



ACID SULFATE SOIL REPORT: Proposed Residential Development

29 Shirley Street and 2-4 Milton Street

Byron Bay

One Project MGMT Group

July 2022

PG-7463

VERSION 2

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ABN: 62 615 248 952

Ref: PG-7463, 2022-04-20, ASR VER 2
Author: Peter Elkington

29th July, 2022

One Project MGMT Group
Email: james@onepmsgroup.com

ATTENTION: JAMES DAVIDSON

Dear Sir,

**ACID SULFATE SOIL INVESTIGATION – PROPOSED RESIDENTIAL DEVELOPMENT
29 SHIRLEY STREET AND 2-4 MILTON STREET, BYRON BAY**

Enclosed is a copy of our report for the above project dated July 2022. An electronic copy of the report has been issued.

Should you have any queries regarding this report, please do not hesitate to contact Peter Elkington at this office.

Yours faithfully,

P. ELKINGTON (RPEQ 7226)

For and on behalf of
PACIFIC GEOTECH PTY LTD



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Acid Sulfate Soil Management Plan

1.0 INTRODUCTION

This report contains the results of the acid sulfate soil investigation by Pacific Geotech and contains advice and recommendations relating to:

- Acid sulfate soil conditions
- Development of an Acid Sulfate Soil Management Plan

Proposed Development

It is understood that the proposed development is to comprise the construction of a three-storey residential building over a single level basement at the above site. Earthworks are envisaged to consist of cuts of up to 3m for the basement.

2.0 METHODOLOGY

The investigation comprised the drilling and sampling of 6 boreholes to depths of 6.0m, using a Digga PDT 1 drilling rig and 100mm solid flight augers, across the proposed building and pavement areas. Dynamic Cone Penetrometer (DCP) testing was conducted adjacent to the boreholes.

The boreholes were sampled for Acid Sulfate purposes, in addition to geotechnical sampling.

The boreholes were located by an experienced geotechnical engineer with reference to the site features and locations were recorded using a hand held GPS. At the completion of the drilling, the holes were checked for groundwater intrusion and then backfilled.

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

AS 1726

Geotechnical Site Investigations

ASSMAC

Acid Sulfate Soil Management Advisory Committee, August 1998

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

3.0 SITE DESCRIPTION

The site of the proposed development is located at 29 Shirley Street and 2-4 Milton Street, Byron Bay.

At the time of the investigation, the site was occupied by an existing backpackers accommodation building, with associated car parking, swimming pool, courtyard, gardens and volleyball courts.

Vegetation comprised short grass cover, and medium to large sized trees and shrubs.

The site was generally level and drainage was considered fair to poor but improved by the local stormwater network around the existing structures.

Refer following aerial and site photographs for typical site conditions.



AERIAL IMAGE

SITE PHOTOGRAPHS







4.0 GEOLOGICAL MODEL

The subsurface profile encountered in the boreholes generally consisted of sand, initially loose but becoming medium dense and dense to the termination of testing

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

TABLE 1 SUBSURFACE PROFILE SUMMARY

BH No.	FILL	NATURAL SAND			BH TD
		Loose	Medium dense	Dense	
BH 01	0.0-2.1	NE	2.1-TD	NE	6.0
BH 02	0.0-0.9	0.9-1.5	1.5-2.2 2.6-TD	2.2-2.6	6.0
BH 03	0.0-1.3	NE	1.3-3.4 3.7-TD	3.4-3.7	6.0
BH 04	0.0-0.05	0.05-1.1	1.1-3.2 3.7-TD	3.2-3.7	6.0
BH 05	0.0-0.5	0.5-2.3	2.3-5.5	5.5-TD	6.0
BH 06	0.0-1.1	NE	1.1-TD	NE	6.0

Notes:

1. All depths in metres below ground level at time of investigation.
2. NE - Not Encountered; TD - Termination Depth.

Groundwater was noted in the boreholes at depths of between 2.1m and 3.2m at the time of drilling in the boreholes. Water levels can be expected to vary with seasonal and climatic conditions.

Typically the groundwater levels in the area are encountered at levels of approximately RL 0.5m to RL 1.0m. Fluctuations of +/- 0.5m are typically noted in the area.

Increases in the groundwater levels often occur following significant rainfall events (floods) with the groundwater levels to as much as RL 1.5m to RL 2.0m being noted in the area.

5.0 LABORATORY TESTING

Laboratory testing was undertaken in general accordance with the recommendations outlined in the ASSMAC 'Acid Sulfate Soils Laboratory Methods Guidelines 2004' and was undertaken by Octief Pty Ltd. The results of the testing program are appended to this report.

The testing program comprised of initial screening tests on recovered samples, followed by quantitative testing using the Chromium Reducible Sulfur (CRS) suite.

Screening Tests

Screening tests were undertaken on each soil sample collected from the bores. Two small sub-samples of each soil sample were prepared; one sub-sample from each sample was mixed with approximately 20mL of distilled water, and the other sub-sample mixed with approximately 20mL of hydrogen peroxide (H_2O_2), buffered to a pH of 5.4 with sodium hydroxide.

Slurry pHs were measured with a calibrated pH meter. The pH of the distilled water/soil slurry (pH_F) was measured approximately one hour after mixing, whilst the pH of the hydrogen peroxide/soil slurry (pH_{FOX}) was measured approximately one to two hours after mixing.

The pH screening tests can be used for the preliminary identification of a potential or actual ASS using a combination of three trigger factors as follows:

- a) The strength of the reaction with peroxide is a useful indicator but cannot be used alone. Organic matter and other soil constituents such as manganese oxides can also cause a reaction.
- b) A pH_{FOX} value at least one unit below pH_F may indicate a potential ASS. The greater the difference between the two measurements, the more indicative the value is of a potential ASS. The lower the final pH_{FOX} value the better the indication of a positive result.
- c) If the pH_{FOX} is less than 3, and the other two conditions apply, then it strongly indicates a potential ASS. The more the pH_{FOX} drops below 3, the more positive the presence of sulfides.

In broad summary, several of the 'natural' soil samples tested did not show an indication of ASS presence. The results of the screening tests were used to assist in the selection of samples for more detailed, quantitative laboratory testing.

Chromium Suite Analysis

Chromium suite analysis was undertaken to quantify existing soil acidity and potential future acid generation from possible ASS. Soil samples were refrigerated until transported to Octief Pty Ltd, under standard chain of custody protocol. A summary of results is given in Table 2.

TABLE 2 CHROMIUM SUITE TESTING SUMMARY

BH No.	Depth (m)	Nett Acidity (mol H ⁺ /t)	Liming Rate (kg CaCO ₃ /t)
01	1.0	<5	Nil
	2.0	<5	Nil
	3.0	10	Nil
02	1.0	<5	Nil
	2.0	<5	Nil
	3.0	<5	Nil
03	1.0	<5	Nil
	2.0	<5	Nil
	3.0	<5	Nil
04	1.0	<5	Nil
	2.0	<5	Nil
	3.0	<5	Nil

Summary

On the basis of the testing undertaken, all samples provided nett acidity values below the ASSMAC defined action criteria. Therefore, soils disturbed on-site do not require treatment for acid sulfate potential.

The results of the laboratory testing are appended to this report.

6.0 LIMITATIONS

We have prepared this report for the Proposed Residential Development at 29 Shirley Street and 2-4 Milton Street, Byron Bay. The report is provided for the exclusive use of One Project MGMT Group, for this project only and for the purposes outlined in the report. It should not be used by, or relied upon, for other projects on the same or different sites or by a third party. In preparing this report, we have relied upon information provided by the client or their agents.

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

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

P. ELKINGTON (RPEQ 7226)

For and on behalf of

PACIFIC GEOTECH PTY LTD

Project No. PG-7463

July 2022

Ref: PG-7463, 2022-04-20, ASR VER 2

One Project MGMT Group – Acid Sulfate Soil Investigation - Proposed Residential Development, 29 Shirley Street and 2-4 Milton Street, Byron Bay

APPENDICES

Project No. PG-7463

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Ref: PG-7463, 2022-04-20, ASR VER 2

One Project MGMT Group – Acid Sulfate Soil Investigation - Proposed Residential Development, 29 Shirley Street and 2-4 Milton Street, Byron Bay

APPENDIX A

NOTES RELATING TO THIS REPORT

Reports

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

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

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

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Borehole and Test Pit Logs

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

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

Description and Classification Methods

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

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the percent of

other particles present (e.g. sandy clay) as set out below:

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

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

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

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

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

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

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



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

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

Sampling

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

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

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

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

Investigation Methods

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

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

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

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

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



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

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

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

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

The test results are reported in the following form:

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

Cone Penetrometer Testing (CPT): Cone Penetrometer Testing with or without pore pressure measurement (CPTu) is carried out

using a Cone Penetrometer in general accordance with AS 1289 6.5.1, 1999.

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

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

The information provided on the plot comprises:

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

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

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

Dynamic Cone Penetrometers:

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



Logs

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

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

Groundwater

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

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

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

Fill

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

for fill, it may be difficult to reliably determine the extent of the fill.

Laboratory Testing

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

Site Anomalies

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

Review of Design

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

Site Inspection

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

Requirements could range from:

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

Project No. PG-7463

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Ref: PG-7463, 2022-04-20, ASR VER 2

One Project MGMT Group – Acid Sulfate Soil Investigation - Proposed Residential Development, 29 Shirley Street and 2-4 Milton Street, Byron Bay

APPENDIX B

BOREHOLE RECORD SHEETS

Project No.: PG-7463

Client: One Project MGMT Group
 Project Name: Proposed Residential Development
 Hole Location: 29 Shirley Street, Byron Bay
 Hole Position:

Commenced: 04/03/2022
 Logged By: EA
 Checked By:

Drill Model and Mounting: Digga PDT 1
 Hole Diameter:

RL Surface: No survey
 Datum: AHD Operator: EA

Drilling Information				Soil Description			DCP								
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm					
										0	5	10	15	20	25
			ASS 0.00-0.50 m			0.01		GM	ASPHALT						
						0.20		CI	FILL SILTY SANDY GRAVEL (GM) Medium dense, fine to coarse sized, brown, fine to medium grained sand, low plasticity fines, moist.						
			ASS 0.50-1.00 m			0.30		SP	FILL SANDY CLAY (CI) Hard, medium plasticity, light orange brown mottled light grey, fine to medium grained sand, moist.						
									FILL SAND (SP) Medium dense, fine grained, grey brown, moist.						
			ASS 1.00-1.50 m			1									
						1.30		CL-CI	FILL SANDY CLAY (CL-CI) Very stiff, low to medium plasticity, brown, fine to medium grained sand, trace of fine sized gravel, moist.						
			ASS 1.50-2.00 m			1.60		SP	FILL SAND (SP) Loose, fine to medium grained, grey brown, moist.						
						1.80		CL	FILL SANDY CLAY (CL) Very stiff, low plasticity, dark grey, fine grained sand, moist.						
			ASS 2.00-2.50 m			2		SP	FILL SAND (SP) Medium dense, fine grained, grey, moist.						
						2.10		SP	NATURAL SAND (SP) Medium dense, fine grained, grey, moist.						
			ASS 2.50-3.00 m			2.60		SP	SAND (SP) Medium dense, fine to medium grained, grey brown, wet.						
						3									
						3.30		SP	SAND (SP) Medium dense to dense, fine to medium grained, grey brown, wet.						
						4									
						5									
						6.00			Hole Terminated at 6.00 m						

<p>Method</p> <p>AS - Auger RR - Rock Roller WB - Washbore</p> <p>Support</p> <p>C - Casing</p>	<p>Water</p> <p> Level (Date) Inflow</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test B - Bulk Sample</p> <p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Remarks</p> <p>1. Groundwater encountered at 2.6m. 2. Standpipe installed to 6.0m.</p>
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Project No.: PG-7463

Client: One Project MGMT Group	Commenced: 04/03/2022
Project Name: Proposed Residential Development	Logged By: EA
Hole Location: 29 Shirley Street, Byron Bay	Checked By:
Hole Position:	

Drill Model and Mounting: Digga PDT 1	RL Surface: No survey
Hole Diameter:	Datum: AHD Operator: EA

Drilling Information				Soil Description			DCP								
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm					
										0	5	10	15	20	25
			ASS 0.00-0.50 m			0.10		GP	FILL SANDY GRAVEL (GP) Loose, fine to medium sized, dark grey, fine to medium grained sand, moist.						
						0.30		SP	FILL SAND (SP) Loose, fine to medium grained, light orange brown, low plasticity fines, trace of fine sized gravel, moist.						
			ASS 0.50-1.00 m			0.50		SP	FILL SAND (SP) Medium dense, fine grained, grey, moist.						
						0.70		SP	FILL SAND (SP) Loose, fine grained, grey brown, moist.						
						0.90		SP	FILL SAND (SP) Very loose, fine grained, dark grey, moist.						
			ASS 1.00-1.50 m D 1.10-1.50 m			1.00		SP	NATURAL SAND (SP) Very loose to loose, fine grained, grey, moist.						
			ASS 1.50-2.00 m			1.50		SP	SAND (SP) Medium dense, fine grained, dark grey brown, moist.						
			ASS 2.00-2.50 m D 2.20-2.50 m			2.00		SP	SAND (SP) Medium dense to dense, fine grained, dark brown, moist.						
			ASS 2.50-3.00 m			2.20		SP	SAND (SP) Medium dense to dense, fine grained, dark brown, moist.						
						2.60		SP	SAND (SP) Medium dense, fine grained, brown, moist.						
						3.00		SP	SAND (SP) Medium dense, fine grained, brown, moist.						
						3.20		SP	SAND (SP) Dense, fine grained, dark brown, wet.						
						4.00		SP	SAND (SP) Dense, fine grained, dark brown, wet.						
						4.10		SP	SAND (SP) Medium dense, fine grained, grey brown, wet.						
						5.00		SP	SAND (SP) Medium dense, fine grained, grey brown, wet.						
						6.00		SP	SAND (SP) Medium dense, fine grained, grey brown, wet.						
Hole Terminated at 6.00 m															

<p>Method</p> <p>AS - Auger RR - Rock Roller WB - Washbore</p> <p>Support</p> <p>C - Casing</p>	<p>Water</p> <p> Level (Date) Inflow</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test B - Bulk Sample</p> <p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Remarks</p> <p>1. Groundwater encountered at 3.2m.</p>
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PACGEO 1.01.1.LIB.GLB Log PACGEO BOREHOLE PG-7463.GPJ <<DrawingFile>> 05/04/2022 17:06 10.02.00.04 D:\git\pacgeo\1.01.1\2018-05-15\Fig_Preview\1.01_2018-11-23

Project No.: PG-7463

Client: One Project MGMT Group
 Project Name: Proposed Residential Development
 Hole Location: 29 Shirley Street, Byron Bay
 Hole Position:

Commenced: 04/03/2022
 Logged By: EA
 Checked By:

Drill Model and Mounting: Digga PDT 1
 Hole Diameter:

RL Surface: No survey
 Datum: AHD Operator: EA

Drilling Information				Soil Description				DCP							
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm					
										0	5	10	15	20	25
			ASS 0.00-0.50 m B 0.00-0.60 m			0.20		SP	FILL SAND (SP) Loose, fine grained, grey, with organics, moist.						
			ASS 0.50-1.00 m					SP	FILL SAND (SP) Very loose to loose, fine grained, grey, moist.						
			ASS 1.00-1.50 m			1.10		SP	FILL SAND (SP) Medium dense, fine grained, dark grey, moist.						
			ASS 1.50-2.00 m			1.30		SP	NATURAL SAND (SP) Medium dense, fine grained, grey, moist.						
			ASS 2.00-2.50 m			2									
			ASS 2.50-3.00 m			2.60		SP	SAND (SP) Medium dense, fine to medium grained, grey, wet.						
						3									
						3.40		SP	SAND (SP) Dense, fine to medium grained, grey brown, wet.						
						3.70		SP	SAND (SP) Medium dense, fine to medium grained, brown, wet.						
						4									
						5									
						6.00			Hole Terminated at 6.00 m						

<p>Method</p> <p>AS - Auger RR - Rock Roller WB - Washbore</p> <p>Support</p> <p>C - Casing</p>	<p>Water</p> <p>Level (Date) Inflow</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test B - Bulk Sample</p> <p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Remarks</p> <p>1. Groundwater encountered at 2.6m.</p>
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PACGEO 1.01.1.LIB.GLB Log PACGEO BOREHOLE PG-7463.GPJ <<DrawingFile>> 05/04/2022 17:06 10.02.00.04 D:\gel Lab and In Situ Tool - DGD [Lib: pacgeo.1.01.1.2018-05-15.Frj; Prease.1.01.2016-11-23]

Project No.: PG-7463

Client: One Project MGMT Group
 Project Name: Proposed Residential Development
 Hole Location: 29 Shirley Street, Byron Bay
 Hole Position:

Commenced: 04/03/2022
 Logged By: EA
 Checked By:

Drill Model and Mounting: Digga PDT 1
 Hole Diameter:

RL Surface: No survey
 Datum: AHD Operator: EA

Drilling Information				Soil Description			DCP								
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm					
										0	5	10	15	20	25
			ASS 0.00-0.50 m			0.05		SP	FILL SAND (SP) Very loose, fine grained, light grey, trace of fine to medium sized gravel, moist.						
			ASS 0.50-1.00 m			0.30		SP	NATURAL SAND (SP) Very loose to loose, fine grained, dark grey, moist.						
			D 0.60-1.00 m			0.60		SP	SAND (SP) Very loose, fine grained, dark grey, moist.						
			ASS 1.00-1.50 m			1.10		SP	SAND (SP) Loose to medium dense, fine grained, light grey, moist.						
			ASS 1.50-2.00 m												
			ASS 2.00-2.50 m			2.10		SP	SAND (SP) Medium dense, fine grained, light grey, moist.						
			ASS 2.50-3.00 m												
			D 2.60-3.00 m												
						3.20		SP	SAND (SP) Medium dense, fine to medium grained, light grey brown, wet.						
						3.70		SP	SAND (SP) Dense, fine to medium grained, brown, wet.						
						4		SP	SAND (SP) Medium dense to dense, fine to medium grained, grey brown, wet.						
						5									
						6.00			Hole Terminated at 6.00 m						

<p>Method</p> <p>AS - Auger RR - Rock Roller WB - Washbore</p> <p>Support</p> <p>C - Casing</p>	<p>Water</p> <p>Level (Date) Inflow</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test B - Bulk Sample</p> <p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Remarks</p> <p>1. Groundwater encountered at 2.1m.</p>
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PACGEO 1.01.1.LIB.GLB Log PACGEO BOREHOLE PG-7463.GPJ <<DrawingFile>> 05/04/2022 17:06 10.02.00.04 D:\gel Lab and In Situ Tool - DGD [Lib: pacgeo.1.01.1.2018-05-15.Frj; Prease 1.01.2016-1-23]

Project No.: PG-7463

Client: One Project MGMT Group
 Project Name: Proposed Residential Development
 Hole Location: 29 Shirley Street, Byron Bay
 Hole Position:

Commenced: 04/03/2022
 Logged By: EA
 Checked By:

Drill Model and Mounting: Digga PDT 1
 Hole Diameter:

RL Surface: No survey
 Datum: AHD Operator: EA

Drilling Information				Soil Description			DCP								
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm					
										0	5	10	15	20	25
						0.05		GP	FILL GRAVEL (GP) Very loose, fine to coarse sized, grey, moist.						
						0.20		SP	FILL SAND (SP) Very loose, fine grained, grey, with organics, moist.						
						0.50		SP	FILL SAND (SP) Loose, fine grained, grey brown, moist.						
			D 0.60-1.00 m			1.00		SP	NATURAL SAND (SP) Loose to medium dense, fine grained, light grey, moist.						
						1.60		SP	SAND (SP) Very loose to loose, fine grained, light grey, moist.						
			D 2.30-2.50 m			2.30		SP	SAND (SP) Medium dense, fine to medium grained, light grey, moist.						
						3.20		SP	SAND (SP) Medium dense, fine to medium grained, light grey brown, wet.						
						5.50		SP	SAND (SP) Dense, fine grained, grey brown, wet.						
						6.00			Hole Terminated at 6.00 m						

<p>Method</p> <p>AS - Auger RR - Rock Roller WB - Washbore</p> <p>Support</p> <p>C - Casing</p>	<p>Water</p> <p>Level (Date) Inflow</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test B - Bulk Sample</p> <p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>
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Remarks

1. Groundwater encountered at 3.2m.

PACGEO 1.01.1.LIB.GLB Log PACGEO BOREHOLE PG-7463.GPJ <<DrawingFile>> 05/04/2022 17:06 10.02.00.04 D:\g\lab\and\in\shu\tool - DGD [Lib: pacgeo 1.01.1.2018-05-15 Proj: Prease 1.01.2016-11-23]

Project No.: PG-7463

Client: One Project MGMT Group
 Project Name: Proposed Residential Development
 Hole Location: 29 Shirley Street, Byron Bay
 Hole Position:

Commenced: 04/03/2022
 Logged By: EA
 Checked By:

Drill Model and Mounting: Digga PDT 1
 Hole Diameter:

RL Surface: No survey
 Datum: AHD Operator: EA

Drilling Information				Soil Description				DCP							
Method	Casing	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description Fraction, Colour, Structure, Bedding, Plasticity, Sensitivity, Additional	DCP TEST (AS 1289.6.3.2-1997) Blows per 100 mm					
										0	5	10	15	20	25
			D 0.30-0.50 m			0.30		SP	NATURAL SAND (SP) Very loose, fine grained, grey, moist (with traces of charcoal).						
						0.60		SP	SAND (SP) Very loose to loose, fine grained, dark grey, moist.						
						1.10		SP	SAND (SP) Loose, fine grained, grey brown, moist.						
						2.60		SP	SAND (SP) Medium dense, fine grained, light grey, moist.						
						3.90		SP	SAND (SP) Medium dense, fine to medium grained, grey brown, wet.						
						6.00		SP	SAND (SP) Dense, fine to medium grained, grey brown, wet.						
Hole Terminated at 6.00 m															

<p>Method</p> <p>AS - Auger RR - Rock Roller WB - Washbore</p> <p>Support</p> <p>C - Casing</p>	<p>Water</p> <p> Level (Date) Inflow</p>	<p>Samples and Tests</p> <p>U - Undisturbed Sample D - Disturbed Sample SPT - Standard Penetration Test B - Bulk Sample</p> <p>Classification Symbols and Soil Descriptions</p> <p>Based on Unified Soil Classification System</p>	<p>Remarks</p> <p>1. Groundwater encountered at 2.6m.</p>
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PACGEO 1.01.1.LIB.GLB Log PACGEO BOREHOLE PG-7463.GPJ <<DrawingFile>> 05/04/2022 17:06 10.02.00.04 D:\gel Lab and In Situ Tool - DGD [Lib: pacgeo.1.01.1.2018-05-15 Proj: Prease.1.01.2016-11-23]

Project No. PG-7463

July 2022

Ref: PG-7463, 2022-04-20, ASR VER 2

One Project MGMT Group – Acid Sulfate Soil Investigation - Proposed Residential Development, 29 Shirley Street and 2-4 Milton Street, Byron Bay

APPENDIX C

LABORATORY TEST CERTIFICATES

CERTIFICATE OF ANALYSIS

Report No. 22-1421

Rev No. 00

Client: Pacific Geotech Pty Ltd
 Client Contact: Peter Elkington
 Client Address: 3 Jowett Street
 Coomera QLD 4209
 Purchase Order #: PG-7463
 Project / Site Ref: 29 Shirley St, Byron Bay

Sample Date: 4/03/2022
 Date Samples Received: 30/03/2022
 Date Analysis Commenced: 30/03/2022
 No. Samples Received: 24
 No. Samples Analysed: 24
 Date Issued: 31/03/2022

Lab Ref No.			pH	pH _{FOX}	pH _{FOX} Reaction Rating
Units	Sample Description	Depth (m)	pH	pH	
LOR			0.1	0.1	
22-1421/1	BH01	0.0-0.5	6.7	5.0	X
22-1421/2	BH01	0.5-1.0	6.0	5.0	X
22-1421/3	BH01	1.0-1.5	6.1	5.0	X
22-1421/4	BH01	1.5-2.0	5.5	4.8	X
22-1421/5	BH01	2.0-2.5	5.4	5.0	X
22-1421/6	BH01	2.5-3.0	5.4	5.0	X
22-1421/7	BH02	0.0-0.5	5.8	4.8	X
22-1421/8	BH02	0.5-1.0	6.0	5.0	X
22-1421/9	BH02	1.0-1.5	5.8	4.8	X
22-1421/10	BH02	1.5-2.0	5.8	4.9	X
22-1421/11	BH02	2.0-2.5	5.6	4.9	X
22-1421/12	BH02	2.5-3.0	5.6	5.0	X
22-1421/13	BH03	0.0-0.5	5.0	4.9	X
22-1421/14	BH03	0.5-1.0	5.6	5.0	X
22-1421/15	BH03	1.0-1.5	5.9	5.0	X
22-1421/16	BH03	1.5-2.0	6.0	5.0	X
22-1421/17	BH03	2.0-2.5	6.0	5.0	X
22-1421/18	BH03	2.5-3.0	6.0	5.0	X
22-1421/19	BH04	0.0-0.5	6.0	5.0	X
22-1421/20	BH04	0.5-1.0	6.1	5.0	X
22-1421/21	BH04	1.0-1.5	6.1	5.0	X
22-1421/22	BH04	1.5-2.0	6.1	5.0	X
22-1421/23	BH04	2.0-2.5	5.9	5.0	X
22-1421/24	BH04	2.5-3.0	6.0	5.0	X

Test Methodology: Analysis is conducted in accordance with inhouse method LAB300 which is in compliance with AS 4969-2008. Analysis Methods are derived from: Ahern CR, McEInea AE, Sullivan LA (2004). Acid Sulfate Soils Laboratory Methods Guidelines. Queensland Acid Sulfate Soils Manual 2004. Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

pH Screen Reaction Rating Table

Reaction Scale

X
 XX
 XXX
 XXXX

Rate of Reaction

Slight Reaction
 Moderate Reaction
 High Reaction
 Very vigorous reaction, gas evolved and heat generated, commonly >80°C

Approved Signatories:



Checked By: Lachlan Modina
Senior Laboratory Technician



Approved By: Daryl Surkitt
Manager Laboratory Technical Services

Notes: NATA Accreditation does not cover the sampling performance
OCTIEF accepts no responsibility for the collection, packaging and transportation of samples submitted by external parties
All samples are analysed as received and the results contained within this report relate only to the sample(s) submitted for analysis.
Measurement uncertainty data is available [here](#).

NATA Accreditation Number: 15172
Accredited for compliance with ISO/IEC 17025- Testing
This document may not be reproduced except in full
Tests not covered by NATA are denoted with *



CERTIFICATE OF ANALYSIS

Report No. 22-1422

Rev No. 00

Client: Pacific Geotech Pty Ltd
 Client Contact: Peter Elkington
 Client Address: 3 Jowett Street
 Coomera QLD 4209
 Purchase Order #: PG-7463
 Project / Site Ref: 29 Shirley St, Byron Bay

Date Samples Received: 30/03/2022
 Date Analysis Commenced: 30/03/2022
 No. Samples Received: 12
 No. Samples Analysed: 12
 Date Issued: 1/04/2022

Lab Ref No. Sample Desc. Depth (m) Sample Date	UNIT	LOR	22-1422-1	22-1422-2	22-1422-3	22-1422-4	22-1422-5	22-1422-6	22-1422-7
			BH01	BH01	BH01	BH02	BH02	BH02	BH03
			1.0	2.0	3.0	1.0	2.0	3.0	1.0
			4/03/2022	4/03/2022	4/03/2022	4/03/2022	4/03/2022	4/03/2022	4/03/2022
pH _{KCL}	pH Unit	0.1	7.0	5.2	5.3	6.8	5.3	6.8	6.7
Chromium Reducible Sulfur	%w/w S	0.005	0.007	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulfur	mol H ⁺ /t	3	4	4	<3	<3	<3	<3	<3
TAA pH 6.5	mol H ⁺ /t	5	<5	13	10	<5	6	<5	<5
s-TAA pH 6.5	%S w/w	0.005	<0.005	0.020	0.015	<0.005	0.010	<0.005	<0.005
KCl Ext S	%w/w S	0.005	<0.005	0.013	<0.005	<0.005	<0.005	<0.005	<0.005
HCl Ext S	%w/w S	0.005	<0.005	0.040	0.006	<0.005	<0.005	<0.005	<0.005
Retained Acidity	%S	0.005	N/R						
ANC	mol H ⁺ /t	5	8	48	<5	60	6	<5	32
Net Acidity	mol H ⁺ /t	5	<5	17	10	<5	6	<5	<5
Net Acidity	%w/w S	0.005	<0.005	0.027	0.016	<0.005	0.010	<0.005	<0.005
Net Acidity-ANC	mol H ⁺ /t	5	<5	<5	10	<5	<5	<5	<5
Liming Rate	kg CaCO ₃ /t	1	<1	1	1	<1	<1	<1	<1
Liming rate-ANC	kg CaCO ₃ /t	1	<1	<1	1	<1	<1	<1	<1

Lab Ref No. Sample Desc. Depth (m) Sample Date	UNIT	LOR	22-1422-8	22-1422-9	22-1422-10	22-1422-11	22-1422-12
			BH03	BH03	BH04	BH04	BH04
			2.0	3.0	1.0	2.0	3.0
			4/03/2022	4/03/2022	4/03/2022	4/03/2022	4/03/2022
pH _{KCL}	pH Unit	0.1	7.1	7.1	7.1	7.1	7.1
Chromium Reducible Sulfur	%w/w S	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium Reducible Sulfur	mol H ⁺ /t	3	<3	<3	<3	<3	<3
TAA pH 6.5	mol H ⁺ /t	5	<5	<5	<5	<5	<5
s-TAA pH 6.5	%S w/w	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
KCl Ext S	%w/w S	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
HCl Ext S	%w/w S	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Retained Acidity	%S	0.005	N/R	N/R	N/R	N/R	N/R
ANC	mol H ⁺ /t	5	13	<5	<5	<5	<5
Net Acidity	mol H ⁺ /t	5	<5	<5	<5	<5	<5
Net Acidity	%w/w S	0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Net Acidity-ANC	mol H ⁺ /t	5	<5	<5	<5	<5	<5
Liming Rate	kg CaCO ₃ /t	1	<1	<1	<1	<1	<1
Liming rate-ANC	kg CaCO ₃ /t	1	<1	<1	<1	<1	<1

General Comments



- I. OCTIEF accepts no responsibility for the collection, packaging and transportation of samples submitted by external parties
- II. All samples are analysed as received (unless indicated otherwise) and the results contained within this report relate only to the sample(s) submitted for analysis.
- III. Measurement uncertainty data is available [here](#).
- IV. NATA Accreditation Number: 15172
- V. Accredited for compliance with ISO/IEC 17025 – Testing
- VI. This document may not be reproduced except in full
- VII. Tests not covered by NATA are denoted with *

Report Comments

Test Methodology: Analysis is conducted in accordance with inhouse method LAB-300 which is in compliance with AS 4969-2008. Analysis Methods are derived from: Ahern CR, McElnea AE, Sullivan LA (2004). Acid Sulfate Soils Laboratory Methods Guidelines. Queensland Acid Sulfate Soils Manual 2004. Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

Notes:

1. Net Acidity = Actual Acidity + Retained Acidity + Potential Sulfidic Acidity.
2. ANC is typically only included in the Net Acidity calculation where the neutralising capacity of the soil has been corroborated with other data.
3. Retained Acidity required where pHKCl <4.5. Retained Acidity (SNAS) calculated as (2 * S-HCl) - S-KCl.
4. Acid Neutralising Capacity is required only where pHKCl >=6.5, however, the ANC results have been reported to identify any previous lime dosing.
5. Liming Rate calculation and Acidity - ANC calculation assumes the use of agricultural lime and incorporates a safety factor of 1.5.
6. The neutralising capacity for Ag lime is 96, hence to convert from kg CaCO₃ to kg Ag Lime (CaCO₃/t), multiply by 100/96.
7. N/R denotes Not Required.

Approved Signatories:

A handwritten signature in black ink, appearing to read 'Daryl Surkitt'.

Daryl Surkitt

Report Checked By:

A handwritten signature in black ink, appearing to read 'Daryl Surkitt'.

Daryl Surkitt

Report Approved By:

Project No. PG-7463

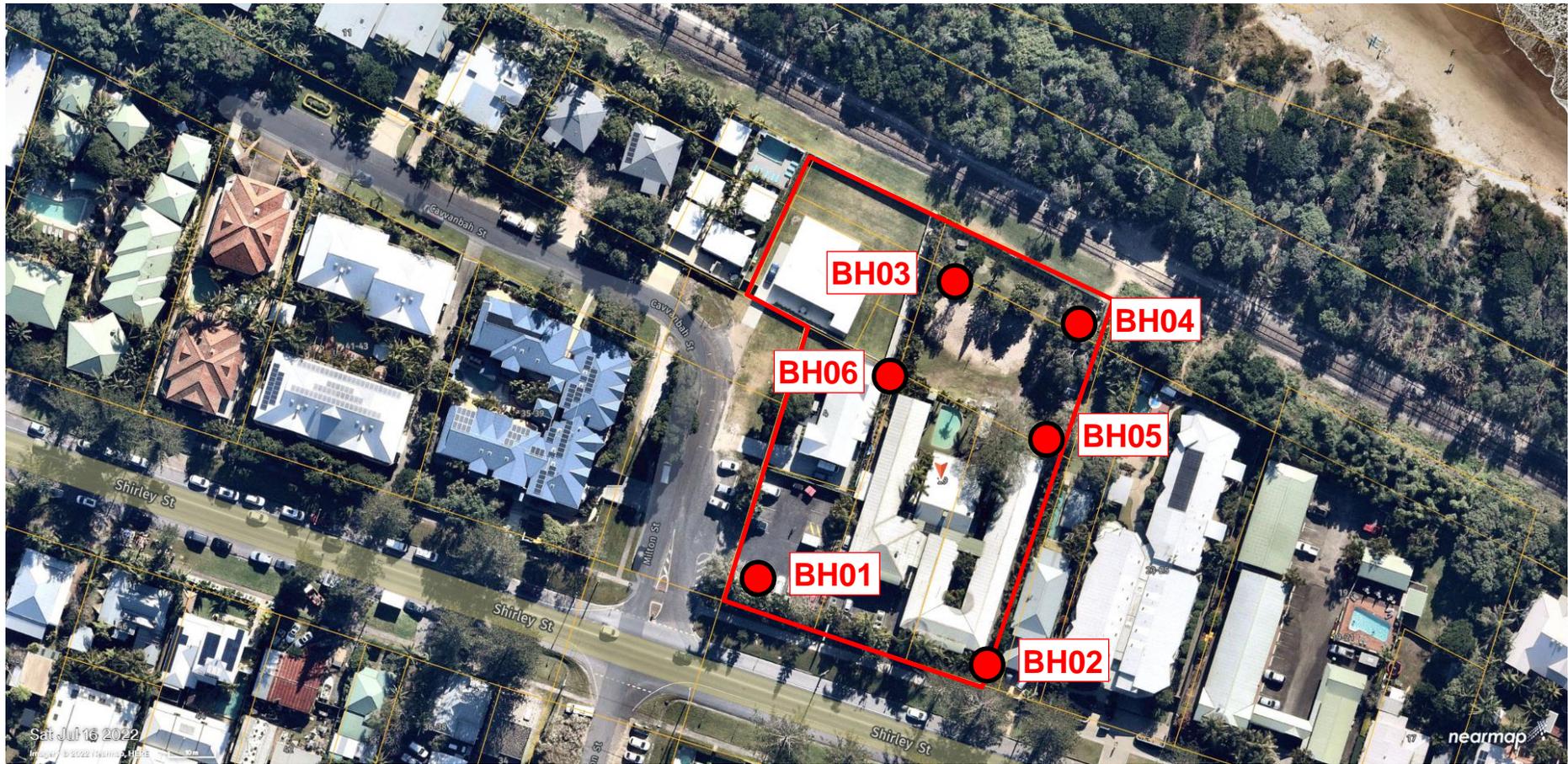
July 2022

Ref: PG-7463, 2022-04-20, ASR VER 2

One Project MGMT Group – Acid Sulfate Soil Investigation - Proposed Residential Development, 29 Shirley Street and 2-4 Milton Street, Byron Bay

APPENDIX D

SITE PLAN



Pacific Geotech
Consulting Geotechnical Engineers

Drawn AB	Project:	Proposed Residential Development	Drawing No. PG-7463-02	A4
Date Jul 2022	Location:	29 Shirley Street and 2-4 Milton Street, Byron Bay		
Checked	Client:	One Project MGMT Group		

Project No. PG-7463

July 2022

Ref: PG-7463, 2022-04-20, ASR VER 2

One Project MGMT Group – Acid Sulfate Soil Investigation - Proposed Residential Development, 29 Shirley Street and 2-4 Milton Street, Byron Bay

APPENDIX E

ACID SULFATE SOIL MANAGEMENT PLAN

Ref: PG-7463, 2022-04-20, ASSMP VER 2
Author: Peter Elkington

29th July, 2022

One Project MGMT Group
Email: james@onepmgrou.com

ATTN: JAMES DAVIDSON

Dear Sir,

**ACID SULFATE SOIL MANAGEMENT PLAN – PROPOSED RESIDENTIAL DEVELOPMENT
29 SHIRLEY STREET AND 2-4 MILTON STREET, BYRON BAY**

It is understood that the proposed development is to comprise the construction of a three storey residential building over a single level basement at the above site. Earthworks are envisaged to consist of cuts of up to 3m for the basement.

Fieldwork comprised the drilling and sampling of 6 boreholes, to depths of 6m and using a Digga PDT 1 drilling rig and 100mm solid flight augers.

Laboratory testing was undertaken in general accordance with the recommendations outlined in the ASSMAC 'Acid Sulfate Soil Management Advisory Committee, August 1998' and was undertaken by Octief Pty Ltd.

The testing program comprised of initial screening tests on recovered samples, followed by quantitative testing using the Chromium Reducible Sulfur (CRS) suite.

Summary

On the basis of the testing undertaken, all samples provided nett acidity values below the ASSMAC defined action criteria. Therefore, soils disturbed on-site do not require treatment for acid sulfate potential.

Should you have any queries in regards to the above, please do not hesitate to contact the undersigned at our office.

Yours faithfully,

P. ELKINGTON (RPEQ 7226)

For and on behalf of
PACIFIC GEOTECH PTY LTD



info@pacgeo.com.au
www.pacgeo.com.au

