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# GEOTECHNICAL SITE CLASSIFICATION LOT 332 FIVE FARMS ESTATE STAGE 3, CLYDE NORTH

Prepared for Frasers Property Australia c/- Beveridge Williams Pty Ltd

Report Reference: G4589.3

Date: 17 May 2022

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## **PROJECT DETAILS**

Project Reference	G4589.3	Rev	BF
Project Title	Five Farms Estate Stage 3		
Project Location	Clyde North	State	VIC
Date	17 May 2022		

## **CLIENT DETAILS**

Prepared For (Client)	Frasers Property Australia		
Prepared For (Facilitator)	Beveridge Williams Pty Ltd		
Client Address	Level 9, 484 St Kilda Road	Suburb	Melbourne

## DISTRIBUTION

Original Held By	Ground Science Pty Ltd
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One (1) Electronic Copy	Beveridge Williams Pty Ltd

This document presents the results of the site classification conducted for the aforementioned project and is detailed for the sole use of the intended recipient. Should you have any questions related to this report please do not hesitate to contact the undersigned.

Author:

Gee Singh, MIEAust (NER) Senior Geotechnical Engineer

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#### 1. INTRODUCTION

This report presents the results of the geotechnical site classification investigation carried out by Ground Science for the Five Farms Estate, Stage 3 located in Clyde North, Victoria (the site). This report presents the results for:

#### • Lot 332

The scope of works detailed herein was commissioned by Beveridge Williams Pty Ltd (facilitator) on behalf of Frasers Property Australia (Principal).

#### 2. PROJECT BACKGROUND

The Five Farms residential development included the construction of building platforms as part of the bulk earthworks phase of the project, which primarily involved the placement of controlled fill and site cuts. Controlled fill was placed and compacted to Level 1 procedures in general accordance with AS3798 (2007) 'Guidelines on Earthworks for Residential and Commercial Developments'. Ground Science were the nominated Geotechnical Inspection and Testing Authority for the Level 1 filling works carried out within this stage (report reference: GS5860.2 AA dated 19<sup>th</sup> April 2022).

The professional advice provided in this report is based on the information provided at the time of the report preparation and may not be valid if changes are made to the site, the development proposal, or the construction methods. In the event of such changes, further advice should be sought from Ground Science.

#### 3. PROJECT AIMS

The aims of the investigation were as follows:

- To assess the subsurface conditions at the site relevant to the proposed development through a desktop regional geological study.
- To recover soil samples for laboratory analysis.
- To log the soils as per the guidelines presented in AS1726 (2017) 'Geotechnical Site Investigations'.
- To classify the site in accordance with AS2870 (2011) 'Residential Slabs and Footings'.
- To calculate the characteristic surface movement (Y<sub>S</sub>) for the site.
- To provide advice on allowable bearing pressures and geotechnical parameters for the design of footing systems.
- To provide general construction advice.

#### 4. SCOPE OF WORKS

The site classification investigation for Stages 2 & 3 was carried out simultaneously. The scope of works involved the drilling of 50 boreholes (BH1 – BH50) spatially distributed across the allotments using a truck mounted (GT10) drilling rig supplied and operated by Ground Science. The soils were logged and hand classified using visual tactile methods (AS1726) by a qualified geotechnical engineer from this office. Representative soil samples were recovered from the controlled fill & residual soil deposits for a total of 12 Shrink/Swell Index (I<sub>SS</sub>) tests. Laboratory testing was carried out in Ground Science's NATA accredited testing facility in Thomastown, Victoria.

Borehole locations are shown on the site plan in **Appendix A**. Engineering borehole log sheets for this allotment and surrounding allotments are presented in **Appendix B**. Laboratory test reports are presented in **Appendix C**.



#### 5. RESULTS

#### 5.1 REGIONAL GEOLOGICAL CONDITIONS

The Geological Survey of Victoria map sheets indicate the site is underlain by Miocene to Pliocene aged 'Red Bluff Sandstone' deposits, with Pleistocene to Holocene aged alluvial deposits indicated towards exist to the west and south/west. This assessment excludes controlled (engineered) fill noted to have been placed on the allotments, however the controlled fill materials are noted to have been generally derived from blending onsite soils or imported fill materials from local source sites of relatively similar geological characteristics.

#### 5.2 SURFACE CONDITIONS

The site is located west of Pound Road and southeast of the Hardys Road / future Bells Road intersection. At the time of our investigation, the site was observed to be generally flat with fair drainage conditions noted. The surface of the allotments was dry and generally comprised barren soil. The site was generally trafficable to a 4WD mounted drilling rig. No trees were observed to be located within close proximity to the building envelopes.

#### 5.3 SUBSURFACE CONDITIONS

The subsurface soil profile encountered during the field investigation is considered to be generally consistent with our expectations of the site. The subsurface soils generally comprised **controlled (engineered) fill** recovered as Sandy CLAY, Silty CLAY or Silty/Clayey SAND overlying **naturally occurring** inferred 'Red Bluff Sandstone' residual soils comprising Silty/Sandy CLAY. The controlled fill and residual soil deposits were generally medium dense to dense, stiff to very stiff, and moisture close to the plastic limit.

#### 5.4 GROUNDWATER

Groundwater was not encountered during the borehole drilling. The Visualising Victoria's Groundwater dataset indicates the regional groundwater table is less than 5.0mbgl. During wet seasons or following torrential rainfalls, there is a possibility for a perched water table to develop in the area. This should be carefully considered during the construction stage, especially when footing excavations are left exposed or prior to topsoil application.

#### 5.5 LABORATORY TESTING

A summary of the laboratory test results are presented in Table 1:

Sample #	Borehole	Depth (m)	Geological Origin	Shrink Swell Index Iss (%)
S1	BH1	1.0 – 1.3	Residual Soils	3.8
S2	BH6	0.8 – 1.0	Controlled Fill	0.5
S3	BH10	1.5 – 1.8	Residual Soils	1.6
S5	BH16	0.6 – 0.9	Residual Soils	0.9
S6	BH19	1.5 – 1.7	Residual Soils	1.6
S7	BH22	1.0 – 1.3	Controlled Fill	3.5
S8	BH26	0.5 – 0.8	Controlled Fill	1.3
S10	BH32	1.5 – 1.7	Residual Soils	2.8
S12	BH41	0.5 – 0.8	Controlled Fill	0.7
S13	BH44	1.5 – 1.7	Residual Soils	2.9
S14	BH46	0.7 – 1.0	Residual Soils	0.4
S15	BH50	1.2 – 1.5	Residual Soils	1.3

Table 1: Laboratory Test Results Summary



#### 6. DISCUSSION & RECOMMENDATIONS

#### 6.1 AS2870-2011 SITE CLASSIFICATION

The site has been classified in general accordance with the guidelines presented in AS2870 (2011) 'Residential Slabs and Footings'. The following site characteristics were adopted in the site classification assessment:

#### **Table 2: Site Characteristics**

Climatic Zone	2 (Figure D1 of AS2870-2011)
Soil Profile Group	Group 3 (Table D1 of AS2870-2011)
Depth of Soil Suction Change (Hs)	1.8m

Based on the results of the geotechnical investigation, the geological setting and the guidelines presented in AS2870 (2011), the site has been classified as **Class H1**, with an assessed characteristic surface movement ( $y_s$ ) of between 40mm and 60mm.

According to the Building Code of Australia (BCA), the above classification is only applicable for Class 1 to 10a building types. For other building types/loads, this classification should only be used as a guide. It is recommended that precautions be taken to control moisture variations within the founding soils given the variable reactivity of subsurface soils, as follows:

- Restrict tree planting in the vicinity of the building. AS2870-2011 advises that trees be planted no closer to the building than a distance equal to 1.0 times their mature height on Class H1 sites. This distance should be increased where rows or groups of trees are involved.
- Provide paving to the edge of the building to limit soil moisture variations due to seasonal wetting and drying. The paved surface should be graded away from the building such that run-off drains away, and water cannot pond against the building.
- Service trenches, particularly plumbing and drainage, should be avoided beneath buildings. Where service trenches are to pass beneath or close to the building, they should be backfilled with a low permeability material, such as compacted clay, to prevent the ingress of water. The use of porous backfill materials should be avoided.
- Any leaking or damaged underground services should be repaired promptly.
- During construction, footing excavations should not be left exposed to the weather for extended periods. Water should not be allowed to pond in these areas, nor should it be left unprotected to dry and crack in the sun.

#### 6.2 FOOTING DESIGN

The use of shallow / spread footings suitably embedded within the controlled fill or naturally occurring soils is considered suitable for this site. Footings shall be proportioned to an allowable bearing pressure of 100kPa, under stiff/medium dense and dry to damp conditions (or better).

It should be noted that construction during wet/winter periods may experience a reduced bearing pressure, particularly if left exposed for periods of time. Where required, a reassessment of the applicable bearing pressures may be undertaken. Footings should not be founded within any fill, unless the fill has been placed as controlled fill in accordance with AS3798 (2007) 'Guidelines for Earthworks on Residential and Commercial Developments' if applicable.



#### 7. GENERAL RECOMMENDATIONS

#### 7.1 FOOTINGS

- It is recommended that all footing excavations be inspected by a geotechnical engineer from this office to confirm that the founding conditions are consistent with design recommendations. The footing size and the founding level may need to be adjusted if the required founding material is not encountered at the design founding level.
- To reduce soil moisture variations near the footings, the builder should compact clean soil (without rubble or organic matter) around the footings to reduce potential water ingress around the footings.
- To reduce, but not eliminate, the possibility of damage to the footing, tree planting should be restricted as indicated earlier in this report.
- Good drainage is important to footing performance. The Builder should prevent water accumulation near the building footings (even during construction). It is recommended that sufficient ground clearance be created to accommodate paving which slopes a minimum of 1:20 away from the building. This slope should be achieved by excavation and not by building up loose fill around the footings.
- The roof water should be diverted away from the footing as soon as the roof is constructed by using temporary pipes, if necessary. The surface water should also be provided by constructing surface gutters or grading the surface to divert the water away from the footing.
- During wet conditions, machinery traffic may disturb the subgrade soils and should be avoided in the area of the building
- Any proposed footings which are close to an easement, underground service trenches, and/or other excavations, (including those in adjoining properties) should be founded below a line projected up at 45° to the horizontal (for firm/stiff Clay) and measured from the nearest base of the easement excavations.
- Avoid excavations close to footings since those founded on sandy soils can experience settlements while those founded in clayey soils can also move due to the shrinking and swelling of the clay. Plumbers and drainers should follow all the recommendations made in AS 2870-2011 and other appropriate codes with respect to drainage works.
- Protection of the footing system from moisture ingress or moisture loss after construction is the responsibility of the homeowner.

#### 7.2 DRAINAGE DESIGN REQUIREMENTS (AS2870-2011)

- It should be noted that the building and site drainage design, as well as height of the floor level above the finished ground level, may be affected by factors other than structural design requirements, such as below:
  - Run-off water and influence of local topography;
  - Possibility of flooding;
  - Effects of existing and post-construction landscaping;
  - Level of the legal point of stormwater discharge;
  - Plumbing and drainage requirements;
  - Minimum height from finished ground level to the damp-proof course level;
  - Termite management.



- Surface drainage shall be designed and constructed to avoid water ponding against or near the footing. The
  ground in the immediate vicinity of the perimeter footing, including the ground uphill from the slab on cut and fill
  sites shall be graded to fall 50mm minimum away from the footing over 1m and shaped to prevent ponding of
  water. Where the filling is placed adjacent to the building, the filling shall be compacted and graded to ensure
  drainage of water away from the building. The requirements of Clause 5.2.2 of AS2870 (2011) shall be applied
  to reduce the possibility of surface water entering living areas. Alternative drainage systems will be required on
  zero lot line construction. Any paving shall also be suitably sloped.
- The site classification as stated in this report shall be stated on any construction drawings. The selected footing system and any required site work and required site drainage shall be documented.

#### 7.3 SUBGRADE PREPARATION

- The subgrade should be stripped of all topsoil and soils containing significant organic matter.
- The exposed subgrade surface should be presented in a suitably moist condition and test rolled with several passes of an 8-10 tonne smooth drum roller. Any soft spots identified during test rolling should be removed by excavation and replaced with well-compacted suitable fill.
- Under no circumstances should any additional fill contain a significant amount of organic matter or be a mixture
  of greatly different particle sizes; e.g. it should not be a mixture of rock and soil, although less than 10% rock
  may be permitted.
- It is important that any fill be compacted close to its optimum moisture content during compaction.
- The compaction method and equipment should suit the fill material used and its degree of compaction should be tested and/or inspected by a suitably accredited NATA laboratory to meet the requirements of AS 3798-2007 "Guidelines on Earthworks for Commercial and Residential Developments".

#### 8. DISCLOSURE

This document is detailed for the sole use of the intended recipient(s) or its authorized representatives. Distribution of this report may be carried out at the Clients discretion and must be reproduced in full. Should you have any questions related to this report please do not hesitate to contact this office.



#### 9. LIMITATIONS

The advice provided in this document (as per our commission) is not designed or capable of identifying all soil conditions, (which can vary with products chosen). The advice given in this document is based on the assumption that the test results are representative of the overall soil conditions. However, it should be noted that actual conditions in some parts of the site might differ from those found. If further sampling/ testing reveals soil characteristics significantly different from those shown in our findings, Ground Science must be consulted.

The scope and the period of Ground Science services are described in the document and are subject to restrictions and limitations. Ground Science did not perform a complete assessment of all possible conditions or circumstances that may exist. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Ground Science in regards to it.

Where data has been supplied by the client or a third party, it is assumed that the information is correct unless otherwise stated. No responsibility is accepted by Ground Science for incomplete or inaccurate data supplied by others.

It is recognized that the passage of time affects the information and assessment provided in this document. Ground Science's assessment is based on information that existed at the time of the preparation of this document. It is understood that the services provided allowed Ground Science to form no more than an opinion of the actual site conditions observed during sampling and observations of the site visit and cannot be used to assess the effects of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

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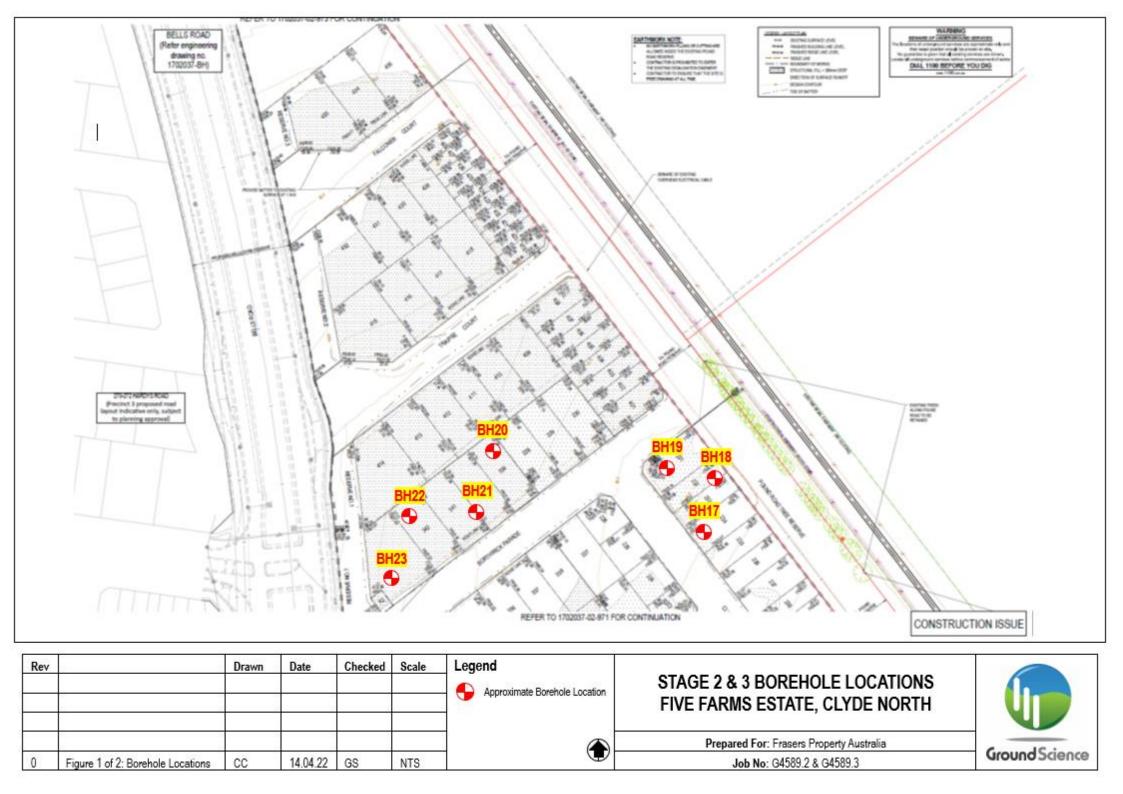


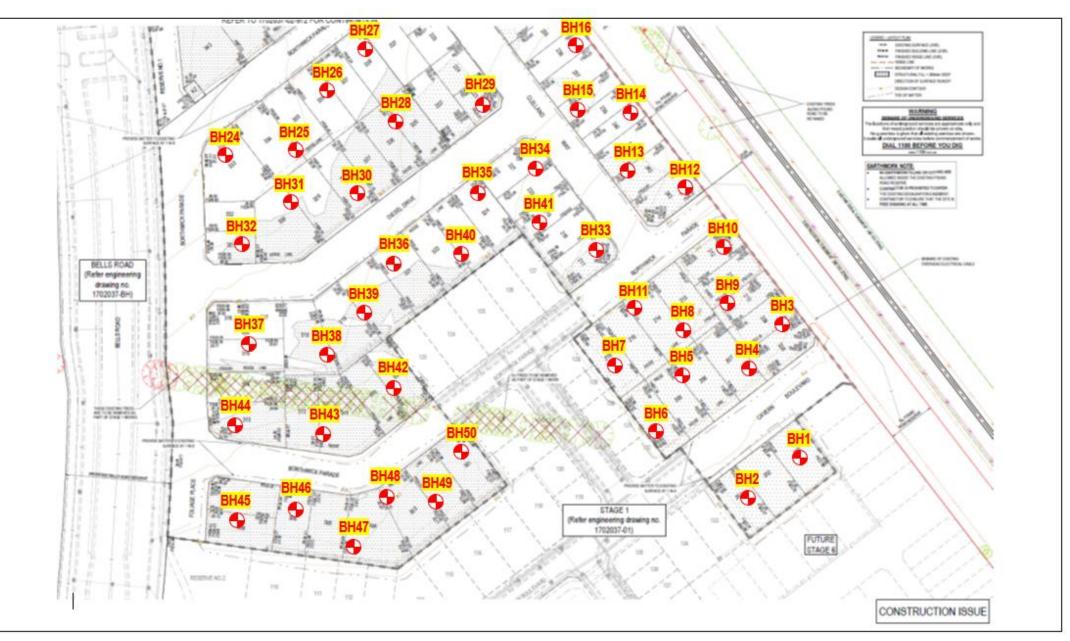
#### 10. REFERENCES

- Geological Survey of Victoria, Geological Map Sheets.
- AS2870 2011 Residential Slabs and Footings.
- AS3798 2007 Guidelines on Earthworks for Residential and Commercial Developments.
- AS1289 Testing of Soils for Engineering Purposes.
- AS1726 2017 Geotechnical Site Investigations.
- Ground Science, GS5860.2 AA 19 April 2022, Level 1 Inspection & Testing, Five Farms Stage 2.
- Ground Science, GS5860.3 AA 19 April 2022, Level 1 Inspection & Testing, Five Farms Stage 3.

## APPENDIX A

Site & Test Location Plans





Rev		Drawn	Date	Checked	Scale	Legend		
					3	Approximate Borehole Location	STAGE 2 & 3 BOREHOLE LOCATIONS	
							FIVE FARMS ESTATE, CLYDE NORTH	
					6	_		
							Prepared For: Frasers Property Australia	Course IC in a
0 Figure 2 of 2: Proposed Boreholes		CC	14.04.22	GS	NTS	<b>U</b>	Job No: G4589.2 & G4589.3	GroundScience

## APPENDIX B

Engineering Borehole Logs

				Gro	undSc	ien	ce	)	ENGIN	EERING BOREHO	LE LOG	Borehole JOB No :	No	BH24	
CLIENT: PROJECT LOCATIO TEST LOC	N:	N:	F	ive Farms E lyde North	erty Group Pty Ltd Estate Site Classificati plan, Appendix A	on - Stag	2&3					TEST DA LOGGED CHECKEI VANE SH	BY: DBY:	12-Apr-22 NH GS N/A	
DRILL ME HOLE DIA				GT10 Drill I 100mm	Rig				EASTING: ND NORTHING: ND			INCLINAT		90° ND	
		DRILLI			SAMPLING	3				FIELD N	MATERIAL DESCRIPTION		1	Γ	
C PENERTRATION	3 4	WATER	DEPTH (metres)	DEPTH (RL)	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	<b>USC SYMBOL</b>		SOIL / ROCK MATERIAL DESCRIPTION		CONSISTENCY DENSITY	MOISTURE	ADDITIONAL OBSERVATIONS	i
			0.0					SM	FILL: silty SAND, fine to coarse grain	ed, angular to subangular, brown, low plasticity	/ silt	MD - D	D - M	Controlled Fill	_
															_
			-	0.20			***	CI-CH	FILL: silty CLAY, medium to high pla:	sticity, brown mottled grey, red and brown-oran	ge, with sand and gravel	St - VSt	w > PL		-
															-
			0.5												-
			1												_
			-												_
		-	1.0	1.00				СН	silty CLAY, high plasticity, red mottler	d pale grey and brown-orange, trace to with sar	nd	VSt	w≈PL	Inferred Red Bluff Sandstone Residual Soil	_
			1											301	=
			-												
			1												_
							ÎX ÎX								_
			1.5												-
		tered	-				X								-
		Encountered	1												-
		Not	1 1												-
			2.0	2.00					Borehole Terminated @ 2m						-
															=
															_
			1.1.1												
		-	2.5												-
			1												
			_												_
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			3.0												=
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			1												_
Ш			3.5								1				-
PENETRA		2 3	4		Vs S	Very Soft	Soft		DENSITY Fb Friable VL Very Loose	MOISTURE CONDITION D Dry M Moist W Wet	TEST NOTES PP Pocket Penetror U50 Undisturbed Sar	nple 50mn	n	Image: Weight of the second	
		5	Ч		F St	Firm Stiff			L Loose MD Medium Dense	w < PL Moist, dry of plastic limit	U63 Undisturbed Sar D Disturbed Samp				
n	o resis	lence			VSt H	Very Hard	Stiff		D Dense VD Very Dense	w ≈ PL Moist, near plastic limit w > PL Moist, wet of plastic limit	Bs Bulk Sample E Environmental s	ample			
			refu	Isal						w ≈ LL Wet, near liquid limit w > LL Wet, wet of liquid limit	HSV Hand Shear Var Cu Undrained Shea	e test			
н	AM_L	OG_6.0	2019		<u>I</u>						onatamod offed			Sheet 1 of 1	

			Gro	undSc	ien	ce	ter t	ENGINE	ERING BOREHO	LE LOG	Borehole JOB No :		BH25 G4589.283	
CLIENT: PROJECT: LOCATION TEST LOCA DRILL MET	n: :Ation: Thod:		Five Farms E Clyde North Refer to site GT10 Drill	plan, Appendix A	ion - Stage	e 2&3		EASTING: ND			TEST DA LOGGED CHECKEI VANE SH	BY: D BY: EAR: FION:	12-Apr-22 NH GS NA 90°	
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C PENERTRATION C RESISTANCE		WAI EK DEPTH (metres)	DEPTH (RL)	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC SYMBOL		SOIL / ROCK MATERIAL DESCRIPTION		CONSISTENCY DENSITY	MOISTURE	ADDITIONAL OBSERVATIONS	
		0.0							angular to subangular, brown, low plasticity s		MD - D		Controlled Fill	
		-	0.20				CI-CH	FILL: silty CLAY, medium to high plasticit fragments	ity, brown mottled grey, red and brown-orang	ye, with sand and gravel, trace brick	St - VSt	w > PL		
		0.5	- 0.60				SC	clayey SAND, fine to coarse grained, anç	gular to subangular,brown, low to medium pla	lasticity clay, with silt, trace gravel	MD - D	м	Inferred Red Bluff Sandstone Residual Soil	
		-	0.80				СН	silty CLAY, high plasticity, brown-orange	mottled brown, grey and red, trace to with se	and	VSt	w ≈ PL		
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	Not Encountered	1.5 DeJejunoo	- - - -											-
	Not Ep.													
		2.0	2.00					Borehole Terminated @ 2m						
		2.5												
		-	- - - -											
		3.0	- - - -											
		-	-											
		3.5	-											
	1 2		efusal	CONSISTENCY Vs S F St VSt H	Very Soft Firm Stiff Very Hard	Stiff		DENSITY Fb Friable VL Very Loose L Loose MD Medium Dense D Dense VD Very Dense	MOISTURE CONDITION           D         Dry           M         Moist           W         Wet           w < PL	TEST NOTES           PP         Pocket Penetror           U50         Undisturbed Sar           D         Disturbed Sar           Bs         Bulk Sample           E         Environmental s           HSV         Hand Shear Var           Cu         Undrained Shear	mple 50mn mple 63mn le cample ne test	n	Groundwater Level UTP Unable to Penetrate Sheet 1 of 1	

	Gro	undSci	en	ce		ENGINEERING BOREHOLE LOG					Borehole No JOB No :		BH26 G4589.283				
CLIENT: PROJECT: LOCATION: TEST LOCATION: DRILL METHOD:	Five Farms E Clyde North	erty Group Pty Ltd state Site Classification plan, Appendix A Rig	n - Stage	283	EASTIN	G: ND							TEST DA LOGGED CHECKEI VANE SH	BY: D BY: EAR:	12-Apr-2 NH GS N/A 90°	2	
HOLE DIAMETER: DRILLING	100mm	SAMPLING			NORTH	ING: ND						SCRIPTION	SURFAC		ND		
PERFERINCE MATER MATER DEPTH (metes)	DEPTH (RL)	SAMPLE OR FIELD TEST		GRAPHIC LOG			SI	OIL / ROCK MA	ATERIAL DESCR			SCRIPTION	CON SISTENCY DENSITY	MOISTURE		ADDITIONAL OBSERVATION	s
-	0.30					ty SAND, fine to coars ty CLAY, medium to h ts						and gravel, trace brick	MD - D St - VSt		-	Controlled Fill	
-	0.80	S8	U63		H silty CLA	tY, high plasticity, bro	wn-orange r	mottled brown, ş	grey and red, tra	ce to with sa	and		VSt	w≈PL	Inferred	d Red Bluff Sandstone Residua Soil	
IS IS Not Encountered																Con	
20 25 25 30 25 - 30 - PENETRATION 1 2 3 4 0 resistence	2.00	CONSISTENCY Vs S F St VSt H	Very Soft Firm Stiff Very Hard		DENSIT Fb VL MD D VD	y Friable Very Loose Medium De Dense Very Dense	ense	w ≈ PL Moi w > PL Moi w ≈ LL Wel	CONDITION Dry Moist Wet ist, dry of plas ist, near liquid I t, near liquid I t, mear liquid I	ic limit stic limit imit	TEST NOTI PP U50 U63 D Bs E HSV Cu	S Pocket Penetrom Undisturbed Sam Undisturbed Sample Environmental sa Hand Shear Vano Undrained Shear	ple 50mr ple 63mr mple mple e test	n	UTP	Groundwater Level Unable to Penetrate	

Gro	oundScience	ENGINEERING BOREHOLE LOG	Borehole No JOB No :	BH27 G4589 283	
PROJECT: Five Farms LOCATION: Clyde North	e plan, Appendix A	EASTING: ND	TEST DATE: LOGGED BY: CHECKED BY: VANE SHEAR: INCLINATION:	12.4pr-22 NH GS NA 90°	
HOLE DIAMETER: 100mm	-	NORTHING: ND	SURFACE RL:	ND	
DEILLUNG DEILLUNG WATER WATER MATER MATER MATER MATER MATER	SAMPLING TEST TEST RECOVERED GRAPHIC LOG GRAPHIC LOG GRAPHIC LOG	FIELD MATERIAL DESCRIPTION SOIL / ROCK MATERIAL DESCRIPTION	CONSISTENCY DENSITY MOISTURE	ADDITIONAL OBSERVATIONS	
0.40	SM	FILL: silty SAND, fine to coarse grained, angular to subangular, brown, low plasticity silt	MD - D D - M St - VSt w > Pt		
Not Europrotection	CH	silty CLAY, high plasticity, brown-orange motified pale grey, trace sand	VSt w≈Pi	L Inferred Red Bluff Sandstone Residual Soil	
20 2.00 20 2.00 21 2.0 22 2.00 22 2.00 23 4 25 - 1 2 3 4 25 - 1 2 3 4 1 3 4	CONSISTENCY Vs Very Soft S Soft F Firm St Stiff VSt Very Stiff H Hard	$ \begin{array}{ccccc} VL & Very Loose & M & Moist & U50 & Undisturt \\ L & Loose & W & Wet & U63 & Undisturt \\ MD & Medium Dense & v < PL Moist, droy of plastic limit & D & Disturbe \\ D & Dense & w \approx PL Moist, near plastic limit & Bs & Bulk San \\ VD & Very Dense & w > PL Moist, wet of plastic limit \\ & w < LL Wet, near liquid limit & HSV & Hand Sh \\ \end{array} $	Penetrometer Test bed Sample Somm bed Sample Somm d Sample mental sample ear Vane test ad Shear Strength		

				Gro	undSci	ien	ce	•	ENGINEERING BOREHOLE LOG BOREHOLE LOG	
CLIEN					erty Group Pty Ltd Estate Site Classificatio	on - Stag	e 2&3		JOB No : G4589.283 TEST DATE: 12-Apr-22 LOGGED BY: NH	
	TION: LOCATI	DN:		lyde North efer to site	plan, Appendix A				CHECKED BY: GS VANE SHEAR: N/A	
	. METHO DIAMET			GT10 Drill 100mm	Rig				EASTING:         ND         INCLINATION:         90°           NORTHING:         ND         SURFACE RL:         ND	
		DRILLI			SAMPLING	i			FIELD MATERIAL DESCRIPTION	
1	C PENEKIRALIUN C RESISTANCE	WATER	DEPTH (metres)	DEPTH (RL)	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	<b>NSC SYMBOL</b>	SOIL / ROCK MATERIAL DESCRIPTION 2014 프 215 SOIL / ROCK MATERIAL DESCRIPTION 2014 프 215 SOIL / ROCK MATERIAL DESCRIPTION	
	Π		0.0				***	SM	FILL: sity SAND, fine to coarse grained, angular to subangular, brown, low plasticity silt MD - D D - M Controlled Fill	
	L.		-							
	L.		_							
			-							_
		╞	0.5							
			-	0.60			***	CI-CH	FILL: silty CLAY, medium to high plasticity, brown mottled grey and red, with sand, gravel and brick fragments St - VSt w > PL	_
			-				***			_
			-							
			-							_
		Ī	1.0	1.00				СН	silly CLAY, high plasticity, brown mottled grey, with sand $VSt = V R Red Bluff Sandstone Residual Soil$	_
			-				X			_
			_							
			-							
			1.5							_
			-	1.60					brown-orange motified brown and grey, trace sand	
		Intered					X			_
		Not Encountered					X			
			-	2.00						11
			2.0	2.00					Borehole Terminated @ 2m	
			-							
			-							
			-							_
			2.5							_
			-							1111
			_							
			-							
			-							-
			3.0							_
			-							_
			_							
			-							
Ш			3.5							
PENE	TRATIO	4			CONSISTENCY Vs	Very	Soft		DENSITY         MOISTURE CONDITION         TEST NOTES           Fb         Friable         D         Dry         PP         Pocket Penetrometer Test         Test Groundwater Level	_
1	⊳r	123	3 4		S F	Soft Firm			VL         Very Loose         M         Moist         U50         Undisturbed Sample 50mm         UTP         Unable to Penetrate           L         Loose         W         Wet         U63         Undisturbed Sample 63mm	
1		<u> </u>	l		St	Stiff	0		MD Medium Dense w < PL Moist, dry of plastic limit D Disturbed Sample	
	no resi	stence			VSt H	Very Hard			D     Dense     w ≈ PL Moist, near plastic limit     Bs     Bulk Sample       VD     Very Dense     w > PL Moist, wet of plastic limit     E     Environmental sample	
1			refu	sal					w = LL Wet, near liquid limit HSV Hand Shear Vane test w > LL Wet, wet of liquid limit Cu Undrained Shear Strength	
<b>—</b>	HAM_	LOG_6.0	0 2019		-				Sheet 1 of 1	-

G		Gr	oundSa	ien	ce	ENGINEERING BOREHOLE LOG	Boreho		BH29
CLIENT: PROJECT: LOCATION:			roperty Group Pty Ltd 1s Estate Site Classifical tth	ion - Stage	2&3		JOB No TEST D. LOGGE CHECK	ATE: D BY:	G4589.2&3 12-Apr-22 NH GS
TEST LOCAT		Refer to s GT10 D	ite plan, Appendix A rill Rig			EASTING: ND	VANE S		N/A 90°
HOLE DIAME		100mm	-	G		NORTHING: ND FIELD MATERIAL DESCRIPTIC	SURFA		ND
C PENERTRATION C RESISTANCE	WATER	DEPTH (metres) DEPTH (RL)	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG USC SYMBOL	SOIL / ROCK MATERIAL DESCRIPTION	CONSISTENCY	MOISTURE	ADDITIONAL OBSERVATIONS
						FILL: silly CLAY, medium to high plasticity, brown motified grey and red, with sand, gravel and brick fragment		St w > PL	Controlled Fill
	C	- - - - - - -			CH	silty CLAY, high plasticity, brown-orange motified brown and pale grey, trace sand	VSt	w ≈ Pl	Inferred Red Bluff Sandstone Residual Soil
	1	°	59	U63					-
	Not Encountered	.5 - - - - - - - -							-
PENETRATIO	3	2.00 	CONSISTENCY		2.9	Borehole Terminated @ 2m Borehole Terminated @			
	1 2 3	refusal	Vs S F St VSt H	Very Soft Firm Stiff Very Hard		VL         Very Loose         M         Moist         U50         Undist           L         Loose         W         Wet         U63         Undist           MD         Medium Dense         w < PL Moist, dry of plastic limit	t Penetrometer Te: urbed Sample 50n urbed Sample 63n bed Sample ample nmental sample Shear Vane test ned Shear Strengt	im Im	Groundwater Level UTP Unable to Penetrate Sheet 1 of 1

Gro	oundScience	ENGINEERING BOREHOLE LOG	Borehole JOB No :		BH30 G4589.283	
PROJECT: Five Farm: LOCATION: Clyde Nort TEST LOCATION: Refer to sit	e plan, Appendix A	EASTING: ND	TEST DA' LOGGED CHECKEI VANE SH	BY: D BY: IEAR:	12-Apr-22 NH GS N/A 90°	
DRILL METHOD: GT10 Dr HOLE DIAMETER: 100mm		NORTHING: ND	INCLINAT SURFACI		ND	
DRILLING	SAMPLING	FIELD MATERIAL DESCRIPTION		<u> </u>		
C PENERTRATION C RESISTANCE WATER WATER	SAMPLE OR FELD TEST FECOVERED GRAPHIC LOG GRAPHIC LOG	SOIL / ROCK MATERIAL DESCRIPTION	d Consistency Density D	MOISTURE	ADDITIONAL OBSERVATIONS	
		FILL: sity SAND, fine to coarse grained, angular to subangular, brown, low plasticity silt	MD - D	D - W	Controlled Fill	
0.30		FILL: silty CLAY, medium to high plasticity, brown-grey mottled red, with sand and gravel, trace brick fragments	St - VSt	w > PL		1 1 1
	- CH	silly CLAY, high plasticity, brown motified grey and red, with sand	VSt	w≈PL	Inferred Red Bluff Sandstone Residual Soil	
1.20		brown-orange motified brown, grey and red			-	
20 2.00	CONSISTENCY Vs Very Soft	Borehole Terminated @ 2m DENSITY MOISTURE CONDITION TEST NOTES Fb Friable D Dry PP Pocket Pene	Irometer Tast		Groundwater Level	
1 2 3 4	Vis Very Solt S Soft F Firm St Stiff VSt Very Stiff H Hard	PD     PI able     D     Di     PP     Pocket Palle       VL     Very Loose     M     Moist     U50     Undisturbed       L     Loose     W     Wet     U63     Undisturbed       MD     Medium Dense     w < PL Moist, dry of plastic limit	Sample 50mr Sample 63mr mple al sample Vane test	n	UTP Unable to Penetrate	

				Gro	undSci	ien	ce	•	ENGINEERING BOREHOLE LOG	Boreho		BH31	
CLIENT: PROJEC					erty Group Pty Ltd state Site Classification	on - Stag	e 2&3			JOB No TEST D LOGGE	ATE: D BY:	G4589.283 12-Apr-22 NH	
LOCATIO TEST LO		DN:		lyde North	plan, Appendix A					CHECK VANE S		GS N/A	
DRILL M HOLE DI				GT10 Drill I 100mm	Rig				EASTING: ND NORTHING: ND	INCLIN SURFA		90° ND	
-		DRILL			SAMPLING	1			FIELD MATERIAL DESCRIPTION				
C PENERTRATION	4 RESISTANCE	WATER	DEPTH (metres)	DEPTH (RL)	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC SYMBOL	SOIL / ROCK MATERIAL DESCRIPTION	CONSISTENCY	MOISTURE	ADDITIONAL OBSERVATIONS	
		Π	0.0					SM	FILL: silty SAND, fine to coarse grained, angular to subangular, brown, low plasticity silt		D D-M	Controlled Fill	-
			-				***						-
			_				***						-
				0.30			***	CI-CH	FILL: silty CLAY, medium to high plasticity, brown-grey mottled red, with sand, gravel and brick fragments	St - V	St w > Pl	-	-
			-										
			0.5										-
			-	0.70				СН	silty CLAY, high plasticity, brown-orange mottled brown, grey and red, with sand	VSt	w≈P	Inferred Red Bluff Sandstone Residual	
			_	0.10				0.1	any our right padenty is only analys mouse of the goy and real managements			Soil	_
			-										-
			1.0				X						
			-										-
			_										_
			-										-
			-										_
			1.5										-
		red	-				X						-
		counte	]										_
		Not Encountered	-										-
			2.0	2.00					Borehole Terminated @ 2m				-
			2.0	2.00					Bolenole reminated @ 2m				_
			-										_
			-										-
			]										_
			2.5										-
			-										
			_										_
			-										
													=
		[	3.0										
			-										=
													=
			-										-
			3.5										
PENETR	ATION				CONSISTENCY Vs	Very	Soft		DENSITY         MOISTURE CONDITION         TEST NOTES           Fb         Friable         D         Dry         PP         Pocket Pet	enetrometer Te	st	Groundwater Level	
	AF	1 2 3	5 4		S F	Soft Firm			VL Very Loose M Moist U50 Undisturb	ed Sample 50n ed Sample 63n	nm	UTP Unable to Penetrate	
		5	Ч		St	Stiff	_		MD Medium Dense w < PL Moist, dry of plastic limit D Disturbed	Sample			
	no resis	stence			VSt H	Very Hard			D         Dense         w ≈ PL Moist, near plastic limit         Bs         Bulk Sam           VD         Very Dense         w > PL Moist, wet of plastic limit         E         Environm	ple ental sample			
			refu	isal					w ≈ LL Wet, near liquid limit HSV Hand She	ar Vane test Shear Streng	th		
	HAM_L	.0G_6.	0 2019		l							Sheet 1 of 1	

				ce	<b>)</b>	ENGINEERING BOREHOLE LOG	LE LOG Borehole No BH32 JOB No : G4589.283						
CLIENT PROJEC LOCAT	CT: ION:	ON:	1	Five Farms E Clyde North	erty Group Pty Ltd Estate Site Classification plan, Appendix A	on - Stage	e 2&3			TEST DA LOGGED CHECKE VANE SH	BY: D BY:	12-Apr-22 NH GS N/A	
DRILL N HOLE D				GT10 Drill I 100mm	Rig				EASTING: ND Northing: ND	INCLINA SURFAC		90° ND	
		DRILL	ING		SAMPLING	1			FIELD MATERIAL DESCRIPTION				
<pre>5 PENERTRATION</pre>	RESISTANCE م	WATER	DEPTH (metres)	DEPTH (RL)	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	USC SYMBOL	SOIL / ROCK MATERIAL DESCRIPTION	CONSISTENCY DENSITY	MOISTURE	ADDITIONAL OBSERVATIONS	
			0.0					SM	FILL: silty SAND, fine to coarse grained, angular to subangular, brown, low plasticity silt	MD - D	D - M	Controlled Fill	_
			-										_
				0.30					FILL: silty CLAY, medium to high plasticity, brown-grey mottled red, with sand and gravel, trace brick fragments	Ct VC	tw>PL		_
			-	0.50				01-011	rich, sing ockrit, meulum tu nigir piasiouy, uruwingrey moueu reu, wini sanu anu graver, izace unce naginemis	31- 13	( W ~ F L		_
			0.5									-	
			-				***						_
			-										_
			-										_
			-										_
			1.0	1.00				СН	silty CLAY, high plasticity, brown mottled brown-orange and grey, with sand	VSt	w≈PL	Inferred Red Bluff Sandstone Residual Soil	_
			-				X						_
			-										1
			-										I I
			-		S10	U63	X					-	-
			-	1.60	010	000			prown-orange mottled brown, grey and red, with sand				11
		Encountered	-				X						I I
		Encou	-				X						
		Not	-										1 1
			2.0	2.00					Borehole Terminated @ 2m				-
			-										1 1
			_										
			-										1.1.1
			-										
			2.5	1									
			-	1									
			-	]									
			-										_
			3.0										_
			-										_
			_										_
			-										
			-										
PENET	RATIO	N	3.5		CONSISTENCY	1	<u> </u>		DENSITY MOISTURE CONDITION TEST NOTES				
	>   no resi	1 2	l	fusal	Vs S F St VSt H	Very Soft Firm Stiff Very Hard	Stiff		Fb         Friable         D         Dry         PP         Pocket Penetro           VL         Very Loose         M         Moist         U50         Undisturbed Sa           L         Loose         W         Wet         U63         Undisturbed Sa           MD         Medium Dense         w < PL Moist, dry of plastic limit	mple 50m mple 63m ble sample ne test	n		
-	HAM_I	LOG_6	.0 2019		l					_ songu		Sheet 1 of 1	

## APPENDIX C

Laboratory Test Reports

# **Material Test Report**

Report Number:	G4589.2-1
Issue Number:	1
Date Issued:	02/05/2022
Client:	Frasers Property Australia c/- Beveridge Williams
	1 Glenferrie Road, Malvern VIC 3144
Project Number:	G4589.2
Project Name:	Five Farms Residential Development - Stage 2/3
Project Location:	Clyde North
Work Request:	8075
Dates Tested:	14/04/2022 - 26/04/2022



Ground Science Pty Ltd Ground Science Laboratory 13 Brock Street Thomastown Victoria 3074 Phone: (03) 9464 4617 Email: pelin@groundscience.com.au Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Pelin Erden gs-pelin NATA Accredited Laboratory Number: 15055

#### Shrink Swell Index AS 1289 7.1.1 & 2.1.1

SHITING SWEILINGER AS 1203 1.1.1 & 2.1.1					
Sample Number	4589.2-S1	4589.2-S2	4589.2-S3	4589.2-S5	4589.2-S6
Date Sampled	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date Tested	19/04/2022	19/04/2022	19/04/2022	19/04/2022	20/04/2022
Material Source	**	**	**	**	**
Sample Location	BH1 (1.0 - 1.3m)	BH6 (0.8 - 1.0m)	BH10 (1.5 - 1.8m)	BH16 (0.6 - 0.9m)	BH19 (1.5 - 1.7m)
Inert Material Estimate (%)	0	10	5	5	0
Pocket Penetrometer before (kPa)	250	150	260	150	250
Pocket Penetrometer after (kPa)	135	80	200	100	125
Shrinkage Moisture Content (%)	31.7	17.6	18.1	15.9	18.6
Shrinkage (%)	6.3	0.9	1.9	1.6	2.5
Swell Moisture Content Before (%)	29.1	18.5	20.0	13.0	17.6
Swell Moisture Content After (%)	35.7	23.8	25.2	19.6	18.7
Swell (%)	1.1	-0.1	1.9	-0.0	0.9
Shrink Swell Index Iss (%)	3.8	0.5	1.6	0.9	1.6
Visual Description	silty CLAY, medium to high plasticity, mottled brown, grey	silty CLAY, low plasticity, mottled brown, grey, trace gravel, trace sand	Silty CLAY, medium to high plasticity, mottled brown, grey, trace gravel, trace sand	Sandy CLAY, low plasticity, brown, trace gravel	silty CLAY, medium plasticity, mottled brown, grey, orange, trace sand
Cracking	SC	MC	SC	MC	SC
Crumbling	No	No	No	No	No
Remarks	**	**	**	**	**

Shrink Swell Index (Iss) 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.

# **Material Test Report**

Report Number:	G4589.2-1
Issue Number:	1
Date Issued:	02/05/2022
Client:	Frasers Property Australia c/- Beveridge Williams
	1 Glenferrie Road, Malvern VIC 3144
Project Number:	G4589.2
Project Name:	Five Farms Residential Development - Stage 2/3
Project Location:	Clyde North
Work Request:	8075
Dates Tested:	14/04/2022 - 26/04/2022



Ground Science Pty Ltd Ground Science Laboratory 13 Brock Street Thomastown Victoria 3074 Phone: (03) 9464 4617 Email: pelin@groundscience.com.au Accredited for compliance with ISO/IEC 17025 - Testing



Approved Signatory: Pelin Erden gs-pelin NATA Accredited Laboratory Number: 15055

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#### Shrink Swell Index AS 1289 7.1.1 & 2.1.1 Sample Number 4589.2-S7

Sample Number	4589.2-S7	4589.2-S8	4589.2-S10	4589.2-S12	4589.2-S13
Date Sampled	14/04/2022	14/04/2022	14/04/2022	14/04/2022	14/04/2022
Date Tested	20/04/2022	20/04/2022	20/04/2022	21/04/2022	21/04/2022
Material Source	**	**	**	**	**
Sample Location	BH22 (1.0 - 1.3m)	BH26 (0.5 - 0.8m)	BH32 (1.5 - 1.7m)	BH41 (0.5 - 0.8m)	BH44 (1.5 - 1.7m)
Inert Material Estimate (%)	0	5	5	0	0
Pocket Penetrometer before (kPa)	200	200	300+	150	300+
Pocket Penetrometer after (kPa)	150	150	125	100	150
Shrinkage Moisture Content (%)	23.4	22.2	22.3	18.7	24.9
Shrinkage (%)	6.2	2.3	4.4	1.2	4.1
Swell Moisture Content Before (%)	23.0	24.2	19.8	16.7	25.6
Swell Moisture Content After (%)	22.2	28.1	23.6	25.9	29.7
Swell (%)	0.3	0.2	1.4	0.1	2.4
Shrink Swell Index Iss (%)	3.5	1.3	2.8	0.7	2.9
Visual Description	Silty CLAY, low to medium plasticity, mottled brown, grey, orange, trace sand	silty CLAY, low to medium plasticity, mottled brown, grey, orange, trace gravel, trace sand	silty CLAY, medium plasticity, mottled grey, orange, red, trace gravel, trace sand	sandy CLAY, low plasticity, brown	Silty CLAY, medium to high plasticity, mottled brown, grey, orange, trace sand
Cracking	SC	SC	SC	HC	SC
Crumbling	No	No	No	No	No
Remarks	**	**	**	**	**

Shrink Swell Index (Iss) 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.

# **Material Test Report**

Report Number:	G4589.2-1
Issue Number:	1
Date Issued:	02/05/2022
Client:	Frasers Property Australia c/- Beveridge Williams
	1 Glenferrie Road, Malvern VIC 3144
Project Number:	G4589.2
Project Name:	Five Farms Residential Development - Stage 2/3
Project Location:	Clyde North
Work Request:	8075
Dates Tested:	14/04/2022 - 26/04/2022



Ground Science Pty Ltd Ground Science Laboratory 13 Brock Street Thomastown Victoria 3074 Phone: (03) 9464 4617 Email: pelin@groundscience.com.au Accredited for compliance with ISO/IEC 17025 - Testing



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Approved Signatory: Pelin Erden gs-pelin NATA Accredited Laboratory Number: 15055

Shrink Swell Index AS 1289 7.1.1 & 2.1.1				
Sample Number	4589.2-S14	4589.2-S15		
Date Sampled	14/04/2022	14/04/2022		
Date Tested	26/04/2022	26/04/2022		
Material Source	**	**		
Sample Location	BH46 (0.7 - 1.0m)	BH50 (1.2 - 1.5m)		
Inert Material Estimate (%)	10	5		
Pocket Penetrometer before (kPa)	120	160		
Pocket Penetrometer after (kPa)	110	150		
Shrinkage Moisture Content (%)	16.8	15.9		
Shrinkage (%)	0.8	2.1		
Swell Moisture Content Before (%)	15.3	15.0		
Swell Moisture Content After (%)	19.9	23.8		
Swell (%)	-0.1	0.4		
Shrink Swell Index Iss (%)	0.4	1.3		
Visual Description	silty CLAY, medium plasticity, brown, trace gravel, with sand	silty CLAY, medium plasticity, mottled brown, grey, orange, trace gravel, with sand		
Cracking	SC	SC		
Crumbling	No	**		
Remarks	**	**		

Shrink Swell Index (Iss) 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.