ABN 31 105 704 078
13 Brock Street, Thomastown
Victoria 3074
(P) +61 3 9464 4617
(F) +61 3 9464 4618

GEOTECHNICAL SITE CLASSIFICATION

LOT 420

FIVE FARMS ESTATE STAGE 4, CLYDE NORTH

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

Report Reference: G4589.4

Date: 29 November 2022

ABN 31 105 704 078
13 Brock Street, Thomastown
Victoria 3074
(P) +61 3 9464 4617
(F) +61 3 9464 4618

PROJECT DETAILS

Project Reference	G4589.4	Rev	AT
Project Title	Five Farms Estate Stage 4		
Project Location	Clyde North	State	VIC
Date	29 November 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
One (1) Electronic Copy	Frasers Property Australia
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

Chris Connelly
Engineering Geologist
(e): chrisc@groundscience.com.au (m): 0402 551 743
Ground Science Pty Ltd

Technical Review

Gee Singh, RPEng
Geotechnical Team Leader
(e): gee@groundscience.com.au (m): 0404 879 558
Ground Science Pty Ltd

Table of Contents

1. INTRODUCTION

This report presents the results of the geotechnical site classification investigation carried out by Ground Science for the Five Farms Estate, Stage 4 located in Clyde North, Victoria (the site). This report presents the results for:

- **Lot 420**

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: GS5860.4 AA dated 11 May 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_S) 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 Stage 4 was carried out on 4, 5 and 11 October 2022. The scope of works involved the drilling of 20 boreholes (BH1 – BH20) 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 qualified geotechnical engineers from this office. Representative soil samples were recovered from the controlled fill & residual soil deposits for a total of 6 Shrink/Swell Index (I_{SS}) 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 to Silty CLAY overlying **naturally occurring** inferred 'Red Bluff Sandstone' residual soils comprising Silty/Sandy CLAY. The controlled fill and residual soil deposits were generally firm to hard, 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:

Table 1: Laboratory Test Results Summary

Sample #	Borehole	Depth (m)	Geological Origin	Shrink Swell Index I_{ss} (%)
S1	BH03	0.5 – 0.7	Controlled Fill	0.7
S2	BH08	1.0 – 1.3	Controlled Fill	0.9
S3	BH09	1.0 – 1.3	Controlled Fill	0.2
S4	BH12	1.0 – 1.3	Controlled Fill	0.6
S5	BH11	1.0 – 1.3	Controlled Fill	1.6
S6	BH13	1.0 – 1.4	Controlled Fill	1.1

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.

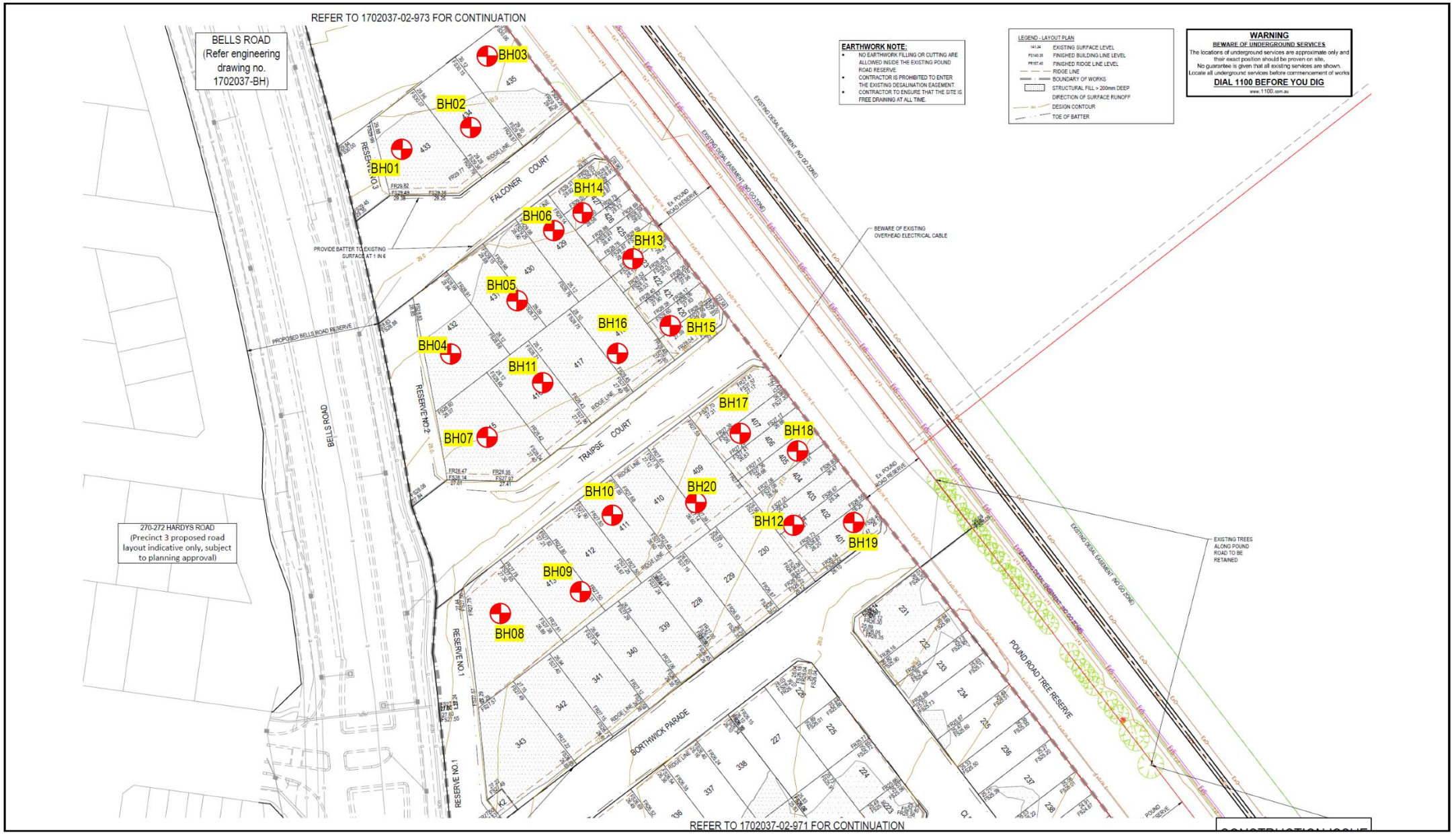
Any drawings or figures presented in this report should be considered only as pictorial evidence of our work. Therefore, unless otherwise stated, any dimensions should not be used for accurate calculations or dimensioning.

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, GS5860.4 AA – 11 May 2022, Level 1 Inspection & Testing, Five Farms Stage 4.

APPENDIX A

Site & Test Location Plans



Rev		Drawn	Date	Checked	Scale
0	Figure 1: Borehole Locations	RK	11.10.22	CC	NTS

Legend

Borehole Test Location (Approx.)

STAGE 4 BOREHOLE LOCATIONS FIVE FARMS ESTATE, CLYDE NORTH

Prepared For: Frasers Property Australia

Job No: G4589.4

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APPENDIX B

Borehole Logs

Ground Science
13 Brock Street, Thomastown VIC 3074
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Engineering Log - Borehole

Borehole No: BH01

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 353489.09195263125	Driller Supplier	: GS	Client	: FRASERS PROPERTY
Northing	: 5780571.330138472	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 1.9m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.5		Controlled Fill	SW	SAND, fine to coarse grained, grey, trace fine to medium sized gravel tracelow plasticity clay	M	L-MD		
		1		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled orange yellow brown, trace fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
		1.5		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, mottled grey orange brown, trace fine to medium sized gravel trace fine to coarse grained sand	w ≈ PL	St-VSt		
		1.6		Inferred Red Bluff Sandstone Residual Soil	SW	SAND, fine to medium grained, white, with low to medium plasticity clay trace fine sized gravel (sand stone) .	D	D-VD		
		2				**BH01 Terminated at 1.9m**				
		2.5								
		3								
		3.5								
		4								
		4.5								
		5								

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Engineering Log - Borehole

Borehole No: BH02

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356877.5	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780816.4	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.15		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		0.5		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled orange yellow brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		1								
		1.5								
		2				**BH02 Terminated at 2m**				
		2.5								
		3								
		3.5								
		4								
		4.5								
		5								

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Engineering Log - Borehole

Borehole No: BH03

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356880.2	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780835.2	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.5		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.3		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled orange yellow brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Sandy CLAY, medium to high plasticity, orange and red mottled yellow, fine to medium grained sand,	w ≈ PL	St-VSt		
						BH03 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH04

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356868.5	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780751.2	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.2		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled orange yellow brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		1.9		Inferred Red Bluff Sandstone Residual Soil	CI-CH	Sandy CLAY, medium to high plasticity, mottled grey orange brown, fine to medium grained sand,	w ≈ PL	St-VSt		
		2		Inferred Red Bluff Sandstone Residual Soil	CL-CI	Silty to sandy CLAY, low to medium plasticity, mottled orange white, fine to medium grained sand,	w ≈ PL	St-VSt		
						BH04 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH05

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356881.0	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780764.1	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.15		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.3		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		2		Inferred Red Bluff Sandstone Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
						BH05 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH06

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356900.1	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780776.6	Logged By	: RK/AM	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.3		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
						BH06 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH07

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356874.3	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780716.5	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 04/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.3		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		2		Inferred Red Bluff Sandstone Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
						BH07 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH08

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356884.9	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780658.6	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 05/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.6		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
				Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
		2				**BH08 Terminated at 2m**				

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Engineering Log - Borehole

Borehole No: BH09

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356907.8	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780673.0	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 05/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.4		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown and red mottled orange with grey, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		1.8		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Light brown mottled orange, with fine to medium grained sand trace fine sized gravel	w ≈ PL	St-VSt		
						BH09 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH10

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356924.3	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780686.6	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 05/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.4		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown and red mottled orange with grey, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	St-VSt		
		1.8		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Light brown mottled orange, with fine to medium grained sand trace fine sized gravel	w ≈ PL	St-VSt		
						BH10 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH11

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356887.1	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780726.8	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 05/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		0.5		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	St-VSt		
		1								
		1.5								
		2				**BH11 Terminated at 2m**				
		2.5								
		3								
		3.5								
		4								
		4.5								
		5								

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Engineering Log - Borehole

Borehole No: BH12

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356976.6	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780696.9	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 05/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.4		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown and red mottled orange with grey, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	St-VSt		
		1.8		Inferred Red Bluff Sandstone Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled red and white, with fine sized gravel trace fine to medium grained sand	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Light brown mottled grey and yellow, trace fine grained sand	w ≈ PL	St-VSt		
						BH12 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH13

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356922.6	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780770.7	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 05/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.7		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown mottled orange yellow and purple, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CH	Silty CLAY, high plasticity, red mottled grey orange and brown, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	VSt-H		
						BH13 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH14

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356912.5	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780784.2	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	ML	Sandy SILT, low plasticity, dark brown, fine grained sand, with low plasticity clay trace fine sized gravel tracelow to medium plasticity clay (with rootlets) ,	w > PL	VS-S		
		1		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled orange light brown, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	F-St		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CH	Silty CLAY, high plasticity, red mottled grey orange and brown, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	St-VSt		
						BH14 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH15

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356934.3	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780747.6	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.35		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled grey orange brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	St-VSt		
		1.7		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown, with fine to coarse grained sand trace fine sized gravel	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CH	Silty CLAY, high plasticity, red mottled grey orange and brown, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	VSt-H		
						BH15 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH16

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356921.0	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780740.8	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2.3m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.28		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		1.4		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled red orange brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	F-St		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CH	Silty CLAY, high plasticity, red mottled grey orange and brown, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	VSt-H		
				Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Sandy CLAY, medium to high plasticity, mottled grey light brown, fine to medium grained sand, trace fine sized gravel	w ≈ PL	VSt-H		
						BH16 Terminated at 2.3m				

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Engineering Log - Borehole

Borehole No: BH17

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356968.0	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780719.6	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		0.6		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled red orange brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	F-St		
		1.6		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown, with fine to coarse grained sand trace fine sized gravel	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, light yellow brown, with fine to medium grained sand trace fine sized gravel	w ≈ PL	VSt-H		
						BH17 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH18

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356978.9	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780716.0	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	SM	Silty SAND, fine to medium grained, grey brown, trace fine to medium sized gravel	D	VL-L		
		0.6		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled red orange brown, with fine to medium sized gravel with fine to coarse grained sand	w ≈ PL	F-St		
		1.7		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown, with fine to coarse grained sand trace fine sized gravel	w ≈ PL	St-VSt		
		2		Inferred 'Red Bluff Sandstone' Residual Soil	CI-CH	Silty CLAY, medium to high plasticity, mottled grey light yellow brown, with fine to medium grained sand trace fine sized gravel	w ≈ PL	VSt-H		
						BH18 Terminated at 2m				

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Engineering Log - Borehole

Borehole No: BH19

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356998.8	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780693.5	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.5 0.6		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled red orange brown and, with fine to medium sized gravel with fine to coarse grained sand	w > PL	F-St		
		1 1.3		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, light brown, with fine to coarse grained sand trace fine sized gravel	w ≈ PL	St-VSt		
		1.5		Inferred 'Red Bluff Sandstone' Residual Soil	CH	Silty CLAY, high plasticity, mottled grey light yellow brown, with fine to medium grained sand trace fine sized gravel	w ≈ PL	St-VSt		
		2				**BH19 Terminated at 2m**				
		2.5								
		3								
		3.5								
		4								
		4.5								
		5								

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Engineering Log - Borehole

Borehole No: BH20

UTM	: 55H	Driller Rig	: GT10 Drilling Rig	Job Number	: G4589.1
Easting	: 356948.8	Driller Supplier	: Ground Science	Client	: FRASERS PROPERTY
Northing	: 5780695.6	Logged By	: RK/WD	Project	: Five Farms Estate
RL	: N/A	Reviewed By	: CC	Location	: Clyde North
Total Depth	: 2m	Date	: 11/10/2022		

Drilling Method	Water	Depth (m)	Graphic Log	Soil Origin	Classification Code	Material Description	Moisture	Consistency	DCP	Samples
100mm SFA		0.2		Controlled Fill	ML	Sandy SILT, low plasticity, dark brown, fine grained sand, with low plasticity clay trace fine sized gravel tracelow to medium plasticity clay (with rootlets) ,	w > PL	VS-S		
		1		Controlled Fill	CI-CH	Silty CLAY, medium to high plasticity, mottled orange light brown, with fine to medium sized gravel with fine to medium grained sand	w ≈ PL	F-St		
		1.4		Controlled Fill	SM	Silty SAND, fine to medium grained, grey, with low to medium plasticity clay	D	MD-D		
		2		Controlled Fill	CI-CH	Sandy CLAY, medium to high plasticity, mottled white brown, fine to medium grained sand, with fine sized gravel	w ≈ PL	St-VSt		
						BH20 Terminated at 2m				

APPENDIX C

Laboratory Test Results

Material Test Report

Report Number: **G4589.4-1**
Issue Number: 1
Date Issued: 20/10/2022
Client: Frasers Property Australia Pty Ltd
Level 9, 484 St Kilda Road, Melbourne VIC 3004
Project Number: G4589.4
Project Name: Five Farms Estate Site Class
Project Location: Clyde North
Work Request: 10491
Dates Tested: 11/10/2022 - 20/10/2022

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					
Sample Number	4589.4-S1	4589.4-S2	4589.4-S3	4589.4-S5	4589.4-S4
Date Sampled	11/10/2022	11/10/2022	11/10/2022	11/10/2022	11/10/2022
Date Tested	18/10/2022	18/10/2022	18/10/2022	20/10/2022	18/10/2022
Material Source	**	**	**	**	**
Sample Location	BH03 (0.5 - 0.7m)	BH08 (1.0 - 1.3m)	BH09 (1.0 - 1.3m)	BH11 (1.0 - 1.3m)	BH12 (1.0 - 1.3m)
Inert Material Estimate (%)	10	15	5	10	10
Pocket Penetrometer before (kPa)	300+	150	150	200	150
Pocket Penetrometer after (kPa)	225	75	100	125	170
Shrinkage Moisture Content (%)	15.8	14.2	12.5	20.6	13.3
Shrinkage (%)	**1.3**	**1.7**	**0.3**	**2.8**	**1.0**
Swell Moisture Content Before (%)	13.9	14.8	11.3	18.1	16.1
Swell Moisture Content After (%)	17.3	24.1	16.3	21.3	21.7
Swell (%)	**-0.0**	**-0.2**	**-0.0**	**0.0**	**0.0**
Shrink Swell Index Iss (%)	**0.7**	**0.9**	**0.2**	**1.6**	**0.6**
Visual Description	Silty CLAY, medium plasticity, mottled brown/reddish brown, trace sand	silty CLAY, medium to high plasticity, mottled brown/ gray/reddish brown, with sand, trace gravel	sandy CLAY, low plasticity, mottled brown/gray, fine sand, trace gravel	sandy silty CLAY, medium plasticity, mottled brown/reddish brown, fine sand	silty CLAY, medium plasticity, mottled brown/gray/light orange, trace gravel
Cracking	SC	MC	HC	SC	SC
Crumbling	No	Yes	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: **G4589.4-1**
Issue Number: 1
Date Issued: 20/10/2022
Client: Frasers Property Australia Pty Ltd
Level 9, 484 St Kilda Road, Melbourne VIC 3004
Project Number: G4589.4
Project Name: Five Farms Estate Site Class
Project Location: Clyde North
Work Request: 10491
Dates Tested: 11/10/2022 - 20/10/2022

Ground Science
Geotechnical & Environmental Consultants
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

NATA
WORLD RECOGNISED ACCREDITATION

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

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	4589.4-S6				
Date Sampled	11/10/2022				
Date Tested	20/10/2022				
Material Source	**				
Sample Location	BH13 (1.0 - 1.4m)				
Inert Material Estimate (%)	10				
Pocket Penetrometer before (kPa)	300+				
Pocket Penetrometer after (kPa)	175				
Shrinkage Moisture Content (%)	20.7				
Shrinkage (%)	**1.7**				
Swell Moisture Content Before (%)	20.9				
Swell Moisture Content After (%)	23.8				
Swell (%)	**0.5**				
Shrink Swell Index Iss (%)	**1.1**				
Visual Description	silty CLAY, medium plasticity, mottled brown/gray/light orange, trace gravel				
Cracking	MC				
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.