Appendix D

Laboratory Test Results

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64-9-367 4954
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Please reply to: [redacted]

Riley Consultants Ltd.
4 Fred Thomas Drive
Takapuna 0622
Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by: [redacted]

28th November 2024

ATTERBERG LIMITS TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA

Your Reference: 240065
Report Number: 63743#L/AL Russell Road

The following report presents the results of Atterberg Limits testing at BGL of bulk soil samples delivered to this laboratory on the 21st of November 2024. Test results are summarised below, with page 3 showing where the samples plot on the Unified Soil Classification System (Casagrande) Chart.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
Liquid Limit:	NZS4402: 1986: Test 2.2
Plastic Limit:	NZS4402: 1986: Test 2.3
Plasticity Index:	NZS4402: 1986: Test 2.4

Borehole Number	Sample Number	Depth (m)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
TP3	BULK	4.00 – 5.00	43.2	46	26	20
TP7	BULK	0.60 – 0.80	49.6	86	33	53
TP10	B	3.60 – 3.80	24.0	52 ◆	18 ◆	34 ◆
TP16	BULK	1.00 – 1.20	50.5	109	34	75

◆ = *The soil fraction passing a 425μm sieve was used for the liquid limit and plastic limit tests.*

The whole soils were used for the water content tests (the soils were in an unknown state), and for the liquid limit and plastic limit tests without a diamond beside them. The soil fractions passing a 0.425mm sieve were used for the liquid limit and plastic limit tests with a diamond (◆) beside them. The soils were wet up and dried where required for the liquid limit and plastic limit tests.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.2: liquid limit and test 2.3: plastic limit are reported to the nearest whole number.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]

Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

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TESTING LABORATORY
№ 126

BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 3 of 3
	Registration Number:	2848		
	Report Number:	63743#L/AL Russell Road		
	Project:	RUSSELL ROAD, UPPER OREWA		

DETERMINATION OF THE LIQUID LIMIT, PLASTIC LIMIT & THE PLASTICITY INDEX

Test Methods: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4

Tested By:	WEC / SG	November 2024			
Compiled By:	JF	28/11/2024			
Checked By:	JF	28/11/2024			
Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

SUMMARY OF TESTING

Borehole Number	Sample Number	Depth (m)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification Based on USCS Chart Below
TP3	BULK	4.00 - 5.00	46	26	20	CL
TP7	BULK	0.60 - 0.80	86	33	53	CH
TP10	B	3.60 - 3.80	52	18	34	CH
TP16	BULK	1.00 - 1.20	109	34	75	CH

The chart below & soil classification terminology is taken from ASTM D2487-17^{e1} "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)", April 2020, & is based on the classification scheme developed by A. Casagrande in the 1940's (Casagrande, A., 1948: Classification and identification of soil. Transactions of the American Society of Civil Engineers, v. 113, p. 901-930). The chart below & the soil classification given in the table above are included for your information only, and are not included in the IANZ endorsement for this report.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) PLASTICITY (CASAGRANDE) CHART

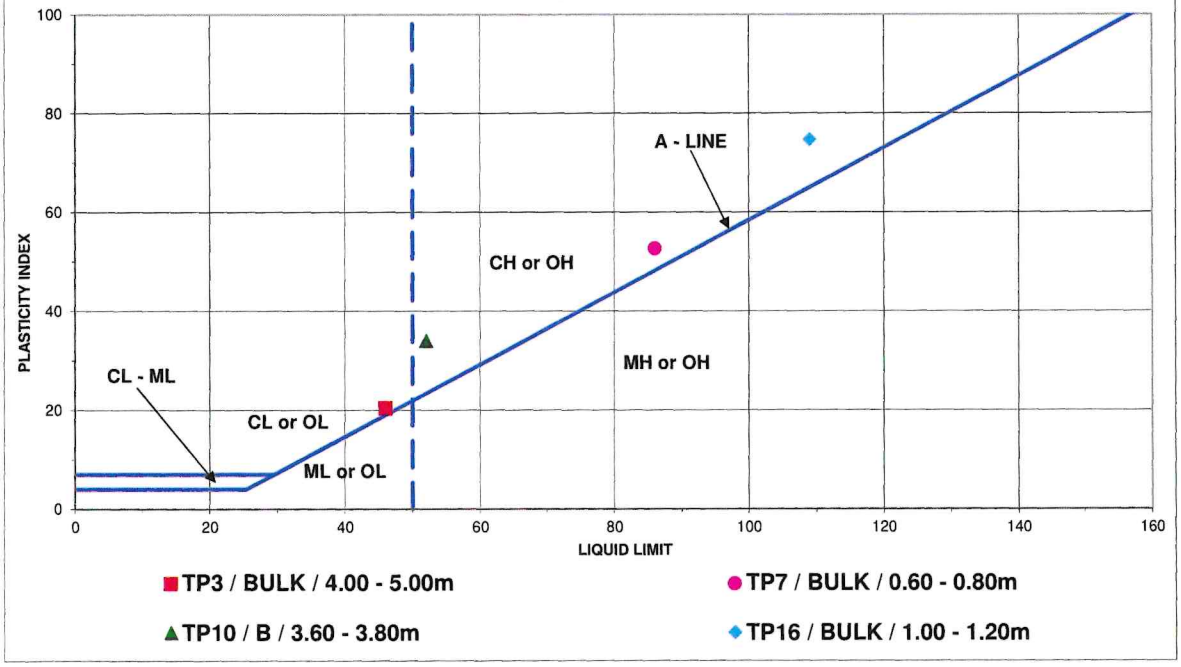

CHART LEGEND

CL = CLAY, low plasticity ('lean' clay)
OL = ORGANIC CLAY or ORGANIC SILT, low liquid limit
ML = SILT, low liquid limit
CL - ML = SILTY CLAY
CH = CLAY, high plasticity ('fat' clay)
OH = ORGANIC CLAY or ORGANIC SILT, high liquid limit
MH = SILT, high liquid limit ('elastic silt')

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Riley Consultants Ltd.
4 Fred Thomas Drive
Takapuna 0622
Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by: [redacted]

18th December 2024

ATTERBERG LIMITS TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA – STAGE 2

Your Reference: 240065 – Stage 2
Report Number: 63743#L/AL2 Russell Road

The following report presents the results of Atterberg Limits testing at BGL of bulk soil samples delivered to this laboratory on the 13th of December 2024. Test results are summarised below, with page 3 showing where the samples plot on the Unified Soil Classification System (Casagrande) Chart.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
Liquid Limit:	NZS4402: 1986: Test 2.2
Plastic Limit:	NZS4402: 1986: Test 2.3
Plasticity Index:	NZS4402: 1986: Test 2.4

Borehole Number	Sample Number	Depth (m)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
TP41	BULK	3.20 – 4.60	47.5	55	23	32
TP47	BULK	1.00 – 2.00	37.4	76	25	51

The whole soils were used for the water content tests (the soils were in an unknown state), and for the liquid limit and plastic limit tests. The soils were wet up and dried where required for the liquid limit and plastic limit tests.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.2: liquid limit and test 2.3: plastic limit are reported to the nearest whole number.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

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№ 126

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.

BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 3 of 3
	Registration Number:	2848		
	Report Number:	63743#L/AL2 Russell Road		
	Project:	RUSSELL ROAD, UPPER OREWA		

DETERMINATION OF THE LIQUID LIMIT, PLASTIC LIMIT & THE PLASTICITY INDEX

Test Methods: NZS4402: 1986: Test 2.2, Test 2.3 and Test 2.4

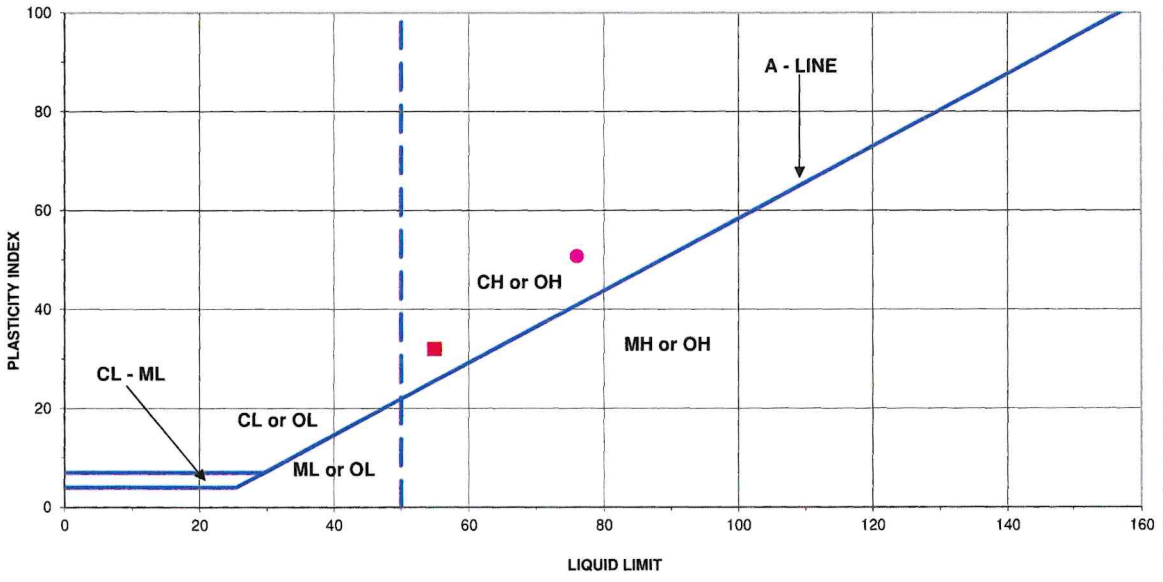
Tested By:	JL / SG	December 2024
Compiled By:	JF	18/12/2024
Checked By:	JF	18/12/2024
Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

SUMMARY OF TESTING

Borehole Number	Sample Number	Depth (m)	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification Based on USCS Chart Below
TP41	BULK	3.20 - 4.60	55	23	32	CH
TP47	BULK	1.00 - 2.00	76	25	51	CH

The chart below & soil classification terminology is taken from ASTM D2487-17^{e1} "Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)", April 2020, & is based on the classification scheme developed by A. Casagrande in the 1940's (Casagrande, A., 1948: Classification and identification of soil. Transactions of the American Society of Civil Engineers, v. 113, p. 901-930). The chart below & the soil classification given in the table above are included for your information only, and are not included in the IANZ endorsement for this report.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) PLASTICITY (CASAGRANDE) CHART



■ TP41 / BULK / 3.20 - 4.60m ● TP47 / BULK / 1.00 - 2.00m

CHART LEGEND

CL = CLAY, low plasticity ('lean' clay)
OL = ORGANIC CLAY or ORGANIC SILT, low liquid limit
ML = SILT, low liquid limit
CL - ML = SILTY CLAY
CH = CLAY, high plasticity ('fat' clay)
OH = ORGANIC CLAY or ORGANIC SILT, high liquid limit
MH = SILT, high liquid limit ('elastic silt')

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Please reply to [redacted]

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4 Fred Thomas Drive
Takapuna 0622
Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by [redacted]

27th November 2024

HYDROMETER PARTICLE-SIZE DISTRIBUTION TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA

Your Reference: 240065
Report Number: 63743#L/HYD Russell Road

The following report presents the results of hydrometer particle-size distribution testing at BGL of bulk soil samples delivered to this laboratory on the 21st of November 2024. Test results are summarised below, with the following pages showing graphs and detailed results.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
Wet Sieve Test:	NZS4402: 1986: Test 2.8.1
Hydrometer Test:	NZS4402: 1986: Test 2.8.4

Borehole Number	Sample Number	Depth (m)	Hydrometer Grading (% of Dry Mass)			
			GRAVEL (2 – <9.50mm)	SAND (0.06 – 2mm)	SILT FRACTION (0.002 – 0.06mm)	CLAY FRACTION (< 0.002mm)
TP10	A	2.40 – 2.70	1	58	23	18
TP10	B	3.60 – 3.80	0	13	63	24

The whole soils were used for these hydrometer tests. NZS4402:1986:Test 2.8.4 uses a 2.00mm sieve as the separation point for obtaining the hydrometer sample, therefore the use of the whole soils represents a departure from the test standard.

As the organic content of the soils tested was very low, peroxide pretreatment was not carried out. A solid density of 2.65t/m^3 was assumed for these hydrometer tests, and is not part of the IANZ endorsement for this report.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.8.1: wet sieve & Test 2.8.4: hydrometer, the 'percentages passing' and 'percentages finer than' are reported to nearest 1%.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

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№ 126

BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 3 of 4	
	Registration Number:	2848			
	Report Number:	63743#L/HYD Russell Road			
	Project:	RUSSELL ROAD, UPPER OREWA			

PARTICLE-SIZE DISTRIBUTION BY HYDROMETER

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1, Test 2.8.4

Tested By:	WEC	26-Nov-24
Compiled By:	WEC	27-Nov-24
Checked By:	JF	27-Nov-24

Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

Borehole No: TP10 **Sample No:** A **Depth:** 2.40 - 2.70m

Water Content (%): 35.7

Sample History: ~~Natural / Air Dried / Oven Dried /~~ Unknown

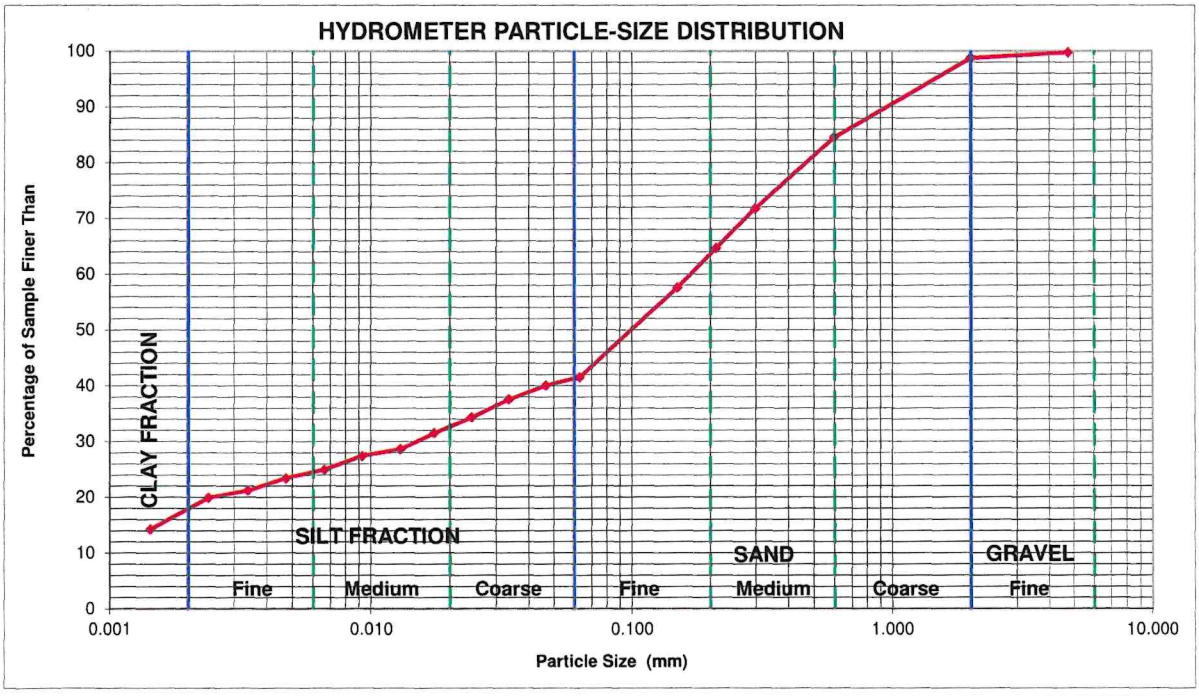
pH of sedimentation suspension: 8.0

Particle-size (mm)	% Finer Than
4.75	100
2.00	99
0.600	85
0.300	72
0.212	65
0.150	58
0.063	42
0.047	40
0.034	38
0.024	34
0.017	32
0.013	29
0.0093	27
0.0066	25
0.0047	23
0.0034	21
0.0024	20
0.0014	14

HYDROMETER ANALYSIS (% of dry mass)

				TOTAL
GRAVEL	Medium	< 9.5 - 6mm	0	
	Fine	6 - 2mm	1	1 %
SAND	Coarse	2.0 - 0.6mm	14	
	Medium	0.6 - 0.2mm	21	58 %
	Fine	0.2 - 0.06mm	23	
SILT FRACTION	Coarse	0.06 - 0.02mm	8	
	Medium	0.02 - 0.006mm	9	23 %
	Fine	0.006 - 0.002mm	6	
CLAY FRACTION		< 0.002mm		18 %
				100%

HYDROMETER TEST WAS CARRIED OUT ON THE WHOLE SOIL / ~~SOIL FRACTION PASSING A 9.50mm SIEVE~~



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 4 of 4
	Registration Number:	2848		
	Report Number:	63743#L/HYD Russell Road		
	Project:	RUSSELL ROAD, UPPER OREWA		

PARTICLE-SIZE DISTRIBUTION BY HYDROMETER

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1, Test 2.8.4

Tested By:	WEC	26-Nov-24
Compiled By:	WEC	27-Nov-24
Checked By:	JF	27-Nov-24

Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

Borehole No: TP10 **Sample No:** B **Depth:** 3.60 - 3.80m

Water Content (%): 24.1

Sample History: ~~Natural / Air Dried / Oven Dried /~~ Unknown

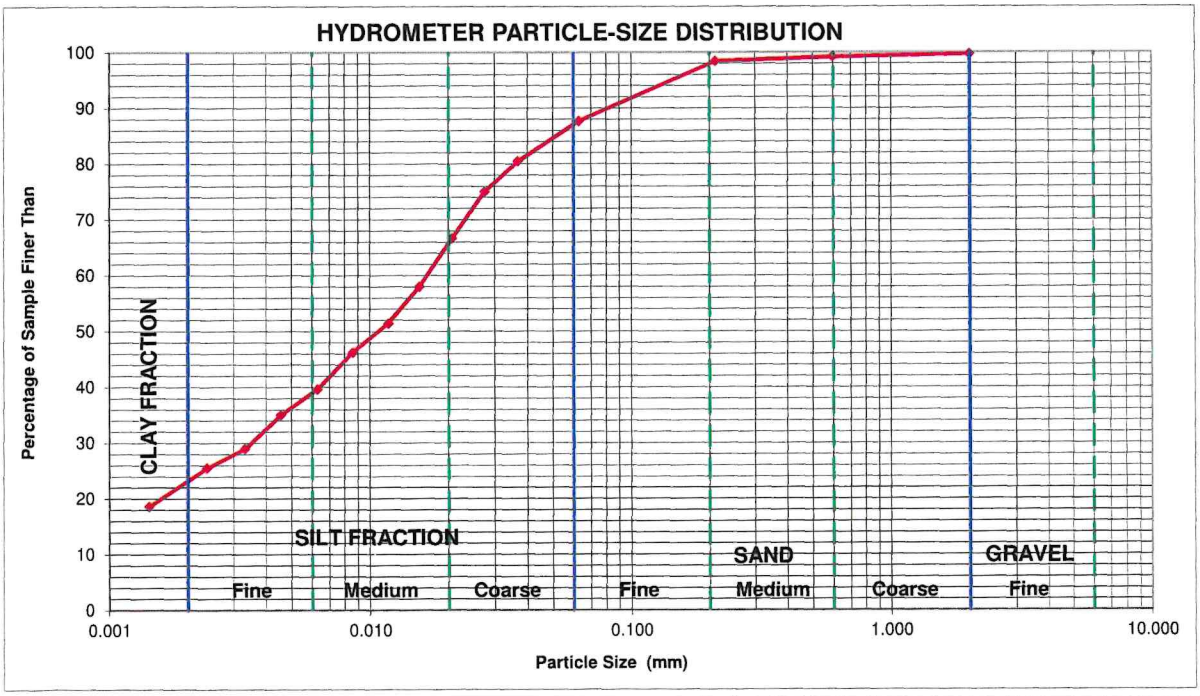
pH of sedimentation suspension: 8.5

Particle-size (mm)	% Finer Than
2.00	100
0.600	99
0.212	98
0.063	88
0.037	81
0.028	75
0.021	67
0.016	58
0.012	51
0.0086	46
0.0063	40
0.0046	35
0.0033	29
0.0024	26
0.0014	19

HYDROMETER ANALYSIS (% of dry mass)

				TOTAL	
GRAVEL	Medium	< 9.5 - 6mm	0		
	Fine	6 - 2mm	0	0	%
SAND	Coarse	2.0 - 0.6mm	1		
	Medium	0.6 - 0.2mm	1	13	%
	Fine	0.2 - 0.06mm	11		
SILT FRACTION	Coarse	0.06 - 0.02mm	21		
	Medium	0.02 - 0.006mm	27	63	%
	Fine	0.006 - 0.002mm	15		
CLAY FRACTION		< 0.002mm		24	%
				100%	

HYDROMETER TEST WAS CARRIED OUT ON THE WHOLE SOIL / ~~SOIL FRACTION PASSING A 9.50mm SIEVE~~



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Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by [redacted]

18th December 2024

HYDROMETER PARTICLE-SIZE DISTRIBUTION TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA – STAGE 2

Your Reference: 240065 – Stage 2
Report Number: 63743#L/HYD2 Russell Road

The following report presents the results of hydrometer particle-size distribution testing at BGL of bulk soil samples delivered to this laboratory on the 13th of December 2024. Test results are summarised below, with the following pages showing graphs and detailed results.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
Wet Sieve Test:	NZS4402: 1986: Test 2.8.1
Hydrometer Test:	NZS4402: 1986: Test 2.8.4

Borehole Number	Sample Number	Depth (m)	Hydrometer Grading (% of Dry Mass)			
			GRAVEL (2 – <9.50mm)	SAND (0.06 – 2mm)	SILT FRACTION (0.002 – 0.06mm)	CLAY FRACTION (< 0.002mm)
TP30	BULK	3.45 – 4.10	0	10	64	26
TP36	BULK	3.80 – 4.60	0	63	25	12
TP41	BULK	3.20 – 4.60	0	36	44	20

The whole soils were used for these hydrometer tests. As the organic content of the soils tested was very low, peroxide pretreatment was not carried out. A solid density of 2.65t/m^3 was assumed for these hydrometer tests, and is not part of the IANZ endorsement for this report.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. Test 2.8.1: wet sieve & Test 2.8.4: hydrometer, the 'percentages passing' and 'percentages finer than' are reported to nearest 1%.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

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BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 3 of 5
	Registration Number:	2848		
	Report Number:	63743#L/HYD2 Russell Road		
	Project:	RUSSELL ROAD, UPPER OREWA		

PARTICLE-SIZE DISTRIBUTION BY HYDROMETER

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1, Test 2.8.4

Tested By:	JL	17-Dec-24
Compiled By:	JL	18-Dec-24
Checked By:	JF	18-Dec-24

Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

Borehole No: TP30 **Sample No:** BULK **Depth:** 3.45 - 4.10m

Water Content (%): 50.8

Sample History: ~~Natural / Air Dried / Oven Dried /~~ Unknown

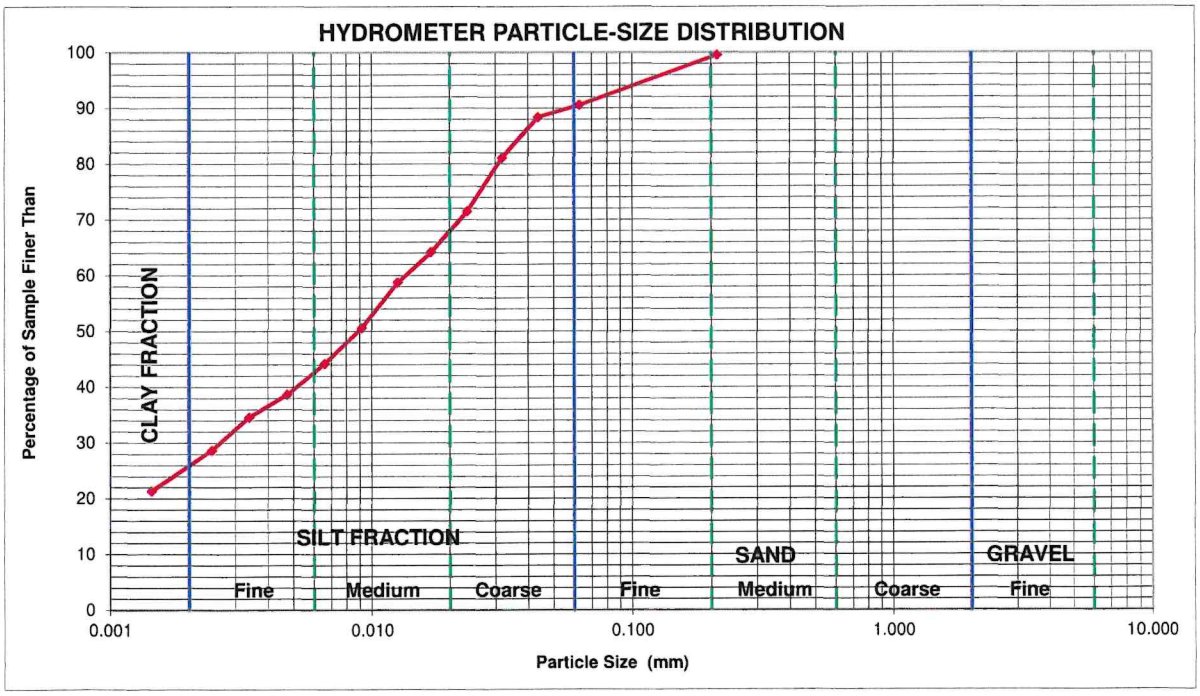
pH of sedimentation suspension: 8.5

Particle-size (mm)	% Finer Than
0.212	100
0.063	91
0.044	88
0.032	81
0.023	72
0.017	64
0.013	59
0.0092	51
0.0066	44
0.0048	39
0.0034	35
0.0024	29
0.0014	21

HYDROMETER ANALYSIS (% of dry mass)

				TOTAL	
GRAVEL	Medium	*< 9.5 - 6mm*	0		
	Fine	*6 - 2mm*	0	**0**	%
SAND	Coarse	*2.0 - 0.6mm*	0		
	Medium	*0.6 - 0.2mm*	1	**10**	%
	Fine	*0.2 - 0.06mm*	9		
SILT FRACTION	Coarse	*0.06 - 0.02mm*	22		
	Medium	*0.02 - 0.006mm*	25	**64**	%
	Fine	*0.006 - 0.002mm*	17		
CLAY FRACTION		*< 0.002mm*		**26**	%
				100%	

HYDROMETER TEST WAS CARRIED OUT ON THE WHOLE SOIL / ~~SOIL FRACTION PASSING A 9.50mm SIEVE~~



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 4 of 5
	Registration Number:	2848		
	Report Number:	63743#L/HYD2 Russell Road		
	Project:	RUSSELL ROAD, UPPER OREWA		

PARTICLE-SIZE DISTRIBUTION BY HYDROMETER

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1, Test 2.8.4

Tested By:	JL	17-Dec-24
Compiled By:	JL	18-Dec-24
Checked By:	JF	18-Dec-24

Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

Borehole No: **TP36** ***Sample No:*** **BULK** ***Depth:*** **3.80 - 4.60m**

Water Content (%): **39.0**

Sample History: ~~Natural / Air Dried / Oven Dried /~~ Unknown

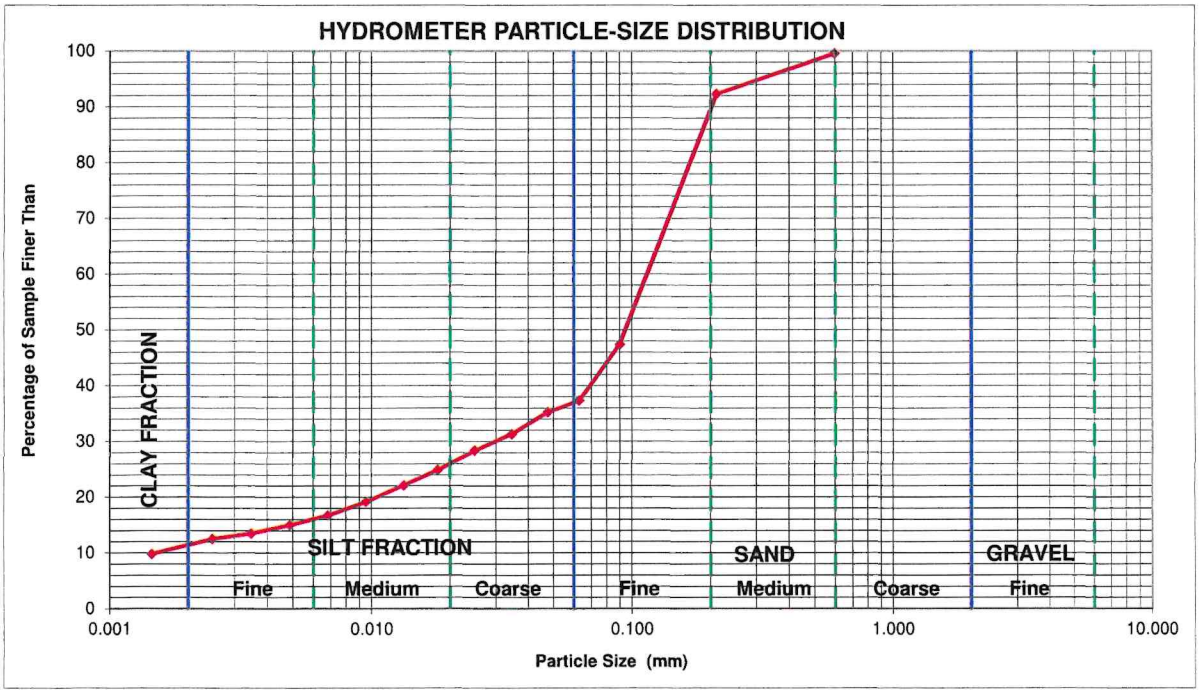
pH of sedimentation suspension: 8.0

Particle-size (mm)	% Finer Than
0.600	100
0.212	92
0.090	47
0.063	37
0.048	35
0.035	31
0.025	28
0.018	25
0.013	22
0.0096	19
0.0069	17
0.0049	15
0.0035	14
0.0025	13
0.0015	10

HYDROMETER ANALYSIS (% of dry mass)

				TOTAL	
GRAVEL	Medium	*< 9.5 - 6mm*	0		
	Fine	*6 - 2mm*	0	**0**	%
SAND	Coarse	*2.0 - 0.6mm*	0		
	Medium	*0.6 - 0.2mm*	11	**63**	%
	Fine	*0.2 - 0.06mm*	52		
SILT FRACTION	Coarse	*0.06 - 0.02mm*	11		
	Medium	*0.02 - 0.006mm*	10	**25**	%
	Fine	*0.006 - 0.002mm*	4		
CLAY FRACTION		*< 0.002mm*		**12**	%
				100%	

HYDROMETER TEST WAS CARRIED OUT ON THE WHOLE SOIL / ~~SOIL FRACTION PASSING A 9.50mm SIEVE~~



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Sheet 1 of 1	Page 5 of 5
	Registration Number:	2848		
	Report Number:	63743#L/HYD2 Russell Road		
	Project:	RUSSELL ROAD, UPPER OREWA		

PARTICLE-SIZE DISTRIBUTION BY HYDROMETER

Test Methods: NZS4402: 1986: Test 2.1, Test 2.8.1, Test 2.8.4

Tested By:	JL	17-Dec-24
Compiled By:	JL	18-Dec-24
Checked By:	JF	18-Dec-24

Version Number:	7	Version Date:	July 2022	Authorised By:	[redacted]

Borehole No: TP41 **Sample No:** BULK **Depth:** 3.20 - 4.60m

Water Content (%): 47.5

Sample History: ~~Natural / Air Dried / Oven Dried /~~ Unknown

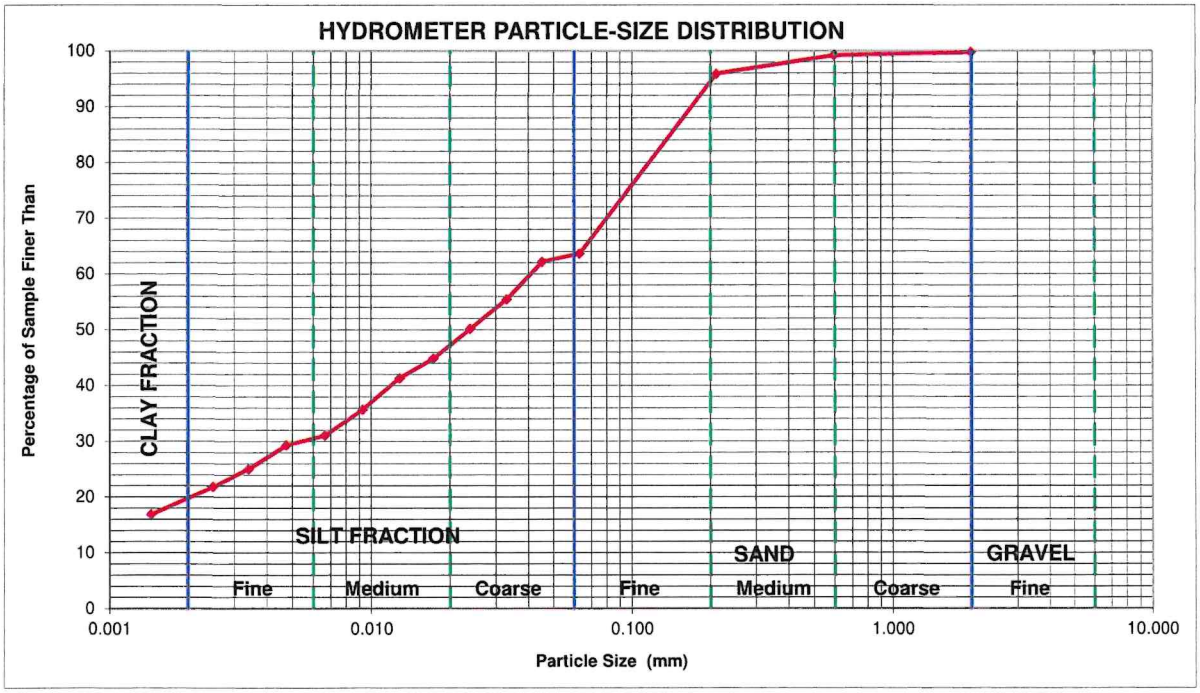
pH of sedimentation suspension: 8.0

Particle-size (mm)	% Finer Than
2.00	100
0.600	99
0.212	96
0.063	64
0.045	62
0.033	55
0.024	50
0.017	45
0.013	41
0.0093	36
0.0067	31
0.0048	29
0.0034	25
0.0025	22
0.0014	17

HYDROMETER ANALYSIS (% of dry mass)

				TOTAL	
GRAVEL	Medium	*< 9.5 - 6mm*	0		
	Fine	*6 - 2mm*	0	**0**	%
SAND	Coarse	*2.0 - 0.6mm*	1		
	Medium	*0.6 - 0.2mm*	5	**36**	%
	Fine	*0.2 - 0.06mm*	30		
SILT FRACTION	Coarse	*0.06 - 0.02mm*	17		
	Medium	*0.02 - 0.006mm*	16	**44**	%
	Fine	*0.006 - 0.002mm*	11		
CLAY FRACTION		*< 0.002mm*		**20**	%
				100%	

HYDROMETER TEST WAS CARRIED OUT ON THE WHOLE SOIL / ~~SOIL FRACTION PASSING A 9.50mm SIEVE~~



Babbage Geotechnical Laboratory
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68 Beach Road
Auckland 1010
Telephone
E-mail

P O Box 2027
New Zealand
64-9-367 4954
[redacted]

Please reply to: [redacted]

Riley Consultants Ltd.
4 Fred Thomas Drive
Takapuna 0622
Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by: [redacted]

18th December 2024

SOAKED CALIFORNIA BEARING RATIO (CBR) TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA – STAGE 2

Your Reference: 240065 – Stage 2
Report Number: 63743#L/CBR Russell Road

The following report presents the results of soaked California Bearing Ratio testing at BGL of bulk soil samples delivered to this laboratory on the 13th of December 2024. Test results are summarised below, with the following pages showing graphs and detailed results.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
NZ Standard Compaction:	NZS4402: 1986: Test 4.1.1
California Bearing Ratio (CBR) – Remoulded:	NZS4402: 1986: Test 6.1.1 (soaked)

The bulk samples were sieved through a 19.0mm sieve to remove any oversized material if present, and then through a 9.5mm aperture sieve to break up the soil (*which is a departure from the NZS4402 Standard which requires a 4.75mm sieve to be used*). Sample TP36 was too wet to be compacted at the as-received water content, so it was dried-back from 40.5% to 31.3% water content. The sieved bulk samples were then compacted into CBR moulds using the NZ Standard Compaction method. The compacted samples were then soaked for four days. The CBR values were then measured using a plunger penetration rate of 1mm per minute.

Sample Details	Water Content (%)		Dry Density (t/m³)	CBR (soaked)	Swell (%)
	Initial (trimmings)	After Testing (under plunger)			
TP30 / BULK / 3.45 – 4.10m	**50.9**	**50.5**	**1.10**	**1**	**0.4**
	SILT, clayey, minor fine sand, moderately plastic, light brown, very moist.				

Note that sample descriptions are not part of BGL IANZ Accreditation.

[redacted]

Sample Details	Water Content (%)			Dry Density (t/m^3)	CBR (soaked)	Swell (%)
	As-received	Adjusted (before Compaction)	After Testing (under plunger)			
TP36 / BULK / 3.80 – 4.60m	40.5	31.3	31.5	1.40	2	0.0
	SAND, silty, non-plastic to slightly plastic, light brown & light grey, from completely weathered siltstone & sandstone that was easily broken up over a 9.50mm sieve.					

Note that sample descriptions are not part of BGL IANZ Accreditation.

Note that a solid density value of $2.65t/m^3$ was used in the calculation of the air voids for these compacted samples. This value is assumed, and is not part of the IANZ endorsement for this report.

As per the reporting requirements of NZS4402: 1986: Test 6.1.1, dry density is reported to the nearest $0.02t/m^3$, swell to the nearest 0.2%, CBR's > 20 to the nearest 5, CBR's between 5 and 20 to the nearest 1, and for CBR's < 5 to the nearest 0.5. As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

ACCREDITED
IANZ
TESTING LABORATORY
№ 126

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.

BGL
Babbage Geotechnical Laboratory

Job Number:	63743#L	Report Number:	
Registration Number:	2848	63743#L/CBR Russell Road	
PROJECT:	RUSSELL ROAD, UPPER OREWA		

CALIFORNIA BEARING RATIO TEST: REMOULDED SAMPLE, SOAKED

Test Methods: NZS4402: 1986: Test 6.1.1 - California Bearing Ratio / NZS4402: 1986: Test 2.1 - Water Content

	Initials	Date
Tested By:	WEC / SG / JL	17/12/2024
Compiled By:	SG	18/12/2024
Checked By:	JF	18/12/2024
Authorised By:	[redacted]	

Version Number:	4	Version Date:	September 2022

Sample Identification:	TP30 / BULK
Sample Depth (m):	3.45 - 4.10m
Sample History:	~~dried / wetted / lime added / cement added /~~ unknown ~~/ natural~~
Compaction Used:	NZ Standard Compaction / ~~NZ Heavy Compaction~~

Proving Ring Number:	1155-3-1320
Ring Calibration Factor:	1452.10
(dial divisions / kN: from calibration worksheet)	

SOAKED CBR

Soil Sieved Through:	19.0 & 9.5	mm sieves
Surcharge Used:	4.00	kg
Mould Number:	B11	

BULK DENSITY

Mass Mould + Base + Soil	10,611.00	(g)
Mass Mould + Base	6,761.30	(g)
Volume Mould (from calibration)	2,306.00	(ml)
Bulk Density	**1.67**	(t/m^3)

WATER CONTENT	Before (trimmings)	After (under plunger)
Mass Wet Soil + Tin (g)	459.298	343.097
Mass Dry Soil + Tin (g)	340.515	255.403
Mass Tin (g)	106.992	81.877
Water Content (%)	**50.9**	**50.5**
Dry Density (t/m^3)	**1.10**	

DETERMINATION OF SWELL

Initial Reading (mm)	14.31
Final Reading (mm)	14.84
Change in Height (mm)	0.53
Initial Height (mm)	127.14
Swell (%)	**0.4**

Air Voids:	2.0	%
Time of Soaking:	4	days
Plunger Penetration Rate:	1.0	mm / minute

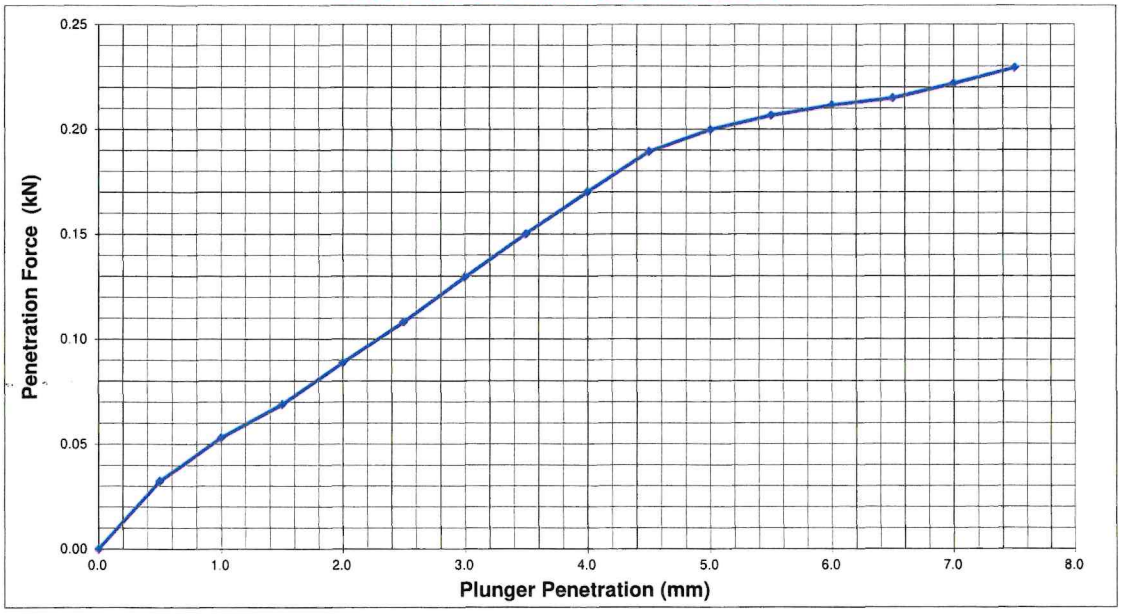
DETERMINATION OF BEARING VALUE

Plunger Penetration (mm)	Proving Ring Dial (divisions)	Force (kN)
0.0	0.0	0.00
0.5	47.0	0.03
1.0	77.0	0.05
1.5	100.0	0.07
2.0	129.0	0.09
2.5	**157.0**	**0.11**
3.0	188.0	0.13
3.5	218.0	0.15
4.0	247.0	0.17
4.5	275.0	0.19
5.0	**290.0**	**0.20**
5.5	300.0	0.21
6.0	307.0	0.21
6.5	312.0	0.21
7.0	322.0	0.22
7.5	333.0	0.23

2.5mm PENETRATION BEARING VALUE	
uncorrected	**0.8**
with curve shape correction (if needed)	**0.8**
5.0mm PENETRATION BEARING VALUE	
uncorrected	**1.0**
with curve shape correction (if needed)	**1.0**
FINAL CBR VALUE:	**1**

Lime Added:	0.0	%
Cement Added:	0.0	%

CBR FORCE-PENETRATION CURVE



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Report Number:	Page 4 of 4
	Registration Number:	2848	63743#L/CBR Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA		

CALIFORNIA BEARING RATIO TEST: REMOULDED SAMPLE, SOAKED

Test Methods: NZS4402: 1986: Test 6.1.1 - California Bearing Ratio / NZS4402: 1986: Test 2.1 - Water Content

	Initials	Date
Tested By:	WEC / SG / JL	17/12/2024
Compiled By:	WEC	18/12/2024
Checked By:	JF	18/12/2024
Authorised By:	[redacted]	

Version Number:	4	Version Date:	September 2022

Sample Identification:	TP36 / BULK
Sample Depth (m):	3.80 - 4.60m
Sample History:	~~dried / wetted / lime added / cement added /~~ unknown ~~/ natural~~
Compaction Used:	NZ Standard Compaction / ~~NZ Heavy Compaction~~

Proving Ring Number:	1155-3-1320
Ring Calibration Factor:	1452.10
(dial divisions / kN: from calibration worksheet)	

SOAKED CBR

Soil Sieved Through:	19.0 & 9.5	mm sieves
Surcharge Used:	4.00	kg
Mould Number:	B8	

BULK DENSITY

Mass Mould + Base + Soil	10,443.20	(g)
Mass Mould + Base	6,188.10	(g)
Volume Mould (from calibration)	2,310.00	(ml)
Bulk Density	**1.84**	(t/m^3)

WATER CONTENT	Before (trimmings)	After (under plunger)
Mass Wet Soil + Tin (g)	480.675	514.368
Mass Dry Soil + Tin (g)	390.160	410.492
Mass Tin (g)	101.282	80.260
Water Content (%)	**31.3**	**31.5**
Dry Density (t/m^3)	**1.40**	

DETERMINATION OF SWELL

Initial Reading (mm)	12.32
Final Reading (mm)	12.23
Change in Height (mm)	-0.09
Initial Height (mm)	127.36
Swell (%)	**0.0**

Air Voids:	3.1	%
Time of Soaking:	4	days
Plunger Penetration Rate:	1.0	mm / minute

DETERMINATION OF BEARING VALUE

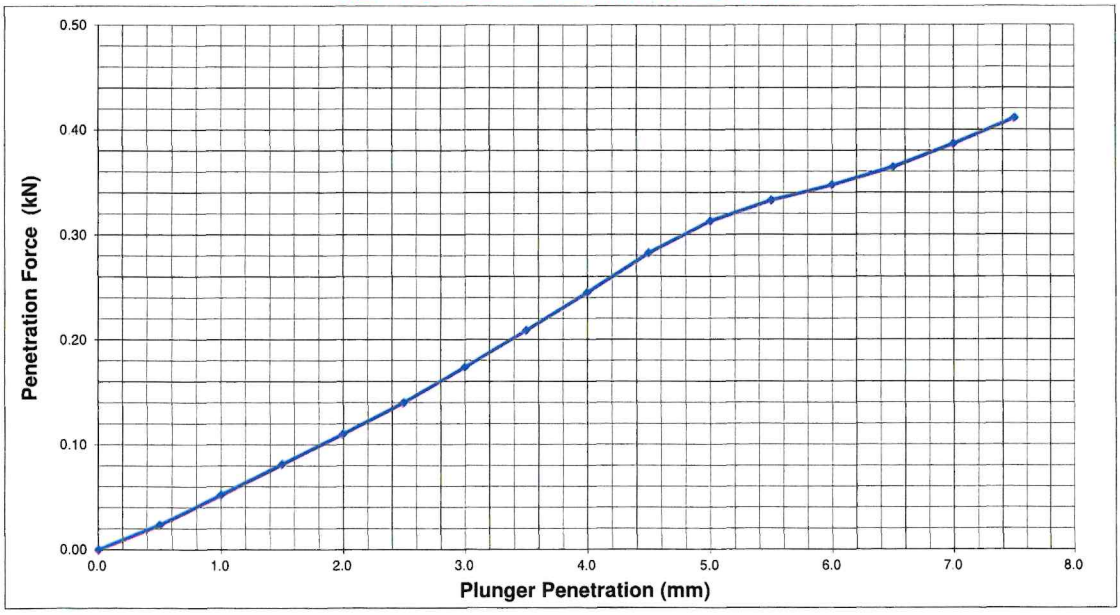
Plunger Penetration (mm)	Proving Ring Dial (divisions)	Force (kN)
0.0	0.0	0.00
0.5	34.0	0.02
1.0	76.0	0.05
1.5	118.0	0.08
2.0	160.0	0.11
2.5	**203.0**	**0.14**
3.0	252.0	0.17
3.5	303.0	0.21
4.0	355.0	0.24
4.5	410.0	0.28
5.0	**454.0**	**0.31**
5.5	483.0	0.33
6.0	504.0	0.35
6.5	529.0	0.36
7.0	561.0	0.39
7.5	597.0	0.41

2.5mm PENETRATION BEARING VALUE	
uncorrected	1.1
with curve shape correction (if needed)	1.1
5.0mm PENETRATION BEARING VALUE	
uncorrected	1.6
with curve shape correction (if needed)	1.6

FINAL CBR VALUE: 2

Lime Added:	0.0	%
Cement Added:	0.0	%

CBR FORCE-PENETRATION CURVE



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Please reply to: [redacted]

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4 Fred Thomas Drive
Takapuna 0622
Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by [redacted]

2nd December 2024

DRY DENSITY / WATER CONTENT RELATIONSHIP (COMPACTION CURVE) TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA

Your Reference: 240065
Report Number: 63743#L/CC Russell Road

The following report presents the results of compaction curve testing at BGL of bulk soil samples delivered to this laboratory on the 21st of November 2024. Test results are summarised below, with the following pages showing graphs and detailed results.

A single shear vane test was carried out on each compacted sample while it was still in the proctor mould, and these results are included on the results tables and water content / density graphs. The shear vane results are included for your information only, and are not included in the IANZ endorsement for this report.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
NZ Standard Compaction:	NZS4402: 1986: Test 4.1.1
Vane Shear Strength:	NZ Geotechnical Society Guideline 2001

Sample Identification	Maximum Dry Density (t/m^3)	Optimum Water Content (%)	Natural Water Content (%)
TP3 / BULK / 4.00 – 5.00m	**1.54**	**20**	**42.4**
	SILT, fine sandy, slightly to moderately plastic, pink with orange & light grey mottles, wet.		
TP7 / BULK / 0.60 – 0.80m	**1.25**	**36**	**49.4**
	CLAY, silty, minor fine sand, moderately plastic, orange with light grey mottles, very moist.		

Note that sample descriptions are not part of BGL IANZ Accreditation.

Sample Identification	Maximum Dry Density (t/m^3)	Optimum Water Content (%)	Natural Water Content (%)
TP10 / A / 2.40 – 2.70m	**1.53**	**21**	**36.1**
	CLAY, silty, some fine to coarse sand, moderately plastic, white & orange, moist.		
TP10 / B / 3.60 – 3.80m	**1.60**	**20**	**23.4**
	SILT, fine sandy, non-plastic, grey, slightly moist, [WEATHERED SILTSTONE & SANDSTONE].		

Note that sample descriptions are not part of BGL IANZ Accreditation.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. As per the reporting requirements of NZS4402: 1986: Test 4.1.1: New Zealand Standard Compaction Test, maximum dry density is reported to the nearest $0.01t/m^3$, optimum water content is reported to the nearest 0.2% for values below 5%, to the nearest 0.5% for values from 5 to 10%, and to the nearest whole number for values greater than 10%.

For calculating the air voids percentages a solid density of $2.65t/m^3$ was assumed for sample TP3, a solid density of $2.64t/m^3$ was assumed for sample TP7, a solid density of $2.65t/m^3$ was assumed for sample TP10 / A, and a solid density of $2.64t/m^3$ was assumed for sample TP10 / B. Note that these assumed values are not part of the IANZ endorsement for this report.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

ACCREDITED
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TESTING LABORATORY
№ 126

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation. This report may not be reproduced except in full & with written approval from BGL.

Job Number:	63743#L
Registration Number:	2848
Report Number:	63743#L/CC Russell Road

Babbage Geotechnical Laboratory

PROJECT: RUSSELL ROAD, UPPER OREWA

Determination of the Dry Density / Water Content Relationship by Standard Compaction

Test Method: NZS4402: 1986: Test 4.1.1

Tested By:	JL	November 2024
Compiled By:	JL	29/11/2024
Checked By:	JF	2/12/2024

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP3 / BULK **Sample Depth:** 4.00 - 5.00m

Sample History: Air-dried from natural water content

Compaction Used: New Zealand Standard Compaction

Test Performed On: Whole Soil / ~~Fraction Passing the 19mm Sieve~~

Solid Density of Soil Particles: 2.65 t/m^3 (~~measured~~ / assumed)

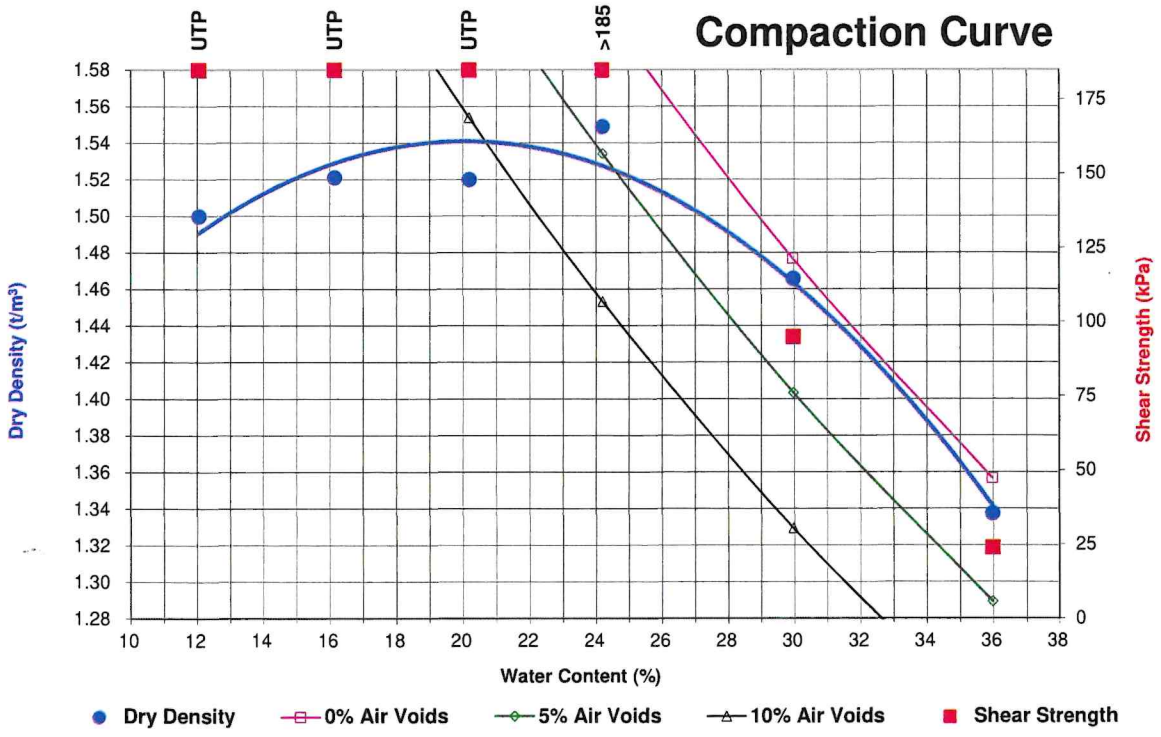
Natural Water Content (%): 42.4

TEST RESULTS

Water Content (%)	12.1	16.1	20.2	24.2	30.0	36.0
Bulk Density (t/m^3)	1.68	1.77	1.83	1.92	1.91	1.82
Dry Density (t/m^3)	1.50	1.52	1.52	1.55	1.47	1.34
Air Voids (%)	25.3	18.0	12.0	4.1	0.8	1.4
Shear Strength (kPa)	UTP*	UTP*	UTP*	>185	95	24

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density: 1.54 t/m^3 **Optimum Water Content:** 20 %



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Page 4 of 6
	Registration Number:	2848	
	Report Number:	63743#L/CC Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction	Tested By:	JL	November 2024
	Compiled By:	JL	29/11/2024
Test Method: NZS4402: 1986: Test 4.1.1	Checked By:	JF	2/12/2024

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP7 / BULK

Sample Depth: 0.60 - 0.80m

Sample History: Air-dried from natural water content

Compaction Used: New Zealand Standard Compaction

Test Performed On: Whole Soil / ~~Fraction Passing the 19mm Sieve~~

Solid Density of Soil Particles: 2.64 t/m^3 (~~measured~~ / assumed)

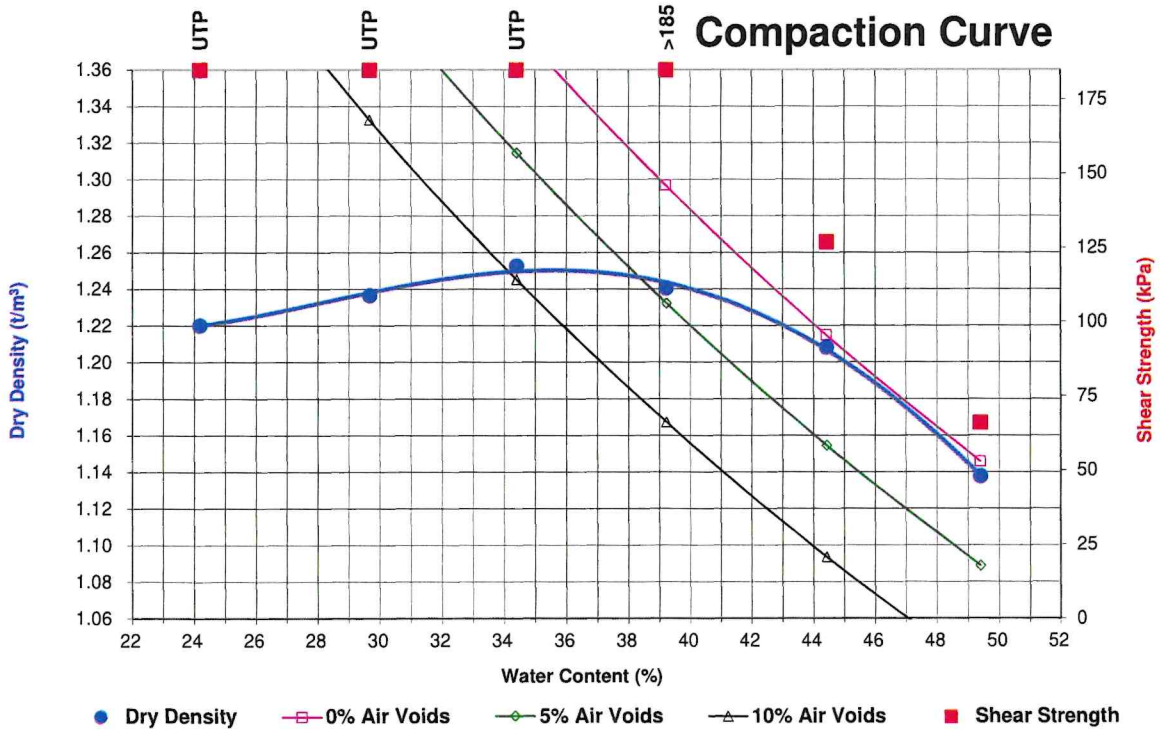
Natural Water Content (%): 49.4

TEST RESULTS

Water Content (%)	24.2	29.7	34.4	39.2	44.4	49.4
Bulk Density (t/m^3)	1.52	1.60	1.68	1.73	1.74	1.70
Dry Density (t/m^3)	1.22	1.24	1.25	1.24	1.21	1.14
Air Voids (%)	24.3	16.5	9.4	4.3	0.6	0.7
Shear Strength (kPa)	UTP*	UTP*	UTP*	>185	127	66

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	1.25 t/m^3	Optimum Water Content:	36 %



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Page 5 of 6
	Registration Number:	2848	
	Report Number:	63743#L/CC Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction

Test Method: NZS4402: 1986: Test 4.1.1

Tested By:	SG	November 2024
Compiled By:	SG	29/11/2024
Checked By:	JF	2/12/2024

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP10 / A **Sample Depth: 2.40 - 2.70m**

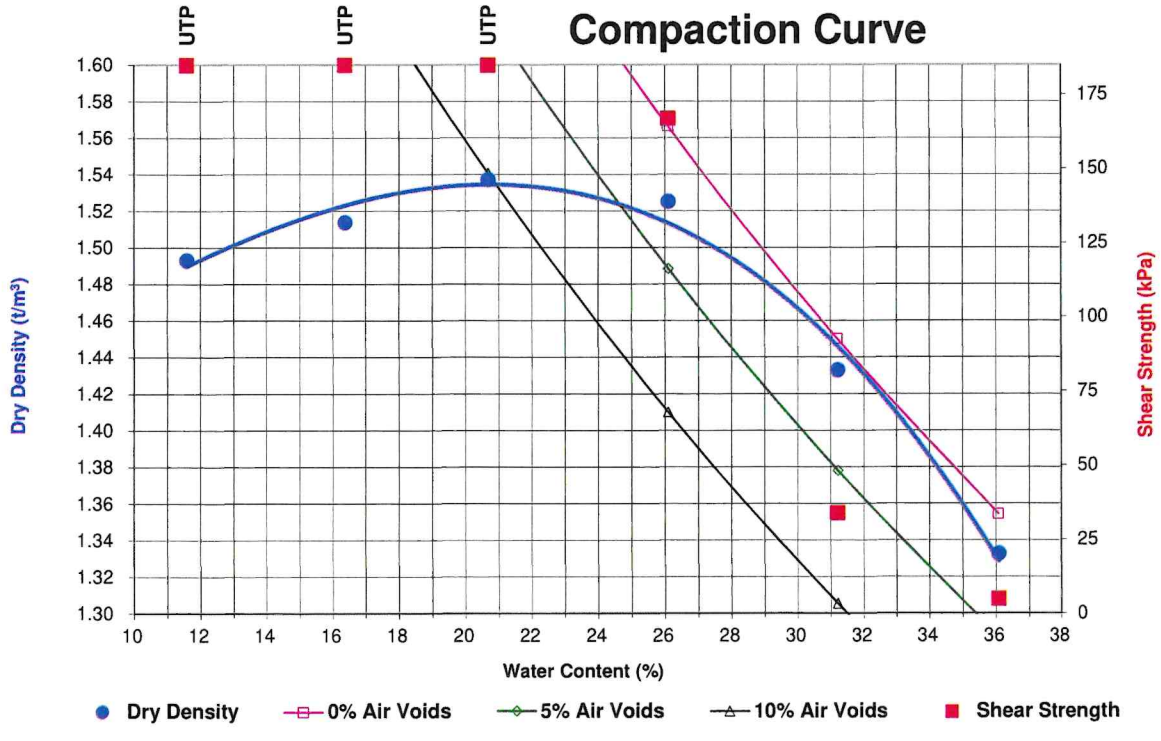
Sample History:	Air-dried and wetted from natural water content
Compaction Used:	New Zealand Standard Compaction
Test Performed On:	Whole Soil / ~~Fraction Passing the 19mm Sieve~~
Solid Density of Soil Particles:	2.65 t/m^3 (~~measured~~ / assumed)
Natural Water Content (%):	36.1

TEST RESULTS

Water Content (%)	11.6	16.4	20.7	26.1	31.2	36.1
Bulk Density (t/m^3)	1.67	1.76	1.86	1.92	1.88	1.81
Dry Density (t/m^3)	1.49	1.51	1.54	1.53	1.43	1.33
Air Voids (%)	26.4	18.1	10.2	2.6	1.2	1.6
Shear Strength (kPa)	UTP*	UTP*	UTP*	167	34	5

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	1.53 t/m^3	Optimum Water Content:	21 %



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Page 6 of 6
	Registration Number:	2848	
	Report Number:	63743#L/CC Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction

Test Method: NZS4402: 1986: Test 4.1.1

Tested By:	JL	November 2024
Compiled By:	JL	29/11/2024
Checked By:	JF	2/12/2024

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP10 / B **Sample Depth: 3.60 - 3.80m**

Sample History:	Air-dried and wetted from natural water content
Compaction Used:	New Zealand Standard Compaction
Test Performed On:	Whole Soil / ~~Fraction Passing the 19mm Sieve~~
Solid Density of Soil Particles:	2.64 t/m^3 (~~measured~~ / assumed)
Natural Water Content (%):	**23.4**

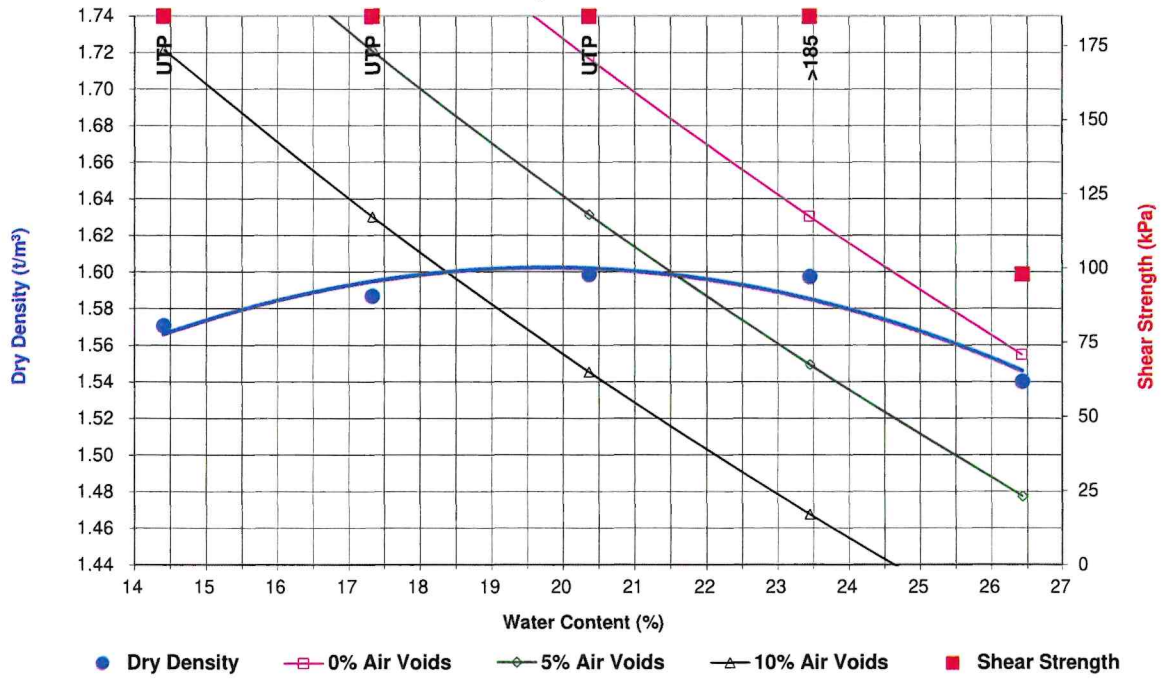
TEST RESULTS

Water Content (%)	14.4	17.3	20.4	23.4	26.4
Bulk Density (t/m^3)	1.80	1.86	1.92	1.97	1.95
Dry Density (t/m^3)	1.57	1.59	1.60	1.60	1.54
Air Voids (%)	17.9	12.4	6.9	2.0	0.9
Shear Strength (kPa)	UTP*	UTP*	UTP*	>185	98

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	1.60 t/m^3	Optimum Water Content:	20 %

Compaction Curve



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[redacted]

Please reply to: [redacted]

Riley Consultants Ltd.
4 Fred Thomas Drive
Takapuna 0622
Auckland

Attention: [redacted]

Job Number: 63743#L
BGL Registration Number: 2848
Checked by: [redacted]

20th December 2024

DRY DENSITY / WATER CONTENT RELATIONSHIP (COMPACTION CURVE) TESTING

Dear Sir,

Re: RUSSELL ROAD, UPPER OREWA – STAGE 2

Your Reference: 240065 – Stage 2
Report Number: 63743#L/CC2 Russell Road

The following report presents the results of compaction curve testing at BGL of bulk soil samples delivered to this laboratory on the 13th of December 2024. Test results are summarised below, with the following pages showing graphs and detailed results.

A single shear vane test was carried out on each compacted sample while it was still in the proctor mould, and these results are included on the results tables and water content / density graphs. The shear vane results are included for your information only, and are not included in the IANZ endorsement for this report.

Test standards used were:

Water Content:	NZS4402: 1986: Test 2.1
NZ Standard Compaction:	NZS4402: 1986: Test 4.1.1
Vane Shear Strength:	NZ Geotechnical Society Guideline 2001

Sample Identification	Maximum Dry Density (t/m³)	Optimum Water Content (%)	Natural Water Content (%)
TP25 / BULK / 4.00 – 5.50m	**1.52**	**21**	**33.5**
	SILT, fine sandy, moderately plastic, grey, moist (completely weathered siltstone & sandstone crushed under finger pressure).		
TP27 / BULK / 4.60 – 5.20m	**1.33**	**31**	**52.3**
	SILTSTONE, grey, saturated.		

Note that sample descriptions are not part of BGL IANZ Accreditation.

Sample Identification	Maximum Dry Density (t/m³)	Optimum Water Content (%)	Natural Water Content (%)
TP41 / BULK / 3.20 – 4.60m	**1.43**	**25**	**48.1**
	SILT, clayey, fine sandy, slightly plastic, light grey & brown, very moist.		
TP47 / BULK / 1.00 – 2.00m	**1.42**	**29**	**37.2**
	CLAY, highly plastic, brownish orange with light grey mottles, moist.		

Note that sample descriptions are not part of BGL IANZ Accreditation.

As per the reporting requirements of NZS4402: 1986: Test 2.1: water content is reported to two significant figures for values below 10%, and to three significant figures for values of 10% or greater. As per the reporting requirements of NZS4402: 1986: Test 4.1.1: New Zealand Standard Compaction Test, maximum dry density is reported to the nearest 0.01t/m³, optimum water content is reported to the nearest 0.2% for values below 5%, to the nearest 0.5% for values from 5 to 10%, and to the nearest whole number for values greater than 10%.

For calculating the air voids percentages a solid density of 2.63t/m³ was assumed for sample TP25, a solid density of 2.68t/m³ was assumed for sample TP27, a solid density of 2.60t/m³ was assumed for sample TP41, and a solid density of 2.64t/m³ was assumed for sample TP47. Note that these assumed values are not part of the IANZ endorsement for this report.

Please note that the test results relate only to the samples as-received, and relate only to the samples under test.

Thank you for the opportunity to carry out this testing. If you have any queries regarding the content of this report please contact the person authorising this report below at your convenience.

Yours faithfully,

[redacted]
Key Technical Person
Assistant Laboratory Manager
Babbage Geotechnical Laboratory

ACCREDITED
IANZ
TESTING LABORATORY
№ 126

BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Page 3 of 6
	Registration Number:	2848	
	Report Number:	63743#L/CC2 Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction	Tested By:	JL	Dec 2024
	Compiled By:	JL	18-Dec-24
Test Method: NZS4402: 1986: Test 4.1.1	Checked By:	WEC	18-Dec-24

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP25 / BULK **Sample Depth: 4.00 - 5.50m**

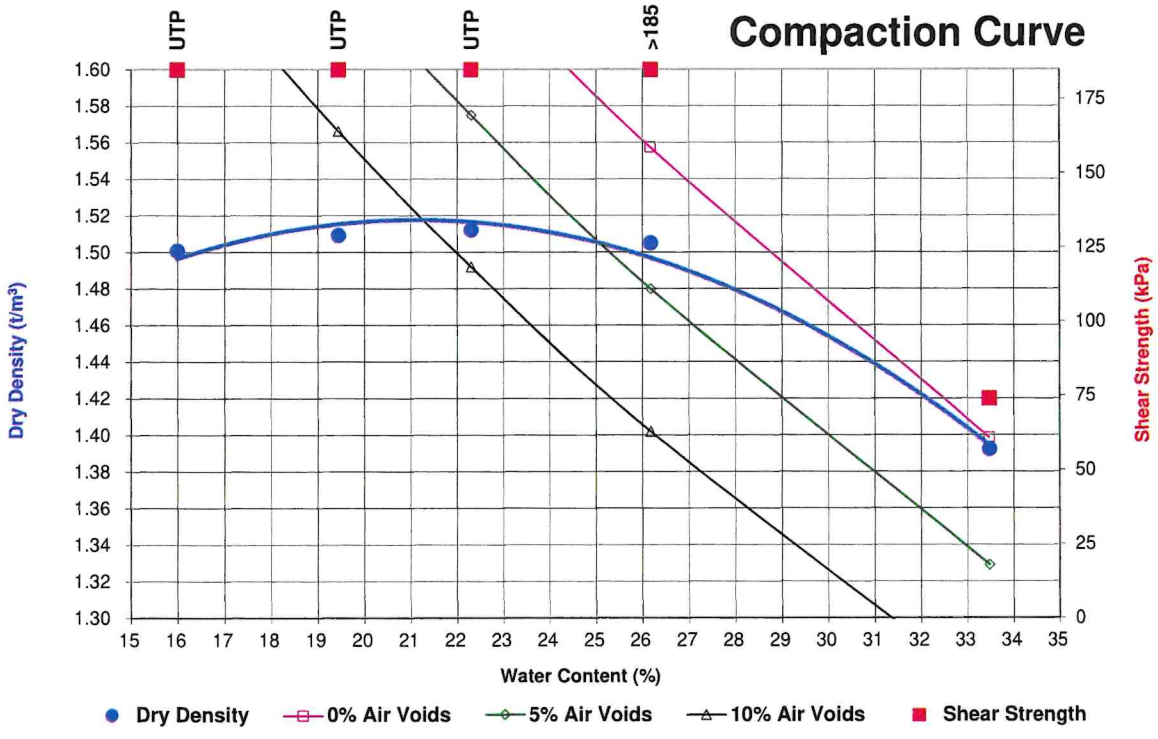
Sample History:	Air-dried from natural water content
Compaction Used:	New Zealand Standard Compaction
Test Performed On:	Whole Soil / ~~Fraction Passing the 19mm Sieve~~
Solid Density of Soil Particles:	2.63 t/m^3 (~~measured~~ / assumed)
Natural Water Content (%):	**33.5**

TEST RESULTS

Water Content (%)	16.0	19.4	22.3	26.2	33.5
Bulk Density (t/m^3)	1.74	1.80	1.85	1.90	1.86
Dry Density (t/m^3)	1.50	1.51	1.51	1.51	1.39
Air Voids (%)	18.9	13.3	8.8	3.4	0.5
Shear Strength (kPa)	UTP*	UTP*	UTP*	>185	74

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	**1.52 t/m^3**	**Optimum Water Content:**	**21 %**



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Page 4 of 6
	Registration Number:	2848	
	Report Number:	63743#L/CC2 Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction

Test Method: NZS4402: 1986: Test 4.1.1

Tested By:	WEC / JL	Dec 2024	
Compiled By:	JL	18/12/2024	
Checked By:	JF	20/12/2024	

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP27 / BULK **Sample Depth: 4.60 - 5.20m**

Sample History:	Air-dried from natural water content
Compaction Used:	New Zealand Standard Compaction
Test Performed On:	Whole Soil / ~~Fraction Passing the 19mm Sieve~~
Solid Density of Soil Particles:	2.68 t/m^3 (~~measured~~ / assumed)
Natural Water Content (%):	**52.3**

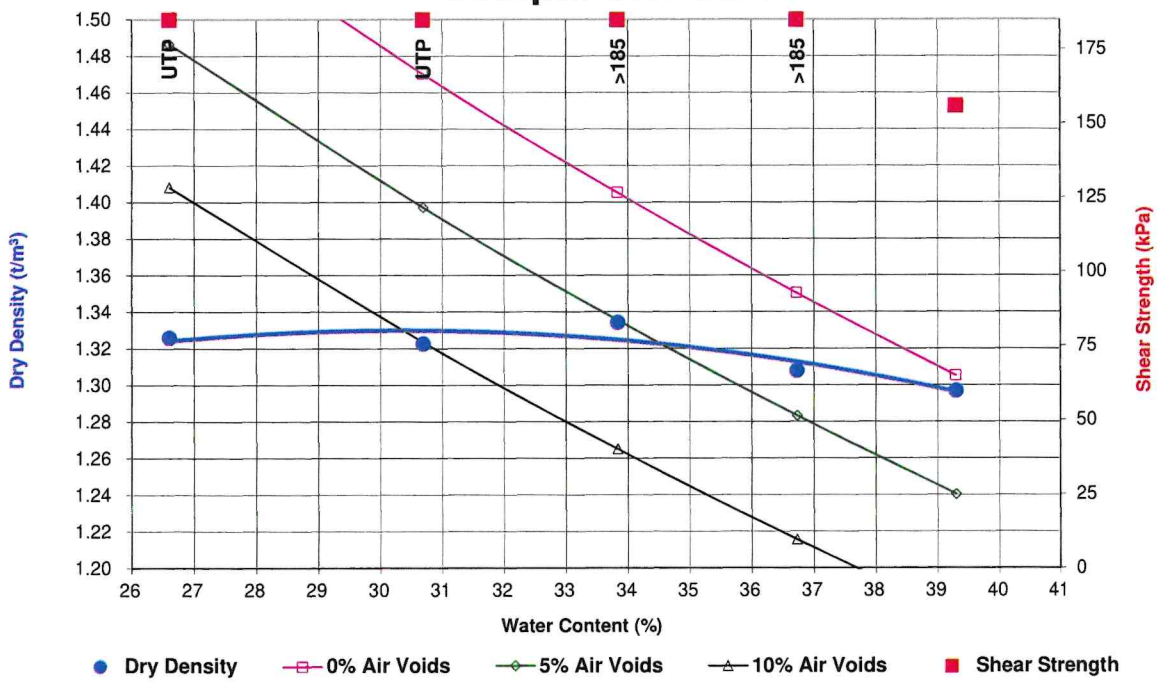
TEST RESULTS

Water Content (%)	26.6	30.7	33.8	36.7	39.3
Bulk Density (t/m^3)	1.68	1.73	1.79	1.79	1.81
Dry Density (t/m^3)	1.33	1.32	1.33	1.31	1.30
Air Voids (%)	15.3	10.1	5.1	3.2	0.7
Shear Strength (kPa)	UTP*	UTP*	>185	>185	156

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	1.33 t/m^3	Optimum Water Content:	31 %

Compaction Curve



BGL Babbage Geotechnical Laboratory	Job Number:	63743#L	Page 5 of 6
	Registration Number:	2848	
	Report Number:	63743#L/CC2 Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction	Tested By:	SG / WEC	Dec 2024
	Compiled By:	SG	Dec 2024
Test Method: NZS4402: 1986: Test 4.1.1	Checked By:	JF	19/12/2024

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP41 / BULK

Sample Depth: 3.20 - 4.60m

Sample History: Air-dried from natural water content

Compaction Used: New Zealand Standard Compaction

Test Performed On: Whole Soil / ~~Fraction Passing the 19mm Sieve~~

Solid Density of Soil Particles: 2.60 t/m^3 (~~measured~~ / assumed)

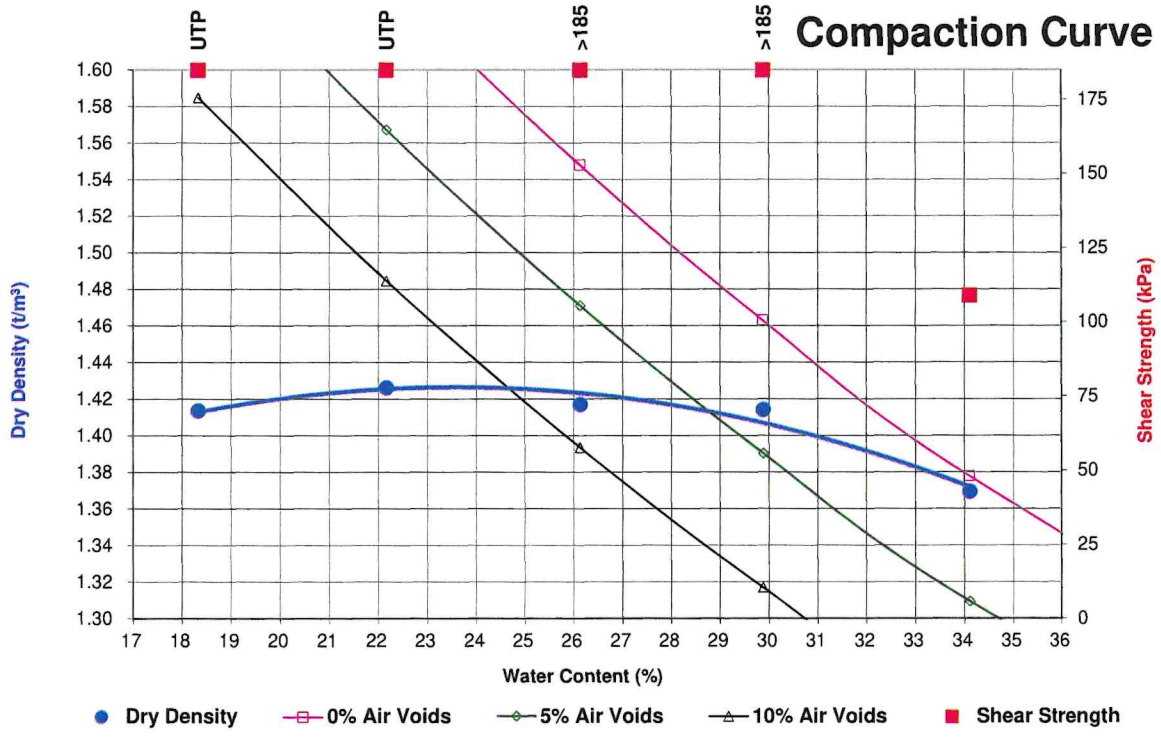
Natural Water Content (%): 48.1

TEST RESULTS

Water Content (%)	18.3	22.2	26.1	29.9	34.1	48.1
Bulk Density (t/m^3)	1.67	1.74	1.79	1.84	1.84	1.70
Dry Density (t/m^3)	1.41	1.43	1.42	1.41	1.37	1.15
Air Voids (%)	19.7	13.5	8.5	3.4	0.6	0.5
Shear Strength (kPa)	UTP*	UTP*	>185	>185	109	5

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	1.43 t/m^3	Optimum Water Content:	25 %



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	Registration Number:	2848	
	Report Number:	63743#L/CC2 Russell Road	
	PROJECT:	RUSSELL ROAD, UPPER OREWA	

Determination of the Dry Density / Water Content Relationship by Standard Compaction

Test Method: NZS4402: 1986: Test 4.1.1

Tested By:	JL	Dec 2024
Compiled By:	JL	18-Dec-24
Checked By:	WEC	18-Dec-24

Version Number:	5	Version Date:	February 2023	Authorised By:	[redacted]

Sample ID: TP47 / BULK **Sample Depth: 1.00 - 2.00m**

Sample History:	Air-dried from natural water content
Compaction Used:	New Zealand Standard Compaction
Test Performed On:	Whole Soil / ~~Fraction Passing the 19mm Sieve~~
Solid Density of Soil Particles:	2.64 t/m^3 (~~measured~~ / assumed)
Natural Water Content (%):	37.2

TEST RESULTS

Water Content (%)	23.0	26.4	29.9	33.3	37.2
Bulk Density (t/m^3)	1.69	1.76	1.86	1.86	1.81
Dry Density (t/m^3)	1.38	1.39	1.43	1.40	1.32
Air Voids (%)	16.3	10.7	3.2	0.6	0.7
Shear Strength (kPa)	UTP*	UTP*	>185	132	64

**UTP = unable to penetrate sample with the shear vane.*

Maximum Dry Density:	1.42 t/m^3	Optimum Water Content:	29 %