SUBDIVISION SUITABILITY REPORT

237 & 239 Marsden Point Road

Ruakaka

(Lot 2 DP 152421)

RS Eng Ltd • 2 Seaview Road, Whangarei 0110 • **09 438 3273** • **office@RSEng.co.nz**
Consulting Engineers

SUBDIVISION SUITABILITY REPORT

237 & 239 Marsden Point Road

Ruakaka

(Lot 2 DP 152421)

Report prepared for: Bruce Stallworthy

Report prepared by: Liam Fuller

Report reviewed by: Matthew Jacobson

Report Approved by: Steve Turner

Report reference: 17560

Date: 15 January 2021

Issue	Details	Date
1	Resource Consent Issue	15 January 2021

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File: 17560
15 January 2021
Issue: 1

SUBDIVISION SUITABILITY REPORT

237 & 239 Marsden Point Road Ruakaka

(Lot 2 DP 152421)

1.0 Introduction

RS Eng Ltd has been engaged by Bruce Stallworthy to investigate the suitability of Lot 2 DP 152421 for a 10 Lot residential subdivision. The purpose of this report is to assess the suitability of the proposed new allotments (Lots 1 - 10) for residential construction, in terms of geotechnical suitability and stormwater attenuation disposal.

This report has been prepared in support of a resource consent application to the Whangarei District Council (WDC). The proposed scheme plan is included in Appendix A.

2.0 Site Description

This property is located on the western side of Marsden Point Road, 350m north of its intersection with Salle Road. The property consists of a near level area adjacent to Marsden Point Road before falling gently to moderately (less than 12°) towards the west. Grounds slopes become gentle again as they reach the western boundary. An open drain is located parallel to the western boundary on the neighbouring property. Ground cover is in rank pasture.



Figure 1. Lot 2 DP 152421

3.0 Desk Study

3.1 Site Geology

The GNS 1:250,000 scale geological map for Whangarei indicates that the property is located within an area that is underlain by Waipapa Group sandstone and siltstone (Waipapa terrane) and OIS5 (Late Pleistocene) stable dune deposits. Subsoil investigations however encountered Late Pleistocene stable dune deposits which has been described as follows: *"Weakly cemented sand in fixed transverse dune ridges."*

3.2 Aerial Photography Review

Historical aerial photography of the property, namely two images from 1961 and 1985 have been reviewed. No features of concern were observed at this property or the adjacent allotments. The land and surrounding area appears to be within pasture and has remained relatively unchanged since 1961 apart from residential development on neighbouring properties.



*Figure 2: 1985 Aerial Photograph of Property. Source: Retrolens.co.*nz (Property Indicated by Yellow Line)

4.0 Field Investigation

A technician from this office visited the property on 21 December 2020 to undertake a walkover inspection, seven Scala Penetrometer tests and seven Hand Augered boreholes. The walkover inspection did not observe any signs of concern in relation to the proposal. Subsoil testing locations and results are attached in Appendix B & C respectively.

Scala Penetrometer tests 1 – 5 and 7 produced similar results encountering medium to very dense sands at depths greater than 0.45m.

The hand augers were dug at the Scala Penetrometer test locations to depths between 0.4m and 1.2m. A similar soil profile was encountered within the hand augers consisting of a shallow depth of topsoil overlying loose to very dense sand and being poorly to well graded. The hand augers were terminated due to not being able to penetrate the very dense sand. Ground water was not encountered.

5.0 Subsoil Conditions

Interpretation of subsurface conditions are based on the investigations shown on the drawings in Appendix A. The conditions are summarised below;

- Fill was not encountered during the subsurface investigations.
- Topsoil was encountered at an average depth of 0.1m.
- Soils consisted of loose to very dense sand, with some silt, being poorly to well graded.
- The loose sand was encountered at an average depth of 0.3m and to a maximum depth of 0.7m.

6.0 Suitability Assessment

The WDC has not designated an instability hazard zone on this property. Considering the underlying geology and low slope angles RS Eng considers the building area is subject to a low instability hazard. The Low Instability Hazard Zone has been described as follows; *"Erosion or landslide morphology is not apparent. Not considered to be at risk of instability. May, however, be at risk as a result of natural events, or development. Steeper slopes may be subject to soil creep."*

Subsoil investigations encountered medium dense to very dense sand at depths generally greater than 0.45m before being impenetrable with the hand auger. Ground slopes are gentle to moderate, being in the range of 5° to 12° and did not observe any signs of recent or historical instability.

6.1 Expansive Soils

Subsoil investigations encountered sand with some silts and is considered as not expansive.

6.2 Acid Sulphate Soils

The WDC have zoned the eastern area of the property (specifically Lots 1 & 2) to be within an area at risk of acid sulphate soils. The zoning indicates land where sulphates have been deposited during the last significant sea level rise. When reacted with oxygen under the right conditions (generally areas with high groundwater tables), the sulphates can become acidic, which in turn can cause problems with the concrete components of structures beneath ground level.

The following paragraph has been extracted from a report entitled "*Acid Sulphate Soils Planning Policy Basic Guide*" completed by Opus International Consultants Ltd 2016: *"If footings are excavated in acid sulphate soils, then a small amount of acid may be generated in the soil around those footings. Once the concrete is poured in, the alkalinity in the concrete would be likely to react with the acidity in the soil and neutralise it (generally resulting in a negligible unnoticeable amount of concrete corrosion in the process). Once the footings and slab are in place, the soil is then cut off from further oxygen supply."*

We concur with the above assessment and therefore consider the risk of damage to future concrete foundations for proposed dwellings or R.O.W construction to be minor. Further to the above statement, groundwater was not encountered during the subsoil investigations. RS Eng considers the risk of acid sulphates to be low.

6.3 Development Recommendations

To create access and form a level building platform, minimal earthworks will be required. To suitably develop the building areas, we recommend as follows:

- Building platforms shall be shaped to avoid concentrating surface water or ponding.
- Earthworks shall generally be carried out in accordance with NZS 4431:1989 and be designed to not negatively affect the stability of the building sites or surrounding areas.
- NZS3604 "Good Ground" was encountered at depths between of 0.3mBGL and 1.0mBGL. It is of note that peat is located on the neighbouring property, although it was not encountered during subsurface investigations. RS Eng recommends site specific investigation and design of foundations is completed at building consent stage.

7.0 Stormwater Assessment

To avoid creating flooding issues downstream the Whangarei District Council requires that any increase of impervious surfaces stormwater is attenuated to 80% of the predevelopment flows where properties are less than 1.0ha to minimises any adverse effects on downstream properties. As the proposed properties will be less than 1.0ha, stormwater attenuation will be required.

RS Eng recommends stormwater runoff from proposed impervious areas be collected where possible and piped to stormwater attenuation storage/soakage pits or tanks designed to reduce the peak flows to predevelopment levels. Specific design will be required at building consent stage once building positions and designs have been confirmed. Stormwater pits are recommended unless the depth to sandstone is insufficient which is expected to be the case at Lots 7 & 8.

As part of the subdivision development, stormwater runoff from the proposed Right of Way (R.O.W) will need to be collected and directed to specifically designed stormwater storage pits located beneath the R.O.W.

Stormwater outflow from attenuation storage pits and tanks should be piped via a reticulated network and into the open drain located along the western boundary. As the drain is located within the neighbouring property, approval from the landowner will be required. If this is not forthcoming, specific design could be undertaken to disperse attenuated stormwater runoff evenly and consistent with predevelopment flows via a dispersal trench. This will require a suitable easement over Lots 7 & 8. An indicative layout is included in the appendices. The piped network will need to comply with the WDC EES and the actual layout confirmed at Engineering Plan preparation stage.

8.0 Conclusions

It is the conclusion of RS Eng Ltd that the new allotments have a building area suitable for residential development, provided the recommendations of the report are complied with.

We also conclude that in terms of Section 106 of the Resource Management Act 1991 and subject to the recommendations of this report that:

a) the land in respect of which a consent is sought, or any structure on the land, is not or is not likely to be subject to material damage by subsidence or slippage from any source; and:

b) any subsequent use that is likely to be made of the land is not likely to accelerate, worsen, or result in material damage to the land, other land, or structure by subsidence or slippage from any source.

9.0 Limitations

This report has been prepared solely for the benefit of our client and the Whangarei District Council. The purpose is to determine the engineering suitability of the proposed residential development, in relation to the material covered by the report. The reliance by other parties on the information or opinions contained therein shall, without our prior review and agreement in writing, do so at their own risk.

Recommendations and opinions in this report are based on data obtained as previously detailed. The nature and continuity of subsoil conditions away from the test locations are inferred and it should be appreciated that actual conditions could vary from those assumed.

This report does not address matters relating to the National Environmental Standard for Contaminated Sites, and if applicable separate advice should be sought on this matter from a suitably qualified person.

If during the construction process, conditions are encountered that differ from the inferred conditions on which the report has been based, the site should be examined by a suitably qualified engineer to determine if any modification of the design based upon this report is required.

Prepared by:



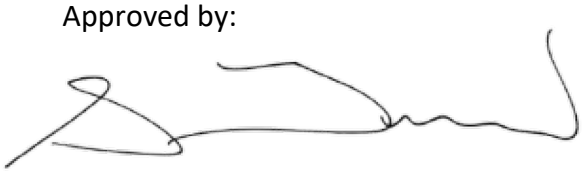
Liam Fuller
Engineering Technician

Reviewed by:



Matthew Jacobson
Team Leader - Geotechnical
NZDE(Civil), BE(Civil)(Hons),MEngNZ

Approved by:



Steve Turner
Director
BE(Civil), CPEng, IntPE(NZ), CMEngNZ

RS Eng Ltd

Appendix A

Proposed Survey Plan



CAUTION:

1. THIS DRAWING SHOULD NOT BE AMENDED MANUALLY.
2. AREAS & DIMENSIONS ARE APPROXIMATE ONLY AND ARE SUBJECT TO FINAL SURVEY.
3. THE VENDOR & PURCHASER MUST CONTACT THE SURVEYOR IF SALE & PURCHASE AGREEMENTS ARE ENTERED INTO USING THIS PLAN.
4. SERVICES MUST NOT BE POSITIONED USING THIS PLAN.
5. DO NOT SCALE OFF DRAWINGS.
6. THIS PLAN IS COPYRIGHT TO REYBURN & BRYANT (1999) LIMITED.
7. DESIGNED BY REYBURN & BRYANT - WHANGAREI - NEW ZEALAND
8. 01m 2014-2015 URBAN AERIAL SOURCED FROM AERIAL SURVEYS LTD INFORMATION AVAILABLE ON LINZ DATA SERVICE.
9. BOUNDARIES SOURCED FROM QUICKMAP. COORDINATES IN TERMS OF MOUNT EDEN 2000.

PROPOSED AMALGAMATION CONDITION

PURSUANT TO SECTION 220 (1)(b)(iv) OF THE RMA 1991:

THAT LOT 11 HEREON (COMMON ACCESS) BE HELD AS TO EIGHT UNDIVIDED ONE EIGHTH SHARES BY THE OWNERS OF LOTS 3 - 10 HEREON IN COMMON IN THE SAID SHARES AND THAT INDIVIDUAL RECORDS OF TITLE BE ISSUED IN ACCORDANCE HEREWITH.

TOTAL AREA: 9991m²

COMPRISED IN: RT NA91A/268 (ALL)

THIS SITE IS ZONED ' LIVING 1 ' AND THE BUILDING SETBACKS ARE THUS: 4.5m FROM ROAD BOUNDARIES AND 3m FROM ALL OTHER BOUNDARIES, WITH ONE ALLOWED AT 1.5m.

REV	DATE	DESCRIPTION
A	17.08.20	FIRST ISSUE - PL/CC

REF. DATA:

reyburn & bryant
Ph: 09 438 3563 PO Box 191, Whangarei 0140
7 Selwyn Ave, Whangarei www.reyburnandbryant.co.nz

CLIENT

STALLWORTHY
237 & 239 MARSDEN POINT ROAD, RUAKAKA

TITLE

PROPOSED SUBDIVISION OF LOT 2 DP 152421

DATE	AUGUST 2020	SCALE	1:750 @A3	
NO.	S16064	SHEET	1/1	Rev. A

Date Plotted: 17/08/2020 File Path: P:\16000 - 16999\16064 - Bruce Stallworthy\Drawings\Scheme Plan\S16064 - Stallworthy - A.dwg

LOCAL AUTHORITY: WHANGAREI DISTRICT COUNCIL

N

15 0 15

METRES - 1:750

LOT 7
1450m²

LOT 6
625m²

LOT 5
695m²

LOT 4
670m²

LOT 3
720m²

LOT 2
710m²

LOT 1
700m²
ACID SOLPHATE SOIL RISK AREA

LOT 8
1145m²

LOT 9
1090m²
Lot 2 DP 152421 RT:NA91A/268

LOT 11 (56.9) (56.7)
1186m² (COMMON ACCESS)
(28.6)

LOT 10
1000m²

NORTHPOWER CRITICAL OVERHEAD LINES

ACID SOLPHATE SOIL RISK AREA

ACID SOLPHATE SOIL RISK AREA

Lot 6 DP 427959

Lot 5 DP 427959

Lot 4 DP 480410

Lot 3 DP 418605

Lot 2 DP 418605

Lot 1 DP 418605

Lot 1 DP 322640

NORTHPOWER CRITICAL OVERHEAD LINES

MARSDEN POINT ROAD
LEGAL, SEALED, OVER 20.12 WIDE

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PURSUANT TO SECTION 220 (1)(b)(iv) OF THE RMA 1991:

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TOTAL AREA: 9991m²

COMPRISED IN: RT NA91A/268 (ALL)

THIS SITE IS ZONED ' LIVING 1 ' AND THE BUILDING SETBACKS ARE THUS: 4.5m FROM ROAD BOUNDARIES AND 3m FROM ALL OTHER BOUNDARIES, WITH ONE ALLOWED AT 1.5m.

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CLIENT

STALLWORTHY
237 & 239 MARSDEN POINT ROAD, RUAKAKA

TITLE

PROPOSED SUBDIVISION OF LOT 2 DP 152421

DATE	AUGUST 2020	SCALE	1:750 @A3
NO.	S16064	SHEET 1/1	Rev. A

LOCAL AUTHORITY: WHANGAREI DISTRICT COUNCIL

Appendix B

Drawings



Note:

Overflow from stromwater attenuation storage pits/tanks directed to open drain of stormwater dispersal trench.

NOTES:

- Do not scale off drawings.
- These drawings are to be read in conjunction with specifications - plans take precedence.
- If any part of these documents are unclear, please contact RS Eng Ltd.
- This plan is copyright to RS Eng Ltd and should not be reproduced without prior permission.

KEY

Borehole Location & Scala Penetrometer Location

Stormwater Attenuation Tank (Indicative Location)

Stormwater Storage Pit (Indicative Location)

Stormwater Dispersal Trench (Indicative Location)

RS Eng Ltd
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2 Seaview Road,
Whangarei 0110

Title
Site Plan

Client
Bruce Stallworthy

Location
237 & 239 Marsden Point Road
Ruakaka

Date	Rev	Notes
11-01-21	A	Original Issue

Scale	Original	Rev
1:750	A3	

Drawn by	Approved by	File	Sheet
LF	ST	17560	2

Appendix C

Subsoil Investigations

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 1

Latitude: 35°52'51.9"S
Longitude: 174°27'00.5"E

Job Number: 17560
Date: 21/12/20

Project: New Subdivision
Elevation: 6.8m
Logged By: LF

Client: Bruce Stallworthy
Shear Vane:
Reviewed By: MJ

Borehole Location: 237 & 239 Marsden Point Road, Ruakaka
Drill Size: 75mm

Terminated at:
- Target Depth ☐
- Refusal ☒
- Near Refusal ☐
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]	
	Sand, some silt, minor clay, brown, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200
	SAND, minor silt, light brownish orange, well graded, very dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	400
	Unable to penetrate End of Bore 0.45m	600
		800
		1000
		1200
		1400
		1600
		1800
		2000
		2200
		2400
		2600
		2800
		3000
		3200
		3400
		3600
		3800
		4000

GW LEVEL

UNDRAINED SHEAR STRENGTH (KPa)
20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 2

Latitude: 35°52'52.9"S
Longitude: 174°27'00.5"E
Elevation: 6.8m
Shear Vane:

Job Number: 17560
Date: 21/12/20
Logged By: LF
Reviewed By: MJ
Drill Size: 75mm

Project: New Subdivision
Client: Bruce Stallworthy
Borehole Location: 237 & 239 Marsden Point Road, Ruakaka

Terminated at:
- Target Depth ☐
- Refusal ☒
- Near Refusal ☐
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]	
	Sand, some silt, minor clay, brown, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200
	SAND, minor silt, light brownish orange, well graded, very dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	400
	Unable to penetrate End of Bore 0.4m	600
		800
		1000
		1200
		1400
		1600
		1800
		2000
		2200
		2400
		2600
		2800
		3000
		3200
		3400
		3600
		3800
		4000

GW LEVEL

UNDRAINED SHEAR STRENGTH (KPa)
20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 3

Latitude: 35°52'52.4"S
Longitude: 174°27'02.5"E

Job Number: 17560
Date: 21/12/20

Project: New Subdivision
Elevation: 8.7m
Logged By: LF

Client: Bruce Stallworthy
Shear Vane:
Reviewed By: MJ

Borehole Location: 237 & 239 Marsden Point Road, Ruakaka
Drill Size: 75mm

Terminated at:
- Target Depth ☐
- Refusal ☐
- Near Refusal ☒
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]	
	Sand, some silt, minor clay, brown, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200
	SAND, minor silt, light brownish orange, very dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	400
	becoming moist	600
		800
		1000
	Unable to penetrate End of Bore 1.1m	1200
		1400
		1600
		1800
		2000
		2200
		2400
		2600
		2800
		3000
		3200
		3400
		3600
		3800
		4000

GW LEVEL

UNDRAINED SHEAR STRENGTH (KPa)
20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 4

Latitude: 35°52'53.4"S
Longitude: 174°27'03.2"E
Elevation: 9.4m
Shear Vane:

Job Number: 17560
Date: 21/12/20
Logged By: LF
Reviewed By: MJ
Drill Size: 75mm

Project: New Subdivision
Client: Bruce Stallworthy
Borehole Location: 237 & 239 Marsden Point Road, Ruakaka

Terminated at:
- Target Depth ☐
- Refusal ☐
- Near Refusal ☒
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]	
	Sand, some silt, minor clay, brown, orange, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200, 400, 600
	SAND, minor silt, light brownish orange, white, very dense, poorly graded, moist, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	800, 1000
	Near refusal End of Bore 1.2m	1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000

GW LEVEL

UNDRAINED SHEAR STRENGTH (KPa)
20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 5

Latitude: 35°52'52.8"S
Longitude: 174°27'04.3"E
Elevation: 15m
Shear Vane:

Job Number: 17560
Date: 21/12/20
Logged By: LF
Reviewed By: MJ
Drill Size: 75mm

Project: New Subdivision
Client: Bruce Stallworthy
Borehole Location: 237 & 239 Marsden Point Road, Ruakaka

Terminated at:
- Target Depth ☐
- Refusal ☒
- Near Refusal ☐
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]	
	Sand, some silt, minor clay, brown, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200
	SAND, minor silt, light brownish orange, dense to very dense, well graded, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	400, 600, 800
	SAND, minor silt, light brownish orange, white, very dense, poorly graded, moist, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	1000
	Unable to penetrate End of Bore 1.1m	1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000

GW LEVEL

UNDRAINED SHEAR STRENGTH (KPa)
20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 6

Latitude: 35°52'53.8"S
Longitude: 174°27'05.0"E
Elevation: 16.2m
Shear Vane:

Job Number: 17560
Date: 21/12/20
Logged By: LF
Reviewed By: MJ
Drill Size: 75mm

Project: New Subdivision
Client: Bruce Stallworthy
Borehole Location: 237 & 239 Marsden Point Road, Ruakaka

Terminated at:
- Target Depth ☐
- Refusal ☐
- Near Refusal ☒
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]	
	Sand, some silt, minor clay, brown, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200, 400, 600
	SAND, minor silt, light brownish orange, dense to very dense, well graded, moist, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	800, 1000
	Near refusal End of Bore 1.1m	1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000

GW LEVEL

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20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
office@RSEng.co.nz
2 Seaview Road,
Whangarei 0110

Hand Auger

Number: HA 7

Latitude: 35°52'53.6"S
Longitude: 174°27'06.9"E
Elevation: 15.4m
Shear Vane:

Job Number: 17560
Date: 21/12/20
Logged By: LF
Reviewed By: MJ
Drill Size: 75mm

Project: New Subdivision
Client: Bruce Stallworthy
Borehole Location: 237 & 239 Marsden Point Road, Ruakaka

Terminated at:
- Target Depth ☐
- Refusal ☒
- Near Refusal ☐
- Saturated ☐

SYMBOL	STRATA DESCRIPTION	DEPTH (mm)	GW LEVEL
	SILT, some sand, brown, dry, loose, non plastic [TOPSOIL]		
	Sand, some silt, minor clay, brown, well graded, medium dense to dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	200, 400	
	SAND, minor silt, light brownish orange, very dense, dry, non plastic [OIS5 (Late Pleistocene) stable dune deposits]	600	
	Unable to penetrate End of Bore 0.6m	800, 1000, 1200, 1400, 1600, 1800, 2000, 2200, 2400, 2600, 2800, 3000, 3200, 3400, 3600, 3800, 4000	

UNDRAINED SHEAR STRENGTH (KPa)
20 40 60 80 100 120 140 160 180

Pilcon Shear Vane readings and comments
Su, Undisturbed
Rm, Remoulded

RS Eng Ltd
09 438 3273
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2 Seaview Road,
Whangarei 0110

File No.	17560
Calculated by	LF
Checked by	ST
Date	21 December 2020

Project NEW SUBDIVISION
Client BRUCE STALLWORTHY

Strengths Shown are Ultimate Bearing

Test 1

height	# of blows	max. depth	depth/ blow	KPa	CBR
1550					
1320	10	230	23	>300	9
1220	10	330	10	>300	22
1130	20	420	5	>300	57
1050	20	500	4	>300	65
950	20	600	5	>300	50
800	20	750	8	>300	31
680	20	870	6	>300	40
560	20	990	6	>300	40

Test 2

height	# of blows	max. depth	depth/ blow	KPa	CBR
1550					
1260	10	290	29	>300	6
1110	11	440	14	>300	16
1090	10	460	2	>300	145
1080	10	470	1	>300	324

Test 3

height	# of blows	max. depth	depth/ blow	KPa	CBR
2920					
2610	10	310	31	299	6
2250	20	670	18	>300	11
1930	20	990	16	>300	13
1650	13	1270	22	>300	9
1310	20	1610	17	>300	12
1150	20	1770	8	>300	29
980	20	1940	9	>300	27

Test 4

height	# of blows	max. depth	depth/ blow	KPa	CBR
1550					
1220	10	330	33	284	6
980	20	570	12	>300	18
700	20	850	14	>300	15
470	20	1080	12	>300	19
260	20	1290	11	>300	21
130	12	1420	11	>300	20

Test 5

height	# of blows	max. depth	depth/ blow	KPa	CBR
2920					
2550	20	370	19	>300	11
2310	20	610	12	>300	18
2130	20	790	9	>300	25
1970	20	950	8	>300	29
1820	20	1100	8	>300	31
1660	20	1260	8	>300	29
1500	20	1420	8	>300	29
1350	20	1570	8	>300	31
1180	20	1740	9	>300	27
1010	20	1910	9	>300	27
820	20	2100	10	>300	24
600	20	2320	11	>300	20
500	20	2420	5	>300	50

Test 6

height	# of blows	max. depth	depth/ blow	KPa	CBR
2910					
2530	10	380	38	253	5
2200	10	710	33	284	6
1950	10	960	25	>300	8
1740	10	1170	21	>300	9
1640	10	1270	10	>300	22
1400	20	1510	12	>300	18
1280	20	1630	6	>300	40
1210	20	1700	4	>300	76

Test 7

height	# of blows	max. depth	depth/ blow	KPa	CBR
1550					
1300	10	250	25	>300	8
1140	7	410	23	>300	9
920	10	630	22	>300	9
740	10	810	18	>300	11
690	10	860	5	>300	50
600	20	950	5	>300	57
500	20	1050	5	>300	50