Date: 16 May 2023
Project No: LTC21220-A

Ngai Tahu Property
115 Eureka Street, Aranui
Attention: Simon Tucker

LandTech Consulting Ltd
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RE: SHALLOW SOIL TEST REPORT
FUTURE RESIDENTIAL FOUNDATIONS
LOT 34, 115 EUREKA STREET, ARANUI

1.0 Introduction & Background

LandTech Consulting Ltd (LandTech) were engaged by Ngai Tahu Property to carry out lot specific shallow soil testing at Lot 34, 115 Eureka Street, Aranui (the site). The purpose of the shallow soil testing is to confirm subsurface conditions and provide geotechnical recommendations with regards to future residential foundations within the site.

We previously investigated the underlying larger property, which this lot has been formed from, to support the corresponding Resource Consent for the subdivision. Our findings are presented in a report titled: *Geotechnical Investigation Report for Proposed Residential Subdivision 115 Eureka Street, Aranui,* project reference: LTC21220, Revision B, dated 13 September 2021.

LandTech has been retained to monitor earthworks and ground remediation for the subdivision site. As earthworks are ongoing across the wider subdivision site at the time of preparing this letter, we have yet to prepare an Earthworks Completion Report for the subdivision. However, earthworks were mostly completed at this particular lot, with the exception of potentially some additional minor topsoil spreading, prior to our current shallow soil testing and had been carried out to the appropriate engineering standards. This report is considered relevant for the ground conditions beneath the lot at the time of testing, and any additional earthworks (ie topsoil spreading) will need to be taken into account for excavation depths of future house foundations. Depths of foundation excavations presented later within this report may therefore need to be increased at the time of house construction should additional topsoil be placed after the date of our testing.

2.0 Shallow Soil Testing

LandTech investigated the site on 12 May 2023, conducting two hand augers with corresponding Scala Penetrometer tests (SPs) and two additional SPs. The locations of the hand auger and SPs were measured using inferred lot boundaries and are approximate only. The test locations are shown on our LandTech *Test Location Plan*, Drawing No. Lot 34/ TLP, attached to this report.

Soil types and conditions within the hand augers were logged by LandTech technical staff in accordance with New Zealand Geotechnical Society *Guideline for the Description of Soil and Rock for Engineering Purposes* (2005). The hand auger logs for each hole are attached.

Our SP testing was carried out in accordance with NZS 4402:1988, Test 6.5.2, *Dynamic Cone Penetrometer*. The SP results are also attached.

Topsoil was encountered within the hand augers from the ground surface to depths between 0.3m to 0.4m, which was typically a dark brown sandy silt material with some gravel. Engineered fill was encountered below the topsoil to the base of auger holes, which was a compacted grey sand material with a trace of silt. The hand augers were terminated at 1.2m depth below ground level to avoid damage to the geotextile layer which was installed at 1.5m depth below ground level. Groundwater was not encountered during testing.

As part of the subdivision earthworks, ground improvement consisting of a reinforced raft is being constructed across the site, which we observed the subgrade excavations for and monitored construction. The reinforced engineered fill raft comprises 250mm compacted sand layers, with a total thickness of 1200mm, capped with a minimum 300mm of topsoil. A layer of geotextile (AS410) was installed at the base of the engineered fill raft and three geogrid layers (Duragrid 40/40) were installed within it for reinforcement (at the base, 250mm, and 750mm).

SPs at each of the four locations returned results between 2 and 12 blows per 100mm penetration below the topsoil and within the engineered fill layer. SPs were terminated at 0.9m depth to confirm near surface bearing capacities, and to avoid damage to the geogrids and geotextile. In addition, the density of the engineered fill and bearing capacity of its underlying subgrade have been confirmed via extensive geotechnical inspection and fill compaction testing during subdivision earthworks.

3.0 Foundation Recommendations

From our previous investigation in support of the subdivision, we concluded that TC2 foundations in accordance with MBIE Guidelines (December 2012) may be used at this site following subdivision earthworks and ground remediation (reinforced engineered fill raft). Our current lot-specific shallow soil testing confirms such foundations remain appropriate. In particular, we confirm Option 4 enhanced slab foundations are required.

All foundations must be embedded to a minimum depth of 0.4m below ground level, where an Ultimate Bearing Capacity of 200kPa and a strength reduction factor of (ϕs) 0.5 is available. Foundations excavations should expose engineered fill of appropriate bearing capacity. All topsoil and unsuitable materials should be removed below foundations and floor slab areas, and where required layers of compacted hardfill should be placed to the underside of foundations.

4.0 Limitations

This shallow soil testing report has been prepared for our client, Ngai Tahu Property, to support foundation design and corresponding Building Consent applications for future housing within the corresponding lot. This report shall not be extrapolated for other nearby sites or used for any other purposes without the express approval of LandTech and our client.

The findings of this report are based on the results of testing conducted at point locations and within the agreed scope of works. Therefore, while we have attempted to conduct a thorough investigation of soils across the site, local subsurface conditions could vary from those used in our geotechnical model, as soils can vary naturally and due to previous human activities. LandTech has no control over and should not be held accountable for these variations. Should exposed soil conditions vary from those described herein, we request to be informed so that we may assess the continued applicability of our recommendations.

Our geotechnical investigation described in this report was confined to geotechnical aspects of the site only and did not involve an assessment for environmental contaminants. Our investigation and analyses have not taken into account possible fault rupture that may cause deformations and displacements of the ground directly below the site. These assessments are outside the scope of our geotechnical engagement.

If you have any queries regarding this report, please contact the undersigned at your convenience.

Yours faithfully,
LandTech Consulting Limited

Prepared By: Kevin Yang – Junior Geotechnical Engineer
BEng.Tech (Civil)

Authorised By: Dwayne Wilson - Director
CMEngNZ, CPEng, IntPE(NZ)

Attachments: Test Location Plan
Test Results

KEY:

- HA01 — LandTech Consulting Ltd. augerhole locations, drilled 12 May 2023
- SP01 — LandTech Consulting Ltd. DCP test location, tested 12 May 2023
- Proposed boundary
- Building exclusion zone
- Existing boundary

North

NOTES:

Locations of features approximate only

Original sheet size A3

Boundary information on this *Test Location Plan* adapted from LINZ website: www.data.linz.govt.nz (accessed 23 March 2023)

Location of proposed lot boundaries adapted from Davie Lovell-Smith drawing titled: Proposed Subdivision, dated May 2021

AMENDMENTS		
DATE	REV	DESCRIPTION
15/05/2023	A	Issued for report

Test Location Plan

Lot 34, 115 Eureka Street,
ARANUI, CHRISTCHURCH

LandTech CONSULTING

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Auckland Office:
9B Collard Place, Henderson, Auckland 0610

Postal Address:
PO Box 119, Christchurch 8013

Website: www.landtech.nz Email: info@landtech.nz

Drawing No.	Drawn by:	Date:
Lot 34/TLP	KY	15 May 2023

Scale:	Checked by:	Revision:
1: 125 (A3) 1: 2000 (A3)	D Wilson	A

Filename: LTC21220 - A - Drawings.dwg

Client: Ngai Tahu Property		**Augerhole No.:** Lot 34 - HA01
Project: Lot Specific Testing		**Sheet No.:** 1 of 1
Address: 115 Eureka Street, Aranui, Christchurch		

Project No.:	LTC21220-A	**Coordinates:**	NZTM2000: E1576365.84, N5183016.36	**Logged By:**	KY
Drill Type:	50mm Hand Auger	**Reduced Level:**	2.83m (LVD1937)	**Shear Vane No.:**	
Date Started:	12-May-23	**Ground Conditions:**	Near level, Topsoil.	**Calibration Factor:**	
Date Finished:	12-May-23	**Groundwater Level (m):**	Not Encountered	**Calibration Date:**	

Stratigraphy	Depth (m)	Graphic Log	Description	Groundwater Level (m)
Topsoil	0.0	TS	Fine to coarse sandy SILT, some fine to coarse subround to rounded greywacke gravel, dark brown, loose, moist, non-plastic, [TOPSOIL].	
Engineered Fill	0.5		Fine SAND, trace silt, grey, medium dense to dense, moist, [ENGINEERED FILL].	
			0.9m: Geogrid.	
	1.0		1.0m: Dark brown.	
			End of Augerhole: 1.2m	
			[TARGET DEPTH]	
	1.5			
	2.0			
	2.5			

In-situ Field Testing

Shear Strength (kPa)

● Peak
● Remoulded

50 100 150 200

Dynamic Cone (Scala) Penetrometer

Depth (m)	Blow Count
-0.1	2
-0.2	4
-0.3	3
-0.4	2
-0.5	4
-0.6	9
-0.7	10
-0.8	10
-0.9	9

Scala Blow Count / 100mm: 0 5 10 15 20

Target depth achieved.

In- situ testing inaccordance with the following standards:

Scala Penetrometer Testing: NZS 4402: 1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

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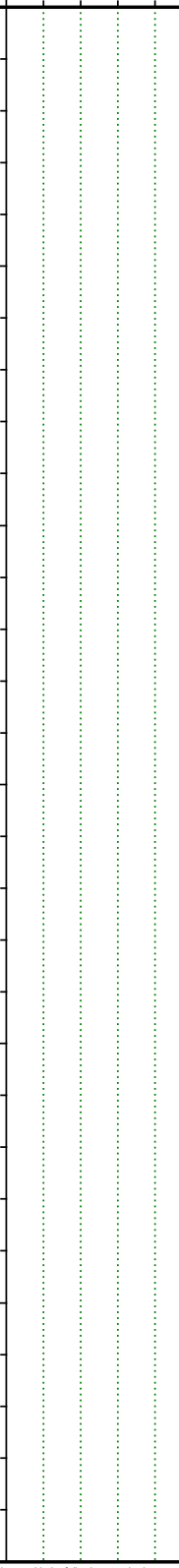
Client: Ngai Tahu Property		**Augerhole No.:** Lot 34 - HA02
Project: Lot Specific Testing		**Sheet No.:** 1 of 1
Address: 115 Eureka Street, Aranui, Christchurch		

Project No.:	LTC21220-A	**Coordinates:**	NZTM2000: E1576360.37, N5182998.33	**Logged By:**	KY
Drill Type:	50mm Hand Auger	**Reduced Level:**	2.83m (LVD1937)	**Shear Vane No.:**	
Date Started:	12-May-23	**Ground Conditions:**	Near level, Topsoil.	**Calibration Factor:**	
Date Finished:	12-May-23	**Groundwater Level (m):**	Not Encountered	**Calibration Date:**	

Stratigraphy	Depth (m)	Graphic Log	Description	Groundwater Level (m)
Topsoil	0	TS	Fine to coarse sandy SILT, some fine to medium subround to rounded greywacke gravel, dark brown, loose, moist, non-plastic, trace glass fragments [TOPSOIL].	
Engineered Fill	0.5		Fine SAND, trace silt, dark grey, medium dense to dense, moist, [ENGINEERED FILL].	
	1.0		0.9m: Geogrid.	
			End of Augerhole: 1.2m	
			[TARGET DEPTH]	
	1.5			
	2.0			
	2.5			

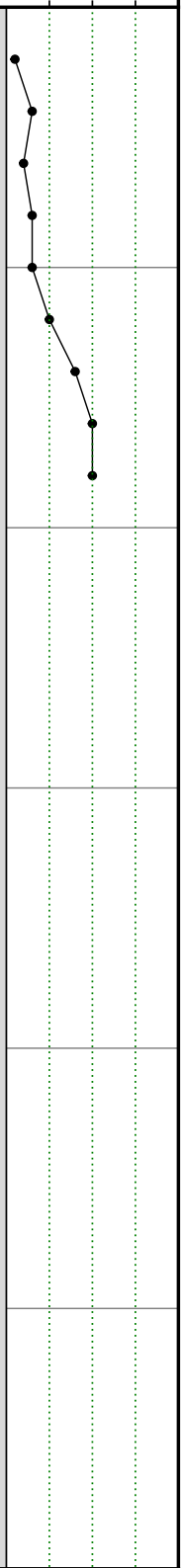
In-situ Field Testing

Shear Strength (kPa) — ● Peak ● Remoulded



Dynamic Cone (Scala) Penetrometer

Depth (m)	Blow Count
-0.1	1
-0.2	3
-0.3	2
-0.4	3
-0.5	3
-0.6	5
-0.7	8
-0.8	10
-0.9	10



Target depth achieved.

In- situ testing inaccordance with the following standards:

Scala Penetrometer Testing: NZS 4402: 1988, Test 6.5.2, Dynamic Cone Penetrometer

Shear Vane Testing: Guideline for Hand Held Shear Vane Test, NZGS, August 2001

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Website: www.landtech.nz

Client: Ngai Tahu Property

Project: Lot Specific Testing

Address: 115 Eureka Street, Aranui, Christchurch

LOT 34- SP01

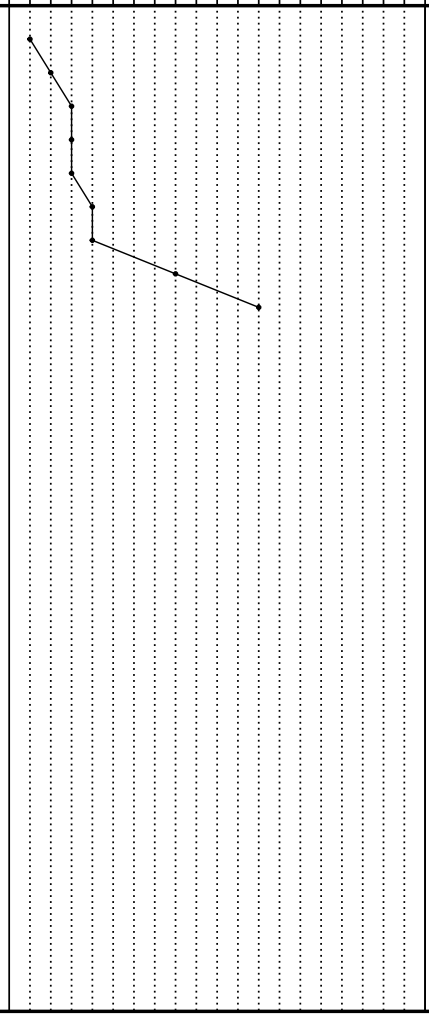
Tested By: KY

Ground Conditions: Near level, Topsoil.

Coordinates: NZTM2000 E 1576367.29 N 5183006.44

Test Date: 12-May-23

DEPTH (m)	DATA
0.2	1
0.4	2
0.6	3
0.8	3
1.0	3
1.2	4
1.4	4
1.6	8
1.8	12
2.0	
2.2	
2.4	
2.6	
2.8	



LOT 34- SP02

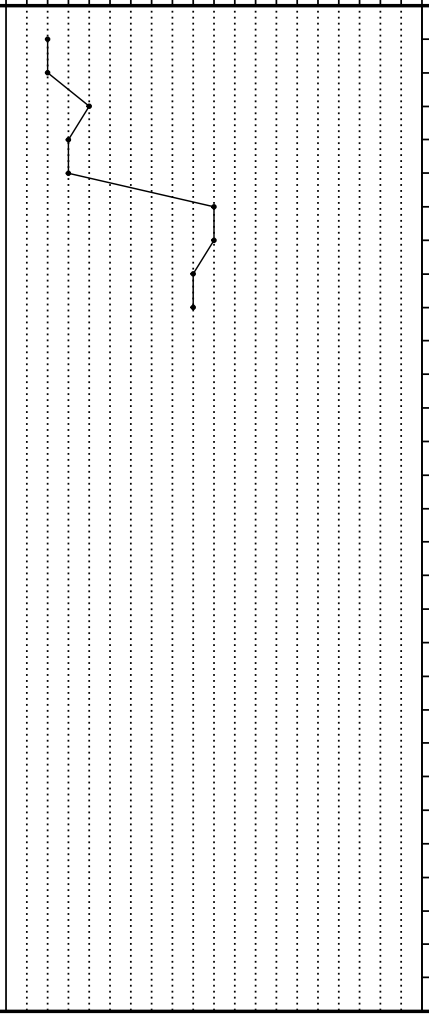
Tested By: KY

Ground Conditions: Near level, Topsoil.

Coordinates: NZTM2000 E 1576358.58 N 5183009.37

Test Date: 12-May-23

DEPTH (m)	DATA
0.2	2
0.4	2
0.6	4
0.8	3
1.0	3
1.2	10
1.4	10
1.6	9
1.8	9
2.0	
2.2	
2.4	
2.6	
2.8	

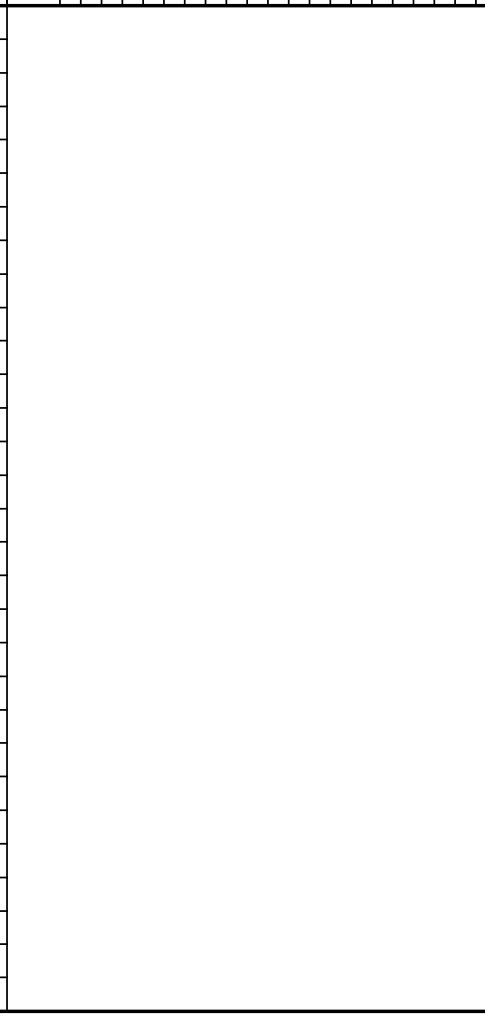


Tested By:

Ground Conditions:

Coordinates:

Test Date:



Tested By:

Ground Conditions:

Coordinates:

Test Date: