

RGS33442.1 – AJ

13 February 2023

Housing Plus
PO Box 968
ORANGE NSW 2800
Email to: beno@housingplus.com.au

Attention: Ben Ogilvie

Dear Ben,

**RE: Proposed Housing Projects – 10a Park Street, Maitland NSW
Geotechnical Site Classification**

1 INTRODUCTION

Regional Geotechnical Solutions Pty Ltd (RGS) has undertaken geotechnical investigations and assessment at 10a Park Street, Maitland NSW.

The design drawings indicate the development will include single and double storey buildings with slab on ground and associated on-grade car parking. Minor site regrading may be required. It is assumed that the performance expectations of AS2870-2011 are acceptable.

The purpose of the geotechnical assessment is to provide a site classification in accordance with AS2870-2011 *Residential Slabs and Footings*, to assist in the design of foundations for the proposed building.

In addition to the geotechnical assessment a preliminary visual appraisal for potential site contamination was undertaken. A detailed site contamination assessment including site history, soil sampling and analysis was outside the scope of works.

2 FIELD WORK

Field work for the assessment was undertaken by a Geotechnician from RGS on 14 November 2022 and included the following:

- Observation of site features and surrounding features relevant to the geotechnical conditions of the site.
- Excavation of three boreholes to depths of up to 1.0m.
- Dynamic Cone Penetrometer (DCP) Testing was undertaken adjacent to two boreholes to assess the soil strength.
- Hand Penetrometer testing was undertaken on recovered soil to further assess the soil strength.
- Samples were recovered for laboratory testing.



Engineering logs of the boreholes and laboratory test sheets are attached. Test locations are shown on the attached Figure 1 and were obtained by measurements to prominent site features.

3 SITE CONDITIONS

3.1 Surface Conditions

The site is situated within undulating residual terrain. The site itself slopes southwest at varying grades in the order of 2-6°. At the time of the fieldwork the site was predominantly cleared with a small shed in the south east corner. The lots to the south are retained above the subject site with timber and concrete block retaining walls up to approximately 1.6m.

Neighbouring properties to the north, south and east consist of residential lots with single and double storey brick buildings. The west is bound by Park Street.

A satellite photograph that illustrates the site location and site setting is reproduced below.

Diagram 1: Site Location and Setting



Site photographs illustrating site features are provided below in Plate 1.



Plate 1: Site Photographs

<p>Looking northwest across the site. Small shed and building materials seen towards the rear of the lot.</p>	<p>Looking southeast across the site towards Park Street. Slight gully at the front of the site</p>

3.2 Subsurface Conditions

The MinView NSW Seamless Geology Map indicates the site is underlain by the Tomago Coal Measures consisting of very fine to medium grained grey lithic sandstone, with carbonaceous shale and mudstone, siltstone, coal, claystone and pebble paraconglomerate.

A summary of the subsurface profiles encountered in the boreholes is presented below.

Table 1: Summary of Subsurface Conditions

Material Name	Material Description	Depth to Base of Material Layer (m)		
		BHM1	BHM2	BHM3
Topsoil	Clayey SILT, low plasticity, trace fine to medium grained gravel and cobbles	0.25	0.15	0.45
Residual	Silty CLAY, high plasticity, trace fine to coarse grained gravel, stiff	0.7	0.9	--
Extremely Weathered Rock	EW SILTSTONE (<i>Gravelly CLAY, medium to high plasticity, fine to medium grained siltstone gravel</i>)	≥0.9*	≥1.0*	≥0.45*

Note: ≥ Indicates base of material unit not encountered.
 -- Indicates the unit was not encountered.
 * Indicates the borehole was terminated due to auger refusal

Groundwater was not encountered during the drilling of the boreholes. Groundwater levels do fluctuate due to inclement weather, seasonal variations, or due to reasons that may not have been apparent at the time of the site investigation.



3.3 Laboratory Testing

One shrink - swell test was undertaken on a sample recovered from BHM2 from 0.25m to 0.7m within the proposed building footprint. The results of the testing indicate the residual silty clay has a shrink-swell index (I_{ss}) of 1.9%.

4 GEOTECHNICAL CONSIDERATION

The site is located on a south facing slope of up to 6°. Given the site slopes and proposed development, significant site regrading will be required. The profile comprises residual soils overlying weathered rock. Based on the assessment undertaken the following geotechnical considerations are highlighted:

- Excavations and retention – cut and fill depths are unknown but based on the proposed development and site slopes are anticipated to be in the order of 1 to 2m. Given the site constraints permanent batters are unlikely to be feasible and retaining walls will be required.
- Footings – The site is variable and will require cut to fill earthworks to achieve level building platforms. Given the soil profile, likely depth of excavation and extent of filling founding entirely on controlled fill or on weathered rock is recommended. This could include shallow footings in areas of exposed or shallow rock and/or bored piles.

Further advice pertaining to the above and other issues is provided in the following sections.

5 SITE CLASSIFICATION

The site classification presented herein is provided on the basis that the performance expectations of AS2870-2011 are acceptable for the proposed structures.

The site classification in its current state is based on the following:

- Depth of design suction change of $H_s = 1.5\text{m}$;
- Crack depth multiplication factor of 0.5;
- Change in suction at design surface level of $\Delta u = 1.2$; and
- A shrink-swell index of 1.9% for the residual soil that extends to up to 1.0m.

Based on the above, a characteristic surface movement (y_s) of less than 40mm is predicted when assessed in accordance with AS2870-2011. The site is therefore classified as a Class M.

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 considered when selecting design values for differential movement across the slab.

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 can be obtained from www.csiro.au.

6 SITE PREPARATION

Details of proposed site works are unknown but will likely require site regrading to achieve level building platforms. The following general comments and recommendation are provided regarding site works:



- Strip and remove all vegetation, root affected soils, topsoil, and any existing fill to expose the underlying residual soils. Stripped topsoil materials should be stockpiled for landscaping purposes only.
- Following stripping, the exposed subgrade materials must be proof rolled to identify any wet or excessively deflecting material. Any such areas should be over excavated and backfilled with an approved select material.
- Proposed fill should comply with the requirements as defined in AS 3798-2007 *Guidelines on Earthworks for Residential and Commercial Developments*. Inspection by a geotechnical testing authority may be required to confirm suitability of proposed fill.
- Fill should not be placed on slopes greater than 10H:1V. For slopes in excess of this the subgrade should be benched.
- Approved fill beneath structures should be placed in layers not exceeding 300mm loose thickness and compacted to a minimum of 95% Standard Compaction and within $\pm 2\%$ of Optimum Moisture Content (OMC).
- 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.
- Temporary batters and / or benching may be feasible for the temporary support of excavations provided there is sufficient setback from boundaries and nearby structures. Batters up to 2m should be constructed as follow:
 - Soils – 2H:1V
 - Weathered Rock – 1H:1V
- Permanent support can be provided by gravity or cantilever walls including reinforced concrete block walls. Retaining walls can be designed based on a triangular lateral earth pressure distribution using the following characteristic earth pressure coefficients and subsoil parameters:
 - Retaining walls should be uniformly founded within the underlying natural soils / rock of at least stiff strength on the basis of an allowable base bearing pressure of 100kPa.
 - For cantilever walls where movement is of little concern, an active earth pressure coefficient (k_a) of 0.4 can be adopted for the soil profile, assuming a horizontal backfill surface.
 - Where walls are retaining areas which are sensitive to movement, an 'at rest' earth pressure coefficient (k_o) of 0.6 should be adopted.
 - To provide lateral restraint at the wall toe the toe of the walls must be embedded below the base of the excavations and below the zone of influence of any nearby service trenches etc. A passive earth pressure coefficient (k_p) of 2.9 can be adopted for the soils at the toe of the wall. The excavation should be assessed during construction to determine appropriate passive resistance values.
- The following soil parameters should be adopted for the soil profile for the design of retaining walls:
 - Angle of internal friction (ϕ) – 24°
 - Effective Cohesion (c') – 2kPa.
 - Bulk Unit Weight (γ) – 18kN/m³.



7 FOOTINGS

The investigations encountered a variable subgrade which will be significantly regraded to create level building pads. In consideration of the site conditions and proposed construction details the following foundation recommendations are provided.

Given the variable profile and requirement for cut and fill it is recommended to found all structures entirely on controlled fill or on the underlying weathered siltstone. Piles or shallow footings founded on weathered siltstone of at least very low strength can be designed based on an allowable base bearing pressure of 250kPa.

Alternatively, the buildings could be founded on shallow footings provided the following recommendations are followed:

- Site is prepared as outlined in Section 6.
- All fill below structures is placed in accordance with Level 1 requirements as specified in AS3798-2007 Guidelines on Earthworks for Residential and Commercial Developments.
- Shallow footings comprising raft slab, waffle pod, strip or pad footings founded within the fill could then be adopted. Shallow footings founded entirely within controlled fill can be designed based on an allowable base bearing pressure of 100kPa.
- If rock is exposed at the base of any excavations the entire structure should be founded within weathered rock or the rock ripped to a depth of at least 300mm below the underside of the footing and recompacted to 95% SMDD.
- All footings should be entirely founded on similar material and outside or below all zones of influence resulting from existing or future service trenches.

Prior to the placement of concrete, we recommend that footings be observed and assessed by an experienced Geotechnical Engineer to assess that the correct founding material has been achieved. Concrete should be placed immediately after the excavation and assessment of the footings.

8 SITE CONTAMINATION

A detailed site contamination assessment was outside the scope of works for this project. The assessment was limited to a visual appraisal during the geotechnical assessment. The assessment included:

- Observation of site surface features to assess possible signs / evidence of potential gross contamination such as soils staining, building debris (including potential asbestos containing material (ACM)), fill.
- Assessment of material recovered from the boreholes for obvious signs of potential contamination such as soil staining and odours or potential contaminating materials such as ACM.
- Brief review of historical online images to assess possible contaminating activities such as previously demolished houses (ACM) or earthworks activities or soil stockpiling / dumping.

The following points are noted regarding site contamination:

- No obvious signs of potential gross contamination such as soil staining or odours were observed during the site assessment.



- No fill was encountered within the boreholes.
- There are two piles containing building debris including corrugated iron sheets, steel and timber.
- Historical images indicate the site has not been developed or significantly modified in the past 50 years apart from a retaining wall. The retaining wall through the centre of the site was removed circa 2020.

No gross contamination was identified during the brief assessment. No potential ACM was observed within the soil. While the potential for gross contamination being encountered is considered low given the site history, there is potential for contaminating materials such as ACM to be encountered during site works. The shed in the south-eastern corner of the property should be assessed prior to demolition and demolition undertaken by appropriately licenced demolition contractors.

9 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

Joel Babbage

Geotechnical Engineer

Reviewed by

Adam Holzhauser

Principal Geotechnical Engineer

Attachments: Borehole Location Plan
 Borehole Logs
 Laboratory Test Results



**REGIONAL
GEOTECHNICAL
SOLUTIONS**

Client:	Housing Plus	Job No.:	RGS33442.1
Project:	Proposed Residential Development	Drawn By:	JB
	10a Park Street, Matiland	Scale:	NTS
Title:	Test Location Plan	Date:	13-Feb-23
		Drawing No.:	Figure 1



ENGINEERING LOG - BOREHOLE

BOREHOLE NO: **BHM1**

CLIENT: Housing Plus
 PROJECT NAME: Proposed Residential Development
 SITE LOCATION: 10A Park Street, Maitland
 TEST LOCATION: Refer to Figure 1

PAGE: 1 of 1
 JOB NO: RGS33442.1
 LOGGED BY: TMc
 DATE: 14/11/22

DRILL TYPE: Hand Auger and Power Auger EASTING: SURFACE RL:
 BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 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		
HA	Not Encountered	0.25m		0.2		ML	TOPSOIL: Clayey SILT, low plasticity, black, trace fine to medium grained subangular siltstone gravel, trace cobbles, organics	M < w _p	St	DCP (0.00-1.40m)	1	TOPSOIL		
				0.25		3								
		B		0.70m	0.4		CH				Silty CLAY: High plasticity, dark brown to black, trace fine to coarse grained subangular siltstone gravel	3	RESIDUAL	
					0.45		3					HP=200kPa		
					0.5		6					HP=180kPa		
					0.55		6							
					0.6		6							
					0.65		6							
						0.7					CH	gravelly CLAY: Medium to high plasticity, dark brown/grey, some fine to medium grained siltstone gravel, highly weathered, very low to low strength	3	EXTREMELY WEATHERED SILTSTONE
						0.75					3			
				0.9		Hole Terminated at 0.90 m Auger refusal		3						
				1.0		5								
				1.2		15								
				1.4		12								
				1.8		25								

RG 2.00.3.LIB.GLB_Log RG NON-CORED BOREHOLE - TEST P/T RGS33442.1 BH LOGS PARK ST MAITLAND.GPJ <<DrawingFile>> 18/11/2022 14:21 10.03.00.09 D:\git\1003\2022-03-03\Proj_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 ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	Consistency 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	UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit
	Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	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: **BHM2**

CLIENT: Housing Plus
 PROJECT NAME: Proposed Residential Development
 SITE LOCATION: 10A Park Street, Maitland
 TEST LOCATION: Refer to Figure 1

PAGE: 1 of 1
 JOB NO: RGS33442.1
 LOGGED BY: TMc
 DATE: 14/11/22

DRILL TYPE: Hand Auger and Power Auger EASTING: SURFACE RL:
 BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 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
HA	Not Encountered			0.2		ML	TOPSOIL: Clayey SILT, low plasticity, black, trace fine to medium grained subangular siltstone gravel, organics	M < Wp	St	DCP (0.00-1.10m)	1	TOPSOIL
						CH	Silty CLAY: High plasticity, dark brown to black, trace fine to coarse grained subangular siltstone gravel				1	RESIDUAL
											2	HP=190kPa
											2	
											3	
											3	
											3	HP=180kPa
											3	
											5	
											10	
				1.0		CH	Gravelly CLAY: Medium to high plasticity, dark brown, some fine to coarse grained siltstone gravel	VSt		10	EXTREMELY WEATHERED SILTSTONE	
				1.00m			Hole Terminated at 1.00 m Auger refusal				25	
				1.2								
				1.4								
				1.6								
				1.8								

RG 2.00.3.LIB.GLB_Log RG NON-CORED BOREHOLE - TEST P/T RGS33442.1 BH LOGS PARK ST MAITLAND.GPJ <<DrawingFile>> 18/11/2022 14:21 10.03.00.09 Dattel Lab and In Situ Tool - CGD | Lib: RG 2.00.3.2022-03-03 P/T: 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 ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	Consistency 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	UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit
	Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	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: **BHM3**

CLIENT: Housing Plus
 PROJECT NAME: Proposed Residential Development
 SITE LOCATION: 10A Park Street, Maitland
 TEST LOCATION: Refer to Figure 1

PAGE: 1 of 1
 JOB NO: RGS33442.1
 LOGGED BY: TMc
 DATE: 14/11/22

DRILL TYPE: Hand Auger and Power Auger EASTING: SURFACE RL:
 BOREHOLE DIAMETER: 100 mm INCLINATION: 90° NORTHING: 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	
HA	Not Encountered			0.2 0.4		ML	TOPSOIL: Clayey SILT, low plasticity, black, trace fine to medium grained subangular siltstone gravel, organics	M < Wp				TOPSOIL
				0.6 0.8 1.0 1.2 1.4 1.6 1.8			Hole Terminated at 0.45 m Auger refusal on high strength moderately weathered siltstone					

RG 2.00.3.LIB.GLB_Log RG NON-CORED BOREHOLE - TEST P/T: RGS33442.1 BHM3 ST MATLAND.GPJ <<DrawingFile>> 18/11/2022 14:21:10.03.00.09 D:\git\1009_Datagel\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 ₅₀ 50mm Diameter tube sample CBR Bulk sample for CBR testing E Environmental sample ASS Acid Sulfate Soil Sample B Bulk Sample	Consistency 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	UCS (kPa) <25 25 - 50 50 - 100 100 - 200 200 - 400 >400	Moisture Condition D Dry M Moist W Wet W _p Plastic Limit W _L Liquid Limit
	Field Tests PID Photoionisation detector reading (ppm) DCP(x-y) Dynamic penetrometer test (test depth interval shown) HP Hand Penetrometer test (UCS kPa)	Density 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%	

Material Test Report



AC TESTING SERVICES
SOILS | AGGREGATES | CONCRETE

P 0438 857 377 E info@actestingservices.com.au ABN 41 634 083 793
Nambucca Valley Laboratory 6 West St, Macksville NSW 2447
Armidale Laboratory Shop 11/215 Mann St, Armidale NSW 2350

Report Number: RGS-500-1
Issue Number: 1
Date Issued: 23/01/2023
Client: Regional Geotechnical Solutions
14/25-27 Hurley Drive, Coffs Harbour NSW 2450
Contact: Toby McNeill
Project Number: RGS-500
Project Name: RGS33442.1 - Proposed Residential Development
Project Location: Maitland, Warners Bay, Singleton
Client Reference: RGS33442.1
Work Request: 5287
Dates Tested: 30/11/2022 - 19/12/2022
Remarks: RGS33442.1

Nambucca Heads
6 West Street Macksville NSW 2447
Phone: 0438 857 377
Email: adam@actestingservices.com.au



Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Adam Crawford
Lab Manager

NATA Accredited Laboratory Number: 19604

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	ACTS22-5287A	ACTS22-5287B	ACTS22-5287C		
Date Sampled	17/11/2022	17/11/2022	17/11/2022		
Date Tested	19/12/2022	19/12/2022	19/12/2022		
Material Source	SI, 0.6-1.0m	WB2, 0.8-1.2m	M1, 0.25-0.7m		
Sample Location	SI (0.6m-1m)	WB2 (0.8m-1.2m)	M1 (0.25m-0.7m)		
Inert Material Estimate (%)	**	**	**		
Pocket Penetrometer before (kPa)	310	200	300		
Pocket Penetrometer after (kPa)	270	140	180		
Shrinkage Moisture Content (%)	16.3	19.5	22.6		
Shrinkage (%)	4.1	7.1	3.0		
Swell Moisture Content Before (%)	15.7	18.8	21.1		
Swell Moisture Content After (%)	20.0	21.5	23.8		
Swell (%)	0.3	0.3	0.9		
Shrink Swell Index I _{ss} (%)	2.4	4.0	1.9		
Visual Description	**	**	**		
Cracking	SC	UC	UC		
Crumbling	No	No	No		
Remarks	**	**	**		

Shrink Swell Index (I_{ss}) reported as the percentage vertical strain per pF change in suction.

Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.

NATA Accreditation does not cover the performance of pocket penetrometer readings.