Vineway Ltd
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1 July 2025

Our Ref: 240065-N
Reissue of: 240065-K

Attention: Andrew Allsopp-Smith

Dear Andrew

Response to Council Groundwater Queries
Delmore Residential Development

1.0 Introduction

Further to your request, we have reviewed the queries raised by the Auckland Council geotechnical specialist and present our responses below to queries numbered 5 and 10. These queries are being addressed in this letter due to the need to provide additional analysis outputs and/or further detailed discussion. Queries 6 to 9 were addressed separately in a consolidated spreadsheet. We note that the Council specialist memo does not apply numbering to their queries. We have applied this numbering for ease of preparing responses.

Riley has previously prepared and issued responses to these queries. These responses were reviewed by the Council Geotechnical Specialist (Hester Hoogenboezem) who subsequently provided feedback in a letter titled Delmore Fast-Track – Auckland Council Response, Annexure 16: Groundwater and Dewatering, dated 25 June 2025. Riley has reviewed this letter and incorporated Council's feedback into the updated responses below. Council have specifically identified the following information gap in their letter:

- The letter asserts that the reporting did not assess wetland losses resulting from groundwater diversion and dewatering. This has been recorded as item 12 paragraph 250 of the Auckland Council Strategic & Planning Matters memorandum. We have previously addressed this item in our responses to Queries 6, 7, and 9 contained within the consolidated spreadsheet. Further commentary addressing this item is presented within this letter.

2.0 Queries and Responses

The Council queries and our responses are presented below.

Queries 1-4:

The body of text in CIRIA C515 (page 148) notes that Sichardt can be used to determine R0 for the "purposes of flow rate calculations", because R0 is a logarithmic term in flow equations, calculated flow rates are not excessively sensitive to different values of R0, however assessment of drawdown and resulting settlement will be sensitive to R0.

Conventional equations for calculating flow to a well are based on Dupuit and Theim and assumed that the radius of the wells was small in comparison to the radius of influence; this is often not the case for an excavation.

Some authors (e.g. Cashman and Preene, 2013) have suggested a correction that can be made when the equation is used to analyse large equivalent wells: and where r_e is the radius of the excavation when considered as an equivalent large well. It is anticipated that this would increase the calculated radius of influence.

It is also noted that of the common formulas used to determine the radius of influence, the Sichardt formula generally results in the smallest calculated radii's.

Response

These are a preamble to Query 5 and are addressed in our response to Query 5.

Query 5:

This shows that low permeability soils and rock in Auckland, Sichardt underestimates the extent of drawdown.

Riley states for Stage 1 "R0=3.8 m to 5.7 m drawdown effect is therefore considered to be contained within the site. "And for Stage 2 "R0=12 m to 18 m for the southern boundary, while for the western, northern and eastern boundaries the R0 is up to 6.4m to 9.6m (southern part of eastern boundary) indicates that the groundwater drawdown is likely to be contained within the site."

Will you kindly provide a comment regarding the use of Sichardt equation for this site's groundwater drawdown assessment? I do note that given the separation distances to potentially affected 3rd parties, that in this instance, the assessment of effects may not be sensitive to this but would still like your thoughts for confirmation of the effects please.

Response

We have discussed the method of assessing the extent of groundwater drawdown with the Council Groundwater specialist and have agreed to assess it using the Powrie & Preen (1994a) formula for plane flow as an alternative to the Sichardt method.

For simplicity, we have calculated the groundwater drawdown at the site boundary assuming a linear hydraulic gradient extending from the point of maximum drawdown (assumed to be either the soil/rock interface or the excavation depth, whichever is shallower) to the point of no drawdown as calculated using Powrie and Preen (1994a). This is a conservative approach and overestimates the groundwater drawdown between the points of none and maximum drawdown. The results of these calculations are attached.

At some locations groundwater drawdown is now considered likely to extend beyond the site boundaries. The effects of this change with regard to neighbouring properties are discussed in the response to Query 10 below. For Stage 1, the maximum groundwater drawdown at the site boundary is approximately 1.8m and occurs along parts of the northern boundary and the northern part of the eastern boundary. For Stage 2, the maximum groundwater drawdown at the site boundary is calculated to be 1.6m and occurs along the southern boundary.

Considering the extent of the groundwater drawdown calculated, the development proposal now complies with E7.6.1.10(3) with respect to not reducing the groundwater table by more than 2m at the site boundary, whereas previously a maximum groundwater drawdown of 6m had been considered.

Settlements associated with calculated groundwater drawdowns are discussed in our response to Query 10 below.

Note: The groundwater level used in the attached drawdown and settlement calculation sheets has been assessed using the groundwater monitoring data presented in Table 1 of our Geotechnical investigation Report (GIR), Ref: 240065-F.

Query 10:

Given that Sichardt underestimates the extent of drawdown. I consider additional assessment of effects on the neighbouring structures should be considered and to confirm worst-case scenario drawdown assessments.

Response

We have carried out calculations to assess the 1D consolidation settlement that could be anticipated as a result of groundwater drawdown at the site boundary utilising the outputs of Query 5 for our calculations. Because of the linear method adopted to assess the groundwater drawdown, the calculated settlements will also likely be conservative. The calculation sheets are attached.

The maximum calculated settlement of ~7mm occurs along the northern boundary of Stage 1, with calculated settlements for the other locations considered being less than 5mm at the site boundary apart from the southern boundary of Stage 2 where the maximum calculated settlement is ~6mm. Consequently, we consider that the effect of this is negligible with respect to neighbouring sites. There are also no existing structures within the extent of the calculated groundwater drawdown around the perimeter the development. The nearest existing structure is approximately 40m beyond the southern part of the eastern boundary of Stage 1. Therefore we consider that there should be no adverse effect on structures beyond the site boundary. This is consistent with the assessment presented in our GIR (Ref: 240065-F).

Note: As per our discussion with the Council Specialist we have also attached the settlement calculation sheets in relation to the calculated settlements presented in our GIR at the location of maximum groundwater drawdown.

3.0 Key Information Gap – Strategic & Planning Matters Memorandum – Paragraph 250: Item 12

- In our responses to Queries 6, 7, and 9 in the consolidated response spreadsheet, Riley stated that groundwater drawdown will occur in the cut slopes above the wetlands but as the groundwater will still be directed to the gullies at the site during all seasons there should be no reduction in water reaching them. Further commentary is provided below.

As part of development works, the size of the water catchments is not being altered and all pre-development surface and groundwater that would otherwise have passed through the wetlands/gullies is still directed there following development.

The groundwater intercepted upslope of the wetlands by excavations, subsoil and retaining wall drainage will be discharged into the wetlands/gullies at the nearest practical point to where the water is collected. It will be discharged at discrete locations via appropriately designed energy dissipation devices (e.g. over rock rip-rap or similar) to minimise the erosion risk. Because of the discrete nature of the discharges, there may be some localised concentration of water at the drain outlets from pre-development conditions, but overall, all the groundwater that would otherwise have entered the wetlands should still be directed to them.

4.0 Proposed Consent Conditions

We consider that the proposed conditions included in the Auckland Council Response, Annexure 16: Groundwater and Dewatering, dated 25 June 2025 are generally acceptable. Specific comments are below:

- We request that Condition 8 be amended to allow separate GSMCPs to be provided for substages of the development. The reason for this is that detailed design will occur progressively in advance of site works commencement but will not all be completed at the start of site works, and the outputs of the detailed design will be key inputs into Schedule A. To require a single GSMCP for all of Stage 1 (for example) would require detailed designs to be significantly advanced for all parts of Stage 1 before site works could commence, causing unnecessary delay to the commencement of earthworks. It is our view that this would not increase groundwater and dewatering risks. Our proposed wording for the first paragraph of Condition 8 is below (new text in red):

  At least ten (10) working days prior to the Commencement of Excavation at any stage or substage, a corresponding GSMCP prepared by a SQEP, must be submitted to the Council for written approval. Any later proposed amendment of the GSMCP must also be submitted to the Council for written approval.

- Also in relation to Condition 8, to be consistent with part (b), part (e) should be adjusted to be clear that Schedule A is to be completed as part of the GSMCP and not at some other time. We have spoken with the Council specialist regarding this item and understand that this is what is intended though it is not stated in the proposed consent condition 8. We present our proposed wording for part (e) of condition 8 below (new text in red):

  Final completed Schedule A for Alert and Alarm Level Triggers (including reasons if changes to such are proposed, for example as a result of recommendations in the building condition surveys or data obtained from pre-dewatering monitoring).

We trust these responses are suitable to address the Council's geotechnical queries.

5.0 Limitation

This letter has been prepared solely for the benefit of Vineway Ltd as our client with respect to the brief and Auckland Council in processing the consent(s). The reliance by other parties on the information or opinions contained in this letter shall, without our prior review and agreement in writing, be at such parties' sole risk.

Yours faithfully
Riley Consultants Ltd

Prepared by:

James Beaumont
Principal Geotechnical Engineer, CPEng

Reviewed and approved for issue by:

Brett Black
Project Director, CPEng

Enc: Query 5 – Groundwater Drawdown Calculations
Query 10 – Settlement calculations at the Site boundary and Maximum Drawdown

cc: Gus Finlayson
Barker & Associates Ltd
gusf@barker.co.nz

Query 5

Groundwater Drawdown Calculations

Calculation of settlement due to groundwater drawdown
Riley Reference: 240065 - Vineway Ltd Stage 1
13 June 2025
Designed: CAO
Check: JLB

Northern Boundary

Powrie and Preene, 1994:

$k := 0.0000001 \ \frac{m}{s}$ Soil permeability

$D := 6 \ m$ Aquifer thickness
$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60 \ s$ Time
$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 10.582 \ m$ Distance from max drawdown

$i := \frac{6 \ m - 0 \ m}{L_0}$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 6 \ m$

$h := i \cdot 7.4 \ m = 4.196 \ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = 1.804 \ m$ Drawdown at x (Boundary)

Northern Part of Eastern Boundary

Powrie and Preene, 1994:

$k := 0.0000001 \ \frac{m}{s}$ Soil permeability

$D := 5 \ m$ Aquifer thickness
$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60 \ s$ Time
$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 9.66 \ m$ Distance from max drawdown

$i := \frac{5\ m - 0\ m}{L_0}$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 5\ m$

$h := i \cdot 6.1\ m = 3.157\ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = 1.843\ m$ Drawdown at x (Boundary)

Southern part of Eastern Boundary and Southern Boundary

Powrie and Preene, 1994:

$k := 0.0000001\ \frac{m}{s}$ Soil permeability

$D := 2\ m$ Aquifer thickness

$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60\ s$ Time

$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 6.109\ m$ Distance from max drawdown

$i := \frac{2\ m - 0\ m}{L_0} = 0.327$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 2\ m$

$h := i \cdot 6.9\ m = 2.259\ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = -0.259\ m$ Drawdown at x (Boundary)

Calculation of settlement due to groundwater drawdown
Riley Reference: 240065 - Vineway Ltd Stage 2
16 June 2025
Designed: CAO
Check: JLB

Western Boundary

Powrie and Preene, 1994:

$k := 0.000001\ \frac{m}{s}$ Soil permeability

$D := 2\ m$ Aquifer thickness
$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60\ s$ Time
$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 19.32\ m$ Distance from max drawdown

$i := \frac{2\ m - 0\ m}{L_0}$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 2\ m$

$h := i \cdot 10.6\ m = 1.097\ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = 0.903\ m$ Drawdown at x (Boundary)

Northern Part of Eastern Boundary

Powrie and Preene, 1994:

$k := 0.000001\ \frac{m}{s}$ Soil permeability

$D := 1.5\ m$ Aquifer thickness
$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60\ s$ Time
$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 16.731\ m$ Distance from max drawdown

$i := \frac{1.5\ m - 0\ m}{L_0}$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 1.5\ m$

$h := i \cdot 24.25\ m = 2.174\ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = -0.674\ m$ Drawdown at x (Boundary)

Southern part of Eastern Boundary

Powrie and Preene, 1994:

$k := 0.000001\ \frac{m}{s}$ Soil permeability

$D := 3.2\ m$ Aquifer thickness

$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60\ s$ Time

$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 24.438\ m$ Distance from max drawdown

$i := \frac{3.2\ m - 0\ m}{L_0} = 0.131$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 3.2\ m$

$h := i \cdot 13.9\ m = 1.82\ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = 1.38\ m$ Drawdown at x (Boundary)

Southern Boundary

Powrie and Preene, 1994:

$k := 0.000001 \ \frac{m}{s}$ Soil permeability

$D := 6.0 \ m$ Aquifer thickness

$t := 6 \cdot 30 \cdot 24 \cdot 60 \cdot 60 \ s$ Time

$S := 1.0$ Aquifer storage coefficient

$L_0 := \sqrt{\frac{12 \cdot k \cdot D \cdot t}{S}} = 33.463 \ m$ Distance from max drawdown

$i := \frac{6.0 \ m - 0 \ m}{L_0} = 0.179$ Change in hydraulic grade bewteen L0 and max drawdown

$h_0 := 6.0 \ m$

$h := i \cdot 24.5 \ m = 4.393 \ m$ GWL at distance x, where x is distance to boundary

$h_0 - h = 1.607 \ m$ Drawdown at x (Boundary)

Query 10

Settlement calculations at the Site boundary and Maximum Drawdown

Inputs:

1. From review of investigation data and groundwater level monitoring adopt a GWL at 3m depth within the surficial soil mantle, which is consistent with gwl data excluding MH01. MH01 is excluded because of its location within a slump mass it is likely that the gwl in the upper piezo is not representative of the overall gwl within the surficial soils. Drawdown within the non-compressible rock materials is not considered. Refer to the groundwater monitoring sheet.
2. For the northern boundary adopt a 9m thick surficial soil mantle based on MH02, for the eastern and southern boundaries adopt 8m depth based on MH06.
3. Typical undrained shear strength along the northern boundary is 50-100kPa, along the eastern and southern boundaries the typical value is >100kPa. Therefore, adopt m_v = 0.067MN/m^2 for the northern boundary (for Cu=50kPa) and for the eastern and southern boundaries adopt m_v = 0.033MN/m^2. These values are considered to be conservative. Mv (MN/m^2) is calculated as 1/(300 x Cu) x 1000
4. Max cuts for calculation 9m (northern boundary), 8m (northern portion of eastern boundary), 5m (southern portion of eastern boundary and southern boundary).
5. A permeability of 1 x 10^{-7}m/s is considered appropriate for the silty clay/clayey silt type materials present.

For plane flow, the distance of influence, L_0, has been estimated using Powrie and Preene, 1994 as below:

$$L_0 = \sqrt{\frac{12 * k * D * T}{S}}$$

Where:
k is the soil permeability in metres/second,
D is the aquifer thickness in metres,
t is the time since pumping started in seconds, and,
S is the aquifer storage coefficient.

The depth of the groundwater drawdown at the boundary has been estimated assuming a linear relationship between the groundwater level at the maximum drawdown and zero drawdown at the distance of influence. This method is considered a conservative evaluation as the groundwater drawdown is not a linear relationship in reality.

We note the distance of influence (L_0) is located within the property boundary at the southern part of the eastern boundary and therefore there is no drawdown beyond the boundary.

The attached spreadsheet indicates the maximum drawdown is expected to be 7.2mm at the northern boundary. The distances from the base of each cut were measured off the drawing set Delmore Stage 1 by McKenzie & CO (Ref: 3725-1 dated 5 Feb 2025). Snippets of the measurement are included below.

Table 1: Calculated GW drawdown induced settlements

Location	Maximum Boundary Cut	Maximum Groundwater drawdown	Initial Calculated Settlement at Maximum drawdown	Calculated Settlement at the Boundary
Northern boundary	9m	6m	14mm	7.2mm
Northern part of eastern boundary and eastern part of northern boundary	8m	5m	<5mm	2.9mm
Southern part of eastern boundary and southern boundary	5m	2m	<5mm	0mm

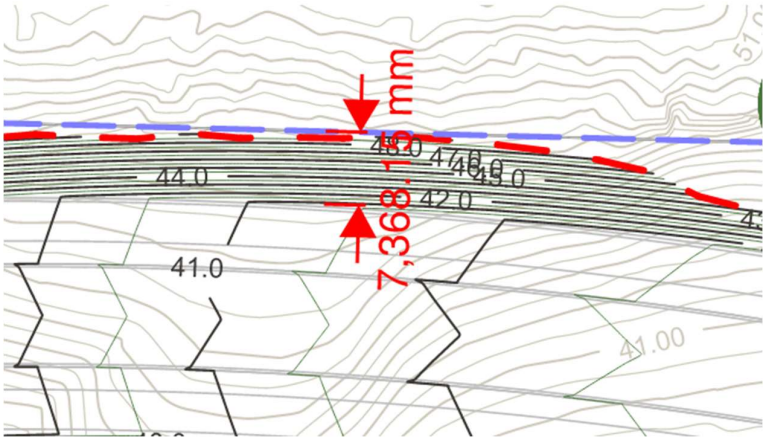

Figure 1: Northern Boundary Measurement

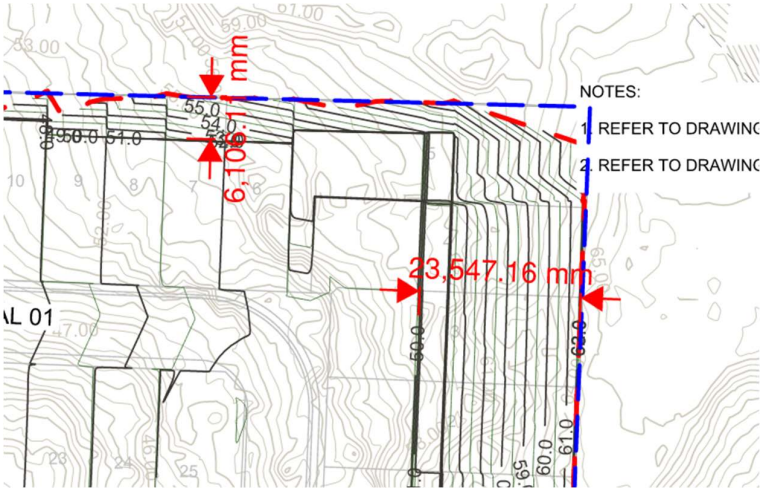

Figure 2: Northern part of eastern boundary and eastern part of northern boundary measurement

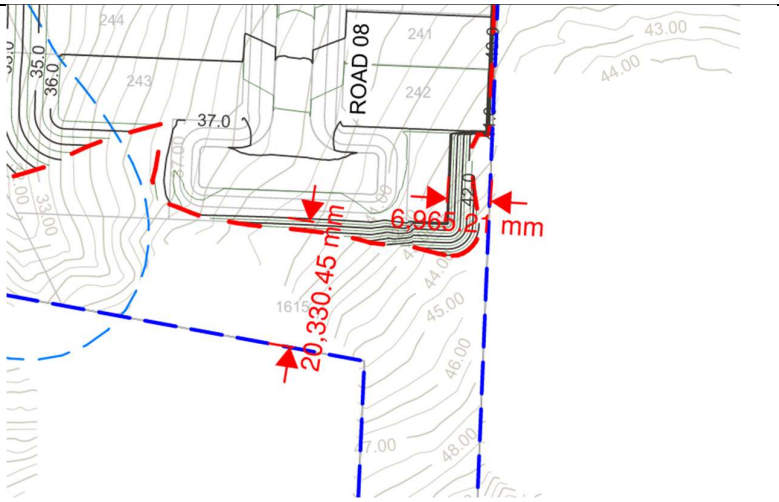

Figure 3: Southern of eastern boundary and southern boundary measurement

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Project No:	240065	**Page**	1	of	2
Project:	Vineway Ltd				
Calc:	CAO	**Date:**	16 June 2025		
Check:	JLB	**Date:**	16 June 2025		
Description:	Calculation of settlement due to groundwater drawdown and extent of the drawdown (Stage 2)				

Inputs:

1. From review of investigation data and groundwater level monitoring adopt a conservative GWL at 2m depth within the surficial soil mantle, which is consistent with the shallowest gwl data. Drawdown within the non-compressible rock materials is not considered for the purpose of calculating in settlements. GWL monitoring sheet at link below.
2. For the western boundary adopt a 4m thick surficial soil mantle based on TP53. For the northeast corner adopt a rock depth of 3.5m (TP25), for the south eastern boundary adopt a depth of 5.2m (TP35 and TP36) and for the southern boundary adopt 8m depth (eg base of cut as rock was not encountered along the southern boundary).
3. Typical undrained shear strength along the western boundary is 40-85kPa, along the northern and eastern boundaries the typical value is 70-100kPa and for the southern boundary 50-100kPa. Therefore, adopt m_v = 0.083MN/m^2 for the western boundary (for Cu=40kPa), for the northern and eastern boundaries adopt m_v = 0.048MN/m^2 (for Cu=70kPa), and for the southern boundary adopt m_v = 0.067MN/m^2 (for Cu=50kPa) . These values are considered to be conservative. Mv (MN/m^2) is calculated as 1/(300 x Cu) x 1000
4. Max cuts for calculation 14m (western boundary), 12m (northern portion of eastern boundary), 9m (southern portion of eastern boundary), and 8m (southern boundary).
5. A permeability of 1 x 10^{-6}m/s is considered appropriate as an average for the sandy silt/clayey silt type materials present.

For plane flow, the distance of influence, L_0, has been estimated using Powrie and Preene, 1994 as below:

$$L_0 = \sqrt{\frac{12 * k * D * T}{S}}$$

Where:
k is the soil permeability in metres/second,
D is the aquifer thickness in metres,
t is the time since pumping started in seconds, and,
S is the aquifer storage coefficient.

The depth of the groundwater drawdown at the boundary has been estimated assuming a linear relationship between the groundwater level at the maximum drawdown and zero drawdown at the distance of influence. This method is considered a conservative evaluation as the groundwater drawdown is not a linear relationship in reality.

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Description: Calculation of settlement due to groundwater drawdown and extent of the drawdown (Stage 2)

Refer to the attached calculation sheet for the groundwater drawdown at the closest point to the western, northern part of the eastern, southern part of the eastern and southern boundary.

We note the distance of influence (L_0) is located within the property boundary at the northern part of the eastern boundary and therefore there is no drawdown beyond the boundary.

The drawdown at the southern part of the boundary extends approximately 8m beyond the property boundary. there are no structures or buildings located within 8m of the southern boundary therefore groundwater drawdown is considered to not have an adverse effect on the adjacent structures or development.

The attached spreadsheet indicates the maximum drawdown is expected to be 6.4mm at the northern boundary. The distances from the base of each cut were measured off the drawing set Delmore Stage 1 by McKenzie & CO (Ref: 3725-1 dated 5 Feb 2025). Snippets of the measurement are included below.

Table 1: Calculated GW drawdown induced settlements

Location	Maximum Boundary Cut	Maximum Groundwater drawdown	Settlement at Maximum drawdown	Calculated Settlement at the Boundary
Western boundary	14m	2m*	<5mm	1.8mm
Northern part of eastern boundary	12m	1.5m*	<5mm	0mm
Southern part of eastern boundary	9m	3.2m*	<5mm	1.2mm
Southern boundary	8m	6m*	14mm	6.4mm

*Maximum groundwater drawdown is taken as the shallower of the depth to rock of the base of the boundary cut.

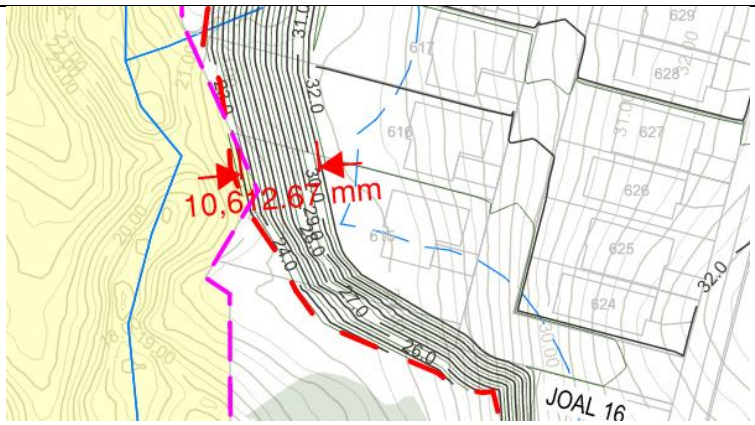

Figure 1: Western boundary Measurement

Figure 2: Northern part of eastern boundary Measurement

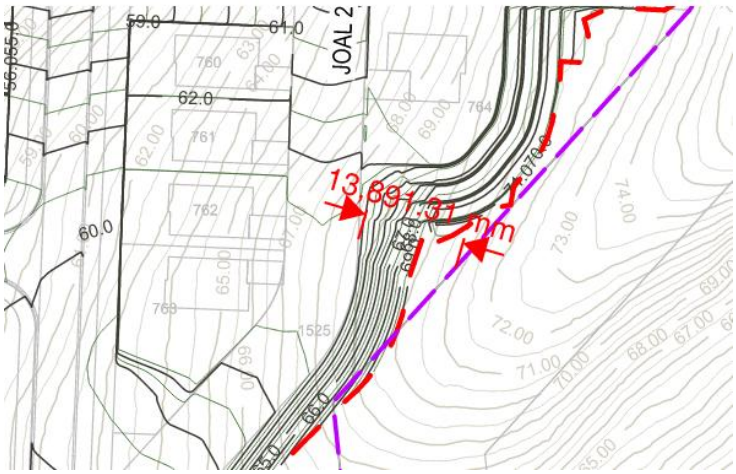

Figure 3: Southern part of eastern boundary Measurement

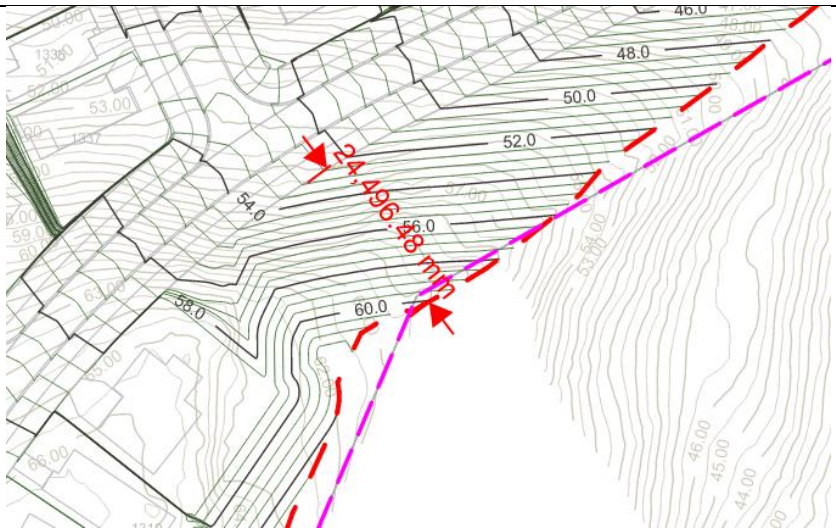

Figure 4: Southern boundary Measurement

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 1 Eastern (Southern Portion) & Southern Boundary (Max 5m cut)

Job No. 240065

Designed CAO 10/06/2025
Checked JLB 16/06/2025

Typical Cross-section

				Initial		Drained		kN/m2	(m2/MN)	(m)
m BLG	Geology	γ	σ	W	σ'			Δσ'	m_v	S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.03	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.03	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.03	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.03	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.03	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.03	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.03	0.00E+00
2	Soils (Cu>100kPa)	18	36	0	36	0	36	0	0.03	0.00E+00
2.25	Soils (Cu>100kPa)	18	40.5	0	40.5	0	40.5	0	0.03	0.00E+00
2.5	Soils (Cu>100kPa)	18	45	0	45	0	45	0	0.03	0.00E+00
2.75	Soils (Cu>100kPa)	18	49.5	0	49.5	0	49.5	0	0.03	0.00E+00
3	Soils (Cu>100kPa)	18	54	10	51.5	0	54	2.5	0.03	2.09E-05
3.25	Soils (Cu>100kPa)	18	58.5	10	53.5	0	58.5	5	0.03	4.19E-05
3.5	Soils (Cu>100kPa)	18	63	10	55.5	10	60.5	5	0.03	4.19E-05
3.75	Soils (Cu>100kPa)	18	67.5	10	57.5	10	62.5	5	0.03	4.19E-05
4	Soils (Cu>100kPa)	18	72	10	59.5	10	64.5	5	0.03	4.19E-05
4.25	Soils (Cu>100kPa)	18	76.5	10	61.5	10	66.5	5	0.03	4.19E-05
4.5	Soils (Cu>100kPa)	18	81	10	63.5	10	68.5	5	0.03	4.19E-05
4.75	Soils (Cu>100kPa)	18	85.5	10	65.5	10	70.5	5	0.03	4.19E-05
5	Soils (Cu>100kPa)	18	90	10	67.5	10	72.5	5	0.03	4.19E-05
5.25	Soils (Cu>100kPa)	18	94.5	10	69.5	10	74.5	5	0.03	4.19E-05
5.5	Soils (Cu>100kPa)	18	99	10	71.5	10	76.5	5	0.03	4.19E-05
5.75	Soils (Cu>100kPa)	18	103.5	10	73.5	10	78.5	5	0.03	4.19E-05
6	Soils (Cu>100kPa)	18	108	10	75.5	10	80.5	5	0.03	4.19E-05
6.25	Soils (Cu>100kPa)	18	112.5	10	77.5	10	82.5	5	0.03	4.19E-05
6.5	Soils (Cu>100kPa)	18	117	10	79.5	10	84.5	5	0.03	4.19E-05
6.75	Soils (Cu>100kPa)	18	121.5	10	81.5	10	86.5	5	0.03	4.19E-05
7	Soils (Cu>100kPa)	18	126	10	83.5	10	88.5	5	0.03	4.19E-05
7.25	Soils (Cu>100kPa)	18	130.5	10	85.5	10	90.5	5	0.03	4.19E-05
7.5	Soils (Cu>100kPa)	18	135	10	87.5	10	92.5	5	0.03	4.19E-05
7.75	Soils (Cu>100kPa)	18	139.5	10	89.5	10	94.5	5	0.03	4.19E-05
8	Soils (Cu>100kPa)	18	144	10	91.5	10	96.5	5	0.03	4.19E-05
										0.9
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 1 Eastern Boundary (Max 8m cut), Northern Portion

Job No. 240065

Designed CAO 10/06/2025

Checked JLB 16/06/2025

Typical Cross-section

				Initial		Drained		kN/m2	(m2/MN)	(m)
m BLG	Geology	γ	σ	W	σ'			Δσ'	m_v	S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.03	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.03	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.03	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.03	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.03	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.03	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.03	0.00E+00
2	Soils (Cu>100kPa)	18	36	0	36	0	36	0	0.03	0.00E+00
2.25	Soils (Cu>100kPa)	18	40.5	0	40.5	0	40.5	0	0.03	0.00E+00
2.5	Soils (Cu>100kPa)	18	45	0	45	0	45	0	0.03	0.00E+00
2.75	Soils (Cu>100kPa)	18	49.5	0	49.5	0	49.5	0	0.03	0.00E+00
3	Soils (Cu>100kPa)	18	54	10	51.5	0	54	2.5	0.03	2.09E-05
3.25	Soils (Cu>100kPa)	18	58.5	10	53.5	0	58.5	5	0.03	4.19E-05
3.5	Soils (Cu>100kPa)	18	63	10	55.5	0	63	7.5	0.03	6.28E-05
3.75	Soils (Cu>100kPa)	18	67.5	10	57.5	0	67.5	10	0.03	8.38E-05
4	Soils (Cu>100kPa)	18	72	10	59.5	0	72	12.5	0.03	1.05E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	61.5	0	76.5	15	0.03	1.26E-04
4.5	Soils (Cu>100kPa)	18	81	10	63.5	0	81	17.5	0.03	1.47E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	65.5	0	85.5	20	0.03	1.68E-04
5	Soils (Cu>100kPa)	18	90	10	67.5	10	87.5	20	0.03	1.68E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	69.5	10	89.5	20	0.03	1.68E-04
5.5	Soils (Cu>100kPa)	18	99	10	71.5	10	91.5	20	0.03	1.68E-04
5.75	Soils (Cu>100kPa)	18	103.5	10	73.5	10	93.5	20	0.03	1.68E-04
6	Soils (Cu>100kPa)	18	108	10	75.5	10	95.5	20	0.03	1.68E-04
6.25	Soils (Cu>100kPa)	18	112.5	10	77.5	10	97.5	20	0.03	1.68E-04
6.5	Soils (Cu>100kPa)	18	117	10	79.5	10	99.5	20	0.03	1.68E-04
6.75	Soils (Cu>100kPa)	18	121.5	10	81.5	10	101.5	20	0.03	1.68E-04
7	Soils (Cu>100kPa)	18	126	10	83.5	10	103.5	20	0.03	1.68E-04
7.25	Soils (Cu>100kPa)	18	130.5	10	85.5	10	105.5	20	0.03	1.68E-04
7.5	Soils (Cu>100kPa)	18	135	10	87.5	10	107.5	20	0.03	1.68E-04
7.75	Soils (Cu>100kPa)	18	139.5	10	89.5	10	109.5	20	0.03	1.68E-04
8	Soils (Cu>100kPa)	18	144	10	91.5	10	111.5	20	0.03	1.68E-04
										2.9
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Northern Portion of Eastern Boundary (Max 12m cut)

Job No. 240065 | Designed / Checked | JLB | 28/01/2025

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.05	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.05	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.05	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.05	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.05	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.05	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.05	0.00E+00
2	Soils (Cu>100kPa)	18	36	0	36	0	36	0	0.05	0.00E+00
2.25	Soils (Cu>100kPa)	18	40.5	0	40.5	0	40.5	0	0.05	0.00E+00
2.5	Soils (Cu>100kPa)	18	45	0	45	0	45	0	0.05	0.00E+00
2.75	Soils (Cu>100kPa)	18	49.5	0	49.5	0	49.5	0	0.05	0.00E+00
3	Soils (Cu>100kPa)	18	54	0	54	0	54	0	0.05	0.00E+00
3.25	Soils (Cu>100kPa)	18	58.5	0	58.5	0	58.5	0	0.05	0.00E+00
3.5	Soils (Cu>100kPa)	18	63	10	60.5	10	60.5	0	0.05	0.00E+00
3.75	Soils (Cu>100kPa)	18	67.5	10	62.5	10	62.5	0	0.00	0.00E+00
4	Soils (Cu>100kPa)	18	72	10	64.5	10	64.5	0	0.00	0.00E+00
4.25	Soils (Cu>100kPa)	18	76.5	10	66.5	10	66.5	0	0.00	0.00E+00
4.5	Soils (Cu>100kPa)	18	81	10	68.5	10	68.5	0	0.00	0.00E+00
4.75	Soils (Cu>100kPa)	18	85.5	10	70.5	10	70.5	0	0.00	0.00E+00
5	Soils (Cu>100kPa)	18	90	10	72.5	10	72.5	0	0.00	0.00E+00
5.25	Soils (Cu>100kPa)	18	94.5	10	74.5	10	74.5	0	0.00	0.00E+00
5.5	Soils (Cu>100kPa)	18	99	10	76.5	10	76.5	0	0.00	0.00E+00
5.75	Soils (Cu>100kPa)	18	103.5	10	78.5	10	78.5	0	0.00	0.00E+00
6	Soils (Cu>100kPa)	18	108	10	80.5	10	80.5	0	0.00	0.00E+00
6.25	Soils (Cu>100kPa)	18	112.5	10	82.5	10	82.5	0	0.00	0.00E+00
6.5	Soils (Cu>100kPa)	18	117	10	84.5	10	84.5	0	0.00	0.00E+00
6.75	Soils (Cu>100kPa)	18	121.5	10	86.5	10	86.5	0	0.00	0.00E+00
7	Soils (Cu>100kPa)	18	126	10	88.5	10	88.5	0	0.00	0.00E+00
7.25	Soils (Cu>100kPa)	18	130.5	10	90.5	10	90.5	0	0.00	0.00E+00
7.5	Soils (Cu>100kPa)	18	135	10	92.5	10	92.5	0	0.00	0.00E+00
7.75	Soils (Cu>100kPa)	18	139.5	10	94.5	10	94.5	0	0.00	0.00E+00
8	Soils (Cu>100kPa)	18	144	10	96.5	10	96.5	0	0.00	0.00E+00
										0.0
										(mm)

Calculate Settlement Due To Groundwater Drawdown.
Russell Road, Wainui : Northern Boundary (9m cut)
Typical Cross-section

Job No. 240065

								Designed	CAO	10/06/2025
								Checked	JLB	16/06/2025
				Initial		Drained		kN/m2	(m2/MN)	(m)
m BLG	Geology	γ	σ	W	σ'			Δσ'	m_v	S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>50kPa)	18	4.5	0	4.5	0	4.5	0	0.07	0.00E+00
0.5	Soils (Cu>50kPa)	18	9	0	9	0	9	0	0.07	0.00E+00
0.75	Soils (Cu>50kPa)	18	13.5	0	13.5	0	13.5	0	0.07	0.00E+00
1	Soils (Cu>50kPa)	18	18	0	18	0	18	0	0.07	0.00E+00
1.25	Soils (Cu>50kPa)	18	22.5	0	22.5	0	22.5	0	0.07	0.00E+00
1.5	Soils (Cu>50kPa)	18	27	0	27	0	27	0	0.07	0.00E+00
1.75	Soils (Cu>50kPa)	18	31.5	0	31.5	0	31.5	0	0.07	0.00E+00
2	Soils (Cu>50kPa)	18	36	0	36	0	36	0	0.07	0.00E+00
2.25	Soils (Cu>50kPa)	18	40.5	0	40.5	0	40.5	0	0.07	0.00E+00
2.5	Soils (Cu>50kPa)	18	45	0	45	0	45	0	0.07	0.00E+00
2.75	Soils (Cu>50kPa)	18	49.5	0	49.5	0	49.5	0	0.07	0.00E+00
3	Soils (Cu>50kPa)	18	54	10	51.5	0	54	2.5	0.07	4.19E-05
3.25	Soils (Cu>50kPa)	18	58.5	10	53.5	0	58.5	5	0.07	8.38E-05
3.5	Soils (Cu>50kPa)	18	63	10	55.5	0	63	7.5	0.07	1.26E-04
3.75	Soils (Cu>50kPa)	18	67.5	10	57.5	0	67.5	10	0.07	1.68E-04
4	Soils (Cu>50kPa)	18	72	10	59.5	0	72	12.5	0.07	2.09E-04
4.25	Soils (Cu>50kPa)	18	76.5	10	61.5	0	76.5	15	0.07	2.51E-04
4.5	Soils (Cu>50kPa)	18	81	10	63.5	0	81	17.5	0.07	2.93E-04
4.75	Soils (Cu>50kPa)	18	85.5	10	65.5	0	85.5	20	0.07	3.35E-04
5	Soils (Cu>50kPa)	18	90	10	67.5	10	87.5	20	0.07	3.35E-04
5.25	Soils (Cu>50kPa)	18	94.5	10	69.5	10	89.5	20	0.07	3.35E-04
5.5	Soils (Cu>50kPa)	18	99	10	71.5	10	91.5	20	0.07	3.35E-04
5.75	Soils (Cu>50kPa)	18	103.5	10	73.5	10	93.5	20	0.07	3.35E-04
6	Soils (Cu>50kPa)	18	108	10	75.5	10	95.5	20	0.07	3.35E-04
6.25	Soils (Cu>50kPa)	18	112.5	10	77.5	10	97.5	20	0.07	3.35E-04
6.5	Soils (Cu>50kPa)	18	117	10	79.5	10	99.5	20	0.07	3.35E-04
6.75	Soils (Cu>50kPa)	18	121.5	10	81.5	10	101.5	20	0.07	3.35E-04
7	Soils (Cu>50kPa)	18	126	10	83.5	10	103.5	20	0.07	3.35E-04
7.25	Soils (Cu>50kPa)	18	130.5	10	85.5	10	105.5	20	0.07	3.35E-04
7.5	Soils (Cu>50kPa)	18	135	10	87.5	10	107.5	20	0.07	3.35E-04
7.75	Soils (Cu>50kPa)	18	139.5	10	89.5	10	109.5	20	0.07	3.35E-04
8	Soils (Cu>50kPa)	18	144	10	91.5	10	111.5	20	0.07	3.35E-04
8.25	Soils (Cu>50kPa)	18	148.5	10	93.5	10	113.5	20	0.07	3.35E-04
8.5	Soils (Cu>50kPa)	18	153	10	95.5	10	115.5	20	0.07	3.35E-04
8.75	Soils (Cu>50kPa)	18	157.5	10	97.5	10	117.5	20	0.07	3.35E-04
9	Soils (Cu>50kPa)	18	162	10	99.5	10	119.5	20	0.07	3.35E-04
										7.2
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Southern Boundary (Max 8m cut)

Job No. 240065

Designed / Checked: JLB

28/01/2025

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.07	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.07	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.07	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.07	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.07	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.07	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.07	0.00E+00
2	Soils (Cu>100kPa)	18	36	10	33.5	0	36	2.5	0.07	4.19E-05
2.25	Soils (Cu>100kPa)	18	40.5	10	35.5	0	40.5	5	0.07	8.38E-05
2.5	Soils (Cu>100kPa)	18	45	10	37.5	0	45	7.5	0.07	1.26E-04
2.75	Soils (Cu>100kPa)	18	49.5	10	39.5	0	49.5	10	0.07	1.68E-04
3	Soils (Cu>100kPa)	18	54	10	41.5	0	54	12.5	0.07	2.09E-04
3.25	Soils (Cu>100kPa)	18	58.5	10	43.5	0	58.5	15	0.07	2.51E-04
3.5	Soils (Cu>100kPa)	18	63	10	45.5	0	63	17.5	0.07	2.93E-04
3.75	Soils (Cu>100kPa)	18	67.5	10	47.5	10	65	17.5	0.07	2.93E-04
4	Soils (Cu>100kPa)	18	72	10	49.5	10	67	17.5	0.07	2.93E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	51.5	10	69	17.5	0.07	2.93E-04
4.5	Soils (Cu>100kPa)	18	81	10	53.5	10	71	17.5	0.07	2.93E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	55.5	10	73	17.5	0.07	2.93E-04
5	Soils (Cu>100kPa)	18	90	10	57.5	10	75	17.5	0.07	2.93E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	59.5	10	77	17.5	0.07	2.93E-04
5.5	Soils (Cu>100kPa)	18	99	10	61.5	10	79	17.5	0.07	2.93E-04
5.75	Soils (Cu>100kPa)	18	103.5	10	63.5	10	81	17.5	0.07	2.93E-04
6	Soils (Cu>100kPa)	18	108	10	65.5	10	83	17.5	0.07	2.93E-04
6.25	Soils (Cu>100kPa)	18	112.5	10	67.5	10	85	17.5	0.07	2.93E-04
6.5	Soils (Cu>100kPa)	18	117	10	69.5	10	87	17.5	0.07	2.93E-04
6.75	Soils (Cu>100kPa)	18	121.5	10	71.5	10	89	17.5	0.07	2.93E-04
7	Soils (Cu>100kPa)	18	126	10	73.5	10	91	17.5	0.07	2.93E-04
7.25	Soils (Cu>100kPa)	18	130.5	10	75.5	10	93	17.5	0.07	2.93E-04
7.5	Soils (Cu>100kPa)	18	135	10	77.5	10	95	17.5	0.07	2.93E-04
7.75	Soils (Cu>100kPa)	18	139.5	10	79.5	10	97	17.5	0.07	2.93E-04
8	Soils (Cu>100kPa)	18	144	10	81.5	10	99	17.5	0.07	2.93E-04
										6.4
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Southern Portion of Eastern Boundary (Max 9m cut)

Job No. 240065

Designed / Checked: JLB

28/01/2025

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.05	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.05	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.05	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.05	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.05	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.05	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.05	0.00E+00
2	Soils (Cu>100kPa)	18	36	0	36	0	36	0	0.05	0.00E+00
2.25	Soils (Cu>100kPa)	18	40.5	0	40.5	0	40.5	0	0.05	0.00E+00
2.5	Soils (Cu>100kPa)	18	45	0	45	0	45	0	0.05	0.00E+00
2.75	Soils (Cu>100kPa)	18	49.5	0	49.5	0	49.5	0	0.05	0.00E+00
3	Soils (Cu>100kPa)	18	54	0	54	0	54	0	0.05	0.00E+00
3.25	Soils (Cu>100kPa)	18	58.5	10	56	0	58.5	2.5	0.05	3.00E-05
3.5	Soils (Cu>100kPa)	18	63	10	58	0	63	5	0.05	6.00E-05
3.75	Soils (Cu>100kPa)	18	67.5	10	60	0	67.5	7.5	0.05	9.00E-05
4	Soils (Cu>100kPa)	18	72	10	62	0	72	10	0.05	1.20E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	64	0	76.5	12.5	0.05	1.50E-04
4.5	Soils (Cu>100kPa)	18	81	10	66	0	81	15	0.05	1.80E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	68	10	83	15	0.05	1.80E-04
5	Soils (Cu>100kPa)	18	90	10	70	10	85	15	0.05	1.80E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	72	10	87	15	0.05	1.80E-04
5.5	Soils (Cu>100kPa)	18	99	10	74	10	89	15	0.00	0.00E+00
5.75	Soils (Cu>100kPa)	18	103.5	10	76	10	91	15	0.00	0.00E+00
6	Soils (Cu>100kPa)	18	108	10	78	10	93	15	0.00	0.00E+00
6.25	Soils (Cu>100kPa)	18	112.5	10	80	10	95	15	0.00	0.00E+00
6.5	Soils (Cu>100kPa)	18	117	10	82	10	97	15	0.00	0.00E+00
6.75	Soils (Cu>100kPa)	18	121.5	10	84	10	99	15	0.00	0.00E+00
7	Soils (Cu>100kPa)	18	126	10	86	10	101	15	0.00	0.00E+00
7.25	Soils (Cu>100kPa)	18	130.5	10	88	10	103	15	0.00	0.00E+00
7.5	Soils (Cu>100kPa)	18	135	10	90	10	105	15	0.00	0.00E+00
7.75	Soils (Cu>100kPa)	18	139.5	10	92	10	107	15	0.00	0.00E+00
8	Soils (Cu>100kPa)	18	144	10	94	10	109	15	0.00	0.00E+00
										1.2
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Western Boundary (Max 14m cut)

Job No. 240065

Designed / Checked: JLB

28/01/2025

Typical Cross-section

				Initial		Drained		kN/m2	(m2/MN)	(m)
m BLG	Geology	γ	σ	W	σ'			Δσ'	m_v	S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.08	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.08	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.08	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.08	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.08	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.08	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.08	0.00E+00
2	Soils (Cu>100kPa)	18	36	10	33.5	0	36	2.5	0.08	5.19E-05
2.25	Soils (Cu>100kPa)	18	40.5	10	35.5	0	40.5	5	0.08	1.04E-04
2.5	Soils (Cu>100kPa)	18	45	10	37.5	0	45	7.5	0.08	1.56E-04
2.75	Soils (Cu>100kPa)	18	49.5	10	39.5	0	49.5	10	0.08	2.08E-04
3	Soils (Cu>100kPa)	18	54	10	41.5	0	54	12.5	0.08	2.59E-04
3.25	Soils (Cu>100kPa)	18	58.5	10	43.5	10	56	12.5	0.08	2.59E-04
3.5	Soils (Cu>100kPa)	18	63	10	45.5	10	58	12.5	0.08	2.59E-04
3.75	Soils (Cu>100kPa)	18	67.5	10	47.5	10	60	12.5	0.08	2.59E-04
4	Soils (Cu>100kPa)	18	72	10	49.5	10	62	12.5	0.08	2.59E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	51.5	10	64	12.5	0.00	0.00E+00
4.5	Soils (Cu>100kPa)	18	81	10	53.5	10	66	12.5	0.00	0.00E+00
4.75	Soils (Cu>100kPa)	18	85.5	10	55.5	10	68	12.5	0.00	0.00E+00
5	Soils (Cu>100kPa)	18	90	10	57.5	10	70	12.5	0.00	0.00E+00
5.25	Soils (Cu>100kPa)	18	94.5	10	59.5	10	72	12.5	0.00	0.00E+00
5.5	Soils (Cu>100kPa)	18	99	10	61.5	10	74	12.5	0.00	0.00E+00
5.75	Soils (Cu>100kPa)	18	103.5	10	63.5	10	76	12.5	0.00	0.00E+00
6	Soils (Cu>100kPa)	18	108	10	65.5	10	78	12.5	0.00	0.00E+00
6.25	Soils (Cu>100kPa)	18	112.5	10	67.5	10	80	12.5	0.00	0.00E+00
6.5	Soils (Cu>100kPa)	18	117	10	69.5	10	82	12.5	0.00	0.00E+00
6.75	Soils (Cu>100kPa)	18	121.5	10	71.5	10	84	12.5	0.00	0.00E+00
7	Soils (Cu>100kPa)	18	126	10	73.5	10	86	12.5	0.00	0.00E+00
7.25	Soils (Cu>100kPa)	18	130.5	10	75.5	10	88	12.5	0.00	0.00E+00
7.5	Soils (Cu>100kPa)	18	135	10	77.5	10	90	12.5	0.00	0.00E+00
7.75	Soils (Cu>100kPa)	18	139.5	10	79.5	10	92	12.5	0.00	0.00E+00
8	Soils (Cu>100kPa)	18	144	10	81.5	10	94	12.5	0.00	0.00E+00
										1.8
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 1 Eastern (Southern Portion) & Southern Boundary (Max 5m cut)

Job No. 240065

Designed JLB 13/01/2025
Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.03	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.03	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.03	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.03	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.03	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.03	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.03	0.00E+00
2	Soils (Cu>100kPa)	18	36	0	36	0	36	0	0.03	0.00E+00
2.25	Soils (Cu>100kPa)	18	40.5	0	40.5	0	40.5	0	0.03	0.00E+00
2.5	Soils (Cu>100kPa)	18	45	0	45	0	45	0	0.03	0.00E+00
2.75	Soils (Cu>100kPa)	18	49.5	0	49.5	0	49.5	0	0.03	0.00E+00
3	Soils (Cu>100kPa)	18	54	10	51.5	0	54	2.5	0.03	2.09E-05
3.25	Soils (Cu>100kPa)	18	58.5	10	53.5	0	58.5	5	0.03	4.19E-05
3.5	Soils (Cu>100kPa)	18	63	10	55.5	0	63	7.5	0.03	6.28E-05
3.75	Soils (Cu>100kPa)	18	67.5	10	57.5	0	67.5	10	0.03	8.38E-05
4	Soils (Cu>100kPa)	18	72	10	59.5	0	72	12.5	0.03	1.05E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	61.5	0	76.5	15	0.03	1.26E-04
4.5	Soils (Cu>100kPa)	18	81	10	63.5	0	81	17.5	0.03	1.47E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	65.5	0	85.5	20	0.03	1.68E-04
5	Soils (Cu>100kPa)	18	90	10	67.5	10	87.5	20	0.03	1.68E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	69.5	10	89.5	20	0.03	1.68E-04
5.5	Soils (Cu>100kPa)	18	99	10	71.5	10	91.5	20	0.03	1.68E-04
5.75	Soils (Cu>100kPa)	18	103.5	10	73.5	10	93.5	20	0.03	1.68E-04
6	Soils (Cu>100kPa)	18	108	10	75.5	10	95.5	20	0.03	1.68E-04
6.25	Soils (Cu>100kPa)	18	112.5	10	77.5	10	97.5	20	0.03	1.68E-04
6.5	Soils (Cu>100kPa)	18	117	10	79.5	10	99.5	20	0.03	1.68E-04
6.75	Soils (Cu>100kPa)	18	121.5	10	81.5	10	101.5	20	0.03	1.68E-04
7	Soils (Cu>100kPa)	18	126	10	83.5	10	103.5	20	0.03	1.68E-04
7.25	Soils (Cu>100kPa)	18	130.5	10	85.5	10	105.5	20	0.03	1.68E-04
7.5	Soils (Cu>100kPa)	18	135	10	87.5	10	107.5	20	0.03	1.68E-04
7.75	Soils (Cu>100kPa)	18	139.5	10	89.5	10	109.5	20	0.03	1.68E-04
8	Soils (Cu>100kPa)	18	144	10	91.5	10	111.5	20	0.03	1.68E-04
										2.9
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 1 Eastern Boundary (Max 8m cut), Northern Portion

Job No. 240065

Designed JLB 13/01/2025

Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.03	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.03	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.03	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.03	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.03	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.03	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.03	0.00E+00
2	Soils (Cu>100kPa)	18	36	0	36	0	36	0	0.03	0.00E+00
2.25	Soils (Cu>100kPa)	18	40.5	0	40.5	0	40.5	0	0.03	0.00E+00
2.5	Soils (Cu>100kPa)	18	45	0	45	0	45	0	0.03	0.00E+00
2.75	Soils (Cu>100kPa)	18	49.5	0	49.5	0	49.5	0	0.03	0.00E+00
3	Soils (Cu>100kPa)	18	54	10	51.5	0	54	2.5	0.03	2.09E-05
3.25	Soils (Cu>100kPa)	18	58.5	10	53.5	0	58.5	5	0.03	4.19E-05
3.5	Soils (Cu>100kPa)	18	63	10	55.5	0	63	7.5	0.03	6.28E-05
3.75	Soils (Cu>100kPa)	18	67.5	10	57.5	0	67.5	10	0.03	8.38E-05
4	Soils (Cu>100kPa)	18	72	10	59.5	0	72	12.5	0.03	1.05E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	61.5	0	76.5	15	0.03	1.26E-04
4.5	Soils (Cu>100kPa)	18	81	10	63.5	0	81	17.5	0.03	1.47E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	65.5	0	85.5	20	0.03	1.68E-04
5	Soils (Cu>100kPa)	18	90	10	67.5	0	90	22.5	0.03	1.88E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	69.5	0	94.5	25	0.03	2.09E-04
5.5	Soils (Cu>100kPa)	18	99	10	71.5	0	99	27.5	0.03	2.30E-04
5.75	Soils (Cu>100kPa)	18	103.5	10	73.5	0	103.5	30	0.03	2.51E-04
6	Soils (Cu>100kPa)	18	108	10	75.5	0	108	32.5	0.03	2.72E-04
6.25	Soils (Cu>100kPa)	18	112.5	10	77.5	0	112.5	35	0.03	2.93E-04
6.5	Soils (Cu>100kPa)	18	117	10	79.5	0	117	37.5	0.03	3.14E-04
6.75	Soils (Cu>100kPa)	18	121.5	10	81.5	0	121.5	40	0.03	3.35E-04
7	Soils (Cu>100kPa)	18	126	10	83.5	0	126	42.5	0.03	3.56E-04
7.25	Soils (Cu>100kPa)	18	130.5	10	85.5	0	130.5	45	0.03	3.77E-04
7.5	Soils (Cu>100kPa)	18	135	10	87.5	0	135	47.5	0.03	3.98E-04
7.75	Soils (Cu>100kPa)	18	139.5	10	89.5	0	139.5	50	0.03	4.19E-04
8	Soils (Cu>100kPa)	18	144	10	91.5	10	141.5	50	0.03	4.19E-04
										4.8
										(mm)

Calculate Settlement Due To Groundwater Drawdown Russell Road, Wainui : Northern Boundary | Job No. 240065 | Designed JLB | 13/01/2025 | Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		Drained kN/m2 Δσ'	Drained (m2/MN) m_v	Drained (m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>50kPa)	18	4.5	0	4.5	0	4.5	0	0.07	0.00E+00
0.5	Soils (Cu>50kPa)	18	9	0	9	0	9	0	0.07	0.00E+00
0.75	Soils (Cu>50kPa)	18	13.5	0	13.5	0	13.5	0	0.07	0.00E+00
1	Soils (Cu>50kPa)	18	18	0	18	0	18	0	0.07	0.00E+00
1.25	Soils (Cu>50kPa)	18	22.5	0	22.5	0	22.5	0	0.07	0.00E+00
1.5	Soils (Cu>50kPa)	18	27	0	27	0	27	0	0.07	0.00E+00
1.75	Soils (Cu>50kPa)	18	31.5	0	31.5	0	31.5	0	0.07	0.00E+00
2	Soils (Cu>50kPa)	18	36	0	36	0	36	0	0.07	0.00E+00
2.25	Soils (Cu>50kPa)	18	40.5	0	40.5	0	40.5	0	0.07	0.00E+00
2.5	Soils (Cu>50kPa)	18	45	0	45	0	45	0	0.07	0.00E+00
2.75	Soils (Cu>50kPa)	18	49.5	0	49.5	0	49.5	0	0.07	0.00E+00
3	Soils (Cu>50kPa)	18	54	10	51.5	0	54	2.5	0.07	4.19E-05
3.25	Soils (Cu>50kPa)	18	58.5	10	53.5	0	58.5	5	0.07	8.38E-05
3.5	Soils (Cu>50kPa)	18	63	10	55.5	0	63	7.5	0.07	1.26E-04
3.75	Soils (Cu>50kPa)	18	67.5	10	57.5	0	67.5	10	0.07	1.68E-04
4	Soils (Cu>50kPa)	18	72	10	59.5	0	72	12.5	0.07	2.09E-04
4.25	Soils (Cu>50kPa)	18	76.5	10	61.5	0	76.5	15	0.07	2.51E-04
4.5	Soils (Cu>50kPa)	18	81	10	63.5	0	81	17.5	0.07	2.93E-04
4.75	Soils (Cu>50kPa)	18	85.5	10	65.5	0	85.5	20	0.07	3.35E-04
5	Soils (Cu>50kPa)	18	90	10	67.5	0	90	22.5	0.07	3.77E-04
5.25	Soils (Cu>50kPa)	18	94.5	10	69.5	0	94.5	25	0.07	4.19E-04
5.5	Soils (Cu>50kPa)	18	99	10	71.5	0	99	27.5	0.07	4.61E-04
5.75	Soils (Cu>50kPa)	18	103.5	10	73.5	0	103.5	30	0.07	5.03E-04
6	Soils (Cu>50kPa)	18	108	10	75.5	0	108	32.5	0.07	5.44E-04
6.25	Soils (Cu>50kPa)	18	112.5	10	77.5	0	112.5	35	0.07	5.86E-04
6.5	Soils (Cu>50kPa)	18	117	10	79.5	0	117	37.5	0.07	6.28E-04
6.75	Soils (Cu>50kPa)	18	121.5	10	81.5	0	121.5	40	0.07	6.70E-04
7	Soils (Cu>50kPa)	18	126	10	83.5	0	126	42.5	0.07	7.12E-04
7.25	Soils (Cu>50kPa)	18	130.5	10	85.5	0	130.5	45	0.07	7.54E-04
7.5	Soils (Cu>50kPa)	18	135	10	87.5	0	135	47.5	0.07	7.96E-04
7.75	Soils (Cu>50kPa)	18	139.5	10	89.5	0	139.5	50	0.07	8.38E-04
8	Soils (Cu>50kPa)	18	144	10	91.5	0	144	52.5	0.07	8.79E-04
8.25	Soils (Cu>50kPa)	18	148.5	10	93.5	0	148.5	55	0.07	9.21E-04
8.5	Soils (Cu>50kPa)	18	153	10	95.5	0	153	57.5	0.07	9.63E-04
8.75	Soils (Cu>50kPa)	18	157.5	10	97.5	0	157.5	60	0.07	1.01E-03
9	Soils (Cu>50kPa)	18	162	10	99.5	10	159.5	60	0.07	1.01E-03
										13.6
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Northern Portion of Eastern Boundary (Max 12m cut)

Job No. 240065

Designed JLB 28/01/2025
Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.05	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.05	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.05	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.05	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.05	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.05	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.05	0.00E+00
2	Soils (Cu>100kPa)	18	36	10	33.5	0	36	2.5	0.05	3.00E-05
2.25	Soils (Cu>100kPa)	18	40.5	10	35.5	0	40.5	5	0.05	6.00E-05
2.5	Soils (Cu>100kPa)	18	45	10	37.5	0	45	7.5	0.05	9.00E-05
2.75	Soils (Cu>100kPa)	18	49.5	10	39.5	0	49.5	10	0.05	1.20E-04
3	Soils (Cu>100kPa)	18	54	10	41.5	0	54	12.5	0.05	1.50E-04
3.25	Soils (Cu>100kPa)	18	58.5	10	43.5	0	58.5	15	0.05	1.80E-04
3.5	Soils (Cu>100kPa)	18	63	10	45.5	0	63	17.5	0.05	2.10E-04
3.75	Soils (Cu>100kPa)	18	67.5	10	47.5	10	65	17.5	0.00	0.00E+00
4	Soils (Cu>100kPa)	18	72	10	49.5	10	67	17.5	0.00	0.00E+00
4.25	Soils (Cu>100kPa)	18	76.5	10	51.5	10	69	17.5	0.00	0.00E+00
4.5	Soils (Cu>100kPa)	18	81	10	53.5	10	71	17.5	0.00	0.00E+00
4.75	Soils (Cu>100kPa)	18	85.5	10	55.5	10	73	17.5	0.00	0.00E+00
5	Soils (Cu>100kPa)	18	90	10	57.5	10	75	17.5	0.00	0.00E+00
5.25	Soils (Cu>100kPa)	18	94.5	10	59.5	10	77	17.5	0.00	0.00E+00
5.5	Soils (Cu>100kPa)	18	99	10	61.5	10	79	17.5	0.00	0.00E+00
5.75	Soils (Cu>100kPa)	18	103.5	10	63.5	10	81	17.5	0.00	0.00E+00
6	Soils (Cu>100kPa)	18	108	10	65.5	10	83	17.5	0.00	0.00E+00
6.25	Soils (Cu>100kPa)	18	112.5	10	67.5	10	85	17.5	0.00	0.00E+00
6.5	Soils (Cu>100kPa)	18	117	10	69.5	10	87	17.5	0.00	0.00E+00
6.75	Soils (Cu>100kPa)	18	121.5	10	71.5	10	89	17.5	0.00	0.00E+00
7	Soils (Cu>100kPa)	18	126	10	73.5	10	91	17.5	0.00	0.00E+00
7.25	Soils (Cu>100kPa)	18	130.5	10	75.5	10	93	17.5	0.00	0.00E+00
7.5	Soils (Cu>100kPa)	18	135	10	77.5	10	95	17.5	0.00	0.00E+00
7.75	Soils (Cu>100kPa)	18	139.5	10	79.5	10	97	17.5	0.00	0.00E+00
8	Soils (Cu>100kPa)	18	144	10	81.5	10	99	17.5	0.00	0.00E+00
										0.8
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Southern Portion of Eastern Boundary (Max 9m cut)

Job No. 240065

Designed JLB 28/01/2025

Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.05	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.05	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.05	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.05	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.05	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.05	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.05	0.00E+00
2	Soils (Cu>100kPa)	18	36	10	33.5	0	36	2.5	0.05	3.00E-05
2.25	Soils (Cu>100kPa)	18	40.5	10	35.5	0	40.5	5	0.05	6.00E-05
2.5	Soils (Cu>100kPa)	18	45	10	37.5	0	45	7.5	0.05	9.00E-05
2.75	Soils (Cu>100kPa)	18	49.5	10	39.5	0	49.5	10	0.05	1.20E-04
3	Soils (Cu>100kPa)	18	54	10	41.5	0	54	12.5	0.05	1.50E-04
3.25	Soils (Cu>100kPa)	18	58.5	10	43.5	0	58.5	15	0.05	1.80E-04
3.5	Soils (Cu>100kPa)	18	63	10	45.5	0	63	17.5	0.05	2.10E-04
3.75	Soils (Cu>100kPa)	18	67.5	10	47.5	0	67.5	20	0.05	2.40E-04
4	Soils (Cu>100kPa)	18	72	10	49.5	0	72	22.5	0.05	2.70E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	51.5	0	76.5	25	0.05	3.00E-04
4.5	Soils (Cu>100kPa)	18	81	10	53.5	0	81	27.5	0.05	3.30E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	55.5	0	85.5	30	0.05	3.60E-04
5	Soils (Cu>100kPa)	18	90	10	57.5	0	90	32.5	0.05	3.90E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	59.5	10	92	32.5	0.05	3.90E-04
5.5	Soils (Cu>100kPa)	18	99	10	61.5	10	94	32.5	0.00	0.00E+00
5.75	Soils (Cu>100kPa)	18	103.5	10	63.5	10	96	32.5	0.00	0.00E+00
6	Soils (Cu>100kPa)	18	108	10	65.5	10	98	32.5	0.00	0.00E+00
6.25	Soils (Cu>100kPa)	18	112.5	10	67.5	10	100	32.5	0.00	0.00E+00
6.5	Soils (Cu>100kPa)	18	117	10	69.5	10	102	32.5	0.00	0.00E+00
6.75	Soils (Cu>100kPa)	18	121.5	10	71.5	10	104	32.5	0.00	0.00E+00
7	Soils (Cu>100kPa)	18	126	10	73.5	10	106	32.5	0.00	0.00E+00
7.25	Soils (Cu>100kPa)	18	130.5	10	75.5	10	108	32.5	0.00	0.00E+00
7.5	Soils (Cu>100kPa)	18	135	10	77.5	10	110	32.5	0.00	0.00E+00
7.75	Soils (Cu>100kPa)	18	139.5	10	79.5	10	112	32.5	0.00	0.00E+00
8	Soils (Cu>100kPa)	18	144	10	81.5	10	114	32.5	0.00	0.00E+00
										3.1

(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Southern Boundary (Max 8m cut)

Job No. 240065

Designed JLB 28/01/2025

Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.07	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.07	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.07	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.07	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.07	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.07	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.07	0.00E+00
2	Soils (Cu>100kPa)	18	36	10	33.5	0	36	2.5	0.07	4.19E-05
2.25	Soils (Cu>100kPa)	18	40.5	10	35.5	0	40.5	5	0.07	8.38E-05
2.5	Soils (Cu>100kPa)	18	45	10	37.5	0	45	7.5	0.07	1.26E-04
2.75	Soils (Cu>100kPa)	18	49.5	10	39.5	0	49.5	10	0.07	1.68E-04
3	Soils (Cu>100kPa)	18	54	10	41.5	0	54	12.5	0.07	2.09E-04
3.25	Soils (Cu>100kPa)	18	58.5	10	43.5	0	58.5	15	0.07	2.51E-04
3.5	Soils (Cu>100kPa)	18	63	10	45.5	0	63	17.5	0.07	2.93E-04
3.75	Soils (Cu>100kPa)	18	67.5	10	47.5	0	67.5	20	0.07	3.35E-04
4	Soils (Cu>100kPa)	18	72	10	49.5	0	72	22.5	0.07	3.77E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	51.5	0	76.5	25	0.07	4.19E-04
4.5	Soils (Cu>100kPa)	18	81	10	53.5	0	81	27.5	0.07	4.61E-04
4.75	Soils (Cu>100kPa)	18	85.5	10	55.5	0	85.5	30	0.07	5.03E-04
5	Soils (Cu>100kPa)	18	90	10	57.5	0	90	32.5	0.07	5.44E-04
5.25	Soils (Cu>100kPa)	18	94.5	10	59.5	0	94.5	35	0.07	5.86E-04
5.5	Soils (Cu>100kPa)	18	99	10	61.5	0	99	37.5	0.07	6.28E-04
5.75	Soils (Cu>100kPa)	18	103.5	10	63.5	0	103.5	40	0.07	6.70E-04
6	Soils (Cu>100kPa)	18	108	10	65.5	0	108	42.5	0.07	7.12E-04
6.25	Soils (Cu>100kPa)	18	112.5	10	67.5	0	112.5	45	0.07	7.54E-04
6.5	Soils (Cu>100kPa)	18	117	10	69.5	0	117	47.5	0.07	7.96E-04
6.75	Soils (Cu>100kPa)	18	121.5	10	71.5	0	121.5	50	0.07	8.38E-04
7	Soils (Cu>100kPa)	18	126	10	73.5	0	126	52.5	0.07	8.79E-04
7.25	Soils (Cu>100kPa)	18	130.5	10	75.5	0	130.5	55	0.07	9.21E-04
7.5	Soils (Cu>100kPa)	18	135	10	77.5	0	135	57.5	0.07	9.63E-04
7.75	Soils (Cu>100kPa)	18	139.5	10	79.5	0	139.5	60	0.07	1.01E-03
8	Soils (Cu>100kPa)	18	144	10	81.5	10	141.5	60	0.07	1.01E-03
										13.6
										(mm)

Calculate Settlement Due To Groundwater Drawdown.

Russell Road, Wainui : Stage 2 Western Boundary (Max 14m cut)

Job No. 240065

Designed JLB 28/01/2025

Checked

Typical Cross-section

m BLG	Geology	γ	σ	Initial W	Initial σ'	Drained		kN/m2 Δσ'	(m2/MN) m_v	(m) S
0	Ground level at boundary				0		0			
0.25	Soils (Cu>100kPa)	18	4.5	0	4.5	0	4.5	0	0.08	0.00E+00
0.5	Soils (Cu>100kPa)	18	9	0	9	0	9	0	0.08	0.00E+00
0.75	Soils (Cu>100kPa)	18	13.5	0	13.5	0	13.5	0	0.08	0.00E+00
1	Soils (Cu>100kPa)	18	18	0	18	0	18	0	0.08	0.00E+00
1.25	Soils (Cu>100kPa)	18	22.5	0	22.5	0	22.5	0	0.08	0.00E+00
1.5	Soils (Cu>100kPa)	18	27	0	27	0	27	0	0.08	0.00E+00
1.75	Soils (Cu>100kPa)	18	31.5	0	31.5	0	31.5	0	0.08	0.00E+00
2	Soils (Cu>100kPa)	18	36	10	33.5	0	36	2.5	0.08	5.19E-05
2.25	Soils (Cu>100kPa)	18	40.5	10	35.5	0	40.5	5	0.08	1.04E-04
2.5	Soils (Cu>100kPa)	18	45	10	37.5	0	45	7.5	0.08	1.56E-04
2.75	Soils (Cu>100kPa)	18	49.5	10	39.5	0	49.5	10	0.08	2.08E-04
3	Soils (Cu>100kPa)	18	54	10	41.5	0	54	12.5	0.08	2.59E-04
3.25	Soils (Cu>100kPa)	18	58.5	10	43.5	0	58.5	15	0.08	3.11E-04
3.5	Soils (Cu>100kPa)	18	63	10	45.5	0	63	17.5	0.08	3.63E-04
3.75	Soils (Cu>100kPa)	18	67.5	10	47.5	0	67.5	20	0.08	4.15E-04
4	Soils (Cu>100kPa)	18	72	10	49.5	10	69.5	20	0.08	4.15E-04
4.25	Soils (Cu>100kPa)	18	76.5	10	51.5	10	71.5	20	0.00	0.00E+00
4.5	Soils (Cu>100kPa)	18	81	10	53.5	10	73.5	20	0.00	0.00E+00
4.75	Soils (Cu>100kPa)	18	85.5	10	55.5	10	75.5	20	0.00	0.00E+00
5	Soils (Cu>100kPa)	18	90	10	57.5	10	77.5	20	0.00	0.00E+00
5.25	Soils (Cu>100kPa)	18	94.5	10	59.5	10	79.5	20	0.00	0.00E+00
5.5	Soils (Cu>100kPa)	18	99	10	61.5	10	81.5	20	0.00	0.00E+00
5.75	Soils (Cu>100kPa)	18	103.5	10	63.5	10	83.5	20	0.00	0.00E+00
6	Soils (Cu>100kPa)	18	108	10	65.5	10	85.5	20	0.00	0.00E+00
6.25	Soils (Cu>100kPa)	18	112.5	10	67.5	10	87.5	20	0.00	0.00E+00
6.5	Soils (Cu>100kPa)	18	117	10	69.5	10	89.5	20	0.00	0.00E+00
6.75	Soils (Cu>100kPa)	18	121.5	10	71.5	10	91.5	20	0.00	0.00E+00
7	Soils (Cu>100kPa)	18	126	10	73.5	10	93.5	20	0.00	0.00E+00
7.25	Soils (Cu>100kPa)	18	130.5	10	75.5	10	95.5	20	0.00	0.00E+00
7.5	Soils (Cu>100kPa)	18	135	10	77.5	10	97.5	20	0.00	0.00E+00
7.75	Soils (Cu>100kPa)	18	139.5	10	79.5	10	99.5	20	0.00	0.00E+00
8	Soils (Cu>100kPa)	18	144	10	81.5	10	101.5	20	0.00	0.00E+00
										2.3
										(mm)