendix A. Figure 1 provides a plan of the site, illustrating the borehole and sample locations.

4 LABORATORY TESTING

Samples collected during the field work were sent to a NATA registered laboratory where the following testing was undertaken:

- 91 Acid Sulfate Soil field screening tests;
- 16 Acid sulfate soil CRS test suites;
- 3 no. four day soak CRB tests for pavement thickness design; and
- 3 no. soil aggressivity suites for durability.

The results of the laboratory testing are presented and discussed in the relevant sections of this report. A copy of the geotechnical laboratory test results sheets is provided in Appendix B.

5 SITE CONDITIONS

5.1 Surface Conditions

Topography the site is situated within a near coastal area of Hawks Nest located between Wanderrabah Beach and Myall River. The site occupies an area of approximately 20ha. The proposed caravan park is to encompass approximately 15ha of the site.

The site is densely vegetated with brushland ranging from small regrowth trees to tall mature trees.

A gravel track has been constructed through the site that extends from the entrance off Mungo Brush Road to a large brick shed structure situated near the southeast extent of the caravan park footprint. There is a smaller shed located near the southern boundary of the site that is outside the caravan park footprint.

The site layout is illustrated in the satellite image below.

General site photographs are provided in Plate 1.

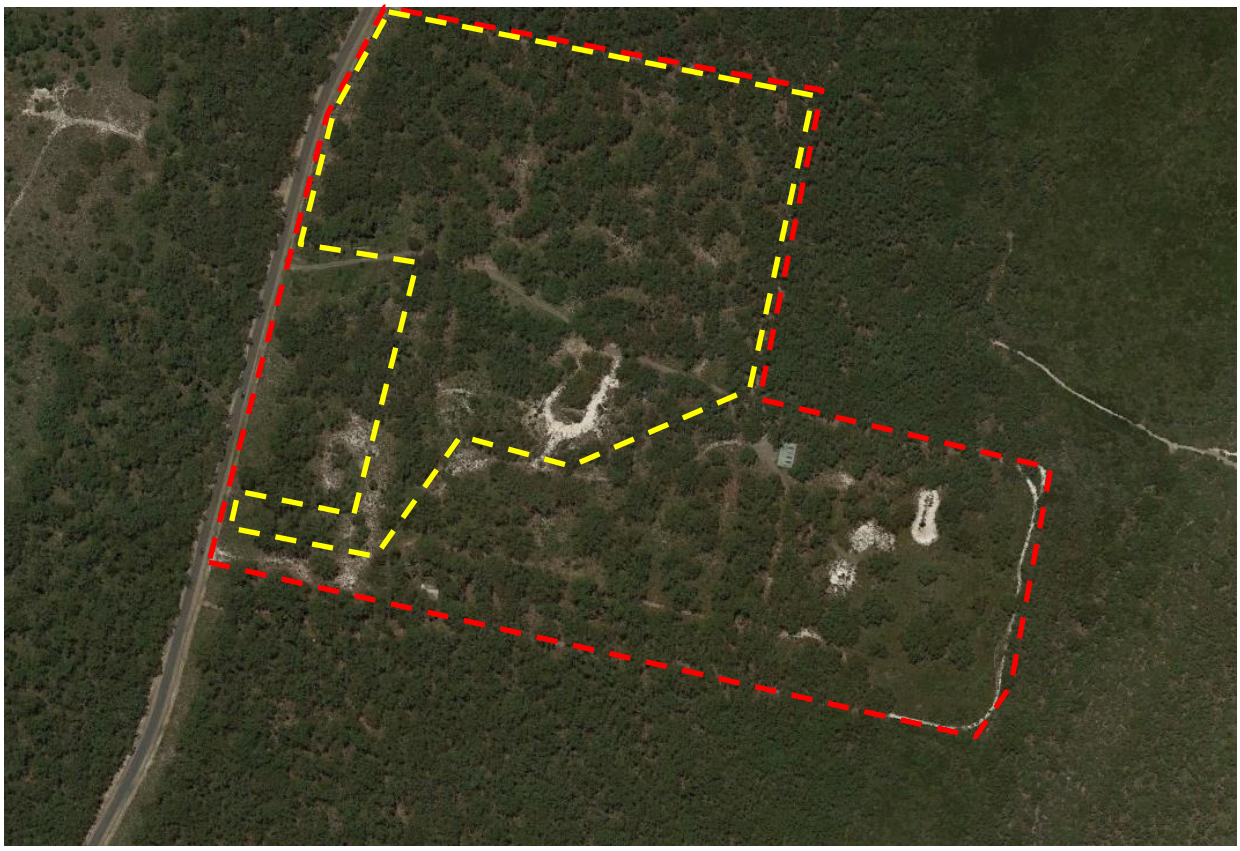


Diagram 2: *Satellite photograph obtained from Google Earth that illustrates the site location and setting. The approximate site boundaries are outlined red, the approximate caravan park footprint is outlined yellow.*

Plate 1: General Site Photographs

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>1. Gravel access track that extends from the entrance off Mungo Brush Road into the site.</td><td>2. Brick shed structure located near the southeast extent of the caravan park footprint.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>3. Shed located outside the caravan park footprint.</td><td>4. Low brick wall located near the centre of the site.</td></tr>
</table>

5.2 SUBSURFACE CONDITIONS

The NSW Seamless Geology Map indicates that the site is underlain by the coastal deposits that comprises fine to coarse grained quartz-lithic-carbonate sand (marine-deposited), shells, and gravel.

A summary of the conditions encountered is provided below with detailed descriptions provided on the Engineering logs presented in Appendix A.

Fill: SAND, fine to medium grained, with some gravel, fine to medium grained (BH4 only);

Topsoil: SAND, fine to medium grained with rootlets, to depths of up to 0.2m; overlying

Aeolian Soils: SAND, fine to medium grained, with some areas of fine to coarse grained sand, medium dense to at least the termination of the boreholes at 7.5m.

Generally, the boreholes were extended to a depth of 4m (1m below the proposed bulk earthworks cut depth). BH3.2 was extended to a depth of 7.5m to assess the depth to groundwater.

Groundwater was encountered in BH3.2 only at a depth of 6.5m groundwater is expected to be at a similar level across the site. Groundwater levels do fluctuate due to inclement weather, seasonal variations, tidally or due to reasons that may not have been apparent at the time of the site investigation.

6 GEOTECHNICAL CONSTRAINTS AND CONSIDERATION

The subsurface profile is generally consistent comprising topsoil overlying deep aeolian sands that are likely underlain by marine sands. Previous investigations in the area indicate the sand profile extends to depths of at least 14m.

Groundwater was encountered at a depth of 6.5m which is well below the proposed bulk earthworks cut depths. In consideration of the beach to the east and Myall River to the west the groundwater table is likely to rise to near surface levels over times of heavy rainfall, however, the profile is likely to drain quickly due to the high permeability of the sand profile.

The dense vegetation across the site was positive for site trafficability. Clearing of the site is likely to produce a loose upper profile which may be untrafficable. The use of construction platforms comprising durable crushed rock or recycled concrete may be required during construction, particularly in high traffic areas such as site access points and site compounds.

Careful attention will need to be given to the maintenance of appropriate cross falls during and following site works to promote surface drainage. The surface of any exposed subgrade or fill layers should be sealed with a smooth drum roller at the end of each day's work to reduce the potential for moisture ingress.

7 DESIGN AND CONSTRUCTION REQUIREMENTS

7.1 General Site Preparation and Site Drainage

Site preparations will generally require the removal of the vegetation including the root structure and the stripping of all topsoil, root affected and otherwise unsuitable material. Any deleterious or obviously contaminated materials should also be stripped and disposed of appropriately. These materials should be stockpiled on site where appropriate for later reuse in landscaping areas only or disposed of offsite. These materials are not considered suitable for reuse as engineered fill.

During site stripping it will be important to maintain suitable cross falls were possible to promote surface drainage. It will also be important not to create low points to reduce the potential for water to pond.

Drainage swales, diversion mounds and silt fencing should be installed around the perimeter to reduce sediment runoff.

Site trafficability will likely be poor following clearing of vegetation the site trafficability may become an issue particularly following rainfall. Construction platforms comprising durable crushed rock or recycled concrete are recommended in high traffic areas such as site access points, haul roads and site compounds.

Where offsite disposal of material, or reuse of material at an alternative site is proposed it should be assessed in accordance with the requirements of the '*Department of Environment and Climate Change NSW Waste Classification* Guidelines *Part 1 Classifying Waste*'(July 2009) and / or the EPA Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014. Any material classified as acid sulfate soils would need to be treated and disposed of at a licenced landfill site. For all other material as a preliminary guide based on the site contamination testing undertaken, the aeolian profile is likely to be classified as Virgin Excavated Natural Material. The fill encountered throughout the site would likely be classified as Excavated Natural Material, however further testing may be required to classify this when quantities are known.

7.2 Subgrade Preparation, Fill Placement and Compaction Control

The initial stages of site filling will be critical with particular care and attention required during subgrade preparation and placement of the initial fill layers. The use of heavy plant and compaction using vibratory methods will result in an increase in pore water pressures and subsequent 'pumping' of moisture into the lower fill layers. This will likely result in significant deflection and heave and make it very difficult to achieve adequate compaction.

The proposed cut fill earthworks are understood to fulfill the filling requires across the site. If imported fill is required the use of cohesive (clay) fill is not recommended in pavement and building areas.

The following general comments and recommendations are provided as a guide to site earthworks:

- All vegetation root affected material, topsoil, over wet material and any uncontrolled fill or otherwise unsuitable material should be stripped and stockpiled for later reuse for landscaping purposes. These materials are not considered suitable for reuse as engineered fill.
- Following striping to an appropriate foundation level, the exposed subgrade material should be proof rolled to identify any wet, excessively deflecting or otherwise deleterious material. Any such areas will require over excavation to a sound base and replacement with a similar to existing material (clean sand).
- The fill layers should comprise site won sand placed and compacted in a manner that

achieves the required compaction without excessive compactive effort. A method Spec should be developed for the site to assess the most appropriate means of achieving compaction. The use of vibration and heavy plant should be avoided within the lower fill layers. The use of bridging layers may need to be considered over some areas of the site and should be allowed for during the planning phase.

- Fill should be placed in layers not exceeding 300mm loose thickness and be compacted to a minimum dry density ratio of not less than 95% Standard Compaction (70% density index for cohesionless soils). Fill should be placed at ±2% standard OMC.
- Filling below proposed structures should be carried out in accordance with Level 1 construction monitoring and testing as defined in AS3798 – 2007. If the fill is not placed in accordance with Level 1 requirements all footings would need to be extended to found within the underlying natural materials.
- Filling below pavements should be carried out in accordance with Level 2 construction monitoring and testing as defined in AS3798 – 2007.

7.3 Fill Materials

Materials recommended for use as engineered fill include good quality well graded granular materials such as crushed or ripped rock, free of deleterious materials and having a maximum particle size of 200mm. Site won aeolian sand would also be appropriate.

The use of clay soils is not recommended and will likely entail more rigorous earthwork monitoring and compaction control, more time drying out the soils, increased potential of delays due to inclement weather and as such greater eventual cost to earthworks. Further, the use of reactive clay soils will result in higher foundation costs due to the higher shrink-swell potential and subsequent increase in characteristic free surface movement (y_s) values.

7.4 Retention

Given the site geometry and anticipated fill depths of up to about 2.5m, permanent batters are likely to fulfil the requirements fill retention.

Temporary batters through the existing soils and engineered fill may be cut no steeper than 2H:1V for heights up to 3m.

Temporary batters should be protected from rainfall by trimming smooth at the end of each days work. Surface runoff from above should be collected and diverted away from the face of the batters.

Permanent fill batter slopes within the existing soils and engineered fill should be cut no steeper than 3H:1V for heights up to 3m and should be protected against erosion by rapidly establishing vegetation. Flatter batters of say 4H:1V would allow for ease of maintenance (mowing).

Trench excavations up to 0.6m depth may stand vertical for short durations while the services are laid and backfilled. Trenches should only be excavated in short sections that enable backfilling within several hours of opening. Entry into unsupported excavations should be avoided. All surcharge loads, such as traffic, stockpiles, equipment should be kept at least 1.5 times the depth of the excavation from the edge of the exaction.

Excavation work should be undertaken in accordance with the Safe Work Australia '*Excavation Code of Practice (January 2020)*'.

Retaining Walls

Permanent retaining walls may be required over some parts of the site. It is anticipated that retaining walls will extend to maximum heights of up to about 2.5m. Conventional gravity retaining walls, such as reinforced concrete filled block walls, segmental stacked block walls or cantilevered retaining walls would be feasible for permanent support of cuts and fill.

Gravity or cantilever retaining walls should be designed based on a triangular lateral earth pressure distribution using the parameters provided in Table 1. The parameters were based on previous experience and published literature on materials with similar engineering properties.

Table 1: Retaining Wall Design Parameters

Material Type	Material Unit Weight, γ (kN/m3)	Effective Friction Angle, Ø'	Effective Cohesion, C' (kPa)	Active Earth Coefficient, Ka	At Rest Earth Coefficient, K0	Passive Earth Coefficient, Ka
Aeolian Sand	20	30	0	0.33	0.5	3
Fill (Sand)	20	30	0	0.33	0.5	3

The earth pressure coefficients detailed in Table 1 have been calculated using Rankine's Theory assuming level backfill. The retaining wall designer should ensure that the use of this method is appropriate for the individual retaining wall.

Retaining walls should be constructed in accordance with the following:

- All retaining elements should be uniformly founded within natural soils or controlled fill below any uncontrolled fill or topsoil. Walls founded on the medium dense aeolian sand could be designed based on an allowable bearing capacity of 100kPa;
- Any surcharge affecting the walls (e.g. traffic loads, adjacent footings, retaining walls or inclined slopes, or construction loads or stockpiles) should be allowed for in the design; and
- Even with appropriate drainage as described below it is recommended that an allowance for potential water pressure build-up equivalent to one third the wall height be made in the design.

The wall backfill should comprise free draining granular material such as 20mm drainage gravel. Subsoil drains should comprise a geocomposite drain or geotextile (Bidim A34 or similar) wrapped

gravel drain at the toe of the back of the wall. The drains should discharge to the stormwater system. Where appropriate flushing points should be incorporated into the design.

7.5 Subsurface Infiltration Rate

In-situ falling head permeability testing was undertaken at two locations near BH13. The testing indicates an average hydraulic conductivity (k) of between 5.56 x 10^{-3} to 1.11 x 10^{-3} m/s. These results are in the range of a typical clean sand.

8 FOUNDATIONS

8.1 Preliminary Site Classification

As the site is proposed to be regraded by cuts and filling in the order of 3m, the site classification and bearing capacity for shallow foundations will be dependent on type of fill material used and whether fill is placed under Level 1 supervision and testing as per AS3798-2007. If approved fill is placed under Level 1 supervision and testing, the site can be further assessed for site classification and suitability of the fill for the support of high-level footings.

AS2870-2011, '*Residential Slabs and Footings*', sets out criteria for the classification of a site and the design and construction of a footing system for a single dwelling house, townhouse or a similar structure. The standard can also be used for other forms of construction, including some light industrial, commercial and institutional buildings if they are similar in size, loading and performance expectation to a typical domestic structure.

In its current condition, the site is classified as **Class 'A'** in accordance with AS2870-2011, footings should be designed based with an allowance for settlement of up to 10mm.

If site won sand is reused as engineered fill the site would likely be reclassified as Class A.

This classification is based on site conditions at the time of the assessment. Changes to the existing profile and/or placement of trees near the proposed footprint can have significant impacts on shrink / swell related ground surface movements and subsequently the site classification. Any fill should comprise non-reactive materials such as sands and gravel. The use of clay soils will result in shrink / swell related movements.

8.2 Foundation Options

<u>Shallow Footings</u>

Shallow footings comprising isolated pad and / or strip footings supporting line or column loads or a stiffened raft slab could be feasible for the support of the structure.

Shallow footings founded within the natural aeolian sand of at least medium dense strength or fill placed under Level 1 monitoring can be designed based on an allowable bearing pressure of 100kPa

Piles

Piles may be adopted to support the proposed structure. Several pile types could be utilised for the proposed structure depending on constraints such as allowable vibration levels during construction and Council approvals.

Based on the vicinity of nearby structures driven piles would not be recommended due of vibration during installation which will affect buildings on the neighbouring site to the south.

Open bored piles or Grout Injected/Continuous Flight Auger (CFA) piles would be considered appropriate. Due to potential for cave in of the sand profile an allowance of temporary or permanent casing should be made.

Piles founded at a depth of at least 4.5 pile diameters could be designed based on an allowable bearing capacity of 660kPa.

9 PREMILINARY PAVEMENT DESIGN

9.1 Design Traffic

RGS has not been provided with a design traffic or expected traffic counts for the proposed caravan park. Based on the supplied drawings (Ref. Tattersall Lander 2220002), the caravan park is proposed to comprise 342 lots. It has been assumed the park will be at an average of 70% capacity over a yearly basis, accessed generally by light vehicles (Class 1) and light vehicles towing a trailer or caravan (Class 2), and the park is accessed by one heavy vehicle (Class 4) such as a garage truck per week. Based on this approximately 87,700 vehicle movements per year is assumed.

Based on the above the following parameters have been adopted for the assessment:

- AADT count of 240;
- 1% heavy vehicles;
- Directional factor of 1.0;
- A 2% annual growth rate;
- A design life of 40 years;
- 2.0 Heavy Vehicle Axle Groups (HVAG) per Heavy Vehicle; and
- 0.9 Equivalent Standard Axles (ESA) per HVAG.

Based on the above, design traffic of 1.1 x 10^5 ESA has been adopted for the assessment.

If design traffic loadings are different to those indicated above or if specific traffic data is obtained, then further assessment and pavement design revisions should be made.

9.2 Subgrade

The site is underlain by aeolian sand. The proposed internal roads subgrade will comprise natural aeolian sand or aeolian sand placed as fill. Laboratory four day soak CBR testing was undertaken on representative samples of the subgrade materials. The test results indicate that the aeolian sand has a four day soaked CBR of between 11% and 18% with a swell in the CBR mould of 0.5%.

Based on the above, a design CBR of 10% has be adopted for the pavement design.

9.3 Pavement Thickness Design

The pavement thickness design presented herein has been prepared in accordance with Austroads '*Guide to Pavement Technology Part 2: Pavement Structural Design*' (2017).

The recommended pavement thickness design is presented in Appendix C and a summary is presented below.

Table 2: Summary of Recommended Pavement Thickness Design

Pavement Layer	Thickness
Wearing Course	Two Coat Seal
Base	100mm DGB20
Subbase	100mm DGS40
Total Thickness	*200mm*

9.4 Pavement Construction & Drainage

Construction recommendations for specific pavement design are included in the appended Pavement Thickness Design Sheets. The following points are also provided to assist with construction methodology:

- Following excavation to design subgrade level the subgrade should be proof rolled to identify any soft, heaving or deleterious materials. Where identified, such materials should be either reworked, over-excavated by at least 300mm and replaced with approved granular fill, or be assessed for the need for a rock bridging layer;
- Where new construction joins onto existing pavements the existing pavement layers should be benched to avoid a vertical joint extending through the pavements at the interface. Pavement seals must extend at least 0.3m over the existing seal;
- Pavement gravels should be placed and maintained at 60% to 90% of Optimum Moisture Content. Should wet weather occur prior to final sealing, the base course should be allowed to dry back to not more than 90% of Optimum Moisture Content prior to sealing. Trapping of excess moisture below the final seal will significantly reduce pavement life;

- Table drains should be constructed or maintained on both sides of the pavement that extend to at least the full depth of the pavement and pavement layers should extend to the edges of formation to allow lateral drainage. Where pavement geometry and surrounding ground does not allow the construction of a table drain, a sump should be provided at the outer edge of the shoulder, with geofabric wrapped subsoil drain installed, draining along the edge of the pavement to discharge to a culvert or other suitable outlet;
- Traffic should be prevented from travelling on partially completed pavement sections;
- Where final sealing cannot be undertaken within a few days of completion of the base course, a primer seal should be used to protect the pavement and maintain equilibrium moisture content. Traffic should not be allowed on a primer seal for more than a few days prior to final sealing; and
- Where a two coat seal is adopted, sealing should be avoided during winter months or at times when pavement temperatures of less than 15° are likely, due to the potential for microcracking of the pavement surface, which can lead to water ingress, pumping of fines, and flushing or embedment of aggregate within wheel paths within a very short time frame. If sealing during winter or cold weather is required, consideration should be given to placing a 7mm primer seal that can remain in place for several weeks, with placement of the two-coat seal then able to be undertaken at a time when the pavement can be dried to remove excess moisture from the upper part of the base course and the microcracking in the primer can be sealed over.

10 ACID SULFATE SOIL ASSESSMENT

10.1 Formation of Acid Sulfate Soils

Acid Sulfate Soils (ASS) contain significant concentrations of pyrite which, when exposed to oxygen, in the presence of sufficient moisture, oxidises, resulting in the generation of sulfuric acid. Unoxidised pyritic soils are referred to as potential ASS (PASS). When the soils are exposed, the oxidation of pyrite occurs and sulfuric acids are generated, the soils are said to be actual ASS (AASS).

10.2 ASS Risk Maps

The Acid Sulfate Soil Risk Mapping of the Hawks Nest area indicates the site to be in an area of low risk of acid sulphate soils greater than 3m below the ground surface (L4). An extract of the map is reproduced below in Diagram 3.

Diagram 3: *Acid Sulfate Soils Risk map of the Hawks Nest are reproduced with NSW Government website "Espade v2.2" the caravan park footprint is outlined red.*

10.3 Laboratory Testing

Samples collected from the boreholes were transported to a NATA registered laboratory for analysis. ASS screening tests were undertaken on 91 samples. The findings from the screening tests are discussed below.

- The samples revealed pH_F values between 4.74 and 8.77 in distilled water. pH_F less than 4 is an indicator of Actual ASS;
- The samples revealed pH_{FOX} values between 2.52 and 5.85 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 all samples tested. A pH change of more than 1 unit is an indicator of PASS.

To provide a more comprehensive assessment, sixteen (16) samples were submitted for Chromium Reducible Sulphur (CRS) analysis. A summary of the test results is presented in Table 3.

Table 3: Summary of ASS CRS Test Results

Test location	Depth (m)	Texture	Action Criteria[1] (mol H^+ / t)	Actual Acidity – TAA (mol H^+ / t)	Potential Sulfidic Acidity – CRS (mol H^+ / t)	KCL-Extractable Sulfur (mol H+/t)	Net Acidity (mol H^+ / t)
BH1	0.4 - 0.5	Coarse	18	2	0	1	2
BH1	3.9 – 4.0	Coarse	18	3	0	1	3
BH2	1.9 – 2.0	Coarse	18	4	0	0	4
BH3.2	3.9 – 4.0	Coarse	18	3	0	1	3
BH4	0.4 – 0.5	Medium	18	0	**32**	3	**32**
BH4	0.9 – 1.0	Medium	18	0	**40**	1	**40**
BH4	1.4 to 1.5	Coarse	18	2	0	0	2
BH4	1.9 – 2.0	Coarse	18	7	12	<1	**19**
BH4	2.4 – 2.5	Medium	18	3	7	1	10
BH4	3.4 – 3.5	Coarse	18	0	3	1	3
BH5	1.9 – 2.0	Coarse	18	3	0	0	3
BH6	1.9 – 2.0	Coarse	18	3	0	0	3
BH6	2.9 – 3.0	Coarse	18	3	0	1	3
BH7	0.4 – 0.5	Coarse	18	9	0	1	9
BH7	1.9 – 2.0	Coarse	18	3	0	1	3
BH8	3.9 – 4.0	Coarse	18	3	0	1	3
BH14	0.4 – 0.5	Coarse	18	4	0	2	4
BH15	0.4 – 0.5	Coarse	18	4	0	1	4

NOTE:

1. *Action criteria is based on greater than 1000 tonnes of soil being disturbed*
2. *Lime calculation includes a factor of safety of 1.5*
3. *Values in **Bold** exceed the action criteria.*

10.4 Analysis of ASS Results

The results of the analysis were compared against the action criteria as presented in Table 5.4 of the Water Quality Australia *National Acid Sulfate Soils Sampling and Identification Methods Manual (NASSIMM) June 2018.*

The laboratory test results indicated:

- The net acidity in all samples tested excluding samples from BH4 at depths of 0.4 – 0.5, 0.9 – 1.0, and 1.9 – 2.0 were below the adopted action criteria. These materials are therefore not considered to be either actual or potential ASS; and
- The net acidity within samples from BH4 at depths of 0.4 – 0.5, 0.9 – 1.0, and 1.9 – 2.0 exceed the action criteria of 18mol H+/t. Potential acidity (CRS) of 32 to 40 mol H+/t , was recorded. This material would therefore be considered PASS.

Based on the depth of the samples from BH4 (up to 2m) and the depth of the groundwater table (6.5m) any PASS should have been oxidated producing actual acid sulfate soils. In consideration of this the soils that have been detected as PASS may be attributed to imported fill such as dredged spoil from the nearby historical sand mining works. It is understood that no sand mining works occurred within the site boundaries, however, there was sand mining to the east and west of the site. With reference to a historical aerial image from 1973 there is evidence of some potential sand mining spoil on the site in the vicinity of BH4, however, the photograph is not clear and the area could also have been a cleared portion of the site. The historical image is reproduced below.

Diagram 3: Historical image from 1973, the approximate site boundaries are outlined red, the approximate location of BH4 is outlined blue.

10.5 Conclusions Regarding Acid Sulfate Soils

Based on the preliminary assessment actual ASS or PASS was not detected in the samples obtained from all proposed deep excavation areas excluding the area of BH4.

The area around BH4 comprises material considered to be PASS at a depth of up to 2m below existing surface level. As such, if excavations are proposed in this area an acid sulfate soil management plan will be required for the site. It is recommended to undertake further assessment in this area to assess the extent of the PASS.

Where possible following treatment it is recommended to reuse the material onsite. Any treated PASS that is to be disposal of offsite would be required to be disposed of at a licenced landfill facility, based on the results of the site contamination assessment the soil would likely be classified as general solid waste following acid sulfate treatment, however, further waste classification testing may be required.

11 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 assessment, or require any additional consultations, please contact the undersigned.

For and on behalf of **Regional Geotechnical Solutions Pty Ltd**

Prepared by

Louis Davison

Senior Geotechnical Engineer

Reviewed by

Adam Holzhauser

Principal Geotechnical Engineer

Figures

REGIONAL GEOTECHNICAL SOLUTIONS	**Client:**	Lands Advisory Services Pty Ltd	Job No.	RGS50057.1
	Project:	Proposed Caravan Park	Drawn By:	LD
		288 Mungo Brush Road Hawks Nest	Date:	16-Jun-23
	Title:	Borehole Location Plan	Drawing No.	**Figure 1**

Appendix A

Results of Field Investigations

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH1

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423540 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387246 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES 1.00m 1.10m ES 1.50m 1.60m ES 1.90m 2.00m ES		0.5 1.0 1.5 2.0		SP	**TOPSOIL:** SAND, fine to medium grained, grey, dark grey, with rootlets 0.20m	D				TOPSOIL
						SP	**SAND:** Fine to medium grained, pale grey		MD			AEOLIAN
							2.00m Hole Terminated at 2.00 m					
				2.5 3.0 3.5 4.0 4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH2

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423639 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387270 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES 1.00m 1.10m ES 1.50m 1.60m ES 1.90m 2.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP	**TOPSOIL:** SAND, fine to medium grained, grey, with rootlets 0.20m	D				TOPSOIL
						SP	**SAND:** Fine to medium grained, grey, pale grey		MD			AEOLIAN
						SP	1.70m **SAND:** Fine to medium grained, brown, yellow					
							2.00m Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH3

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423579 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387310 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES		0.5		SP	**TOPSOIL:** SAND, fine to medium grained, grey, dark grey, with rootlets 0.20m **SAND:** Fine to medium grained, grey, dark grey	D	MD			TOPSOIL AEOLIAN
		1.00m 1.10m ES		1.0		SP	0.70m **SAND:** Fine to medium grained, yellow 0.90m **SAND:** Fine to medium grained, yellow, brown					
		1.50m 1.60m ES		1.5								
		1.90m 2.00m ES		2.0			2.00m Hole Terminated at 2.00 m					
				2.5								
				3.0								
				3.5								
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH4

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423576 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387442 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES SPT 4,3,2 N=5 1.00m 0.95m 1.10m ES 1.50m SPT 2,2,4 N=6 1.90m 2.00m 1.95m ES 2.50m SPT 2,4,6 N=10 2.95m 3.50m 3.60m ES SPT 3,6,6 N=12 3.95m		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP SP SP	**FILL:** SAND, fine to medium grained, orange, grey, with some gravel, fine to medium grained 0.70m **SAND:** Fine to medium grained, dark grey 1.50m **SAND:** Fine to medium grained, grey, brown 4.00m Hole Terminated at 4.00 m	D	MD			FILL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH5

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423572 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387502 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES 1.00m 1.10m ES 1.50m 1.60m ES 1.90m 2.00m ES		0.5 1.0 1.5 2.0		SP	**TOPSOIL:** SAND, fine to medium grained, grey, with rootlets 0.20m **SAND:** Fine to medium grained, pale grey 1.30m **SAND:** Fine to medium grained, grey, brown 2.00m	D				TOPSOIL AEOLIAN
				2.5 3.0 3.5 4.0 4.5			Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH6

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423660 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387589 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES SPT 3,2,3 N=5 1.00m 0.95m 1.10m ES SPT 5,5,9 N=14 1.45m		0.5 1.0 1.5		SP	**TOPSOIL:** SAND, fine to medium grained, grey, dark grey, with rootlets 0.20m **SAND:** Fine to medium grained, grey, pale grey	D	MD			TOPSOIL AEOLIAN
						SP	1.50m **SAND:** Fine to coarse grained, yellow					
		3.00m 3.10m ES 3.50m SPT 3,5,6 N=11 3.90m 4.00m 3.95m ES		2.0 2.5 3.0 3.5 4.0			4.00m Hole Terminated at 4.00 m					
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH7

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423723 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387590 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES SPT 2,2,2 N=4 1.00m 0.95m 1.10m ES 2.00m 2.10m ES SPT 2,4,6 N=10 2.45m 3.50m 3.60m ES 3.90m 4.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP	**TOPSOIL:** SAND, fine to medium grained, grey, with rootlets 0.20m					TOPSOIL
						SP	**SAND:** Fine to medium grained, grey	D	MD			AEOLIAN
						SP	1.00m **SAND:** Fine to medium grained, pale grey					
						SP	2.00m **SAND:** Fine to coarse grained, yellow					
							4.00m Hole Terminated at 4.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH8

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423885 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387545 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES SPT 2,3,2 N=5 0.95m 1.50m 1.60m ES 2.00m 2.10m ES SPT 2,2,4 N=6 2.45m 3.00m 3.10m ES 3.50m 3.60m ES 3.90m 4.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP	**TOPSOIL:** SAND, fine to medium grained, grey, dark grey 0.20m **SAND:** Fine to medium grained, grey, dark grey 1.60m **SAND:** Fine to coarse grained, grey, yellow 4.00m Hole Terminated at 4.00 m	D	MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH9

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423612 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387498 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.20m				SP	**TOPSOIL:** SAND, fine to medium grained, pale grey, with rootlets	D				TOPSOIL
		B 0.50m		0.5		SP	**SAND:** Fine to medium grained, pale grey (0.20m)		MD			AEOLIAN
		1.00m		1.0		SP	**SAND:** Fine to medium grained, grey, dark grey (0.70m)					
		1.10m ES		1.5			Hole Terminated at 1.00 m (1.00m)					
				2.0								
				2.5								
				3.0								
				3.5								
				4.0								
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH10

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423801 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387392 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES SPT 3,2,3 N=5 1.00m 0.95m 1.10m ES 1.50m 1.60m ES SPT 3,3,5 N=8 1.95m 2.00m 2.05m ES		0.5 1.0 1.5 2.0		SP	**TOPSOIL:** SAND, fine to medium grained, pale grey, dark grey, with rootlets 0.20m **SAND:** Fine to medium grained, grey, dark grey 0.90m **SAND:** Fine to coarse grained, pale grey 2.00m Hole Terminated at 2.00 m	D	MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH11

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423889 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387358 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES SPT 3,3,3 N=6 1.00m 0.95m 1.10m ES 1.50m 1.60m ES SPT 2,4,4 N=8 1.95m 2.00m ES		0.5 1.0 1.5 2.0		SP	**TOPSOIL:** SAND, fine to medium grained, grey, dark grey, with rootlets 0.20m	D	L			TOPSOIL
						SP	**SAND:** Fine to medium grained, grey 2.00m		MD			AEOLIAN
				2.5 3.0 3.5 4.0 4.5			Hole Terminated at 2.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH12

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423665 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387437 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.30m 0.50m B 0.60m ES SPT 2,2,3 N=5 1.00m 0.95m 1.10m ES 1.50m 1.60m ES SPT 1,4,6 N=10 1.95m 2.00m ES		0.5 1.0 1.5 2.0		SP	**TOPSOIL:** SAND, fine to medium grained, pale grey, with rootlets 0.20m **SAND:** Fine to medium grained, grey, pale grey 1.50m **SAND:** Fine to medium grained, grey, brown 2.00m Hole Terminated at 2.00 m	D	MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH13

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 19/1/23

DRILL TYPE: Hand Auger
EASTING: 423840 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387336 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
HA	Not Encountered	0.50m 0.60m ES 1.00m		0.5 1.0		SP SP	**TOPSOIL:** SAND, fine to medium grained, pale grey, with rootlets (0.20m) **SAND:** Fine to medium grained, pale grey (1.00m)	D	MD			TOPSOIL AEOLIAN
		1.10m ES		1.5 2.0 2.5 3.0 3.5 4.0 4.5			Hole Terminated at 1.00 m					

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BH14**

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig
EASTING: 423768 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387773 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	0.40m 0.50m ES 0.90m 1.00m ES 1.40m 1.50m ES 1.90m 2.00m ES 2.40m 2.50m ES 2.90m 3.00m ES 3.40m 3.50m ES 3.90m 4.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP SP SP	0.10m **TOPSOIL:** SAND, fine to medium grained, pale grey, with rootlets **SAND:** Fine to medium grained, pale grey 1.20m **SAND:** Fine to coarse grained, yellow 4.00m Hole Terminated at 4.00 m	D M	MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH15

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig
EASTING: 423746 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387206 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	0.40m 0.50m ES 0.90m 1.00m ES 1.40m 1.50m ES 1.90m 2.00m ES 2.40m 2.50m ES 2.90m 3.00m ES 3.40m 3.50m ES 3.90m 4.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP SP SP SP SP	0.10m **TOPSOIL:** SAND, fine to medium grained, pale grey, with rootlets **SAND:** Fine to medium grained, grey 1.40m **SAND:** Fine to coarse grained, yellow 2.00m **SAND:** FIne to coarse grained, yellow 2.70m **SAND:** Fine to medium grained, yellow, brown 3.20m **SAND:** Fine to coarse grained, yellow, brown 4.00m Hole Terminated at 4.00 m	D M D	MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH 1.2

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig
EASTING: 423546 m
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING: 6387243 m
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered			0.0		SP	0.10m **TOPSOIL:** SAND, fine to medium grained, grey, rootlets	D	MD			TOPSOIL
						SP	**SAND:** Fine to medium grained, grey					AEOLIAN
				0.5								
				1.0								
				1.5								
				2.0			2.00m					
						SP	**SAND:** Fine to medium grained, grey, brown					
		2.40m										
		2.50m ES		2.5			2.50m					
						SP	**SAND:** Fine to medium grained, yellow-brown					
		2.90m										
		3.00m ES		3.0								
		3.40m										
		3.50m ES		3.5								
		3.90m										
		4.00m ES		4.0			4.00m					
							Hole Terminated at 4.00 m					
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH 2.2

CLIENT: Land Advisory Services
PROJECT NAME: Proposed Caravan Park
SITE LOCATION: Mungo Brush Road, Hawks Nest
TEST LOCATION: Refer to Figure 1

PAGE: 1 of 1
JOB NO: RGS50057.1
LOGGED BY: LD
DATE: 2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
EASTING: 423612 m
NORTHING: 6387259 m
SURFACE RL:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	2.40m 2.50m ES 2.90m 3.00m ES 3.40m 3.50m ES 3.90m 4.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP SP SP SP	0.10m **TOPSOIL:** SAND, fine to medium grained, grey, with rootlets **SAND:** Fine to medium grained, pale grey 1.20m **SAND:** Fine to medium grained, yellow, grey 2.80m **SAND:** Fine to coarse grained, grey, brown 4.00m Hole Terminated at 4.00 m	D	MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH 3.2

CLIENT:	Land Advisory Services	**PAGE:**	1 of 2
PROJECT NAME:	Proposed Caravan Park	**JOB NO:**	RGS50057.1
SITE LOCATION:	Mungo Brush Road, Hawks Nest	**LOGGED BY:**	LD
TEST LOCATION:	Refer to Figure 1	**DATE:**	2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig **EASTING:** **SURFACE RL:**

BOREHOLE DIAMETER: 100 mm **INCLINATION:** 90° **NORTHING:** **DATUM:** AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered	2.40m 2.50m ES 2.90m 3.00m ES 3.40m 3.50m ES 3.90m 4.00m ES		0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5		SP	**TOPSOIL:** SAND, fine to medium grained, grey, with rootlets 0.20m **SAND:** Fine to medium grained, grey, dark grey 0.90m **SAND:** Fine to medium grained, yellow-brown 2.00m **SAND:** Fine to medium grained, yellow, pale grey 5.00m		MD			TOPSOIL AEOLIAN

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH 3.2

CLIENT: Land Advisory Services
PAGE: 2 of 2
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered			5.5		SP	**SAND:** Fine to coarse grained, yellow	M				
				6.0								
				6.5								
				7.0								
				7.5			7.50m					
							Hole Terminated at 7.50 m					
				8.0								
				8.5								
				9.0								
				9.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density		
V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition	
D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

REGIONAL GEOTECHNICAL SOLUTIONS

ENGINEERING LOG - BOREHOLE

BOREHOLE NO: BH 5.2

CLIENT: Land Advisory Services
PAGE: 1 of 1
PROJECT NAME: Proposed Caravan Park
JOB NO: RGS50057.1
SITE LOCATION: Mungo Brush Road, Hawks Nest
LOGGED BY: LD
TEST LOCATION: Refer to Figure 1
DATE: 2/2/23

DRILL TYPE: RGS Ute Mounted Drill Rig
EASTING:
SURFACE RL:
BOREHOLE DIAMETER: 100 mm
INCLINATION: 90°
NORTHING:
DATUM: AHD

Drilling and Sampling					Material description and profile information					Field Test		
METHOD	WATER	SAMPLES	RL (Not measured)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION: Soil type, plasticity/particle characteristics,colour,minor components	MOISTURE CONDITION	CONSISTENCY DENSITY	Test Type	Result	Structure and additional observations
AD/T	Not Encountered			0		SP	0.10m **TOPSOIL:** SAND, fine to medium grained, pale grey, with rootlets	D	MD			TOPSOIL
						SP	**SAND:** Fine to medium grained, dark grey					AEOLIAN
				0.5								
				1.0								
				1.5								
				2.0			2.00m					
						SP	**SAND:** Fine to medium grained, yellow-brown					
		2.50m		2.5								
		2.60m ES										
		2.90m										
		3.00m ES		3.0				M				
		3.40m										
		3.50m ES		3.5								
		3.90m										
		4.00m ES		4.0			4.00m					
							Hole Terminated at 4.00 m					
				4.5								

LEGEND:

Water
- Water Level (Date and time shown)
- Water Inflow
- Water Outflow

Strata Changes
- Gradational or transitional strata
- Definitive or distict strata change

Notes, Samples and Tests

U_{50}	50mm Diameter tube sample
CBR	Bulk sample for CBR testing
E	Environmental sample
ASS	Acid Sulfate Soil Sample
B	Bulk Sample

Field Tests

PID	Photoionisation detector reading (ppm)
DCP(x-y)	Dynamic penetrometer test (test depth interval shown)
HP	Hand Penetrometer test (UCS kPa)

Consistency

		UCS (kPa)
VS	Very Soft	<25
S	Soft	25 - 50
F	Firm	50 - 100
St	Stiff	100 - 200
VSt	Very Stiff	200 - 400
H	Hard	>400
Fb	Friable	

Density

V	Very Loose	Density Index <15%
L	Loose	Density Index 15 - 35%
MD	Medium Dense	Density Index 35 - 65%
D	Dense	Density Index 65 - 85%
VD	Very Dense	Density Index 85 - 100%

Moisture Condition

D	Dry
M	Moist
W	Wet
W_p	Plastic Limit
W_L	Liquid Limit

Appendix B

Laboratory Test Results

QUALTEST Laboratory (NSW) Pty Ltd (20708)
2 Murray Dwyer Circuit, Mayfield West, NSW 2304
T: 02 4968 4468
F: 02 4960 9775
E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

California Bearing Ratio Test Report

Report No: CBR:NEW23W-0253-S01
Issue No: 1

Client: Regional Geotechnical Solutions Pty Ltd
44 Bent Street
Wingham NSW 2429

Project No.: MNC16P-0001
Project Name: Various Testing
Project Location: 288 Mungo Brush, Hawks Nest, NSW

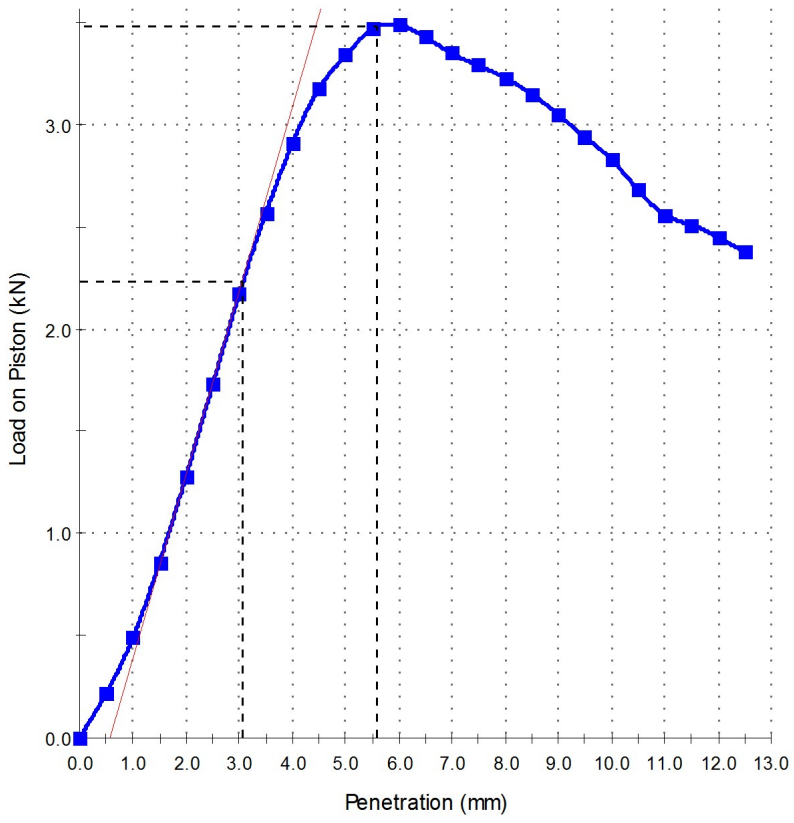
Accredited for compliance with ISO/IEC 17025-Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Results provided relate only to the items tested or sampled.

Approved Signatory: Brent Cullen
(Engineering Geologist)
NATA Accredited Laboratory Number: 18686
Date of Issue: 14/02/2023

Sample Details

Sample ID: NEW23W-0253-S01
Test Request No.: RGS50057.1
Date Sampled: 20/01/2023
Sampling Method: The results outlined below apply to the sample as received
Specification: No Specification
Source: On-Site
Location: BH9 - (0.2 - 0.5m)
Material: Insitu
Date Tested: 10/02/2023

Load vs Penetration



Test Results

	AS 1289.6.1.1
CBR at 5.0mm (%):	**18**
Maximum Dry Density(t/m³):	1.60
Optimum Moisture Content(%):	22.0
Dry Density before Soaking (t/m³):	1.59
Density Ratio before Soaking (%):	99.0
Moisture Content before Soaking (%):	22.3
Moisture Ratio before Soaking (%):	101.0
Dry Density after Soaking (t/m³):	1.58
Density Ratio after Soaking (%):	99.0
Swell (%):	0.5
Moisture Content of Top 30mm (%):	20.0
Moisture Content of Remaining Depth (%):	20.1
Compaction Hammer Used:	Standard AS 1289.5.1.1
Surcharge Mass (kg):	4.50
Period of Soaking (Days):	4
Retained on 19 mm Sieve (%):	0
CBR Moisture Content Method:	AS 1289.2.1.1
Sample Curing Time (h):	72
Plasticity Determination Method:	Visual/Tactile
——— AS1289.2.1.1 ———	
In Situ (Field) Moisture Content (%):	4.6

Comments

AS1289.6.1.1 - Material is non-cohesive (< 5% passing the 75um) therefore the CBR was compacted at a target density of 100% standard compactive effort, at estimated Optimum Moisture Content.

QUALTEST Laboratory (NSW) Pty Ltd (20708)
2 Murray Dwyer Circuit, Mayfield West, NSW 2304
T: 02 4968 4468
F: 02 4960 9775
E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

California Bearing Ratio Test Report

Report No: CBR:NEW23W-0253-S02
Issue No: 1

Client: Regional Geotechnical Solutions Pty Ltd
44 Bent Street
Wingham NSW 2429

Project No.: MNC16P-0001
Project Name: Various Testing
Project Location: 288 Mungo Brush, Hawks Nest, NSW

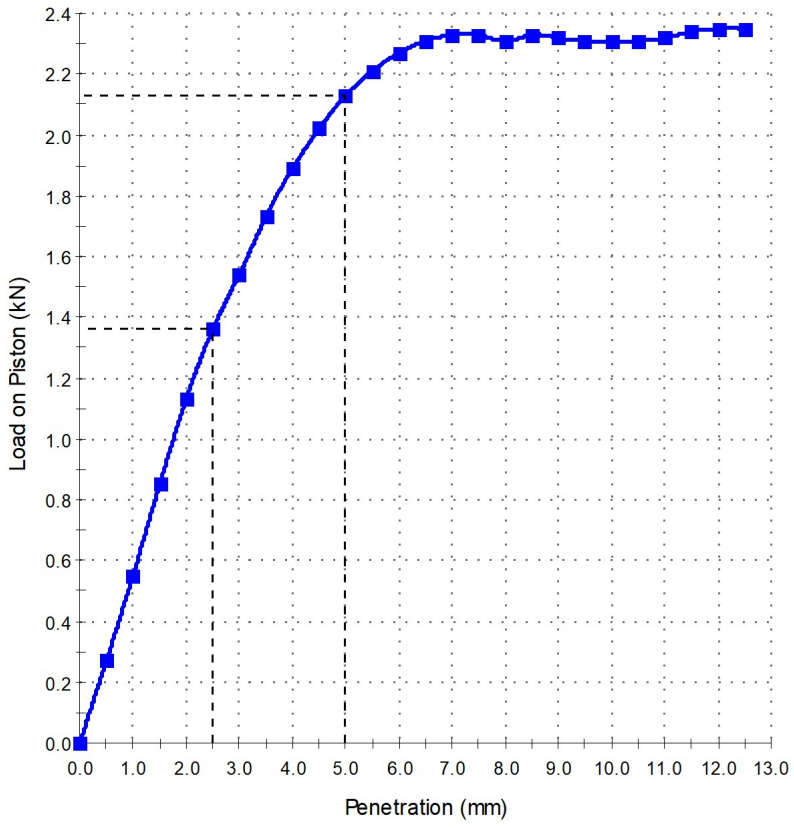
Accredited for compliance with ISO/IEC 17025-Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Results provided relate only to the items tested or sampled.

Approved Signatory: Brent Cullen
(Engineering Geologist)
NATA Accredited Laboratory Number: 18686
Date of Issue: 7/02/2023

Sample Details

Sample ID: NEW23W-0253-S02
Test Request No.: RGS50057.1
Date Sampled: 20/01/2023
Sampling Method: The results outlined below apply to the sample as received
Specification: No Specification
Source: On-Site
Location: BH10 - (0.3 - 0.6m)
Material: Insitu
Date Tested: 3/02/2023

Load vs Penetration



Test Results

	AS 1289.6.1.1
CBR at 5.0mm (%):	**11**
Maximum Dry Density(t/m³):	1.65
Optimum Moisture Content(%):	8.4
Dry Density before Soaking (t/m³):	1.64
Density Ratio before Soaking (%):	99.0
Moisture Content before Soaking (%):	8.2
Moisture Ratio before Soaking (%):	98.0
Dry Density after Soaking (t/m³):	1.63
Density Ratio after Soaking (%):	98.5
Swell (%):	0.5
Moisture Content of Top 30mm (%):	11.9
Moisture Content of Remaining Depth (%):	11.9
Compaction Hammer Used:	Standard
	AS 1289.5.1.1
Surcharge Mass (kg):	4.50
Period of Soaking (Days):	4
Retained on 19 mm Sieve (%):	0
CBR Moisture Content Method:	AS 1289.2.1.1
Sample Curing Time (h):	120
Plasticity Determination Method:	Visual/Tactile
——— AS1289.2.1.1 ———	
In Situ (Field) Moisture Content (%):	3.0

Comments

QUALTEST Laboratory (NSW) Pty Ltd (20708)
2 Murray Dwyer Circuit, Mayfield West, NSW 2304
T: 02 4968 4468
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E: admin@qualtest.com.au
W: www.qualtest.com.au
ABN: 98 153 268 896

California Bearing Ratio Test Report

Report No: CBR:NEW23W-0253-S03
Issue No: 1

Client: Regional Geotechnical Solutions Pty Ltd
44 Bent Street
Wingham NSW 2429

Project No.: MNC16P-0001
Project Name: Various Testing
Project Location: 288 Mungo Brush, Hawks Nest, NSW

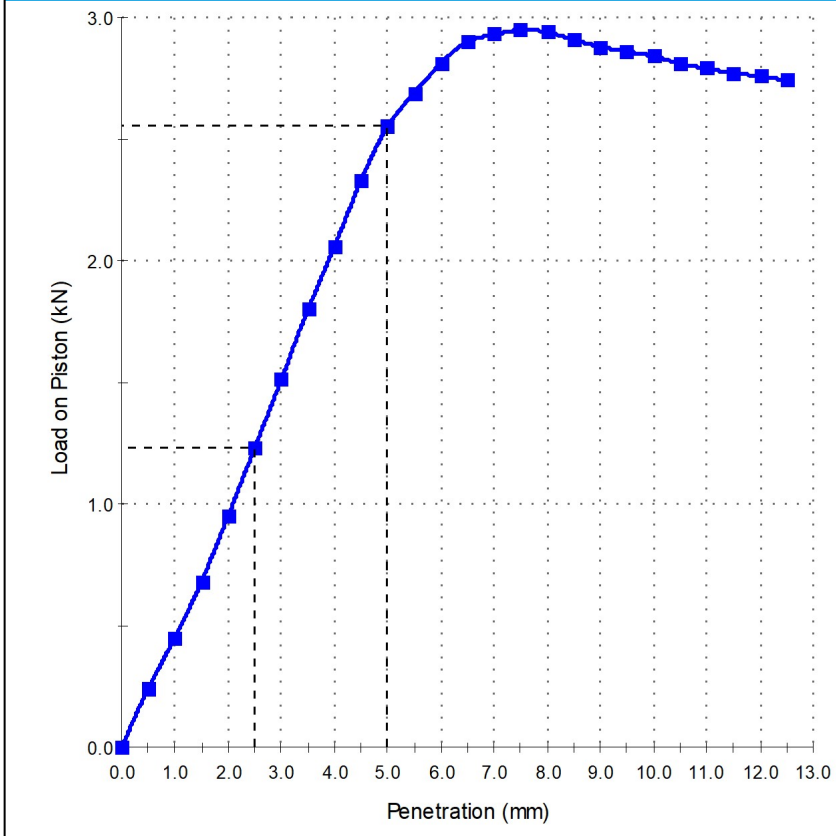
Accredited for compliance with ISO/IEC 17025-Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
Results provided relate only to the items tested or sampled.

Approved Signatory: Brent Cullen
(Engineering Geologist)
NATA Accredited Laboratory Number: 18686
Date of Issue: 7/02/2023

Sample Details

Sample ID: NEW23W-0253-S03
Test Request No.: RGS50057.1
Date Sampled: 20/01/2023
Sampling Method: The results outlined below apply to the sample as received
Specification: No Specification
Source: On-Site
Location: BH12 - (0.3 - 0.6m)
Material: Insitu
Date Tested: 6/02/2023

Load vs Penetration



Test Results

	AS 1289.6.1.1
CBR at 5.0mm (%):	**13**
Maximum Dry Density(t/m³):	1.59
Optimum Moisture Content(%):	15.6
Dry Density before Soaking (t/m³):	1.58
Density Ratio before Soaking (%):	99.0
Moisture Content before Soaking (%):	15.7
Moisture Ratio before Soaking (%):	101.0
Dry Density after Soaking (t/m³):	1.60
Density Ratio after Soaking (%):	100.5
Swell (%):	-1.5
Moisture Content of Top 30mm (%):	19.9
Moisture Content of Remaining Depth (%):	19.1
Compaction Hammer Used:	Standard
	AS 1289.5.1.1
Surcharge Mass (kg):	4.50
Period of Soaking (Days):	4
Retained on 19 mm Sieve (%):	0
CBR Moisture Content Method:	AS 1289.2.1.1
Sample Curing Time (h):	48
Plasticity Determination Method:	Visual/Tactile
——— AS1289.2.1.1 ———	
In Situ (Field) Moisture Content (%):	2.2

Comments

RESULTS OF ACID SULFATE SOIL ANALYSIS

64 samples supplied by Regional Geotechnical Solutions Pty Ltd on 24/01/2023. Lab Job No. N6619.
Analysis requested by Louis Davidson. Your Job: Project No. RGS50057.1.

1/21 Cook Drive COFFS HARBOUR NSW 2450

Sample Identification	EAL Lab Code	Texture	Moisture Content		pH_F and pH_{FOX}				KCl-extractable sulfur (S_{KCl})		Potential Sulfidic Acidity (Chromium Reducible Sulfur - CRS)		pH_{KCl}	Actual Acidity (Titratable Actual Acidity - TAA)	Retained Acidity		Non-treated soil: Acid Neutralising Capacity (ANC_{BT})		Non-treated soil: Net Acidity	Non-treated soil: Lime Calculation
			(% moisture of total wet weight)	(g moisture / g of oven dry soil)	pH_F	pH_{FOX}	pH change	Reaction	(% S_{KCl})	(equiv. mol H^+/t)	(% S_{Cr})	(mol H^+/t)		(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 method S21)*				**		*(In-house method S20)*		*(In-house method 16b)*		**		*(In-house method S14)*		**	**
BH1 0.4-0.5	*N6619/1*	Coarse	2.9	0.03	5.98	3.39	-2.59	Low	0.001	1	< 0.005	0	5.78	2	..	..	..	..	2	0
BH1 0.9-1	*N6619/2*	Coarse	2.6	0.03	6.54	4.54	-2.00	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH1 1.4-1.5	*N6619/3*	Coarse	3.2	0.03	6.52	4.81	-1.71	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH1 1.9-2	*N6619/4*	Coarse	3.4	0.04	6.49	4.42	-2.07	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2 0.4-0.5	*N6619/5*	Coarse	3.2	0.03	5.99	3.42	-2.57	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2 0.9-1	*N6619/6*	Coarse	2.5	0.03	6.22	4.38	-1.84	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2 1.4-1.5	*N6619/7*	Coarse	2.7	0.03	6.42	4.75	-1.67	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2 1.9-2	*N6619/8*	Coarse	3.5	0.04	6.04	2.57	-3.47	Medium	0.000	0	< 0.005	0	5.30	4	..	..	..	..	4	0
BH3 0.4-0.5	*N6619/9*	Coarse	3.4	0.04	6.44	4.20	-2.24	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3 0.9-1	*N6619/10*	Coarse	3.7	0.04	6.37	4.28	-2.09	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3 1.4-1.5	*N6619/11*	Coarse	3.8	0.04	6.40	4.71	-1.69	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3 1.9-2	*N6619/12*	Coarse	2.9	0.03	6.38	5.09	-1.29	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH4 0.4-0.5	*N6619/13*	Medium	5.1	0.05	8.22	5.12	-3.10	High	..	..	..	..	..	..	..	..	..	..	..	..
BH4 0.9-1	*N6619/14*	Medium	4.0	0.04	7.38	3.91	-3.47	High	0.002	1	0.064	40	7.22	0	..	..	1.19	237	40	3
BH4 1.4-1.5	*N6619/15*	Coarse	3.6	0.04	6.91	3.64	-3.27	Medium	0.001	0	< 0.005	0	6.22	2	..	..	..	..	2	0
BH4 1.9-2	*N6619/16*	Coarse	4.8	0.05	6.04	2.52	-3.52	Medium	..	..	..	..	..	..	..	..	..	..	..	..
BH4 2.4-2.5	*N6619/17*	Coarse	3.4	0.04	6.60	2.85	-3.75	Medium	0.001	1	0.011	7	5.91	3	..	..	..	..	10	1
BH4 2.9-3	*N6619/18*	Coarse	3.5	0.04	7.00	3.41	-3.59	Medium	..	..	..	..	..	..	..	..	..	..	..	..
BH4 3.4-3.5	*N6619/19*	Coarse	2.5	0.03	8.77	5.85	-2.92	Medium	0.002	1	0.005	3	8.68	0	..	..	0.17	33	3	0
BH4 3.9-4	*N6619/20*	Coarse	3.2	0.03	6.84	3.97	-2.87	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5 0.4-0.5	*N6619/21*	Coarse	3.1	0.03	6.52	3.74	-2.78	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5 0.9-1	*N6619/22*	Coarse	3.6	0.04	6.57	4.74	-1.83	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5 1.4-1.5	*N6619/23*	Coarse	3.9	0.04	6.46	3.90	-2.56	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5 1.9-2	*N6619/24*	Coarse	4.5	0.05	5.82	2.60	-3.22	Medium	0.001	0	< 0.005	0	5.38	3	..	..	..	..	3	0
BH6 0.4-0.5	*N6619/25*	Coarse	3.4	0.04	5.26	2.61	-2.65	Medium	..	..	..	..	..	..	..	..	..	..	..	..
BH6 0.9-1	*N6619/26*	Coarse	3.1	0.03	6.42	3.38	-3.04	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH6 1.4-1.5	*N6619/27*	Coarse	2.3	0.02	6.10	3.51	-2.60	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH6 1.9-2	*N6619/28*	Coarse	3.0	0.03	6.04	2.80	-3.24	Medium	0.000	0	< 0.005	0	5.36	3	..	..	..	..	3	0
BH6 2.4-2.5	*N6619/29*	Coarse	3.3	0.03	6.29	3.85	-2.44	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH6 2.9-3	*N6619/30*	Coarse	3.6	0.04	6.19	3.06	-3.13	Low	0.002	1	< 0.005	0	5.49	3	..	..	..	..	3	0
BH6 3.4-3.5	*N6619/31*	Coarse	3.1	0.03	6.35	3.38	-2.97	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH6 3.9-4	*N6619/32*	Coarse	2.3	0.02	6.50	4.31	-2.19	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH7 0.4-0.5	*N6619/33*	Coarse	3.9	0.04	5.36	2.57	-2.79	Low	0.001	1	< 0.005	0	4.75	9	..	..	..	..	9	1
BH7 0.9-1	*N6619/34*	Coarse	3.0	0.03	6.60	4.28	-2.32	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH7 1.4-1.5	*N6619/35*	Coarse	2.9	0.03	6.47	3.95	-2.52	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH7 1.9-2	*N6619/36*	Coarse	2.4	0.02	6.26	3.04	-3.22	Low	0.001	1	< 0.005	0	5.66	3	..	..	..	..	3	0
BH7 2.4-2.5	*N6619/37*	Coarse	3.3	0.03	6.08	4.56	-1.52	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH7 2.9-3	*N6619/38*	Coarse	3.7	0.04	5.60	4.07	-1.53	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH7 3.4-3.5	*N6619/39*	Coarse	3.1	0.03	5.74	4.47	-1.27	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH7 3.9-4	*N6619/40*	Coarse	2.8	0.03	6.45	4.41	-2.04	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 0.4-0.5	*N6619/41*	Coarse	2.5	0.03	5.90	3.75	-2.15	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 0.9-1	*N6619/42*	Coarse	1.9	0.02	6.35	4.91	-1.44	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 1.4-1.5	*N6619/43*	Coarse	2.6	0.03	5.56	3.50	-2.06	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 1.9-2	*N6619/44*	Coarse	1.7	0.02	5.65	4.46	-1.19	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 2.4-2.5	*N6619/45*	Coarse	1.5	0.02	6.30	4.73	-1.57	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 2.9-3	*N6619/46*	Coarse	2.1	0.02	6.42	4.87	-1.55	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 3.4-3.5	*N6619/47*	Coarse	2.3	0.02	6.43	4.25	-2.18	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH8 3.9-4	*N6619/48*	Coarse	2.5	0.03	6.58	4.61	-1.97	Low	0.001	1	< 0.005	0	5.77	3	..	..	..	..	3	0
BH10 0.4-0.5	*N6619/49*	Coarse	3.4	0.04	4.74	3.31	-1.43	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH10 0.9-1	*N6619/50*	Coarse	3.2	0.03	5.70	3.79	-1.91	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH10 1.4-1.5	*N6619/51*	Coarse	2.6	0.03	6.47	4.28	-2.19	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH10 1.9-2	*N6619/52*	Coarse	2.7	0.03	5.84	3.59	-2.25	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH11 0.4-0.5	*N6619/53*	Coarse	1.1	0.01	6.07	4.17	-1.90	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH11 0.9-1	*N6619/54*	Coarse	2.2	0.02	6.65	5.03	-1.63	Low	..	..	..	..	..	..	..	..	..	..	..	..

checked: .....
Graham Lancaster
Laboratory Manager

RESULTS OF ACID SULFATE SOIL ANALYSIS

3 of 64 samples supplied by Regional Geotechnical Solutions Pty Ltd on 24/01/2023. Lab Job No. N8229 (formerly N6619).
Analysis requested by Louis Davidson. Your Job: Project No. RGS50057.1.

1/21 Cook Drive COFFS HARBOUR NSW 2450

Sample Identification	EAL Lab Code	Texture	Moisture Content		pH_F and pH_{FOX}				KCl-extractable sulfur (S_{KCl})		Potential Sulfidic Acidity (Chromium Reducible Sulfur - CRS)		pH_{KCl}	Actual Acidity (Titratable Actual Acidity - TAA)	Retained Acidity		Non-treated soil: Acid Neutralising Capacity (ANC_{BT})		Non-treated soil: Net Acidity	Non-treated soil: Lime Calculation
			(% moisture of total wet weight)	(g moisture / g of oven dry soil)	pH_F	pH_{FOX}	pH change	Reaction	(% S_{KCl})	(equiv. mol H^+/t)	(% S_{cr})	(mol H^+/t)		(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 method S21)*				**		*(In-house method S20)*		*(In-house method 16b)*		**		*(In-house method S14)*		**	**
BH4 0.4-0.5	*N8829/1 (N6619/13)*	Medium	5.1	0.05	8.22	5.12	-3.10	High	0.005	3	0.052	32	8.43	0	..	..	1.31	262	32	2
BH4 0.9-1	*N8829/2 (N6619/14)*	Medium	4.0	0.04	7.38	3.91	-3.47	High	0.002	1	0.064	40	7.22	0	..	..	1.19	237	40	3
BH4 1.9-2	*N8829/3 (N6619/16)*	Coarse	4.8	0.05	6.04	2.52	-3.52	Medium	<0.001	<1	0.020	12	5.94	7	..	..	..	..	19	1

NOTES:

1. 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 (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 Inital 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+/t; medium texture ≥ 0.06% S or 36 mol H+/t; fine texture ≥ 0.1% S or 62 mol H+/t) (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 determination.
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.
18. ** NATA accreditation does not cover the performance of this service.
19. 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).
21. Results relate to the samples tested.
22. This final report was issued on 08/03/2023 and replaces the report issued on 07/03/2023. All KCl-extractable sulfur data is now included.

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

checked: .....
Graham Lancaster
Laboratory Manager

RESULTS OF ACID SULFATE SOIL ANALYSIS

64 samples supplied by Regional Geotechnical Solutions Pty Ltd on 24/01/2023. Lab Job No. N6619.
Analysis requested by Louis Davidson. Your Job: Project No. RGS50057.1.

1/21 Cook Drive COFFS HARBOUR NSW 2450

																		Non-treated soil		Non-treated soil	
Sample Identification	**EAL Lab Code**	**Texture**	**Moisture Content**		**pH_F and pH_{FOX}**				**KCl-extractable sulfur (S_{KCl})**		**Potential Sulfidic Acidity (Chromium Reducible Sulfur - CRS)**			**Actual Acidity (Titratable Actual Acidity - TAA)**	**Retained Acidity**		**Acid Neutralising Capacity (ANC_{BT})**		**Net Acidity**	**Lime Calculation**
			(% moisture of total wet weight)	(g moisture / g of oven dry soil)	pH_F	pH_{FOX}	pH change	Reaction	(% S_{KCl})	(equiv. mol H^+/t)	(% S_{Cr})	(mol H^+/t)	pH_{KCl}	(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 method S21)*				**		*(In-house method S20)*		*(In-house method 16b)*		**		*(In-house method S14)*		**	**
BH11 1.4-1.5	*N6619/55*	Coarse	2.1	0.02	6.71	4.70	-2.01	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH11 1.9-2	*N6619/56*	Coarse	1.0	0.01	5.91	3.88	-2.03	Medium	..	..	..	..	..	..	..	..	..	..	..	..
BH12 0.4-0.5	*N6619/57*	Coarse	1.9	0.02	5.59	3.38	-2.21	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH12 0.9-1	*N6619/58*	Coarse	2.5	0.03	6.75	5.06	-1.69	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH12 1.4-1.5	*N6619/59*	Coarse	2.6	0.03	6.82	5.24	-1.58	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH12 1.9-2	*N6619/60*	Medium	1.8	0.02	5.13	3.25	-1.88	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH9 0.5	*N6619/61*	Coarse	3.7	0.04	5.40	3.75	-1.65	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH9 1.0	*N6619/62*	Coarse	3.7	0.04	5.87	3.48	-2.39	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH13 0.5	*N6619/63*	Coarse	3.3	0.03	6.49	4.09	-2.40	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH13 1.0	*N6619/64*	Coarse	3.6	0.04	6.60	4.80	-1.80	Low	..	..	..	..	..	..	..	..	..	..	..	..

NOTES:

1. 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 (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 Inital 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.
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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+/t; medium texture ≥ 0.06% S or 36 mol H+/t; fine texture ≥ 0.1% S or 62 mol H+/t) (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 determination.
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.
18. ** NATA accreditation does not cover the performance of this service.
19. 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).
21. Results relate to the samples tested.
22. This report was issued on 8/02/2023.

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checked: .....
Graham Lancaster
Laboratory Manager

RESULTS OF ACID SULFATE SOIL ANALYSIS

31 samples supplied by Regional Geotechnical Solutions Pty Ltd on 8/02/2023. Lab Job No. N7168.
Analysis requested by Louis Davidson. Your Job: Project No. RGS50057.1.

1/21 Cook Drive COFFS HARBOUR NSW 2450

Sample Identification	EAL Lab Code	Texture	Moisture Content		pH_F and pH_{FOX}				KCl-extractable sulfur (S_{KCl})		Potential Sulfidic Acidity (Chromium Reducible Sulfur - CRS)		Actual Acidity (Titratable Actual Acidity - TAA)		Retained Acidity		Non-treated soil: Acid Neutralising Capacity (ANC_{BT})		Non-treated soil: Net Acidity	Non-treated soil: Lime Calculation
			(% moisture of total wet weight)	(g moisture / g of oven dry soil)	pH_F	pH_{FOX}	pH change	Reaction	(% S_{KCl})	(equiv. mol H^+/t)	(% S_{Cr})	(mol H^+/t)	pH_{KCl}	(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 method S21)*				**		*(In-house method S20)*		*(In-house method 16b)*		**		*(In-house method S14)*		**	**
BH1.1 2.9-3	*N7168/1*	Coarse	2.9	0.03	6.24	5.03	-1.21	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH1.1 3.4-3.5	*N7168/2*	Coarse	3.7	0.04	6.07	4.04	-2.03	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH1.1 3.9-4	*N7168/3*	Coarse	3.4	0.04	6.56	4.28	-2.28	Low	0.002	1	< 0.005	0	6.07	3	..	..	..	..	3	0
BH2.2 2.4-2.5	*N7168/4*	Coarse	3.2	0.03	6.55	5.08	-1.47	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2.2 2.9-3	*N7168/5*	Coarse	3.7	0.04	6.69	5.06	-1.63	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2.2 3.4-3.5	*N7168/6*	Coarse	2.3	0.02	6.73	5.10	-1.63	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH2.2 3.9-4	*N7168/7*	Coarse	3.0	0.03	6.68	4.99	-1.69	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3.2 2.4-2.5	*N7168/8*	Coarse	17.9	0.22	6.62	5.07	-1.55	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3.2 2.9-3	*N7168/9*	Coarse	17.5	0.21	6.81	5.02	-1.79	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3.2 3.4-3.5	*N7168/10*	Coarse	3.0	0.03	6.61	5.00	-1.61	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH3.2 3.9-4	*N7168/11*	Coarse	3.0	0.03	6.65	4.84	-1.81	Low	0.002	1	< 0.005	0	6.28	3	..	..	..	..	3	0
BH5.2 2.4-2.5	*N7168/12*	Coarse	8.0	0.09	6.77	4.60	-2.17	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5.2 2.9-3	*N7168/13*	Coarse	4.4	0.05	6.55	4.36	-2.19	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5.2 3.4-3.5	*N7168/14*	Coarse	15.0	0.18	6.91	5.01	-1.90	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH5.2 3.9-4	*N7168/15*	Coarse	4.7	0.05	6.91	4.99	-1.92	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 0.4-0.5	*N7168/16*	Coarse	4.6	0.05	6.32	2.85	-3.47	Low	0.003	2	< 0.005	0	5.87	4	..	..	..	..	4	0
BH14 0.9-1	*N7168/17*	Coarse	4.3	0.05	6.85	3.48	-3.37	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 1.4-1.5	*N7168/18*	Coarse	2.6	0.03	6.66	3.81	-2.86	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 1.9-2	*N7168/19*	Coarse	4.8	0.05	6.68	4.47	-2.21	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 2.4-2.5	*N7168/20*	Coarse	3.3	0.03	6.80	5.07	-1.73	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 2.9-3	*N7168/21*	Coarse	4.6	0.05	6.73	5.08	-1.65	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 3.4-3.5	*N7168/22*	Coarse	4.1	0.04	6.82	5.07	-1.75	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH14 3.9-4	*N7168/23*	Coarse	2.3	0.02	6.83	4.94	-1.89	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 0.4-0.5	*N7168/24*	Coarse	4.0	0.04	6.10	2.52	-3.58	Low	0.002	1	< 0.005	0	5.82	4	..	..	..	..	4	0
BH15 0.9-1	*N7168/25*	Coarse	4.2	0.04	6.74	3.98	-2.76	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 1.4-1.5	*N7168/26*	Coarse	3.0	0.03	6.56	3.07	-3.49	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 1.9-2	*N7168/27*	Coarse	1.4	0.01	6.67	4.68	-1.99	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 2.4-2.5	*N7168/28*	Coarse	1.1	0.01	6.74	4.65	-2.09	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 2.9-3	*N7168/29*	Coarse	1.3	0.01	6.48	3.41	-3.07	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 3.4-3.5	*N7168/30*	Coarse	12.8	0.15	6.69	4.69	-2.00	Low	..	..	..	..	..	..	..	..	..	..	..	..
BH15 3.9-4	*N7168/31*	Coarse	1.4	0.01	6.90	4.53	-2.37	Low	..	..	..	..	..	..	..	..	..	..	..	..

NOTES:

1. 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.
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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.
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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+/t; medium texture ≥ 0.06% S or 36 mol H+/t; fine texture ≥ 0.1% S or 62 mol H+/t) (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).
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17. Results refer to samples as received at the laboratory. This report is not to be reproduced except in full.
18. ** NATA accreditation does not cover the performance of this service.
19. 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).
21. Results relate to the samples tested.
22. This report was issued on 15/02/2023 and replaces the previous report issued on 10/02/23. The Net Acidity data for selected samples is now included.

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checked: .....
Graham Lancaster
Laboratory Manager

Appendix C

Pavement Thickness Design Sheet

FLEXIBLE PAVEMENT THICKNESS DESIGN

CLIENT: Lands Advisory Services Pty Ltd **Job No.:** RGS50057.1

PROJECT: Proposed Caravan Park

LOCATION: Lot 2 DP 1015609 (288) Mungo Brush Road Hawks Nest **Date:** 10-Mar-23

REGIONAL GEOTECHNICAL SOLUTIONS

ROAD NAME:	**Internal Roads**	**Refer to drawing:**	
Chainage Interval (m):	Full Length	**Road classification ref:**	N/A
Road Classification:	N/A	**Design Traffic:**	1 x 10^5 ESA

Subgrade Conditions

Expected subgrade:	SAND		
Adopted Subgrade CBR value:	10	Required subgrade compaction:	100%
Potential construction or performance issues:	Subgrade will comprise medium dense sand. Proof roll to identify and remove excessively soft or heaving areas. Where identified, remove and replace with approved granular fill.		

Pavement Design

Recommended Pavement Layer Thickness:		**Recommended Material requirements**	**Required Compaction**
Wearing course thickness (mm):		14/7 two coat with a 320 binder or 40mm DG10 AR450 Asphalt	
Base thickness (mm):	100	DGB20 or equivalent	98% Modified Compaction
Sub-base thickness (mm):	100	DGS40 or equivalent	95% Modified Compaction
Select thickness (mm):	--	CBR>15%, PI<15%, max particle size 100mm	100% Standard Compaction
Total thickness (mm):	200		

Definitions:

Design traffic loading:	The anticipated number of equivalent standard axles (ESA), as defined by AUSTROADS, in the design lane during the design life of the pavement.
Modified Compaction:	Minimum required dry density ratio (AS1289 5.4.1-2007) defined as the ratio of the calculated field dry density (AS1289 5.3.1-2004 or equivalent) to the maximum dry density obtained using AS1289 5.2.1-2003 or equivalent.
Standard Compaction:	Minimum required dry density ratio (AS1289 5.4.1-2007) defined as the ratio of the calculated field dry density (AS1289 5.3.1-2004 or equivalent) to the maximum dry density obtained using AS1289 5.1.1-2003 or equivalent.
Density Index:	Minimum required Density Index AS1289 5.6.1-1998, defined as the ratio of field dry density determined by AS1289 5.3.1-2004 or equivalent to the laboratory values of maximum and minimum density obtained by AS1289 5.5.1-1998 or equivalent

Note: Pavement designs assume appropriate drainage is installed and maintained. Refer to Regional Geotechnical Solutions Report No. RGS50057.1-AB for recommendations regarding drainage.