

**St Vincent's Foundation Pty Ltd**

**Geotechnical Site Classification**

**Proposed Residential Subdivision**

**Stage 2, Precinct B, Rainbow Beach, Ocean Drive, Lake Cathie**

Report No. RGS20337.1-CN

22 August 2022



RGS20337.1-CN

22 August 2022

St Vincent's Foundation Pty Ltd  
c/ King & Campbell Pty Ltd  
PO Box 243  
PORT MACQUARIE NSW 2444

**Attention: Steve Kipreotis**

Dear Steve,

**RE: Proposed Residential Subdivision – Stage 2, Precinct B, Rainbow Beach, Ocean Drive, Lake Cathie**

**Geotechnical Site Classification**

As requested, Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken a geotechnical a site classification in accordance with AS2870-2011 *Residential Slabs and Footings* for the 28 proposed residential lots located in Stage 2 of Precinct B, Rainbow Beach, Ocean Drive, Lake Cathie. Stage 2 of Precinct B comprises Lot No's 300 to 327 as shown on the supplied plan titled "PLAN OF SUBDIVISION OF LOT 238 DP 1278887".

Based on the existing profiles encountered at the time of the field investigations and on the basis that all fill present was placed under Level One Inspection and Testing as defined in AS3798-2007, the building areas within the lots present would be classified or reclassified as **Class S** (Slightly Reactive), in accordance with AS2870-2011 as detailed in the attached report.

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

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

Prepared by



**Tim Morris**

Associate Engineering Geologist



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## 1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd has undertaken a geotechnical a site classification in accordance with AS2870-2011 *Residential Slabs and Footings* for the 28 proposed residential lots in Stage 2 of Precinct B, Rainbow Beach, Ocean Drive, Lake Cathie. Stage 2 of Precinct B comprises Lot No's 300 to 327 as shown on Figure 1.

The majority of the residential lots have been modified by site regrading works comprising up to approximately 2m cut, or, placement of up to approximately 0.75m of mixed clay and gravel fill. The approximate extent of lot filling works for Stage 1 is shown on Figure 2.

Filling works was undertaken by Kazac Civil Pty Ltd, with Level One Inspection and Testing of the works undertaken by AC Testing Services Pty Ltd on behalf of RGS. The Level 1 Report was prepared by RGS (Report Ref: RGS20337.1-BW, dated 19 October 2021).

The work was commissioned by Scott Marchant on behalf of King & Campbell Pty Ltd and was undertaken in accordance with proposal number RGS20337.1-BR dated 31 August 2020.

## 2 METHODOLOGY

Field work for the assessment was undertaken on 19 and 26 July 2022 and was based on the supplied drawing titled "ROADWORKS AND DRAINAGE PLAN 01". Fieldwork was undertaken by a Geotechnical Engineer from RGS and included:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site;
- 16 boreholes undertaken by a 4WD mounted drilling rig logged and sampled by a Geotechnical Engineer; and
- U50 tube samples collected from soil horizons considered representative of cohesive soil profiles.

Engineering logs of the boreholes are presented in Appendix A. Investigation locations are shown on Figure 1 and were obtained by approximate measurements to prominent site features. Coordinates of investigation locations were recorded using a handheld GPS and the coordinates are shown on the engineering logs.

## 3 LABORATORY TESTING

Samples considered representative of foundation soils were submitted to a NATA accredited laboratory for the measurement of soil volume change over an extreme range of moisture content (shrink / swell index) on four U50 samples. Results are presented in Appendix B and summarised in Table 1.



**Table 1: Laboratory Testing Summary**

Location	Depth (m)	Lot	Material	Shrink Swell Index (%)
BHB208	0.3 – 0.6	313/314	Residual	1.1
BHB213	0.5 – 0.8	323/324	EW Dolerite	2.0
BHB215	0.4 – 0.7	319/320	Residual	1.5
BHB216	0.35 – 0.55	312/313	Residual	1.4

## 4 SITE CONDITIONS

### 4.1 Surface Conditions

Stage 2 of Precinct B is located in the Rainbow Beach Residential Subdivision and is situated in an area of moderately undulated terrain on the south-west facing mid to toe slopes of a broad rounded southeast plunging ridgeline. Surface elevations range from 17m AHD at the upper slopes of the ridge in the north-east corner to approximately 9m AHD in the south-west corner at the completion of site regrading works. Surface slopes following site regrading range from 2 – 5° across the site to the south-west.

An image of the site taken from technology one spatial that shows the location of the site and the site setting is reproduced in Plate 1.



**Plate 1:** Satellite image dated July 2021 obtained from Google Earth that illustrates the site location and setting. The approximate site boundaries are outlined in red. Stage 2 was modified by site regrading earthworks including cut of up to 2m and placement of up to 0.75m fill.



The regrading works have included areas of cut and placement of fill. The fill typically comprised a blend of site won crushed rock and clays. Lot filling works were undertaken under Level 1 inspection and monitoring as defined in AS3798-2007 *Guidelines on Earthworks for Commercial and Residential Developments* by AC Testing Services Pty Ltd. The Level 1 Report was prepared by RGS (Report Ref: RGS20337.1-BW, dated 19 October 2021). The approximate extent of earthworks is shown on Figure 2, based on the supplied drawing titled "Total Cut Fill BC".

Drainage of the site would be via a combination of overland flow, surface infiltration and collected stormwater through kerb and gutter drainage in roadways.

Typical site photographs are presented below.



## 4.2 Subsurface Conditions

The site is situated in an area underlain by undifferentiated rocks of the Watonga Formation which can include slate, chert, mudstone and the intrusive Karikeree Meta-dolerite.

RGS has previously undertaken geotechnical assessments of the site, including Report RGS20337.1-AR, dated 1 June 2018 and Report RGS20337.1-BE, dated 26 March 2019. The previous investigations were undertaken prior to bulk earthworks and encountered variable profiles with colluvial clays overlying high plasticity residual clay grading into extremely weathered to fresh meta-dolerite rock in areas of proposed deep excavations.

The materials encountered during the investigation are summarised in Table 2 and 3. Further details are presented on the engineering logs in Appendix B.



**Table 2: Summary of Geotechnical Units**

<b>Unit</b>	<b>Material</b>	<b>Material Description</b>
UNIT 1A	TOPSOIL/ FILL	Sandy SILT to Clayey SAND, low plasticity, dark brown
UNIT 1B	FILL – GRAVEL	Sandy to Clayey GRAVEL, fine to coarse grained, pale brown / brown / grey, with fine to coarse sand and trace to some cobbles
UNIT 2	SLOPEWASH	Sandy to Silty CLAY, medium plasticity, red/brown, gravel fine to medium grained, subrounded, friable
UNIT 3	RESIDUAL	Sandy CLAY, medium to high plasticity, pale brown/orange, traces of gravel, fine to medium grained, subangular, very stiff
UNIT 4A	EW DOLERITE	Gravelly Sandy Clay to Sandy CLAY, medium plasticity, pale brown/pale yellow, traces of rock fabric, gravel is fine to medium grained, subangular dolerite, very stiff
UNIT 4B	HW – MW DOLERITE	Highly Weathered to Moderately Weathered DOLERITE, fine to medium grained, pale grey - white, inferred low to high strength. Recovered as Sandy GRAVEL. Bands of higher strength rock resulted in auger refusal.



**Table 3: Summary of Subsurface Profiles - Depth to Base of Material Layer (m)**

BH	Lot	Unit 1A Topsoil	Unit 1B Fill – Gravel	UNIT 2 Slopewash	UNIT 3 Residual	UNIT 4A EW Dolerite	UNIT 4B HW – MW Dolerite
BHB201	306/307	0.15	0.25	--	--	--	≥0.7*
BHB202	308/309	0.25*	--	--	--	--	--
BHB203	303/304	0.2	--	--	--	--	≥0.4*
BHB204	301/302	0.4	--	--	≥0.5*	--	--
BHB205	301	0.2	0.4	--	--	--	≥1.5
BHB206	305	0.2	0.35*	--	--	--	---
BHB207	311/312	0.3	--	--	--	0.8	≥1.5
BHB208	313/314	0.15	--	0.3	0.6	--	≥1.5
BHB209	315/316	0.15	--	--	0.5	--	≥1.5
BHB210	317/318	0.35*	--	--	--	--	--
BHB211	326/327	0.15	0.65*	--	--	--	--
BHB212	325/326	0.25	--	--	--	--	≥0.9*
BHB213	323/324	0.15	--	--	--	0.85	≥1.5
BHB214	321/322	0.15	0.4	--	--	0.6	≥0.75*
BHB215	319/320	0.25	--	0.4	0.7	--	≥1.5
BHB216	312/313	0.1	--	0.35	0.55	--	≥1.5

Note: ≥ Indicates that base of material layer was not encountered  
 \* Indicates that the test was terminated due to practical refusal on rock  
 -- Indicates that the material was not encountered at the test location





Groundwater not encountered within boreholes. It should be noted that fluctuations in groundwater levels can occur as a result of seasonal variations, temperature, rainfall and other similar factors, the influence of which may not have been apparent at the time of the assessment

## 5 SITE CLASSIFICATION

For structures or components that are similar in construction, performance expectation, and loading to a typical domestic structure, the guidance provided in AS2870-2011 “Residential Slabs and Footings” would be appropriate.

In assessing the estimated characteristic surface movement ( $y_s$ ) values the following has been adopted:

- All clay and gravel fill of > 0.4m thickness was placed under Level 1 Inspection and Testing as defined in AS3798-2007, and can therefore be considered as Controlled Fill;
- Where there was cut undertaken the depth of cracked zone was reduced by the depth of cut;
- Suction change at ground surface of pf 1.2;
- Depth of suction change of 1.5m;
- Characteristic  $I_{ss}$  for residual clay of 1.1% to 1.5%;
- Characteristic  $I_{ss}$  for extremely weathered dolerite as clay of 2.0%;
- Characteristic  $I_{ss}$  for mixed gravel fill of 0.5% based on previous experience with similar materials at the site; and
- Highly weathered rock (Unit 4B) was encountered at depths ranging from 0.25 m to 0.85m. Where bands of moderately weathered dolerite of higher strength were encountered, they typically resulting in auger refusal.

The proposed building area for 325 to 327 as shown on Figure 2 have been modified by filling works of >0.4m thickness. These lots are classified as Class P in accordance with AS2870-2011, Clause 2.5.3 Section (a) due to the presence of fill >0.4 m, requiring footings to be designed in accordance with engineering principles.

The building area for these lots modified by filling works undertaken under Level 1 supervision have been reclassified as summarised in Table 4 in accordance with Clause 2.5.3 Section C of AS2870-2011, based on the existing profile at the time of field investigation, the properties of the Controlled Fill that was placed under Level 1 supervision as defined by AS3798-2007, the properties of the underlying natural profile and the estimated surface movement ( $y_s$ ).

The site classifications and expected shrink-swell related characteristic free surface movements ( $y_s$ ) estimated for the profiles encountered during the field investigation in the building areas in each lot are summarised in Table 4.

**Table 4: Site Re-classification Summary**

Lots	Site Classification	Site Re-classification	Expected Surface Movement (mm)
300 to 324	S	--	<20mm
325 to 327	P (Controlled Fill – Crushed Rock)	S	<20mm



## 6 CONSTRUCTION AND SITE MAINTENANCE CONSIDERATIONS

All structural footings should be founded as follows:

- All footings should be founded in Controlled Fill, colluvial, residual soils or highly weathered rock below all topsoil and uncontrolled fill materials;
- Footings can be designed on the basis of a maximum allowable base bearing pressure of **100 kPa** for footings founded within the Controlled Fill, colluvial, residual soils or extremely weathered rock of at least very stiff strength;
- Footings founded within highly weathered rock (Unit 4B) can be designed on the basis of a maximum allowable base bearing pressure of **300 kPa**;
- All footings, edge beams and internal beams should be entirely founded on similar material and outside or below the zones of influence resulting from existing or future service trenches and other subsurface structures;
- The engineering design for any retaining walls present allows for any surcharge affecting the walls such as proposed footings, structures or sloping surfaces;
- Future earthworks may result in parts of some buildings being founded on weathered rock and other parts on residual clays or placed fill. Should differential shrink-swell related movements be of concern for the proposed dwelling it is recommended that all footings be deepened to found uniformly on the weathered rock profile;
- The soils in the Port Macquarie area, particularly the yellow residual clays (Unit 3) are prone to fretting and softening on exposure to air and water. It is therefore recommended that concrete be poured as soon as possible after footing excavation. In the event that wet weather occurs prior to pouring of concrete, the base of footing excavations should be checked for the presence of loose or softened material, which should be removed prior to pouring concrete; and
- Prior to the placement of concrete we recommend that footings be observed and assessed by a suitably experienced geotechnical engineer to assess that the correct founding material has been achieved.

Where lot filling works are proposed, all fill for the support of structures should be placed and compacted in accordance with the recommendations outlined in AS3798-2007 *Guidelines on Earthworks for Residential and Commercial Developments*, under Level 1 supervision, for it to be considered Controlled Fill as defined in AS2870-2011. The founding of structures on fill that is not placed in accordance with Level 1 requirements is not recommended.

Site maintenance must comply with the recommendations and advice provided in CSIRO Sheet BTF18 "*Foundation Maintenance and Footing Performance: A Homeowners Guide*" a copy of which is which is available from the CSIRO website <http://www.publish.csiro.au/pid/7076.htm>

Shrink-swell related movements can be affected by alterations to the soil profile by cutting and filling, and by the suction related effects of trees close to the building area. The effects of any such cutting, filling or tree planting should be taken into account when selecting design values for differential movement across the building.

If further site regarding works are undertaken at the site, reclassification may be required once final cut and fill depths and fill material types are known.



## 7 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 project, or require any additional consultations, please contact the undersigned.

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

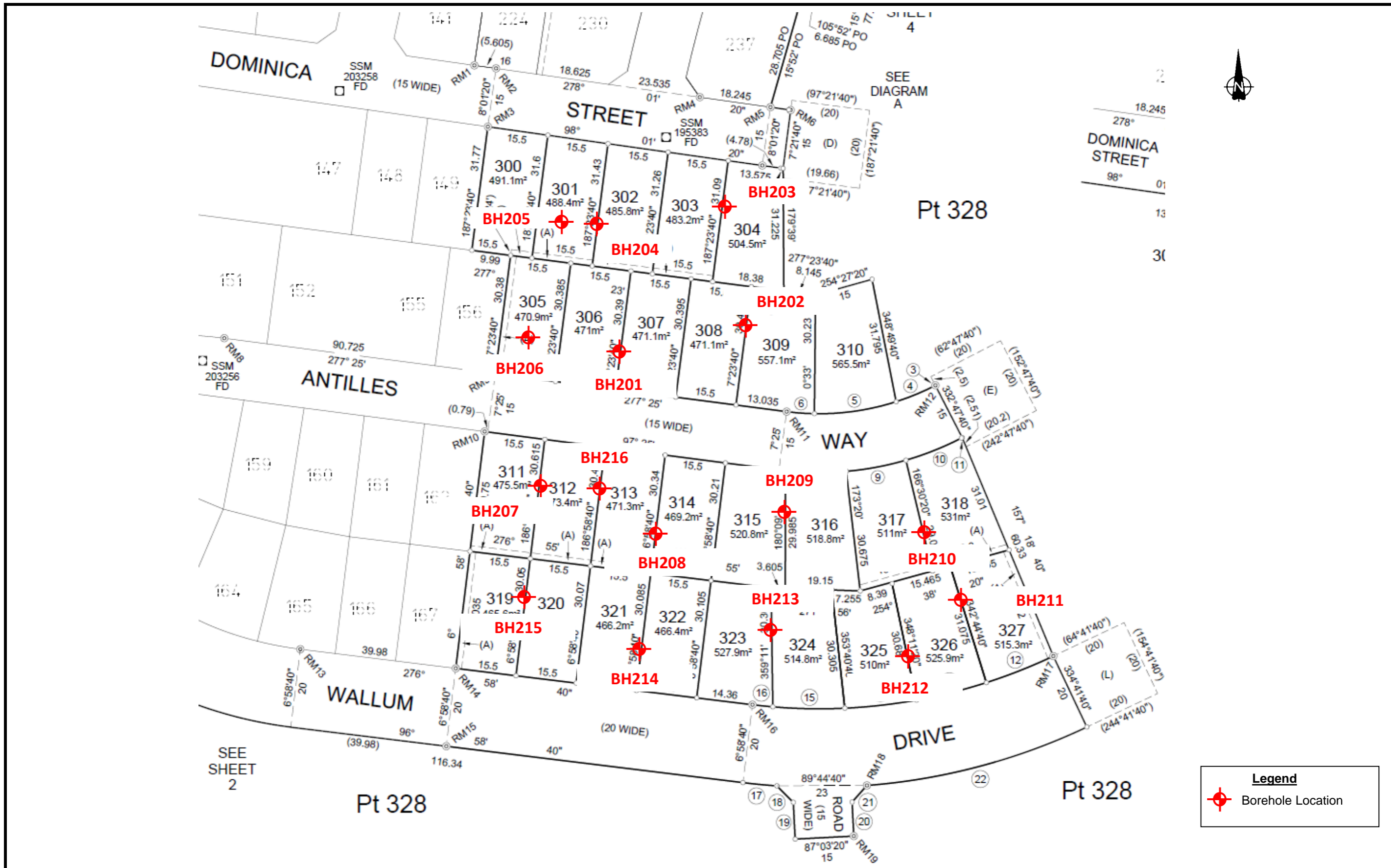
Prepared by

**Tim Morris**


Associate Engineering Geologist



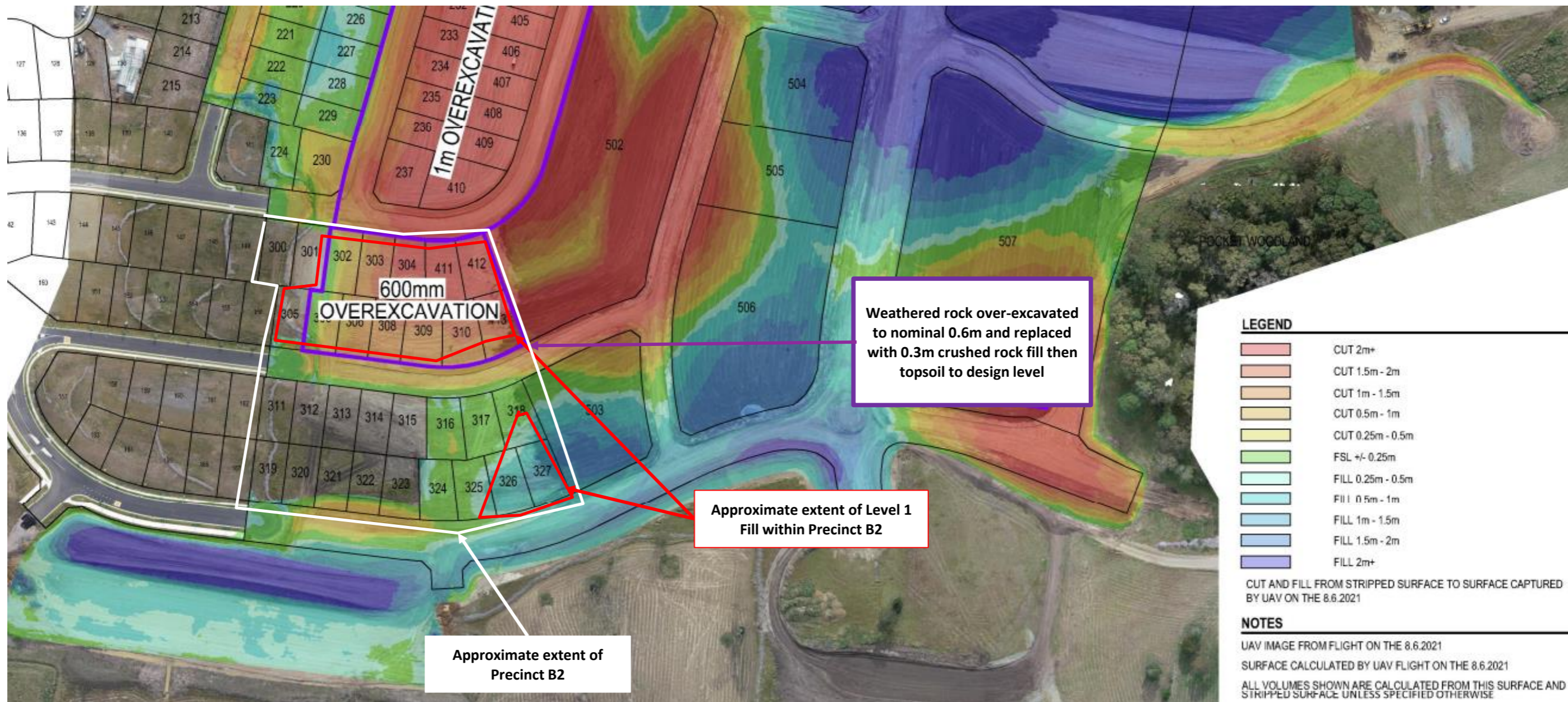
## Figures



Based on supplied drawing titled " PLAN OF SUBDIVISION OF LOT 238 DP1278887 "

	<b>Client:</b>	ST VINCENT'S FOUNDATION PTY LTD	Job No.	RGS20337.1
	<b>Project:</b>	PROPOSED RESIDENTIAL SUBDIVISION	Drawn By:	DS
		STAGE 2, PRECINCT B, RAINBOW BEACH, OCEAN	Scale:	NTS
	<b>Title:</b>	INVESTIGATION LOCATION PLAN	Date:	18-Aug-22
			Figure No.	1





**LEGEND**

[Red]	CUT 2m+
[Orange]	CUT 1.5m - 2m
[Light Orange]	CUT 1m - 1.5m
[Yellow]	CUT 0.5m - 1m
[Light Green]	CUT 0.25m - 0.5m
[Green]	FSL +/- 0.25m
[Light Blue]	FILL 0.25m - 0.5m
[Medium Blue]	FILL 0.5m - 1m
[Dark Blue]	FILL 1m - 1.5m
[Purple]	FILL 1.5m - 2m
[Dark Purple]	FILL 2m+

CUT AND FILL FROM STRIPPED SURFACE TO SURFACE CAPTURED BY UAV ON THE 8.6.2021

**NOTES**

UAV IMAGE FROM FLIGHT ON THE 8.6.2021  
 SURFACE CALCULATED BY UAV FLIGHT ON THE 8.6.2021  
 ALL VOLUMES SHOWN ARE CALCULATED FROM THIS SURFACE AND STRIPPED SURFACE UNLESS SPECIFIED OTHERWISE

Based on supplied drawing titled " TOTAL CUT FILL BC "

	<b>Client:</b>	ST VINCENT'S FOUNDATION PTY LTD	Job No.	RGS20337.1
	<b>Project:</b>	PROPOSED RESIDENTIAL SUBDIVISION	Drawn By:	DS
		STAGE 2, PRECINCT B, RAINBOW BEACH, OCEAN	Scale:	NTS
	<b>Title:</b>	LEVEL 1 FILLING PLAN	Date:	18-Aug-22
			Figure No.	<b>2</b>



# **Appendix A**

## **Results of Field Investigations**



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB201**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 306/307

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483966 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507276 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations	
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		
AD/T	Not Encountered			0.2		ML	FILL: Sandy SILT, low plasticity, dark brown-black					FILL/TOPSOIL	
							0.15m	GP	FILL: Sandy GRAVEL, fine to coarse grained, angular	D			FILL
							0.25m		DOLERITE: Excavated as Sandy GRAVEL, fine to coarse grained, pale grey-white, inferred low strength			HIGHLY WEATHERED DOLERITE	
				0.4									
				0.6									
				0.70m			Hole Terminated at 0.70 m Refusal						
				0.8									
				1.0									
				1.2									
				1.4									
				1.6									
				1.8									

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB200 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.3 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	





# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB202**

**CLIENT:** St Vincents Foundation  
**PROJECT NAME:** Proposed Residential Subdivision  
**SITE LOCATION:** Precinct B2 Rainbow Beach Estate Lake Cathie  
**TEST LOCATION:** Lots 308/309

**PAGE:** 1 of 1  
**JOB NO:** RGS20337.1  
**LOGGED BY:** DS  
**DATE:** 19/7/22

**DRILL TYPE:** RGS Ute Mounted Drill Rig **EASTING:** 484000 m **SURFACE RL:**  
**BOREHOLE DIAMETER:** 100 mm **INCLINATION:** 90° **NORTHING:** 6507286 m **DATUM:** AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	<b>FILL:</b> Sandy SILT, low plasticity, brown, fine to coarse grained sand					FILL/TOPSOIL
				0.25			Hole Terminated at 0.25 m Refusal on Highly Weathered Dolerite					
				0.4								
				0.6								
				0.8								
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB200 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB203**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 303/304

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484946 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507317 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	<b>FILL:</b> Sandy SILT, low plasticity, dark brown, fine to coarse grained sand					FILL/TOPSOIL
				0.4			<b>HIGHLY WEATHERED DOLERITE:</b> Excavated as Gravelly SAND, fine to coarse grained, pale grey-pale brown, fine to coarse grained angular gravel, low plasticity fines, inferred very low strength					HIGHLY WEATHERED DOLERITE
				0.40m			Hole Terminated at 0.40 m Refusal					
				0.6								
				0.8								
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB203 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB204**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 301/302

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483962 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507312 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	<b>FILL:</b> Sandy SILT, low plasticity, dark brown-black, fine to coarse grained sand					FILL/TOPSOIL
				0.4		CI	<b>Sandy CLAY:</b> Medium plasticity, pale brown/orange, fine to medium grained sand	M <sub>p</sub>	Fr			RESIDUAL
				0.50m			Hole Terminated at 0.50 m Refusal on Highly Weathered Dolerite					
				0.6								
				0.8								
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB204 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB205**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 301

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483952 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507313 m      DATUM: AHD

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
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
AD/T	Not Encountered			0.0	[Cross-hatched pattern]	ML	FILL: Sandy SILT, low plasticity, grey, fine to coarse grained sand					FILL/TOPSOIL
				0.2		GC	FILL: Clayey GRAVEL, fine to coarse grained, angular, grey-blue, low plasticity fines, with fine to medium grained sand					FILL
				0.4		DOLERITE: Excavated as Gravelly SAND, fine to coarse grained, pale brown/orange, fine to medium grained gravel, inferred very low strength						HIGHLY WEATHERED DOLERITE
				1.0		Trace moisture from 1.0-1.2m						
				1.50m			Hole Terminated at 1.50 m					

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB205 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel Lbh and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB206**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 305

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483950 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507280 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	FILL: Sandy SILT, low plasticity, dark brown-black					FILL/TOPSOIL
				0.20m		GC	FILL: Clayey GRAVEL, fine to coarse grained, angular, brown-grey					FILL-GRAVEL
				0.35m			Hole Terminated at 0.35 m Refusal on Highly Weathered Dolerite					
				0.4								
				0.6								
				0.8								
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB206 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

**LEGEND:**

**Water**

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

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

U<sub>50</sub> 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)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H Hard	>400	
Fb Friable		
Density	V Very Loose	Density Index <15%
L Loose	MD Medium Dense	Density Index 15 - 35%
D Dense	D Dense	Density Index 35 - 65%
VD Very Dense	D Dense	Density Index 65 - 85%
		Density Index 85 - 100%



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB207**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 311/312

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483947 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507247 m      DATUM: AHD

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
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
AD/T	Not Encountered			0.2		ML	<b>FILL:</b> Sandy SILT, low plasticity, dark brown-grey, fine to coarse grained sand					FILL/TOPSOIL
				0.30m		CI	<b>Silty Sandy CLAY:</b> Medium plasticity, pale grey-pale brown, fine to medium grained sand	M < W <sub>p</sub>	Fr			EXTREMELY WEATHERED DOLERITE
				0.80m			<b>DOLERITE:</b> Excavated as Gravelly SAND, fine to coarse grained, pale grey, fine to medium grained gravel, inferred very low strength			HP	220	HIGHLY WEATHERED DOLERITE
				1.50m			Hole Terminated at 1.50 m					

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB207 - SERIES LOGS.GPJ - <DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pjt: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB208**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 313/314

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483977 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507237 m      DATUM: AHD

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations			
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		
AD/T	Not Encountered	0.30m	U	0.30m		ML	<b>FILL:</b> Sandy SILT, low plasticity, dark brown-black	M ~ W <sub>p</sub>	VSt	HP	350	FILL/TOPSOIL		
						CL	<b>Silty CLAY:</b> Low plasticity, dark brown-brown, trace fine grained rounded gravel					SLOPEWASH		
						CI	<b>Silty CLAY:</b> Medium plasticity, pale brown-pale grey, with fine to medium grained sand					RESIDUAL		
						DOLERITE	Excavated as Sandy GRAVEL, fine to coarse grained, grey/white, fine to medium grained gravel, inferred low strength					HP	300	HIGHLY WEATHERED DOLERITE
						Hole Terminated at 1.50 m								
				1.50m										

RG 2.00.31.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB208 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:22 10.03.00.09 Datagel Lnh and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pjt: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> 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%		



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB209**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 315/316

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484005 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507239 m      DATUM: AHD

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations		
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	
AD/T	Not Encountered					ML	FILL: Sandy SILT, low plasticity, dark brown-grey, fine to coarse grained sand					FILL/TOPSOIL	
				0.2		CI	Silty CLAY: Medium plasticity, pale brown-brown/orange, fine to medium grained sand grading sharply to Extremely Weathered DOLERITE	M > W <sub>p</sub>	St	HP	180	RESIDUAL	
				0.4									
				0.6				DOLERITE: Excavated as Gravelly SAND, fine to coarse grained, grey/white, fine to medium grained gravel, inferred very low strength					HIGHLY WEATHERED DOLERITE
				1.50m			Hole Terminated at 1.50 m						
				1.6									
				1.8									

RG 2.00.31.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB209 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:23 10.03.00.09 Datagel Lbh and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> 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%		





# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB210**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 317/318

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484043 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507237 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	FILL: Sandy SILT, low plasticity, brown-grey, fine to coarse grained sand, with fine to coarse grained gravel					FILL/TOPSOIL
				0.4			Hole Terminated at 0.35 m Refusal on Highly Weathered Dolerite					
				0.6								
				0.8								
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB210 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:23 10.03.00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB211**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 326/322

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484052 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507208 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered					ML	FILL: Sandy SILT, low plasticity, dark brown-black, fine to medium grained sand					FILL/TOPSOIL
				0.2		GP	FILL: Sandy GRAVEL, fine to medium grained, angular blue Dolerite, fine to coarse grained brown sand, with low plasticity clay					
				0.6			Hole Terminated at 0.65 m Refusal					
				0.8								
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB211 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:23 10:03:00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.3 2021-06-30

**LEGEND:**

**Water**

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

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

U<sub>50</sub> 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)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
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%



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB212**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 325/326

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484038 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507196 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	<b>FILL:</b> Sandy SILT, low plasticity, dark brown-black, fine to medium grained sand					FILL/TOPSOIL
				0.25m			<b>DOLERITE:</b> Excavated as Gravelly SAND, pale grey-blue, fine to coarse grained sand, fine to medium grained dolerite gravel fragments					HIGHLY WEATHERED DOLERITE
				0.4								
				0.6								
				0.8			Trace seams of Extremely Weathered Dolerite excavated as Sandy CLAY, medium plasticity, brown mottled red, inferred very low strength from 0.6-0.8m					
				0.90m			Hole Terminated at 0.90 m Refusal					
				1.0								
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.31.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB212 - SERIES LOGS.GPJ - <DrawingFiles> 24/08/2022 09:23 10:03:00.09 Datagel.Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pjt: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> VS Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard Fb Friable	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> V Very Loose L Loose MD Medium Dense D Dense VD Very Dense	Density Index <15% Density Index 15 - 35% Density Index 35 - 65% Density Index 65 - 85% Density Index 85 - 100%	



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB213**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 323/324

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484007 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507210 m      DATUM: AHD

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
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
AD/T	Not Encountered	U		0.0		ML	FILL: Sandy SILT, low plasticity, dark brown, fine to medium grained sand					FILL/TOPSOIL
				0.15		CI	Silty CLAY: Indistinct foliated rock fabric of pale brown/orange/red and grey, with fine to medium grained sand, trace fine grained blue dolerite gravel inclusions	M ~ Wp	H		EXTREMELY WEATHERED DOLERITE	
				0.85			DOLERITE: Excavated as Sandy GRAVEL, fine to medium grained, angular blue dolerite gravel, fine to medium grained sand, with low plasticity fines				HIGHLY WEATHERED DOLERITE	
				1.50		Hole Terminated at 1.50 m						

**LEGEND:**

**Water**

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

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

U<sub>50</sub> 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)	Moisture Condition
VS	Very Soft	<25	D Dry
S	Soft	25 - 50	M Moist
F	Firm	50 - 100	W Wet
St	Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt	Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
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%

RG 2.00.31.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB213 - SERIES LOGS.GPJ - <<DrawingFiles>> 24/08/2022 09:23 10.03.00.09 Datagel Lnh and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pj: RG 2.00.0 2021-06-30



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB214**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 321/322

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 484971 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507206 m      DATUM: AHD

Drilling and Sampling				Material description and profile information						Field Test		Structure and additional observations
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	
AD/T	Not Encountered			0.2		ML	FILL: Sandy SILT, low plasticity, dark brown, fine to medium grained sand					FILL/TOPSOIL
						CI	FILL: Sandy GRAVEL, fine to medium grained,, angular, pale brown/orange-brown, fine to coarse grained sand, trace low plasticity fines	D			FILL-GRAVEL	
						CI	Silty CLAY: Medium plasticity, pale brown-pale grey, fine to medium grained sand, trace fine grained dolerite gravel	M ^ Wp	VSt	HP 220	EXTREMELY WEATHERED DOLERITE	
							DOLERITE: Excavated as Gravelly SAND, fine to coarse grained, pale brown-blue, fine to medium grained dolerite gravel fragments, inferred very low strength				HIGHLY WEATHERED DOLERITE	
				0.8			Hole Terminated at 0.75 m Refusal					

RG 2.00.31.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB214 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:23 10.03.00.09 D:\git\Lab and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pjt: RG 2.00.0 2021-06-30

**LEGEND:**

**Water**

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

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

U<sub>50</sub> 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)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H Hard	>400	
Fb Friable		
Density	V Very Loose	Density Index <15%
L Loose	MD Medium Dense	Density Index 15 - 35%
D Dense		Density Index 35 - 65%
VD Very Dense		Density Index 65 - 85%
		Density Index 85 - 100%



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB215**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 319/320

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

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

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
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
AD/T	Not Encountered	U		0.2		ML	FILL: Sandy SILT, low plasticity, dark brown, fine to medium grained sand					FILL/TOPSOIL
				0.25		CL	Silty CLAY: Low plasticity, dark brown mottled red, with fine grained sand					SLOPEWASH
				0.40		CI	Silty CLAY: Medium to high plasticity, pale brown-pale grey mottled orange	M > Wp	VSt	HP 340	RESIDUAL	
				0.70			DOLERITE: Excavated as Gravelly SAND, fine to coarse grained, pale brown-blue, fine to medium grained dolerite fragments, inferred very low strength				HIGHLY WEATHERED DOLERITE Rocky at 0.85m	
				1.50			Hole Terminated at 1.50 m					

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT\_RGS20337.1 BHB215 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:23 10.03.00.09 Datagel Lnh and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pjt: RG 2.00.0 2021-06-30

<b>LEGEND:</b> <b>Water</b> Water Level (Date and time shown) Water Inflow Water Outflow <b>Strata Changes</b> Gradational or transitional strata Definitive or distinct strata change	<b>Notes, Samples and Tests</b> U <sub>50</sub> 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	<b>Consistency</b> 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	<b>UCS (kPa)</b> <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	<b>Moisture Condition</b> D Dry M Moist W Wet W <sub>p</sub> Plastic Limit W <sub>L</sub> Liquid Limit
	<b>Field Tests</b> PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	<b>Density</b> 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%		



# ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHB216**

CLIENT: St Vincents Foundation  
 PROJECT NAME: Proposed Residential Subdivision  
 SITE LOCATION: Precinct B2 Rainbow Beach Estate Lake Cathie  
 TEST LOCATION: Lots 312/313

PAGE: 1 of 1  
 JOB NO: RGS20337.1  
 LOGGED BY: DS  
 DATE: 19/7/22

DRILL TYPE: RGS Ute Mounted Drill Rig      EASTING: 483962 m      SURFACE RL:  
 BOREHOLE DIAMETER: 100 mm      INCLINATION: 90°      NORTHING: 6507246 m      DATUM: AHD

Drilling and Sampling				Material description and profile information					Field Test		Structure and additional observations	
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
AD/T	Not Encountered	U		0.10m		ML	<b>FILL:</b> Sandy SILT, low plasticity, dark brown, fine to medium grained sand	M > W <sub>p</sub>		HP	220	FILL/TOPSOIL
				0.15m		CL	<b>Sandy CLAY:</b> Low plasticity, dark brown mottled red					SLOPEWASH
				0.35m		CI	<b>Silty CLAY:</b> Medium to high plasticity, pale brown/orange					RESIDUAL
				0.55m			<b>DOLERITE:</b> Excavated as Gravelly SAND, fine to coarse grained, grey-blue, fine to medium grained dolerite fragments					HIGHLY WEATHERED DOLERITE Rocky at 0.85m
				1.50m			Hole Terminated at 1.50 m					

RG 2.00.3.LIB.GLB.Log\_RG\_NON-CORED BOREHOLE - TEST PIT - RGS20337.1 BHB216 SERIES LOGS.GPJ -<DrawingFiles> 24/08/2022 09:23 10.03.00.09 Datagel Lnh and In Situ Tool - DGD | Lib: RG 2.00.3 2022-03-03 Pjt: RG 2.00.0 2021-06-30

**LEGEND:**

**Water**

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

**Strata Changes**

- Gradational or transitional strata
- Definitive or distinct strata change

**Notes, Samples and Tests**

- U<sub>50</sub> 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)	Moisture Condition
VS Very Soft	<25	D Dry
S Soft	25 - 50	M Moist
F Firm	50 - 100	W Wet
St Stiff	100 - 200	W <sub>p</sub> Plastic Limit
VSt Very Stiff	200 - 400	W <sub>L</sub> Liquid Limit
H Hard	>400	
Fb Friable		

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



# **Appendix B**

## **Laboratory Test Result Sheets**




**Report No: SSI:NEW22W-2418-S01**

**Issue No: 1**

# Shrink Swell Index Report

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

**Project No.:** MNC16P-0001  
**Project Name:** Various Testing  
**Project Location:** Precinct B2, Rainbow Beach, 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.

*Kyle Spencer*  
 Approved Signatory: Kyle Spencer  
 (Geotechnician)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 12/08/2022

## Sample Details

**Sample ID:** NEW22W-2418-S01      **Test Request No.:** RGS20337.1

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Insitu      **Date Sampled:** 21/07/2022

**Source:** On-Site      **Date Submitted:** 21/07/2022

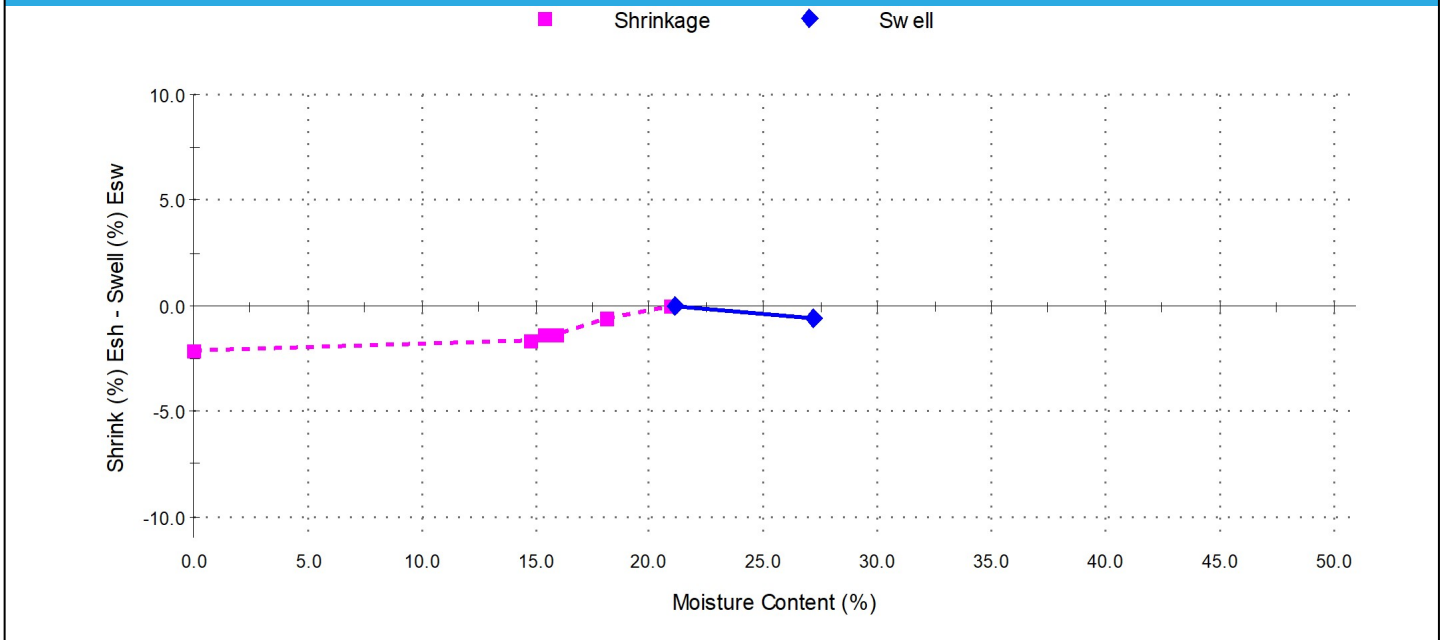
**Specification:** No Specification

**Sample Location:** BHB208 - (0.3 - 0.6m)

**Date Tested:** 2/08/2022

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.6	<b>Shrink on drying (%):</b>	2.1
<b>Moisture Content before (%):</b>	21.1	<b>Shrinkage Moisture Content (%):</b>	21.0
<b>Moisture Content after (%):</b>	27.2	<b>Est. inert material (%):</b>	1%
<b>Est. Unc. Comp. Strength before (kPa):</b>	290	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	270	<b>Cracking during shrinkage:</b>	Moderate

## Shrink Swell



**Shrink Swell Index - Iss (%): 1.1**

## Comments


**Report No: SSI:NEW22W-2657-S01**

**Issue No: 1**

# Shrink Swell Index Report

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

**Project No.:** MNC16P-0001  
**Project Name:** Various Testing  
**Project Location:** Precint B2, Rainbow Beach, 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.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 18/08/2022

## Sample Details

**Sample ID:** NEW22W-2657-S01      **Test Request No.:** RGS20337.1

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Insitu      **Date Sampled:** 28/07/2022

**Source:** On-Site      **Date Submitted:** 3/08/2022

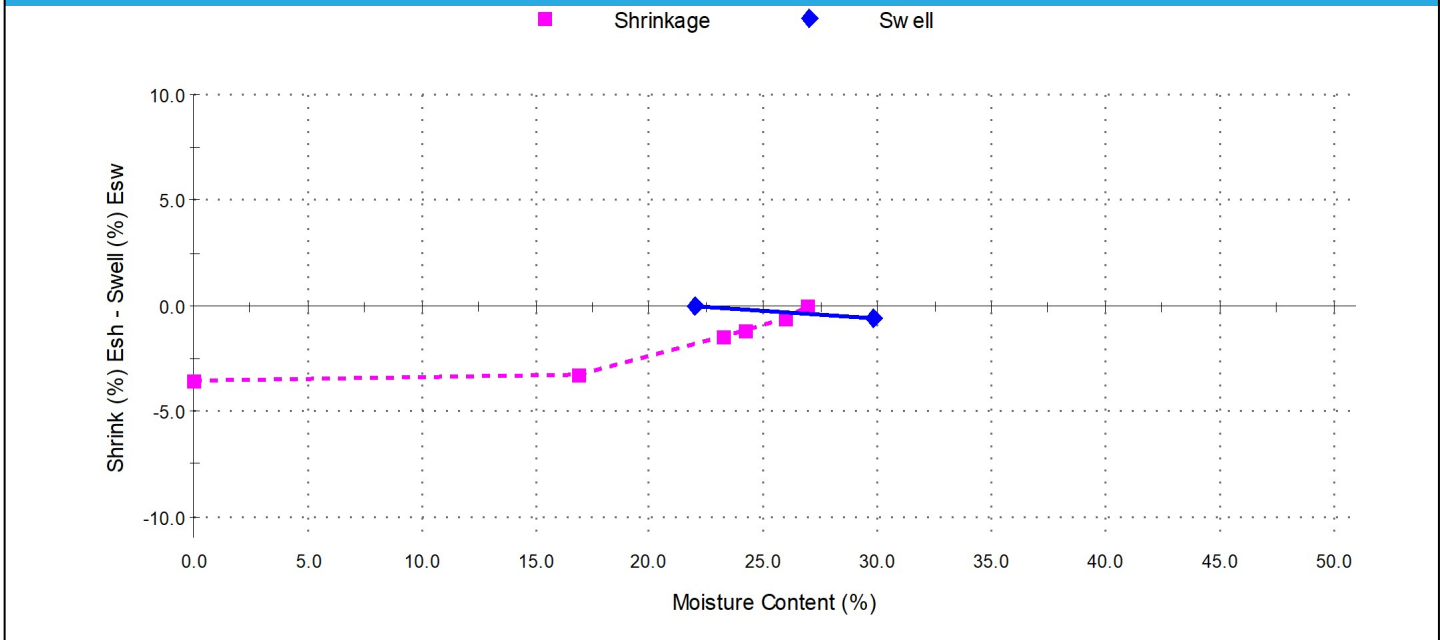
**Specification:** No Specification

**Sample Location:** BHB213 - (0.5 - 0.8m)

**Date Tested:** 10/08/2022

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	-0.6	<b>Shrink on drying (%):</b>	3.6
<b>Moisture Content before (%):</b>	22.0	<b>Shrinkage Moisture Content (%):</b>	26.9
<b>Moisture Content after (%):</b>	29.8	<b>Est. inert material (%):</b>	12%
<b>Est. Unc. Comp. Strength before (kPa):</b>	580	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	500	<b>Cracking during shrinkage:</b>	Moderate

## Shrink Swell



**Shrink Swell Index - Iss (%): 2.0**

## Comments

**Report No: SSI:NEW22W-2657-S02**

**Issue No: 1**

# Shrink Swell Index Report

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

**Project No.:** MNC16P-0001  
**Project Name:** Various Testing  
**Project Location:** Precint B2, Rainbow Beach, 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.  
*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 18/08/2022

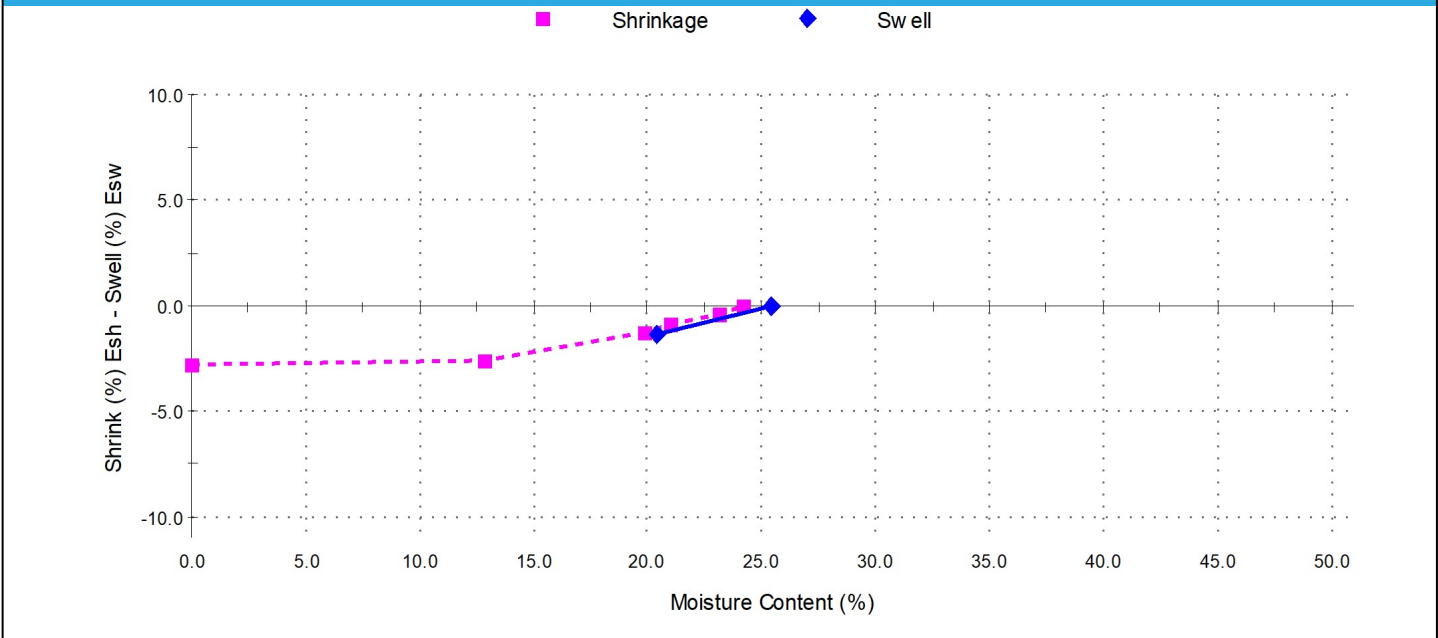
## Sample Details

**Sample ID:** NEW22W-2657-S02      **Test Request No.:** RGS20337.1  
**Sampling Method:** The results outlined below apply to the sample as received  
**Material:** Insitu      **Date Sampled:** 28/07/2022  
**Source:** On-Site      **Date Submitted:** 3/08/2022  
**Specification:** No Specification  
**Sample Location:** BHB215 - (0.4 - 0.7m)  
**Date Tested:** 10/08/2022

Swell Test		AS 1289.7.1.1
<b>Swell on Saturation (%):</b>	-1.3	
<b>Moisture Content before (%):</b>	25.4	
<b>Moisture Content after (%):</b>	20.4	
<b>Est. Unc. Comp. Strength before (kPa):</b>	>600	
<b>Est. Unc. Comp. Strength after (kPa):</b>	260	

Shrink Test		AS 1289.7.1.1
<b>Shrink on drying (%):</b>	2.8	
<b>Shrinkage Moisture Content (%):</b>	24.2	
<b>Est. inert material (%):</b>	12%	
<b>Crumbling during shrinkage:</b>	Nil	
<b>Cracking during shrinkage:</b>	Minor	

## Shrink Swell



**Shrink Swell Index - Iss (%): 1.5**

## Comments


**Report No: SSI:NEW22W-2657-S03**

**Issue No: 1**

# Shrink Swell Index Report

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

**Project No.:** MNC16P-0001  
**Project Name:** Various Testing  
**Project Location:** Precint B2, Rainbow Beach, 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.

*B. Cullen*  
 Approved Signatory: Brent Cullen  
 (Engineering Geologist)  
 NATA Accredited Laboratory Number: 18686  
 Date of Issue: 18/08/2022

## Sample Details

**Sample ID:** NEW22W-2657-S03      **Test Request No.:** RGS20337.1

**Sampling Method:** The results outlined below apply to the sample as received

**Material:** Insitu      **Date Sampled:** 28/07/2022

**Source:** On-Site      **Date Submitted:** 3/08/2022

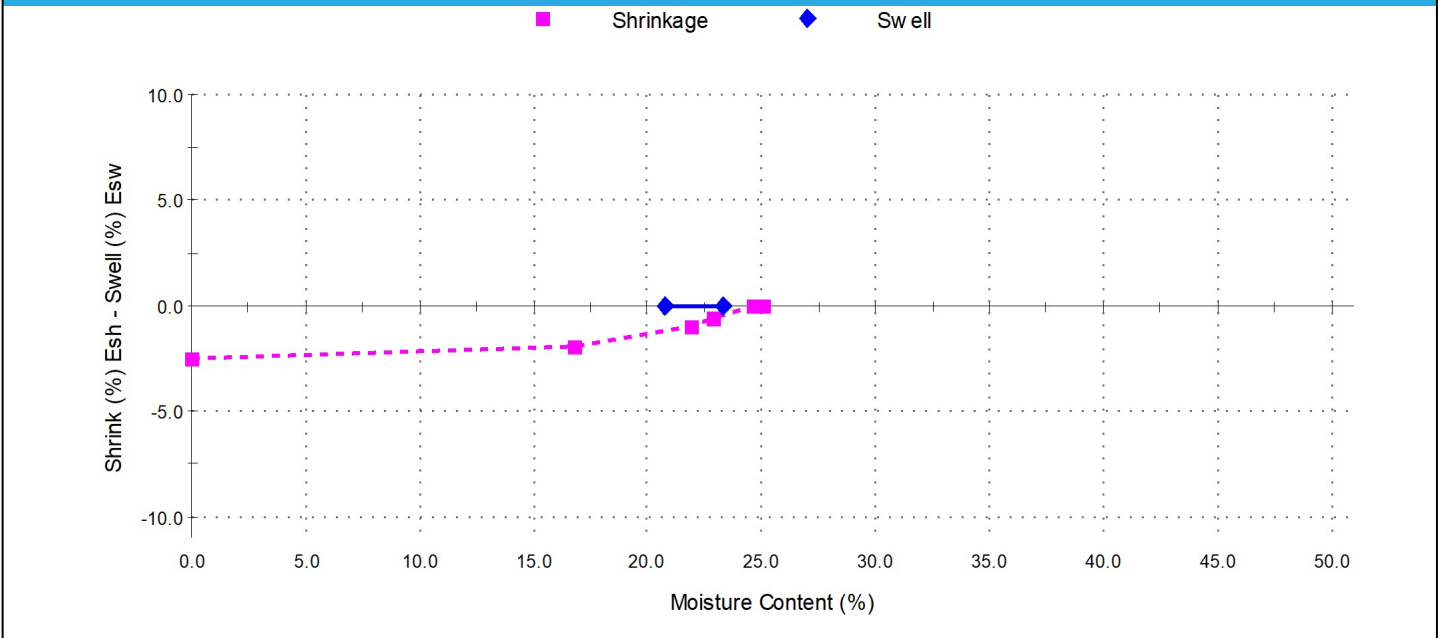
**Specification:** No Specification

**Sample Location:** BHB216 - (0.35 - 0.55m)

**Date Tested:** 10/08/2022

Swell Test AS 1289.7.1.1		Shrink Test AS 1289.7.1.1	
<b>Swell on Saturation (%):</b>	0.0	<b>Shrink on drying (%):</b>	2.5
<b>Moisture Content before (%):</b>	23.3	<b>Shrinkage Moisture Content (%):</b>	25.1
<b>Moisture Content after (%):</b>	20.7	<b>Est. inert material (%):</b>	5%
<b>Est. Unc. Comp. Strength before (kPa):</b>	450	<b>Crumbling during shrinkage:</b>	Nil
<b>Est. Unc. Comp. Strength after (kPa):</b>	460	<b>Cracking during shrinkage:</b>	Moderate

## Shrink Swell



**Shrink Swell Index - Iss (%): 1.4**

## Comments