THOMSON SURVEY LIMITED

SURVEYORS AND RESOURCE PLANNERS

Our Reference: 10519.1 (FNDC)

16th May 2025

Resource Consents Department
Far North District Council
JB Centre
KERIKERI

Dear Sir/Madam

RE: Proposed Subdivision at Range Road, Kawakawa – K & M Trust

I am pleased to submit application on behalf of K & M Trust, for a proposed subdivision of land at Range Road, Kawakawa, zoned Rural Production. The application is a restricted discretionary activity.

The application fee of $4,910 has been paid separately via direct credit.

Regards

Lynley Newport
Senior Planner
THOMSON SURVEY LTD

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Te Kaunihera o Te Hiku o te Ika
Far North District Council

Office Use Only Application Number:

Application for resource consent or fast-track resource consent

(Or Associated Consent Pursuant to the Resource Management Act 1991 (RMA)) (If applying for a Resource Consent pursuant to Section 87AAC or 88 of the RMA, this form can be used to satisfy the requirements of Schedule 4). Prior to, and during, completion of this application form, please refer to Resource Consent Guidance Notes and Schedule of Fees and Charges — both available on the Council's web page.

1. Pre-Lodgement Meeting

Have you met with a council Resource Consent representative to discuss this application prior to lodgement? ◯ **Yes** ✓ **No**

2. Type of Consent being applied for

(more than one circle can be ticked):

- ◯ **Land Use**
- ◯ **Fast Track Land Use***
- ✓ **Subdivision**
- ◯ **Consent under National Environmental Standard** (e.g. Assessing and Managing Contaminants in Soil)
- ◯ **Discharge**
- ◯ **Change of Consent Notice (s.221(3))**
- ◯ **Extension of time (s.125)**
- ◯ **Other (please specify)** _____

** The fast track is for simple land use consents and is restricted to consents with a controlled activity status.*

3. Would you like to opt out of the Fast Track Process?

✓ **Yes** ◯ **No**

4. Consultation

Have you consulted with Iwi/Hapū? ◯ **Yes** ✓ **No**

If yes, which groups have you consulted with?	
Who else have you consulted with?	

For any questions or information regarding iwi/hapū consultation, please contact Te Hono at Far North District Council tehonosupport@fndc.govt.nz

5. Applicant Details

Name/s: K & M Trust

Email: [redacted]

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

6. Address for Correspondence

Name and address for service and correspondence (if using an Agent write their details here)

Name/s: Lynley Newport

Email: [redacted]

Phone number:

Postal address:
(or alternative method of service under section 352 of the act)

** All correspondence will be sent by email in the first instance. Please advise us if you would prefer an alternative means of communication.*

7. Details of Property Owner/s and Occupier/s

Name and Address of the Owner/Occupiers of the land to which this application relates (where there are multiple owners or occupiers please list on a separate sheet if required)

Name/s: Megan McCracken & Keith Taylor

Property Address/ Location:
1127 Pungaere Road
RD2
Kerikeri
Postcode 0295

8. Application Site Details

Location and/or property street address of the proposed activity:

Name/s: Refer above

Site Address/ Location: Range Road
KAWAKAWA

Postcode

Legal Description: Sec 77 & Pt Sec 30 Blk XVI Kawa **Val Number:**

Certificate of title: NA879/87

Please remember to attach a copy of your Certificate of Title to the application, along with relevant consent notices and/or easements and encumbrances (search copy must be less than 6 months old)

Site visit requirements:

Is there a locked gate or security system restricting access by Council staff? ◯ **Yes** ✓ **No**

Is there a dog on the property? ◯ **Yes** ✓ **No**

Please provide details of any other entry restrictions that Council staff should be aware of, e.g. health and safety, caretaker's details. This is important to avoid a wasted trip and having to re-arrange a second visit.

Please contact Megan McCracken 0272910875 at least 1 day before any visits so farm managers can be notified.

9. Description of the Proposal:

Please enter a brief description of the proposal here. Please refer to Chapter 4 of the District Plan, and Guidance Notes, for further details of information requirements.

Subdivision of land in the Rural Production Zone where the title is older than April 2000, to create a total of 5 lots all in excess of 2ha, as a restricted discretionary activity.

If this is an application for a Change or Cancellation of Consent Notice conditions (s.221(3)), please quote relevant existing Resource Consents and Consent Notice identifiers and provide details of the change(s), with reasons for requesting them.

10. Would you like to request Public Notification?

◯ **Yes** ✓ **No**

11. Other Consent required/being applied for under different legislation

(more than one circle can be ticked):

- ◯ **Building Consent** Enter BC ref # here (if known)
- ◯ **Regional Council Consent (ref # if known)** Ref # here (if known)
- ◯ **National Environmental Standard consent** Consent here (if known)
- ◯ **Other (please specify)** Specify 'other' here

12. National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health:

The site and proposal may be subject to the above NES. In order to determine whether regard needs to be had to the NES please answer the following:

Is the piece of land currently being used or has it historically ever been used for an activity or industry on the Hazardous Industries and Activities List (HAIL) ◯ **Yes** ✓ **No** ◯ **Don't know**

Is the proposed activity an activity covered by the NES? Please tick if any of the following apply to your proposal, as the NESCS may apply as a result. ✓ **Yes** ◯ **No** ◯ **Don't know**

- ✓ **Subdividing land**
- ◯ **Changing the use of a piece of land**
- ◯ **Disturbing, removing or sampling soil**
- ◯ **Removing or replacing a fuel storage system**

13. Assessment of Environmental Effects:

Every application for resource consent must be accompanied by an Assessment of Environmental Effects (AEE). This is a requirement of Schedule 4 of the Resource Management Act 1991 and an application can be rejected if an adequate AEE is not provided. The information in an AEE must be specified in sufficient detail to satisfy the purpose for which it is required. Your AEE may include additional information such as Written Approvals from adjoining property owners, or affected parties.

Your AEE is attached to this application ✓ **Yes**

13. Draft Conditions:

Do you wish to see the draft conditions prior to the release of the resource consent decision? ● **Yes** ◯ **No**

If yes, do you agree to extend the processing timeframe pursuant to Section 37 of the Resource Management Act by 5 working days? ✓ **Yes** ◯ **No**

14. Billing Details:

This identifies the person or entity that will be responsible for paying any invoices or receiving any refunds associated with processing this resource consent. Please also refer to Council's Fees and Charges Schedule.

Name/s: (please write in full) K&MTrust

Email: [redacted]

Phone number: [redacted]

Postal address: (or alternative method of service under section 352 of the act) [redacted]

Fees Information

An instalment fee for processing this application is payable at the time of lodgement and must accompany your application in order for it to be lodged. Please note that if the instalment fee is insufficient to cover the actual and reasonable costs of work undertaken to process the application you will be required to pay any additional costs. Invoiced amounts are payable by the 20th of the month following invoice date. You may also be required to make additional payments if your application requires notification.

Declaration concerning Payment of Fees

I/we understand that the Council may charge me/us for all costs actually and reasonably incurred in processing this application. Subject to my/our rights under Sections 357B and 358 of the RMA, to object to any costs, I/we undertake to pay all and future processing costs incurred by the Council. Without limiting the Far North District Council's legal rights if any steps (including the use of debt collection agencies) are necessary to recover unpaid processing costs I/we agree to pay all costs of recovering those processing costs. If this application is made on behalf of a trust (private or family), a society (incorporated or unincorporated) or a company in signing this application I/we are binding the trust, society or company to pay all the above costs and guaranteeing to pay all the above costs in my/our personal capacity.

Name: (please write in full) Megan McCracken

Signature: (signature of bill payer) [redacted] MANDATORY

Date 12-May-2025

15. Important Information:

Note to applicant

You must include all information required by this form. The information must be specified in sufficient detail to satisfy the purpose for which it is required.

You may apply for 2 or more resource consents that are needed for the same activity on the same form.

You must pay the charge payable to the consent authority for the resource consent application under the Resource Management Act 1991.

Fast-track application

Under the fast-track resource consent process, notice of the decision must be given within 10 working days after the date the application was first lodged with the authority, unless the applicant opts out of that process at the time of lodgement. A fast-track application may cease to be a fast-track application under section 87AAC(2) of the RMA.

Privacy Information:

Once this application is lodged with the Council it becomes public information. Please advise Council if there is sensitive information in the proposal. The information you have provided on this form is required so that your application for consent pursuant to the Resource Management Act 1991 can be processed under that Act. The information will be stored on a public register and held by the Far North District Council. The details of your application may also be made available to the public on the Council's website, www.fndc.govt.nz. These details are collected to inform the general public and community groups about all consents which have been issued through the Far North District Council.

15. Important information continued...

Declaration

The information I have supplied with this application is true and complete to the best of my knowledge.

Name: (please write in full) Megan McCracken

Signature:

Date 12-May-2025

A signature is not required if the application is made by electronic means

Checklist (please tick if information is provided)

- ☑ Payment (cheques payable to Far North District Council)
- ☑ A current Certificate of Title (Search Copy not more than 6 months old)
- ☐ Details of your consultation with Iwi and hapū
- ☑ Copies of any listed encumbrances, easements and/or consent notices relevant to the application
- ☑ Applicant / Agent / Property Owner / Bill Payer details provided
- ☑ Location of property and description of proposal
- ☑ Assessment of Environmental Effects
- ☐ Written Approvals / correspondence from consulted parties
- ☑ Reports from technical experts (if required)
- ☐ Copies of other relevant consents associated with this application
- ☐ Location and Site plans (land use) AND/OR
- ☑ Location and Scheme Plan (subdivision)
- ☐ Elevations / Floor plans
- ☐ Topographical / contour plans

Please refer to Chapter 4 of the District Plan for details of the information that must be provided with an application. Please also refer to the RC Checklist available on the Council's website. This contains more helpful hints as to what information needs to be shown on plans.

K & M Trust

Far North District Plan

PROPOSED SUBDIVISION

Range Road, Kawakawa

PLANNING REPORT AND ASSESSMENT OF ENVIRONMENTAL EFFECTS

Thomson Survey Ltd
Kerikeri

1.0 INTRODUCTION

1.1 The Proposal

The applicants propose to carry out a subdivision of their property on Range Road, Kawakawa to create five lots (four additional). The property also has frontage to Settlement Road. The existing title consists of Section 77 Blk XVI Kawakawa SD and Pt Section 30 Blk XVI Kawakawa SD, held in Record of Title NA879/87, with an area of 46.37ha.

The proposal seeks the creation of Lots 1-4 all between 2.2 and 2.5ha in area, with frontage to Range Road; and balance Lot 5, with frontage to both Range and Settlement Roads, of 36.97ha. All lots are vacant sites.

Range and Settlements Roads are public roads, maintained by Council, metal surface.

Refer to Appendix 1 for copies of the Scheme Plans.

1.2 Scope of this Report

This assessment and report accompanies the Resource Consent Application and is provided in accordance with Section 88 and Schedule 4 of the Resource Management Act 1991. The application seeks consent under the District Plan for a subdivision as a restricted discretionary activity. The name and address of the owner of the property is contained in the Form 9 Application form.

2.0 PROPERTY DETAILS

Location:	Range Road, Kawakawa. Location Plan is attached in Appendix 2.
Legal description:	Section 77 Blk XVI Kawakawa SD and Pt Section 30 Blk XVI Kawakawa SD
CT:	NA879/87, with an area of 46.37ha (copy attached in Appendix 3).

3.0 SITE DESCRIPTION

3.1 Physical characteristics.

The Range Road frontage runs along a ridgeline and is the high point for the application site. The land then slopes downwards to the west and to Settlement Road. The topography is undulating, with moderate gradient in the location of the proposed additional lots.

Looking west, down slope from inside property adjacent to Range Road- approximate location of potential house site within Lot 2

The land is in grazing in its entirety, fenced into paddocks and with farm access tracks and stock water sources. The surrounding land is in similar usage, with a property to the immediate south containing a dwelling.

The site is vacant (no buildings). Power lines run along the same ridge line that accommodates Range Road, with the poles and lines just inside the application site boundaries, before veering off to the northwest through lots 1-2.

The site is not serviced by Council 3 waters services. Frontage to the new lots is via Council maintained public road, metal surface.

For geological setting, refer to the Site Suitability Report in Appendix 5.

The property is zoned Rural Production in both the Operative and Proposed District Plans. No high or outstanding landscape or natural features are identified within the site. The property contains predominantly LUC Class 4 soils, with no LUC Class 1-3 soils in the vicinity. It is not mapped as containing any heritage/cultural sites, nor is the site mapped as kiwi present or high density kiwi, nor any Protected Natural Area (PNA).

The site is not mapped as being subject to river flood hazard, apart from a tiny area in the property's extreme southwest corner (within large balance lot); and is not mapped as being Erosion Prone in the Regional Plan for Northland.

3.2 Legal Interests

The Title is not subject to any legal interests that affect the proposed subdivision.

3.3 Consent History

There are no building consents listed for the property. There is also no resource consent history relevant to the current title, which is dated 1947.

4.0 SCHEDULE 4 – INFORMATION REQUIRED IN AN APPLICATION

Clauses 2 & 3: Information required in all applications

(1) An application for a resource consent for an activity must include the following:	
(a) a description of the activity: .*	Refer Sections 1 and 5 of this Planning Report.
(b) an assessment of the actual or potential effect on the environment of the activity:	Refer to Section 6 of this Planning Report.
(b) a description of the site at which the activity is to occur:	Refer to Section 3 of this Planning Report.
(c) the full name and address of each owner or occupier of the site:	This information is contained in the Form 9 attached to the application.
(d) a description of any other activities that are part of the proposal to which the application relates:	Refer to Sections 3 and 5 of this Planning Report for existing activities within the site. The application is for subdivision.
(e) a description of any other resource consents required for the proposal to	No other consents are required other than that being applied for pursuant to the Far North Operative District Plan.

which the application relates:	
(f) an assessment of the activity against the matters set out in Part 2:	Refer to Section 7 of this Planning Report.
(g) an assessment of the activity against any relevant provisions of a document referred to in section 104(1)(b), including matters in Clause (2): (*a) any relevant objectives, policies, or rules in a document; and* *(b) any relevant requirements, conditions, or permissions in any rules in a document; and* *(c) any other relevant requirements in a document (for example, in a national environmental standard or other regulations).*	Refer to Sections 5 & 7 of this Planning Report.
(3) *An application must also include any of the following that apply:*	
(a) if any permitted activity is part of the proposal to which the application relates, a description of the permitted activity that demonstrates that it complies with the requirements, conditions, and permissions for the permitted activity (so that a resource consent is not required for that activity under section 87A(1)):	Refer sections 3 and 5. The site is vacant.
(b) if the application is affected by section 124 or 165ZH(1)(c) (which relate to existing resource consents), an assessment of the value of the investment of the existing consent holder (for the purposes of section 104(2A)):	There is no existing resource consent. Not applicable.
(c) if the activity is to occur in an area within the scope of a planning document prepared by a customary marine title group under section 85 of the Marine and Coastal Area (Takutai Moana) Act 2011, an assessment of the activity against any resource management matters set out in that planning document (for the purposes of section 104(2B)).	The site is not within an area subject to a customary marine title group. Not applicable.

Clause 4: Additional information required in application for subdivision consent

(4) An application for a subdivision consent must also include information that adequately defines the following:	
(a) the position of all new boundaries: *(b) the areas of all new allotments, unless the subdivision involves a cross*	Refer to Scheme Plans in Appendix 1.

lease, company lease, or unit plan: *(c) the locations and areas of new reserves to be created, including any esplanade reserves and esplanade strips:* *(d) the locations and areas of any existing esplanade reserves, esplanade strips, and access strips:* *(e) the locations and areas of any part of the bed of a river or lake to be vested in a territorial authority under section 237A:* *(f) the locations and areas of any land within the coastal marine area (which is to become part of the common marine and coastal area under section 237A):* *(g) the locations and areas of land to be set aside as new roads.*	

Clause 5: Additional information required for application for reclamation – not applicable.

Clause 6: Information required in assessment of environmental effects

(1) An assessment of the activity's effects on the environment must include the following information:	
(a) if it is likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:	Refer to Section 6 of this planning report. The activity will not result in any significant adverse effect on the environment.
(b) an assessment of the actual or potential effect on the environment of the activity:	Refer to Section 6 of this planning report.
(c) if the activity includes the use of hazardous installations, an assessment of any risks to the environment that are likely to arise from such use:	Not applicable as the application does not involve hazardous installations.
(d) if the activity includes the discharge of any contaminant, a description of— *(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and* *(ii) any possible alternative methods of discharge, including discharge into any other receiving environment:*	The subdivision does not involve any discharge of contaminant.
(e) a description of the mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help prevent or reduce the actual or potential effect:	Refer to Section 6 of this planning report.
(f) identification of the persons affected by the activity, any consultation	Refer to Section 8 of this planning report. No affected persons are identified.

undertaken, and any response to the views of any person consulted:	
g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved:	No monitoring is required as the scale and significance of effects does not warrant any.
(h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).	No protected customary right is affected.

Clause 7: Matters that must be addressed by assessment of environmental effects (RMA)

(1) An assessment of the activity's effects on the environment must address the following matters:	
(a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects:	Refer to Sections 6 and 8 of this planning report and also to the assessment of objectives and policies in Section 7.
(b) any physical effect on the locality, including any landscape and visual effects:	Refer to Section 6. The proposed activity will have no adverse, effects on the physical environment and landscape and visual amenity values.
(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity:	Refer to Section 6.0. The proposal will not result in adverse effects in regard to habitat and ecosystems.
(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations:	Refer to Section 6, and above comments
(e) any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants:	The subdivision will not result in the discharge of contaminants, nor any unreasonable emission of noise.
(f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or hazardous installations.	The subdivision site is not subject to natural hazards and does not involve hazardous installations.

5.0 COMPLIANCE ASSESSMENT

5.1 Weighting of the Plans

The proposal is subject to the Proposed District Plan (PDP) process, whereby the PDP was publicly notified on 27th July 2022. The site is zoned Rural Production under the PDP. When the PDP was first notified there were a number of rules which were identified as having immediate legal effect. As such, an assessment of the relevant rules and related objectives and policies of the PDP form part of this application.

In regard to the weighting of the Plans, submissions and further submissions have closed (including those to Variation 1) and hearings are under way and not expected to conclude until near the end of 2025. I have not identified any rules in the PDP, relevant to this proposal that had immediate legal effect from July 2022, and decisions on submissions have yet to be notified. As such this application gives no weight to any PDP rules.

5.2 Operative District Plan Zoning

The property is zoned Rural Production. No Resource features apply. The subdivision standards applying in the zone are contained in Table 13.7.2.1 as shown below.

TABLE 13.7.2.1: MINIMUM LOT SIZES

(i) RURAL PRODUCTION ZONE

Controlled Activity Status (Refer also to 13.7.3)	**Restricted Discretionary Activity Status (Refer also to 13.8)**	**Discretionary Activity Status (Refer also to 13.9)**
The minimum lot size is 20ha.	1. Subdivision that complies with the controlled activity standard, but is within 100m of the boundary of the Minerals Zone; 2. The minimum lot size is 12ha; or 3. A maximum of 3 lots in any subdivision, provided that the minimum lot size is 4,000m2 and there is at least 1 lot in the subdivision with a minimum lot size of 4ha, and provided further that the subdivision is of sites which existed at or prior to 28 April 2000, or which are amalgamated from titles existing at or prior to 28 April 2000; or **4. A maximum of 5 lots in a subdivision (including the parent lot) where the minimum size of the lots is 2ha, and where the subdivision is created from a site that existed at or prior to 28 April 2000;**	1. The minimum lot size is 4ha; or 2. A maximum of 3 lots in any subdivision, provided that the minimum lot size is 2,000m² and there is at least 1 lot in the subdivision with a minimum size of 4ha, and provided further that the subdivision is of sites which existed at or prior to 28 April 2000, or which are amalgamated from titles existing at or prior to 28 April 2000; or 3. A subdivision in terms of a management plan as per Rule 13.9.2 may be approved. ....

The creation of five lots of greater than 2ha, where the title is older than April 2000, is a restricted discretionary subdivision activity pursuant to option 4 above (in bold). The proposal creates five lots and the title is dated 1947, therefore meets the requirements of option 4. The subdivision is therefore regarded as a Restricted Discretionary subdivision activity.

Zone Rules:

I have not identified any zone rule breaches.

District Wide Rules:

The site is not subject to chapters 12.1 or 12.2 (landscape and indigenous vegetation). In regard to Chapter 12.3, earthworks associated with subdivision site works will be restricted to access and crossings. The threshold applying to the Rural Production Zone is large, at 5000m^3. The Site Suitability Report in Appendix 5 confirms that cut and fill volumes for any subdivision site works will easily meet permitted activity standards.

Chapter 12.4 (Natural Hazards) is not relevant in regard to coastal hazards given the site is not located on the coast. Rule 12.4.6.1.2 Fire Risk to Residential Units is not relevant as there are no areas of bush to stay clear of.

The proposal is not subject to Chapter 12.5 (Heritage) as there are no heritage or cultural resources mapped for the site, nor Chapter 12.7 (Waterbodies) as there are no qualifying waterbodies from which setback is required, particularly in regard to the proposed additional smaller lots along Range Road frontage. No works is proposed in any indigenous wetland.

An assessment of the proposal against Chapter 15.1.6C.1.1 to 11 has been carried out, with no breaches identified.

Rule 15.1.6C.1.1(a) – private access is all via direct crossing to Range Road (no shared rights of way proposed). Part (b) only applies to urban zones. Parts (c) and (d) are complied with. Similarly, part (e) is complied with. Rule 15.1.6C.1.3 is not applicable as no passing bays are required. Similarly, there is no footpath so Rule 15.1.6C.1.4 does not apply.

Rule 15.1.6C.1.5 specifies vehicle crossing standards and new crossings into the additional lots can be formed to these standards, as they apply to single width unkerbed crossings off metal road surface.

Rule 15.1.6C.1.7 can be complied with. Rule 15.1.6C.1.8(a) is not applicable as no legal road width widening is required. Range Road is Council maintained public road to reasonable width and standard (part (b)). Part (c) may apply to the large balance Lot 5, however there is nothing in the District Plan that precludes a large rural allotment from having more than one crossing, and these need not be to the same frontage. I do not believe there to be any road encroachment, so part (d) does not apply.

No other district wide rules in the ODP are applicable.

The application remains a restricted discretionary subdivision activity overall.

5.2 Proposed District Plan (PDP) Assessment

There are certain rules that have been identified in the PDP as having immediate legal effect and that may affect the category of activity under the Act. These include:

Rules HS-R2, R5, R6 and R9 in regard to hazardous substances on scheduled sites or areas of significance to Maori, significant natural areas or a scheduled heritage resource.

There are no scheduled sites or areas of significance to Maori, significant natural areas or any scheduled heritage resource on the site, therefore these rules are not relevant to the proposal.

Heritage Area Overlays – N/A as none apply to the application site.

Historic Heritage rules and Schedule 2 – N/A as the site does not have any identified (scheduled) historic heritage values.

Notable Trees – N/A – no notable trees on the site.

Sites and Areas of Significance to Maori – N/A – the site does not contain any site or area of significance to Maori.

Ecosystems and Indigenous Biodiversity – Rules IB-R1 to R5 inclusive.
No indigenous vegetation clearance is proposed.

Subdivision (specific parts) – only subdivision provisions relating to land containing Significant Natural Area or Heritage Resources have immediate legal effect. The site contains no scheduled or mapped Significant Natural Areas or Heritage Resources.

Activities on the surface of water – N/A as no such activities are proposed.

Earthworks – Only some rules and standards have legal effect. These are Rules EW-R12 and R13 and related standards EW-S3 and ES-S5 respectively. EW-R12 and associated EW-S3 relate to the requirement to abide by Accidental Discovery Protocol if carrying out earthworks and artefacts are discovered. EW-R13 and associated EW-S5 refer to operating under appropriate Erosion and Sediment Control measures. The only earthworks required to give effect to the subdivision is the formation of crossings to the boundary of the proposed new lots. This can be carried out in compliance with the above referenced rules/standards.

Signs – N/A – signage does not form part of this application.

Orongo Bay Zone – N/A as the site is not in Oronga Bay Zone.

There are no zone rules in the PDP with immediate legal effect that affect the proposal's activity status.

6.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

The assessment of environmental effects below includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment, as required by Clause 2(3)(c) of Schedule 4 of the Act.

A restricted discretionary activity is described in s87A of the Act, clause (3).

If an activity is described in this Act, regulations (including any national environmental standard), a plan, or a proposed plan as a restricted discretionary activity, a resource consent is required for the activity and—

*(a)**the consent authority's power to decline a consent, or to grant a consent and to impose conditions on the consent, is restricted to the matters over which discretion is restricted** (whether in its plan or proposed plan, a national environmental standard, or otherwise); and*

(b)if granted, the activity must comply with the requirements, conditions, and permissions, if any, specified in the Act, regulations, plan, or proposed plan.

It is also subject to s104C of the Act:

*(1) When considering an application for a resource consent for a restricted discretionary activity, a consent authority must consider **only** those matters over which-*
(a) A discretion is restricted in national environmental standards or other regulations;
(b) It has restricted the exercise of its discretion in its plan or proposed plan; …..
*(3) ……. if it grants the application, the consent authority may impose conditions under section 108 **only** for those matters over which –*
(a) A discretion is restricted in national environmental standards or other regulations;
(b) It has restricted the exercise of its discretion in its plan or proposed plan.

The subdivision meets the restricted discretionary number/size of lots specified in Table 13.7.2.1. Far North District Plan lays out in 13.8.1, the matters to which it restricts its discretion in determining whether to grant consent to a restricted discretionary activity, and then lays out the matters to which it will restrict its discretion when considering whether to impose conditions.

13.8.1 SUBDIVISION WITHIN THE RURAL PRODUCTION ZONE

*……. In considering **whether or not to grant consent** on applications for restricted discretionary subdivision activities, the Council will restrict the exercise of its discretion to the following matters:*

(i) for applications under 13.8.1(a):
- *effects on the natural character of the coastal environment for proposed lots which are in the coastal environment.*

(ii) for applications under 13.8.1(b) or (c):
- *effects on the natural character of the coastal environment for proposed lots which are in the coastal environment;*
- *effects of the subdivision under (b) and (c) above within 500m of land administered by the Department of Conservation upon the ability of the Department to manage and administer its land;*
- *effects on areas of significant indigenous flora and significant habitats of indigenous fauna;*
- *the mitigation of fire hazards for health and safety of residents.*

*In considering **whether or not to impose conditions** on applications for restricted discretionary subdivision activities the Council will restrict the exercise of its discretion to the following matters:*
(1) the matters listed in 13.7.3;
(2) the matters listed in (i) and (ii) above

In the case of this application, the application is lodged pursuant to 13.8.1(c), and therefore clause (ii) applies:

- *effects on the natural character of the coastal environment for proposed lots which are in the coastal environment;*

The property is not within the coastal environment.

- *effects of the subdivision under (b) and (c) above within 500m of land administered by the Department of Conservation upon the ability of the Department to manage and administer its land;*

There is no land administered by the Department of Conservation within 500m of the application site.

- *effects on areas of significant indigenous flora and significant habitats of indigenous fauna;*

There are no areas of significant indigenous flora or significant habitats of indigenous fauna within the application site.

- *the mitigation of fire hazards for health and safety of residents.*

There are no areas of bush from which separation distance is required.

In summary, there are no grounds for the Council to refuse consent.

In determining conditions of consent, the following AEE is offered.

6.1 Allotment Sizes and Dimensions

All lots are all in excess of 2ha, have been shown to be able to provide for future residential development, and are of an appropriate size and dimension for such development, easily accommodating a 30m x 30m square building envelope complying with setback requirements.

6.2 Natural and Other Hazards

Refer to the Site Suitability Report in Appendix 5 and to the Geotechnical Investigation Report in Appendix 6. Neither report identifies any reason pursuant to s106 of the RMA to decline the subdivision. Slope analysis was carried out with all lots "passing" and containing suitable building platforms, with the exception of Lot 4. However, instability issues can be remedied or mitigated by shifting the building platform further away from the slope and/or imposing a building line restriction. Alternatively earth stabilisation works could be carried out. Risk from landslip can be appropriately mitigated such that effects are less than minor.

In terms of other hazards, any erosion potential can be mitigated by means of stormwater dispersion control and erosion and sediment control measures resulting in effects being less than minor. Overland flow paths, flooding and inundation can be avoided and effects rendered less than minor through mitigation by means of flood control attenuation.

The site is not subject to rockfall; alluvion; avulsion; unconsolidated fill; subsidence; fire hazard or sea level rise.

The property is not listed as a HAIL site by Northland Regional Council [*source*: NRC online maps], or on Far North Maps.

6.3 Water Supply

There is no Council reticulated water supply available to the property and the Council can impose its standard requirement in regard to potable and fire fighting water supply for Lots 1-4. It is not considered necessary for Lot 5 given it is a balance farm lot. Refer also to Section 7 of the Site Suitability Report in Appendix 5.

6.4 Energy Supply & Telecommunications

Energy supply and telecommunications are not a requirement of rural subdivisions. The Council can impose its standard consent notice as follows:

Electricity supply is not a condition of this consent and power has not been reticulated to the boundary of the lot. The lot owner is responsible for the provision of a power supply to operate the on-site aerobic wastewater treatment plant and any other device which requires electrical power to operate.

Notwithstanding this, power infrastructure runs along Range Road, and through proposed lots. Top Energy has been contacted and has requested easement in gross over the existing infrastructure alignment. Correspondence is attached in Appendix 4.

6.5 Stormwater Disposal

Refer to the Site Suitability Report in Appendix 5, specifically Section 6 of that report, and Table 11 in Appendix C of that Report. A reasonable level of development on each of the proposed vacant lifestyle lots would see an impermeable surface coverage of around 300m^2 for buildings and 200m^2 for driveways. This equates to between 2 and 2.3% of each of the lots. Impermeable coverage will easily remain within permitted activity status at time of each lot's development.

The Site Suitability Report provides commentary on stormwater management concepts, design storm event, and concept stormwater attenuation for house sites and access.

In summary the proposal, and future development of lots, will not create adverse stormwater runoff effects.

6.6 Sanitary Sewage Disposal

Refer to Section 5 of the Report in Appendix 5. The Report assumes that the proposed new lots may comprise up to a five bedroom dwelling with a peak occupancy of eight people. This equates to a maximum total daily wastewater generation of 160litres/day per/per person on each proposed lot. The report recommends an appropriate land disposal system, with primary disposal area of 640m^2 and a conservative 50% reserve field (if utilising secondary treatment, noting the Regional Plan only requires 30%).

The report provides a summary of concept wastewater design and assesses environmental effects. It also assesses proposed future systems against the criteria in the Regional Plan for compliance (Table 10 of Appendix C of the Site Suitability Report).

Whilst the report bases its assessment on secondary treatment and can confirm compliance with permitted activity thresholds on that basis, it may also be possible for future lot owners to install primary treatment. This should be a decision for a future lot owner at time of building consent, where a TP58 Site Suitability report can be provided and compliance against the Regional Plan assessed for the specific design being proposed.

6.7 Easements for any purpose

The application site is not subject to any existing easements. At Top Energy's request, easement in gross to protect electricity infrastructure can be added to the survey plan prior to it being submitted to Council for approval.

6.8 Property Access

As stated earlier, access to all 4 additional lot is directly off Range Road. This is a Council maintained metal surface road. Good sightlines can be achieved for crossings into each lot. Indicative crossing locations are shown on drawings forming part of the Site Suitability Report.

Range Road, looking north, along frontage to Lots 1 & 2

Range Road looking south along frontage to balance Lot 5

Lot 1's crossing can be located in the approximately location of an existing farm gate crossing. Lot 2's crossing would be located on the same straight section of Range Road, some 70m south of Lot 1's crossing. Lot 3's indicative crossing is approximately 120m further south again, still on the same straight portion of Range Road. An indicative crossing into Lot 4 has been shown near the adjacent property's driveway entrance, on the outside of a gentle curve, affording good visibility in both directions.

6.9 Earthworks

Refer to Section 8 of the Site Suitability Report in Appendix 5. Subdivision works will require earthworks for vehicle crossings. These will be minimal and easily complying with permitted activity thresholds.

6.10 Building Locations

All lots are capable of providing physically suitable building sites – refer to commentary in e Site Suitability Report in Appendix 5. Given slope stability findings, the house site on Lot 4 will need to be setback from the slope and a building line restriction can be imposed. Alternatively it would be possible to carry out site stabilisation works prior to building. This is the only restriction identified in terms of building locations. Further site specific investigation should be undertaken at building consent stage by an appropriately qualified professional.

All lots can provide for a building site that will not be subject to inundation. As such there is no need for minimum floor levels to be specified.

Potential house sites are elevated on undulating. All are near the road frontage.

6.11 Preservation and enhancement of heritage resources (including cultural), vegetation, fauna and landscape, and land set aside for conservation purposes

Heritage Resources, including cultural values

The site contains no historic sites or sites of cultural significance to Māori as recorded on/in the District Plan's Resource Maps or Schedules. There are no NZAA archaeological sites mapped on the site.

Vegetation, Fauna and Landscape

The subdivision will not require the clearance of any indigenous vegetation on the application site. The site is entirely in grazing. There are no areas of significant indigenous flora or fauna on the site. The site is not in a high density or kiwi present area.

The site is not mapped as containing any inland natural wetlands, nor any areas of high or outstanding natural character or landscape areas.

In short, there are no flora/fauna or landscape values worthy of identification and protection, and no justification for any ban or restriction on the keeping of dogs or cats.

6.12 Soil

The property contains poorer quality soils – primarily Class 4 LUC soils. The proposal is low density and will have very little, if any, impact on the life supporting capacity of soils.

6.13 Access to, and protection of, waterbodies

There are no qualifying waterbodies to which public access is required. The subdivision does not adversely affect waterbodies, including any wetlands (refer to comments under 6.11 above).

6.14 Land use compatibility (reverse sensitivity)

The property is vacant. The surrounding area supports limited residential development in a rural setting, but is reasonably close to the Kawakawa residential area. The area is ideal for those wanting to be in the country side, yet close to an urban centre. The creation of additional low density lots will not unduly increase the risk of reverse sensitivity.

6.15 Energy Efficiency and renewable Energy Development/Use

The proposal has not considered energy efficiency. This is an option for future lot owners, albeit the intention is that the lots be self sufficient in regard to power supply.

6.16 Effects on Rural Character and Amenity

All proposed lots are rural in nature/character. The proposal is low density, the size of the lots means that rural amenity will be maintained. In my opinion, the proposal will have no adverse effects on rural character. As stated under 6.14 above, even though rural in nature, the site is not that far from the Kawakawa township and amenities.

6.17 Cumulative and Precedent Effects

The proposal will create four additional lots, however, all are large enough to maintain rural character and amenity and the density level does not create a more than minor adverse cumulative effect in terms of built development.

Determining whether there is an adverse precedent effect is generally reserved for non complying activities, which this is not. In any event, the proposed subdivision does not set an adverse precedent effect and does not threaten the integrity of the ODP or those parts of the PDP with legal effect.

7.0 STATUTORY ASSESSMENT

In accordance with Section 104(1)(b) of the Act, the following documents are considered relevant to the application.

7.1 National Policy Statements & Standards

I have not identified any National Policy Statement relevant to the proposal, nor any National Environmental Standard. No natural inland wetlands or water bodies are affected, the site has not historically been used for any HAIL activity, there is no indigenous vegetation

clearance or protection proposed, and the soils are not 'highly productive land' by definition.

7.2 Regional Policy Statement for Northland (RPS)

I do not consider the proposal to be inconsistent with any relevant objectives and policies in the RPS for Northland. The proposed lots will result in additional built development, but the proposal does not result in any material loss in productivity and does not result in reverse sensitivity effects.

The site is not subject to hazard. The site is not coastal and has no high or outstanding natural character or landscape values, and no heritage/cultural values.

The proposal does not, in my opinion, create any undue reverse sensitivity effects.

7.3 Regional Plan (Appeals Version)

The subdivision does not result in any breaches of rules in the Regional Plan.

7.4 District Plan Objectives and Policies

I consider the subdivision to be consistent with the subdivision objectives and policies in Chapter 13. In particular I consider the proposal to be consistent with Objective 13.3.1 which provides for (enables) subdivision in a way that promotes sustainable management of natural and physical resources; and Objective 13.3.2 and associated Policy 13.4.1, which seek to ensure that the subdivision of land is appropriate and carried out in a manner that does not compromise air, water, soil or ecosystems, and that avoids, remedies or mitigates any adverse effects.

The Rural Production zone is an enabling zone, providing for a variety of activities subject to avoiding, remedying or mitigating adverse effects and compatibility with the amenity values of rural areas and rural production activities. I consider the proposed subdivision to be consistent with the zone's objectives and policies.

OBJECTIVES

13.3.1 To provide for the subdivision of land in such a way as will be consistent with the purpose of the various zones in the Plan, and will promote the sustainable management of the natural and physical resources of the District, including airports and roads and the social, economic and cultural well being of people and communities.

13.3.2 To ensure that subdivision of land is appropriate and is carried out in a manner that does not compromise the life-supporting capacity of air, water, soil or ecosystems, and that any actual or potential adverse effects on the environment which result directly from subdivision, including reverse sensitivity effects and the creation or acceleration of natural hazards, are avoided, remedied or mitigated.

The subdivision is consistent with both the above objectives. It promotes sustainable management of the natural and physical resources of the District and provides for the applicants' social and economic well being. It is an appropriate subdivision that does not compromise the life-supporting capacity of air, water, soil or ecosystems, and adverse effects are minimal.

13.3.3 To ensure that the subdivision of land does not jeopardise the protection of outstanding landscapes or natural features in the coastal environment.

13.3.4 To ensure that subdivision does not adversely affect scheduled heritage resources through alienation of the resource from its immediate setting/context.

The property has no outstanding landscape values, and is not within the coastal environment. There are no 'scheduled heritage resources' identified in the District Plan on the property.

13.3.5 To ensure that all new subdivisions provide a reticulated water supply and/or on-site water storage and include storm water management sufficient to meet the needs of the activities that will establish all year round.

On-site water supply and on-site stormwater management can be achieved.

13.3.7 To ensure the relationship between Māori and their ancestral lands, water, sites, wahi tapu and other taonga is recognised and provided for and associated

Policy 13.4.11 That subdivision recognises and provides for the relationship of Māori and their culture and traditions, with their ancestral lands, water, sites, waahi tapu and other taonga and shall take into account the principles of the Treaty of Waitangi.

There are no 'scheduled' sites of significance to Māori affecting the property. The proposal is low density. The site is not known to have any special habitat values and there are no substantial waterbodies.

13.3.8 To ensure that all new subdivision provides an electricity supply sufficient to meet the needs of the activities that will establish on the new lots created.

13.3.9 To ensure, to the greatest extent possible, that all new subdivision supports energy efficient design through appropriate site layout and orientation in order to maximise the ability to provide light, heating, ventilation and cooling through passive design strategies for any buildings developed on the site(s).

13.3.10 To ensure that the design of all new subdivision promotes efficient provision of infrastructure, including access to alternative transport options, communications and local services.

Power supply is not a requirement of rural subdivision. The expectation is that future lot owners may either choose to be non reliant on grid power, or to arrange connection independently to electricity network. The sites will be self sufficient in three waters servicing and all have road frontage.

POLICIES

13.4.1 That the sizes, dimensions and distribution of allotments created through the subdivision process be determined with regard to the potential effects including cumulative effects, of the use of those allotments on: (a) natural character, particularly of the coastal environment; (b) ecological values; (c) landscape values; (d) amenity values; (e) cultural values; (f) heritage values; and (g) existing land uses.

I believe the subdivision has less than minor impact on the relevant matters listed in the above policy.

13.4.2 That standards be imposed upon the subdivision of land to require safe and effective vehicular and pedestrian access to new properties.

13.4.3 That natural and other hazards be taken into account in the design and location of any subdivision.

13.4.4 That in any subdivision where provision is made for connection to utility services, the potential adverse visual impacts of these services are avoided.

13.4.5 That access to, and servicing of, the new allotments be provided for in such a way as will avoid, remedy or mitigate any adverse effects on neighbouring property, public roads (including State Highways), and the natural and physical resources of the site caused by silt runoff, traffic, excavation and filling and removal of vegetation.

Access to the site is directly off Council maintained public road. Crossings into each lot can be constructed to the required standard. The site is not subject to hazards. Provision of power and telecoms is not a requirement of rural subdivision.

13.4.6 That any subdivision proposal provides for the protection, restoration and enhancement of heritage resources, areas of significant indigenous vegetation and significant habitats of indigenous fauna, threatened species, the natural character of the coastal environment and riparian margins, and outstanding landscapes and natural features where appropriate.

There is no indigenous bush on the property. The site is not located within a kiwi present or high density kiwi zone. The property is not located within the coastal environment. No known heritage resources exist on or close to the application site. The site does not contain any outstanding natural landscape or features.

13.4.8 That the provision of water storage be taken into account in the design of any subdivision.

Future lots will be responsible for their own on-site water storage.

13.4.13 Subdivision, use and development shall preserve and where possible enhance, restore and rehabilitate the character of the applicable zone in regards to s6 matters.....

s6 matters are discussed elsewhere in this report. The subdivision does not adversely affect the character of the Rural Production Zone in regard to s6 matters, or any of those matters listed in 13.4.13.

13.4.14 That the objectives and policies of the applicable environment and zone and relevant parts of Part 3 of the Plan will be taken into account when considering the intensity, design and layout of any subdivision.

The Objectives and Policies of the Rural Production Zone have been considered in the design and layout of the subdivision and I consider the subdivision to be consistent with those objectives and policies.

8.6.3.1 To promote the sustainable management of natural and physical resources in the Rural Production Zone.

The proposal creates four 2ha lots in the Rural Production Zone, a scenario provided for in the District Plan. It leaves a large balance grazing lot. There are no areas of indigenous flora on the property that will be affected by the subdivision. I believe that this proposal represents sustainable management for the zone.

8.6.3.2 To enable the efficient use and development of the Rural Production Zone in a way that enables people and communities to provide for their social, economic, and cultural well being and for their health and safety.

The proposal provides for lot owners to enjoy and experience rural living in reasonably close proximity to urban amenities. I believe the zone is intended to provide for variety of lifestyle and activities such that people can make choices about their lifestyle.

8.6.3.3 To promote the maintenance and enhancement of the amenity values of the Rural Production Zone to a level that is consistent with the productive intent of the zone.

The proposal does not adversely affect amenity values of the zone. The site contains no highly productive land.

8.6.3.4 To promote the protection of significant natural values of the Rural Production Zone.

The property does not contain any significant natural areas or indigenous biodiversity.

8.6.3.6 To avoid, remedy or mitigate the actual and potential conflicts between new land use activities and existing lawfully established activities (reverse sensitivity) within the Rural Production Zone and on land use activities in neighbouring zones.

8.6.3.7 To avoid remedy or mitigate the adverse effects of incompatible use or development on natural and physical resources.

The proposal is not a land use activity. I have not identified any likely conflicting land uses that cannot be mitigated.

8.6.3.8 To enable the efficient establishment and operation of activities and services that have a functional need to be located in rural environments.

This policy relates to land use activities, not subdivisions. N/A.

8.6.3.9 To enable rural production activities to be undertaken in the zone.

Rural production activities can continue to be undertaken following the subdivision.

8.6.4.1 That the Rural Production Zone enables farming and rural production activities, as well as a wide range of activities, subject to the need to ensure that any adverse effects on the environment, including any reverse sensitivity effects, resulting from these activities are avoided, remedied or mitigated and are not to the detriment of rural productivity.

The site is in grazing. This use can continue on the balance lot. Areas within the proposed smaller lots, not utilised for buildings or hardstand, will remain available for low density livestock grazing should the lot owner wish to. I do not see the proposal adversely impacting on the underlying site's productive capability.

8.6.4.2 That standards be imposed to ensure that the offsite effects of activities in the Rural Production Zone are avoided, remedied or mitigated.

Again, this policy is directed at land uses, not subdivisions.

8.6.4.4 That the type, scale and intensity of development allowed shall have regard to the maintenance and enhancement of the amenity values of the Rural Production Zone to a level that is consistent with the productive intent of the zone.

The proposed subdivision scale and intensity meets restricted discretionary subdivision standards and is consistent with the requirements and expectations of the District Plan.

8.6.4.5 That the efficient use and development of physical and natural resources be taken into account in the implementation of the Plan.

I believe the proposal represents efficient use and development of the physical and natural resources.

8.6.4.7 That although a wide range of activities that promote rural productivity are appropriate in the Rural Production Zone, an underlying goal is to avoid the actual and potential adverse effects of conflicting land use activities.

8.6.4.8 That activities whose adverse effects, including reverse sensitivity effects, cannot be avoided remedied or mitigated are given separation from other activities.

8.6.4.9 That activities be discouraged from locating where they are sensitive to the effects of or may compromise the continued operation of lawfully established existing activities in the Rural Production zone and in neighbouring zones.

Refer to earlier comments in regard to reverse sensitivity. I believe any potential adverse effects can be readily avoided, remedied or mitigated. The proposal is not increasing the risk of reverse sensitivity issues to the local area. The proposal will not prevent existing lawfully established activities from continuing to operate.

15.1.3.1 To minimise the adverse effects of traffic on the natural and physical environment.

The proposal is low density, creating the number of lots provided for as a restricted discretionary activity. Range Road is a low volume road.

15.1.4.6 That the number, size, gradient and placement of vehicle access points be regulated to assist traffic safety and control, taking into consideration the requirements of both the New Zealand Transport Agency and the Far North District Council.

Entranceways into the lots can be formed to Council standard.

7.2 Proposed District Plan Objectives and Policies

The property is zoned Rural Production under the PDP. An assessment of the proposal against the zone's Objectives and Policies follows:

RPROZ-O1
The Rural Production zone is managed to ensure its availability for primary production activities and its long-term protection for current and future generations.

The proposal does not impact unduly on the availability of land for primary production. The land does not contain good quality soils and is effectively unsuitable for horticultural use, with arable use limited to low density grazing. This use can continue.

RPROZ-O2
The Rural Production zone is used for primary production activities, ancillary activities that support primary production and other compatible activities that have a functional need to be in a rural environment.

This objective is in a zone chapter, not subdivision, and is aimed at 'activities'. The application is for a subdivision that does not pre-determine the activities to take place within each lot.

RPROZ-O3
Land use and subdivision in the Rural Production zone:

a. *protects highly productive land from sterilisation and enables it to be used for more productive forms of primary production;*
b. *protects primary production activities from reverse sensitivity effects that may constrain their effective and efficient operation;*
c. *does not compromise the use of land for farming activities, particularly on highly productive land;*
d. *does not exacerbate any natural hazards; and*
e. *is able to be serviced by on-site infrastructure.*

There is no highly productive land within the site. Any primary production activity within the site and on adjacent sites will not be constrained as a result of the proposal. The site is not subject to hazards. New lots will be fully self serviced.

RPROZ-O4
The rural character and amenity associated with a rural working environment is maintained.

The subdivision will not adversely impact on rural character and amenity.

RPROZ-P1
Enable primary production activities, provided they internalise adverse effects onsite where practicable, while recognising that typical adverse effects associated with primary production should be anticipated and accepted within the Rural Production zone.

The proposal is not for a primary production activity. It is a subdivision.

RPROZ-P2
Ensure the Rural Production zone provides for activities that require a rural location by:

a. *enabling primary production activities as the predominant land use;*
b. *enabling a range of compatible activities that support primary production activities, including ancillary activities, rural produce manufacturing, rural produce retail, visitor accommodation and home businesses.*

Refer to earlier comments in regard to Objectives. The majority of the land in the underlying title will remain in primary production use.

RPROZ-P3
Manage the establishment, design and location of new sensitive activities and other non-productive activities in the Rural Production Zone to avoid where possible, or otherwise mitigate, reverse sensitivity effects on primary production activities.

Refer to earlier comments in regard to reverse sensitivity.

RPROZ-P4
Land use and subdivision activities are undertaken in a manner that maintains or enhances the rural character and amenity of the Rural Production zone, which includes:

a. *a predominance of primary production activities;*
b. *low density development with generally low site coverage of buildings or structures;*
c. *typical adverse effects such as odour, noise and dust associated with a rural working environment; and*
d. *a diverse range of rural environments, rural character and amenity values throughout the District.*

The subdivision is a low-density development, consistent with the level of density provided for by the ODP. The area is not dominated by high intensity agriculture or horticultural use – which are the type of uses that can generate reverse sensitivity issues if not managed. I believe the proposal will maintain the rural character and amenity of the area.

RPROZ-P5
Avoid land use that:....

N/A. Activity is not a land use.

RPROZ-P6
Avoid subdivision that:

a. *results in the loss of highly productive land for use by farming activities;*
b. *fragments land into parcel sizes that are no longer able to support farming activities, taking into account:*
    1. *the type of farming proposed; and*
    2. *whether smaller land parcels can support more productive forms of farming due to the presence of highly productive land.*
c. *provides for rural lifestyle living unless there is an environmental benefit.*

The subdivision will not result in the loss of highly productive land. The proposed smaller lots will likely have built development on the upper parts of the site, with the lower slopes remaining available for grazing, or alternatively planted out. The site does not possess any special habitat, landscape or natural values. Strictly speaking, however, the proposal cannot be consistent with part (c) of RPROZ-P6, as no specific environmental 'benefit' is proposed.

RPROZ-P7
Manage land use and subdivision to address the effects of the activity requiring resource consent, including (but not limited to) consideration of the following matters where relevant to the application:

a. *whether the proposal will increase production potential in the zone;*
b. *whether the activity relies on the productive nature of the soil;*
c. *consistency with the scale and character of the rural environment;*
d. *location, scale and design of buildings or structures;*
e. *for subdivision or non-primary production activities:*
    i. *scale and compatibility with rural activities;*
    ii. *potential reverse sensitivity effects on primary production activities and existing infrastructure;*
    iii. *the potential for loss of highly productive land, land sterilisation or fragmentation*
f. *at zone interfaces:*
    i. *any setbacks, fencing, screening or landscaping required to address potential conflicts;*
    ii. *the extent to which adverse effects on adjoining or surrounding sites are mitigated and internalised within the site as far as practicable;*
g. *the capacity of the site to cater for on-site infrastructure associated with the proposed activity, including whether the site has access to a water source such as an irrigation network supply, dam or aquifer;*
h. *the adequacy of roading infrastructure to service the proposed activity;*
i. *Any adverse effects on historic heritage and cultural values, natural features and landscapes or indigenous biodiversity;*
j. *Any historical, spiritual, or cultural association held by tangata whenua, with regard to the matters set out in Policy TW-P6.*

The proposal does not require consent under the PDP's zone provisions and is not a land use activity in any event, so the policy is of limited relevance. The proposal does not rely on the productive nature of the soil and the site contains no highly productive land. The proposal is

low density and built environment will not dominate. Rural amenity will be maintained. There is no zone interface. The sites can cater for their on-site servicing. The site has no historic heritage or cultural values, there are no natural features or landscapes, and there are no areas of indigenous vegetation.

Subdivision objectives and policies:

SUB-O1
Subdivision results in the efficient use of land, which:

a. *achieves the objectives of each relevant zone, overlays and district wide provisions;*
b. *contributes to the local character and sense of place;*
c. *avoids reverse sensitivity issues that would prevent or adversely affect activities already established on land from continuing to operate;*
d. *avoids land use patterns which would prevent land from achieving the objectives and policies of the zone in which it is located;*
e. *does not increase risk from natural hazards or risks are mitigates and existing risks reduced; and*
f. *manages adverse effects on the environment.*

I believe that the proposed subdivision is more consistent than not with the zone's objectives and policies, and any relevant district wide objectives and policies. I believe it will result in the efficient use of land.

SUB-O2
Subdivision provides for the:

a. *Protection of highly productive land; and*
b. *Protection, restoration or enhancement of Outstanding Natural Features, Outstanding Natural Landscapes, Natural Character of the Coastal Environment, Areas of High Natural Character, Outstanding Natural Character, wetland, lake and river margins, Significant Natural Areas, Sites and Areas of Significance to Māori, and Historic Heritage.*

The site contains none of the above.

SUB-O3
Infrastructure is planned to service the proposed subdivision and development where:

a. *there is existing infrastructure connection, infrastructure should provided in an integrated, efficient, coordinated and future-proofed manner at the time of subdivision; and*
b. *where no existing connection is available infrastructure should be planned and consideration be given to connections with the wider infrastructure network.*

There is no planned infrastructure for the wider area. On-site infrastructure can be utilised for wastewater, stormwater and potable water supply.

SUB-O4
Subdivision is accessible, connected, and integrated with the surrounding environment and provides for:

a. *public open spaces;*
b. *esplanade where land adjoins the coastal marine area; and*
c. *esplanade where land adjoins other qualifying waterbodies.*

The site is rural and is not adjoining, nor contain, any qualifying waterbodies. It is not coastal and there are no nearby public open spaces.

SUB-P1
Enable boundary adjustments that:...

Not applicable.

SUB-P2
Enable subdivision for the purpose of public works, infrastructure, reserves or access.

Not applicable.

SUB-P3
Provide for subdivision where it results in allotments that:

a. *are consistent with the purpose, characteristics and qualities of the zone;*
b. *comply with the minimum allotment sizes for each zone;*
c. *have an adequate size and appropriate shape to contain a building platform; and*
d. *have legal and physical access.*

The subdivision is more consistent than not, with the purpose and qualities of the zone, largely because it is low density, maintains character, and the site contains no highly productive land, with poorer soils predominating. Whilst the proposed lots do not 'comply' with the PDP's minimum lot sizes for the zone, the lots are nonetheless able to provide for building platforms. They have / can have legal and physical access.

SUB-P4
Manage subdivision of land as detailed in the district wide, natural environment values, historical and cultural values and hazard and risks sections of the plan

The subdivision does not adversely impact on natural environmental values, nor historical and cultural values. The site is not subject to hazards.

SUB-P5
Manage subdivision design and layout in the General Residential, Mixed Use and Settlement zone to .....

Not applicable.

SUB-P6
Require infrastructure to be provided in an integrated and comprehensive manner by:

a. *demonstrating that the subdivision will be appropriately serviced and integrated with existing and planned infrastructure if available; and*
b. *ensuring that the infrastructure is provided is in accordance the purpose, characteristics and qualities of the zone.*

This is a rural area with no planned infrastructure improvements on the part of the Council. Future lot owners will be responsible for on-site infrastructure of wastewater, stormwater and potable water. I believe the subdivision can be appropriately serviced.

SUB- P7
Require the vesting of esplanade reserves when subdividing land adjoining the coast or other qualifying waterbodies.

Not applicable. There are no waterbodies that require esplanade reserves.

SUB-P8
Avoid rural lifestyle subdivision in the Rural Production zone unless the subdivision:

a. *will protect a qualifying SNA in perpetuity and result in the SNA being added to the District Plan SNA schedule; and*
b. *will not result in the loss of versatile soils for primary production activities.*

There are no 'qualifying SNA's' and there are no versatile soils.

SUB-P9
Avoid subdivision rural lifestyle subdivision in the Rural Production zone and Rural residential subdivision in the Rural Lifestyle zone unless the development achieves the environmental outcomes required in the management plan subdivision rule.

The subdivision is not a management plan subdivision.

SUB-P10
To protect amenity and character by avoiding the subdivision of minor residential units from principal residential units where resultant allotments do not comply with minimum allotment size and residential density.

Not applicable.

SUB-P11
Manage subdivision to address the effects of the activity requiring resource consent including (but not limited to) consideration of the following matters where relevant to the application:

a. *consistency with the scale, density, design and character of the environment and purpose of the zone;*
b. *the location, scale and design of buildings and structures;*
c. *the adequacy and capacity of available or programmed development infrastructure to accommodate the proposed activity; or the capacity of the site to cater for on-site infrastructure associated with the proposed activity;*
d. *managing natural hazards;*
e. *Any adverse effects on areas with historic heritage and cultural values, natural features and landscapes, natural character or indigenous biodiversity values; and*
f. *any historical, spiritual, or cultural association held by tangata whenua, with regard to the matters set out in Policy TW-P6.*

The subdivision does not require consent under the PDP so the above policy is of limited relevance. Notwithstanding this, relevant matters in SUB-P11 have been considered.

8.0 NOTIFICATION ASSESSMENT & CONSULTATION

8.1 S95A Public Notification Assessment

A consent authority must follow the steps set out in s95A to determine whether to publicly notify an application for a resource consent. Step 1 specifies when public notification is mandatory in certain circumstances. None of these circumstances apply. Step 2 of s95A specifies the circumstances that preclude public notification. Neither circumstance exists therefore public notification is not precluded and Step 3 of s95A must be considered. This specifies that public notification is required in certain circumstances. The application is not subject to a rule or national environmental standard that requires public notification. This report and AEE concludes that the activity will not have, nor is it likely to have, adverse

effects on the environment that are more than minor. In summary public notification is not required pursuant to Step 3 of s95A.

8.2 S95B Limited Notification Assessment

A consent authority must follow the steps set out in s95B to determine whether to give limited notification of an application for a resource consent, if the application is not publicly notified pursuant to s95A. Step 1 identifies certain affected groups and affected persons that must be notified. No such group or persons exist in this case. Step 2 of s95B specifies the circumstances that preclude limited notification. Neither circumstance applies and Step 3 of s95B must be considered. This specifies that certain other affected persons must be notified, in this case being any identified pursuant to s95E. The s95E assessment below concludes that there are no affected persons to be notified.

8.3 S95D Level of Adverse Effects

The AEE in this report assesses effects on the environment and concludes that these will be no more than minor, therefore no public notification is required.

8.4 S95E Affected Persons

A person is an 'affected person' if the consent authority decides that the activity's adverse effects on the person are minor or more than minor (but are not less than minor). A person is not an affected person if they have provided written approval for the proposed activity.

The size and layout of the proposed lots is consistent with the zone's restricted discretionary activity threshold. I do not consider any adjacent properties to be affected by the creation of built development on four additional lots. I have not identified any affected persons in regard to adjacent properties. The one property to the south that contains a dwelling will have a dwelling adjacent to them at some point in the future, however, this is the case now, prior to subdivision. There is no shared access that might be affected by the proposal.

There are no identified Sites of Significance to Māori within or in the vicinity of the property, and no archaeological sites. With less than minor effects on any habitat, including water bodies, and no impact on DOC's ability to manage its resources, it has not been considered necessary to consult with DOC.

9.0 PART 2 MATTERS

5 Purpose
(1)The purpose of this Act is to promote the sustainable management of natural and physical resources.

The proposal is considered to have had adequate regard to Part 2 matters. I believe the proposal fulfils the Purpose in s5.

6Matters of national importance

(a)the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:
(b)the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:
(c)the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:
(d)the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:
(e)the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:
(f)the protection of historic heritage from inappropriate subdivision, use, and development:
(g)the protection of protected customary rights:
(h)the management of significant risks from natural hazards.

The site is not within the coastal environment and there are no known wetlands, lakes or rivers. The site does not have any outstanding landscape values. There is no significant indigenous bush on the property. No public access is required to any lake or river. There are no culturally significant areas on or near the application site, and no identified heritage values. There are no significant risks from natural hazards.

7 Other matters
(a)kaitiakitanga:
(aa) the ethic of stewardship:
(b)the efficient use and development of natural and physical resources:
(ba)the efficiency of the end use of energy:
(c)the maintenance and enhancement of amenity values:
(d)intrinsic values of ecosystems:
(e)[Repealed]
(f)maintenance and enhancement of the quality of the environment:
(g)any finite characteristics of natural and physical resources:
(h)the protection of the habitat of trout and salmon:
(i)the effects of climate change:
(j)the benefits to be derived from the use and development of renewable energy.

In regard to "other matters" (s7), I see (c) the maintenance and enhancement of amenity values; (d) intrinsic values of ecosystems; and (f) maintenance and enhancement of the quality of the environment as having relevance. All lots are large enough to provide for house sites and on-site services. The proposal represents the efficient use and development of resources. It has minimal, if any, adverse effect on amenity values or the intrinsic values of ecosystems.

8 Treaty of Waitangi
In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi).

I have not identified anything in the proposal that gives offence to, or is contrary to, s8.

10.0 CONCLUSION

The proposed subdivision is of a type and density considered consistent with the surrounding environment. The proposal is consistent with the intent of both the Operative and Proposed District Plans.

No significant adverse effects will arise from the activity. There has been no need to consider alternatives. All effects can be appropriately and adequately avoided, remedied or mitigated such that the proposal will result in less than minor effects on the environment. No affected persons have been identified and limited notification is not required.

The relevant provisions of Part 2 of the Act have been addressed. The proposal is considered consistent with the objectives and policies of relevant planning provisions in National Policy Statements and the Regional Policy Statement.

It is requested that the Council give favourable consideration to the application and grant approval, subject to appropriate conditions, under delegated authority.

Lynley Newport Dated 16th May 2025
Senior Planner
THOMSON SURVEY LTD

11.0 LIST OF APPENDICES

Appendix 1 Scheme Plan(s)

Appendix 2 Locality Plan

Appendix 3 Record of Title & Relevant Instruments

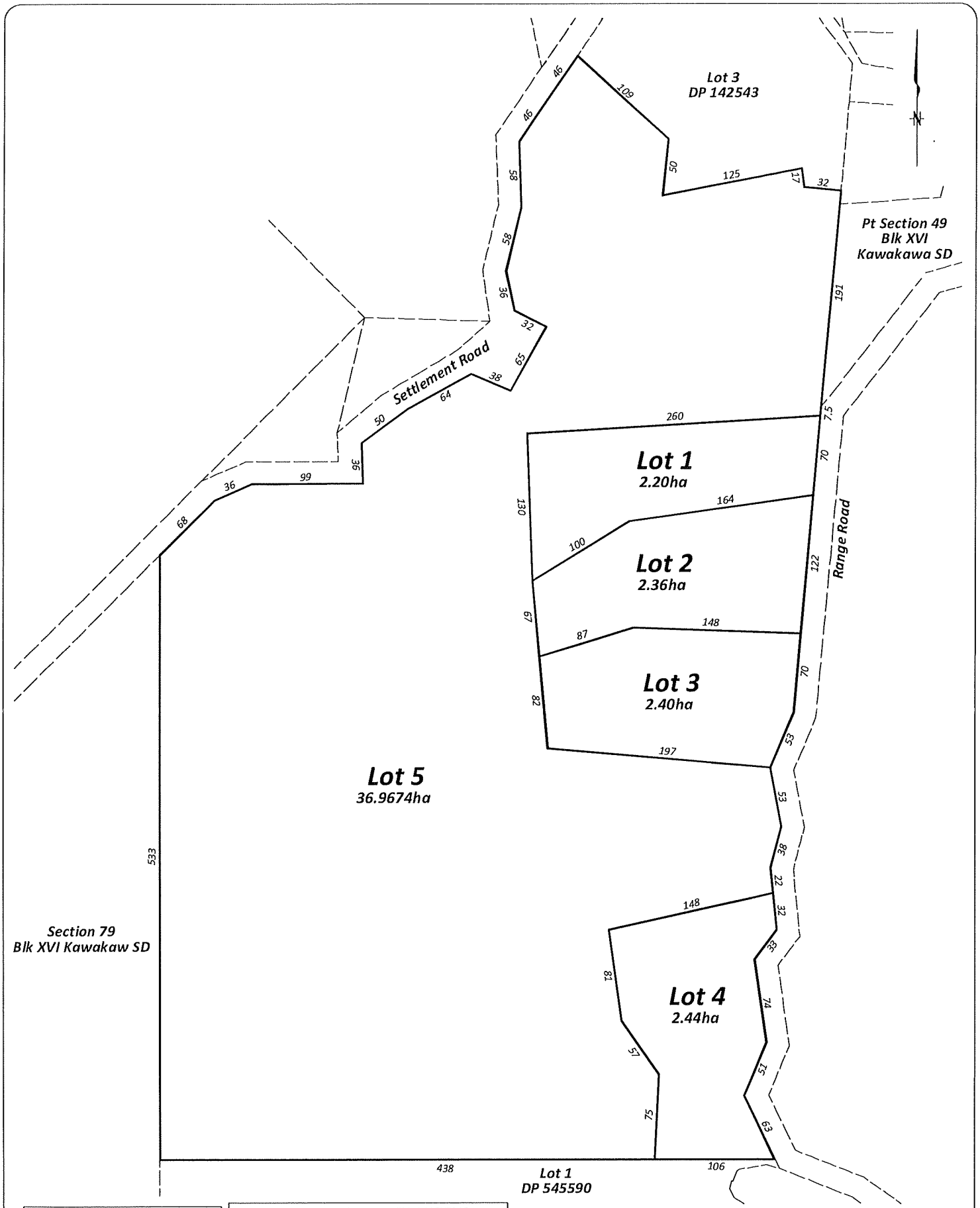
Appendix 4 Correspondence from Top Energy

Appendix 5 Subdivision Site Suitability Engineering Report

Appendix 6 Geotechnical Assessment

Appendix 1

Scheme Plan(s)



Local Authority:	Far North District Council
Comprised in:	NA879/87
Total Area:	46.3674ha
Zoning:	Rural Production
Resource features:	NIL

AREAS AND MEASUREMENTS ARE SUBJECT TO FINAL SURVEY

TOPOGRAPHICAL DETAIL IS APPROXIMATE ONLY AND SCALED FROM AERIAL PHOTOGRAPHY

0 30 150 300m

Bar Scale 1:3000 @ A3

THOMSON SURVEY LIMITED
315 Kerikeri Rd
P.O. Box 372 Kerikeri
Email: kerikeri@tsurvey.co.nz
Ph: (09) 4077360
www.tsurvey.co.nz
Registered Land Surveyors, Planners & Land Development Consultants

PROPOSED SUBDIVISION OF SECTION 77 BLK XVI KAWAKAWA SD & PT SECTION 30 BLK XVI KAWAKAWA SD

RANGE ROAD, KAWAKAWA

PREPARED FOR: K & M TRUST

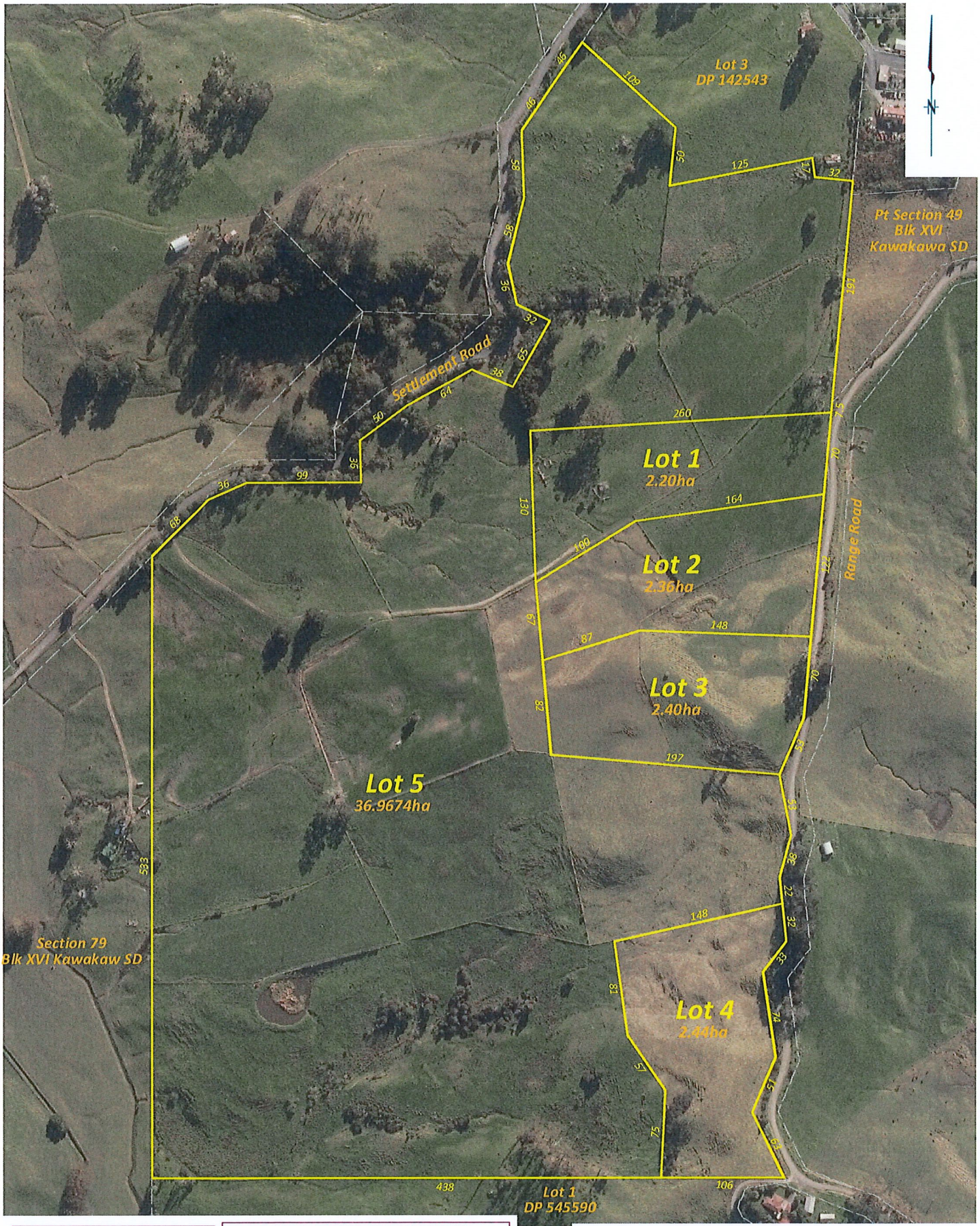
	Name	Date
Survey		
Design		
Drawn	KY	30.06.23
Approved		
Rev	KY	17.08.23

10519 Scheme 20230817

ORIGINAL

SCALE 1:3000 SHEET SIZE A3

Surveyors Ref. No: 10519



Local Authority: Far North District Council
Comprised in: NA879/87
Total Area: 46.3674ha
Zoning: Rural Production
Resource features: NIL

AREAS AND MEASUREMENTS ARE SUBJECT TO FINAL SURVEY

TOPOGRAPHICAL DETAIL IS APPROXIMATE ONLY AND SCALED FROM AERIAL PHOTOGRAPHY

This plan and accompanying report(s) have been prepared for the purpose of obtaining a Resource Consent only and for no other purpose. Use of this plan and/or information on it for any other purpose is at the user's risk.

0 30 150 300m

Bar Scale 1:3000 @ A3

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PROPOSED SUBDIVISION OF SECTION 77 BLK XVI KAWAKAWA SD & PT SECTION 30 BLK XVI KAWAKAWA SD

RANGE ROAD, KAWAKAWA

PREPARED FOR: K & M TRUST

	Name	Date
Survey		
Design		
Drawn	KY	30.06.23
Approved		
Rev	KY	17.08.23

10519 Scheme 20230817

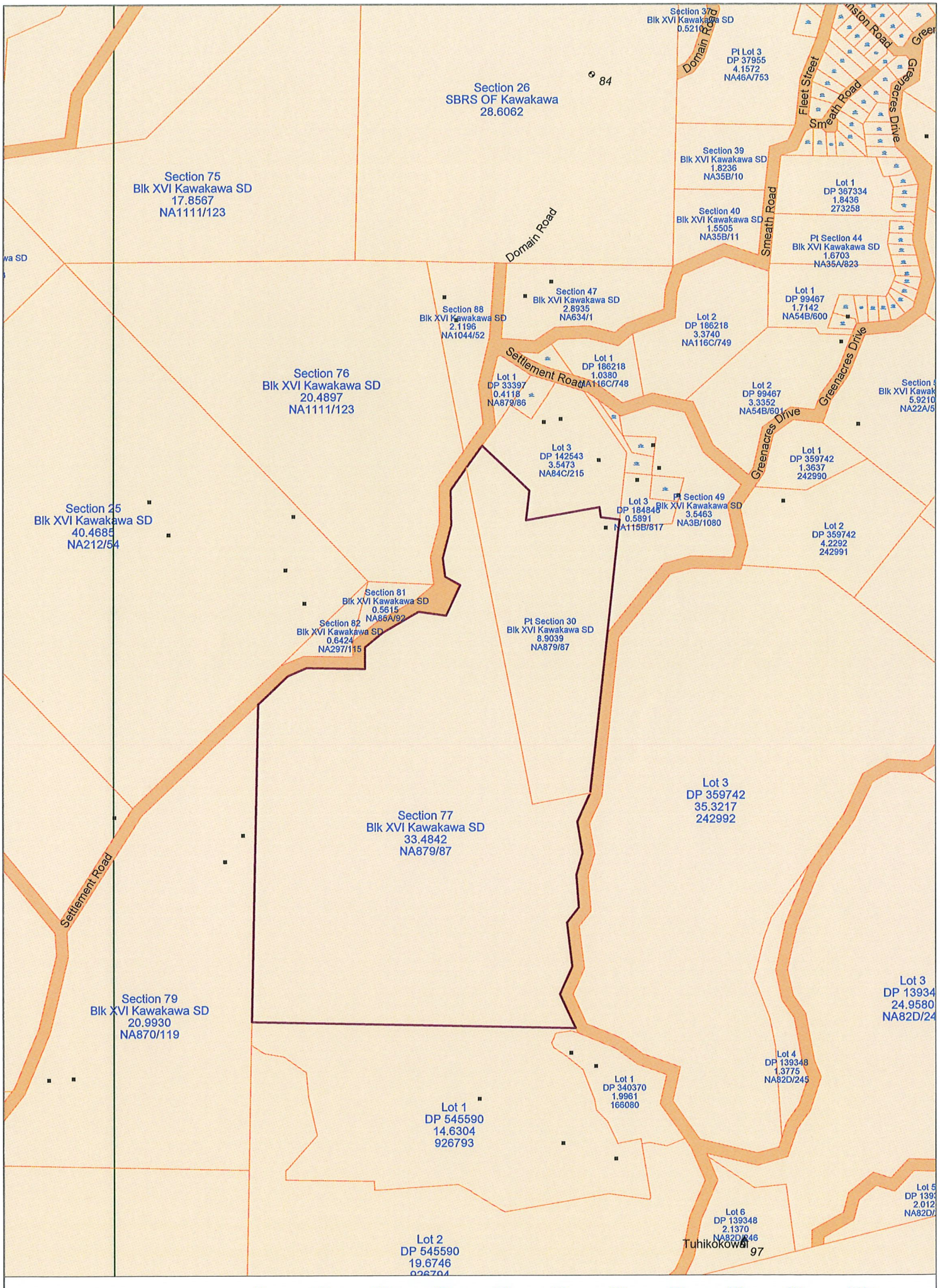
ORIGINAL
SCALE 1:3000
SHEET SIZE A3

Surveyors Ref. No: 10519

Sheet 1 of 1

Appendix 2

Locality Plan



QuickMap
Custom Software Ltd

Any person wishing to rely on the information shown on this map must independently verify the information

Scale 1:8000 Topographical and Cadastral map derived from LINZ data. Printed: 18-Feb-2025 11:52.

Appendix 3

Record of Title & Relevant Instruments

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Part-Cancelled

Identifier	**NA879/87**
Land Registration District	**North Auckland**
Date Issued	25 June 1947

Prior References
NA445/12

Estate	Fee Simple
Area	46.3674 hectares more or less
Legal Description	Section 77 Block XVI Kawakawa Survey District and Part Section 30 Block XVI Kawakawa Survey District

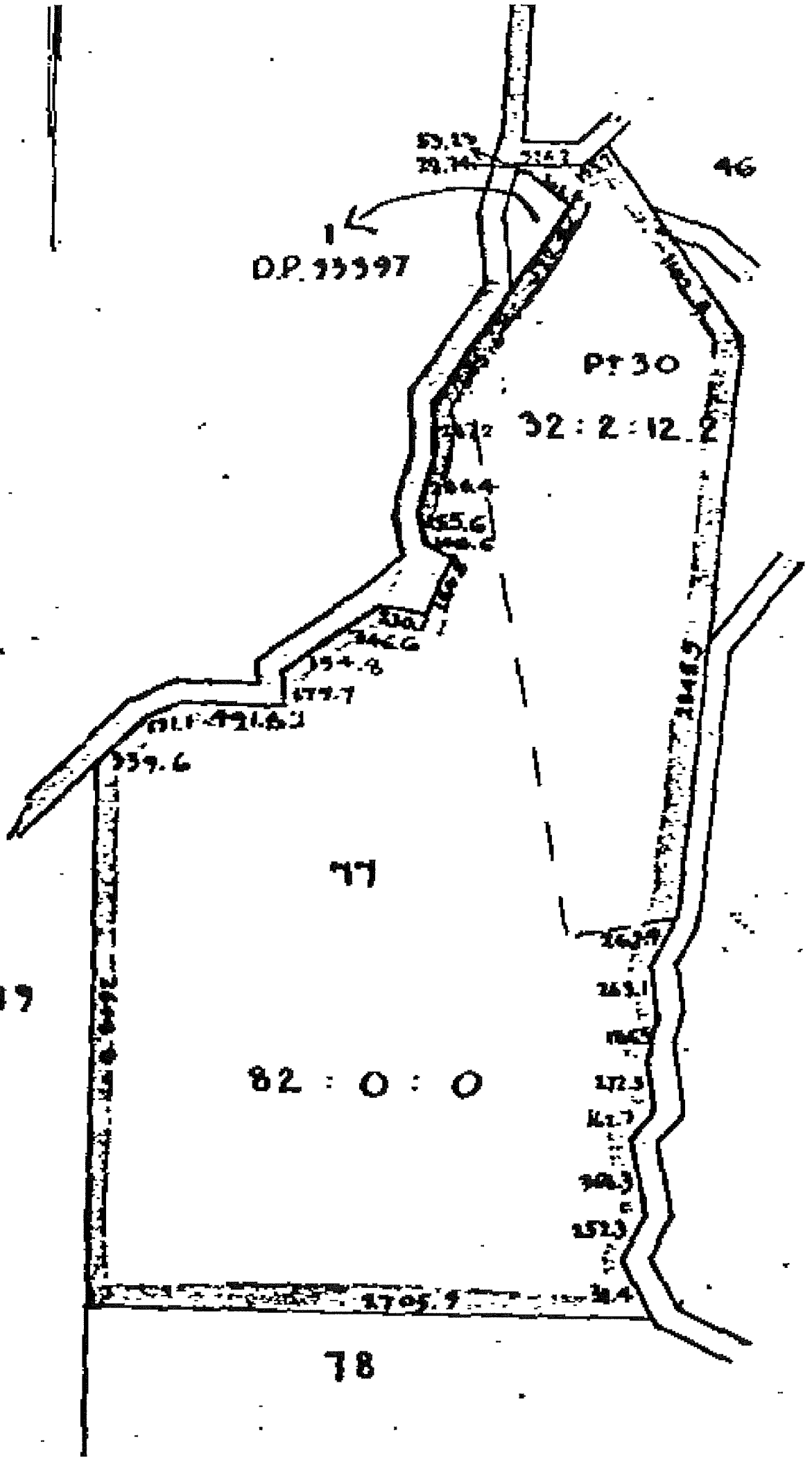
Registered Owners
Keith Alan Taylor, Megan Jean McCracken and Johnston O'Shea Trustee Limited

Interests

Pursuant to Section 306(5) Local Government Act 1974 Lot 4 DP 142543 is vested in the Far North District Council as road.

C236263.2 CTs NA84C/213-215 issued for Lots 1-3 DP 142543 - 8.2.1991 at 2:41 pm

12883877.12 Mortgage to Rabobank New Zealand Limited - 30.11.2023 at 11:18 am


46
1
D.P. 33397
Pt 30
32 : 2 : 12.2
49
77
82 : 0 : 0
77
78

Appendix 4

Correspondence from Top Energy

TOP ENERGY®
Te Puna Hihiko
www.topenergy.co.nz

Top Energy Limited
Level 2, John Butler Centre
60 Kerikeri Road
P O Box 43
Kerikeri 0245
New Zealand
PH +64 (0)9 401 5440
FAX +64 (0)9 407 0611

5 May 2025

Lynley Newport
Thomson Survey
PO Box 372
KERIKERI 0245

Email: lynley@tsurvey.co.nz

To Whom It May Concern:

RE: PROPOSED SUBDIVISION
K & M Trust - Range Road, Kawakawa.
Section 77 BLK XVI Kawakawa SD & Pt Section 30 BLK XVI Kawakawa SD

Thank you for your recent correspondence with attached subdivision scheme plans.

Top Energy's requirement for this subdivision is the creation of an electrical easement in gross over all overhead lines within the proposed subdivision area.

In order to get a letter from Top Energy upon completion of your subdivision, a copy of the resource consent decision must be provided.

If you have any further queries, please do not hesitate to contact the writer.

Yours sincerely

Aaron Birt
Planning and Design
T: 09 407 0685
E: aaron.birt@topenergy.co.nz

Appendix 5

Subdivision Site Suitability Engineering Report

geologix
consulting engineers

SUBDIVISION SITE SUITABILITY ENGINEERING REPORT

RANGE ROAD, KAWAKAWA

K & M TRUST

C0589-S-01
MAY 2025
REVISION 1

www.geologix.co.nz 09 392 0007 Auckland | Northland

geologix
consulting engineers

DOCUMENT MANAGEMENT

Document Title	Subdivision Site Suitability Engineering Report
Site Reference	Range Road, Kawakawa
Client	K & M Trust
Geologix Reference	C0589-S-01
Issue Date	May 2025
Revision	01
Prepared	Gerard McHardy Civil Design Engineer, BEng Civil, MEngNZ
Reviewed	Sebastian Hicks Principal Civil Engineer, CPEng Reg. 1168062, CMEngNZ, IntPE(NZ) /APEC Engineer
Approved	Edward Collings Managing Director, CEnvP Reg. 0861, CPEng Reg. 1033153, CMEngNZ
File Reference	*Z:\Geologix Files\Projects\C0500-C0599\C0589 - Range Road, Kawakawa\06 – Reports/C0589-S-01-R01*

REVISION HISTORY

Date	Issue	Prepared	Reviewed	Approved
May 2025	First Issue	GM	SH	EC

geologix
consulting engineers

TABLE OF CONTENTS

TABLES

1 INTRODUCTION

This Site Suitability Engineering Report has been prepared by Geologix Consulting Engineers Ltd (Geologix) for K & M Trust as our Client in accordance with our standard short form agreement and general terms and conditions of engagement.

Our scope of works has been undertaken to assist with the Resource Consent application in relation to the proposed subdivision of rural properties Section 77 BLK XVI Kawakawa SD & PT section 30 BLK XVI Kawakawa SD situated along Range Road, Kawakawa, the 'site', into four new residential lots with a remaining balance lot. Specifically, this assessment provides a civil engineering assessment for the management of wastewater, stormwater, potable water and firefighting.

It is noted that this report refers in part to a corresponding Geotechnical Investigation Report[1].

1.1 Proposal

A proposed scheme plan was presented to Geologix at the time of writing, prepared by Thomson Survey Ltd[2] and has been reproduced within Appendix A as Drawing No 100. It is understood from the scheme plan that there will be five separate lots comprising:

- Proposed Lots 1, 2, 3 and 4 which are proposed rural residential lots.
- Proposed Lot 5, which is the balance farmland comprising the balance areas of section 77 BLK XVI Kawakawa SD & PT section 30 BLK XVI Kawakawa SD. The above is summarised in Table 1. Any amendments to the referenced scheme plan may require an update to the recommendations of this report which are based on conservative, typical rural residential development concepts.

The site is located in the rural production zone as per the FNDC Operative District Plan.

Table 1: Summary of Proposed Subdivision

Proposed Lot No.	Size	Purpose
1	2.2000 ha	New residential
2	2.3600 ha	New residential
3	2.4000 ha	New residential
4	2.4400 ha	New residential
5	36.9674 ha	Production Land/ Balance Lot

[1] *Geotechnical Investigation Report, C0589-G-01, April 2025, prepared by Geologix*

[2] *Thomson Survey, PROPOSED SUBDIVISION OF SECTION 77 BLK XVI KAWAKAWA SD & PT SECTION 30 BLK XVI KAWAKAWA SD, dated Aug 2023.*

It is understood that site access for each lot will be provided from Range Road from separate, new vehicle crossings.

2 DESKTOP APPRAISAL

The site is located along the western side of Range Road and eastern side of Settlement Road. It has an irregular alignment to define the northern and western boundary of the site. Topographically, the site area is undulating with gullies running predominantly east to west from a ridgeline extending along Range Road. The overall slope of the terrain is moderate to steep with some localised areas sloping more gently further west within the site.

The site setting is presented schematically as Figure 1 below.

Figure 1: Site Setting

The entire site area is currently in pasture with rough grass and occasional vegetation. No apparent existing structures or infrastructure are present within the site boundaries.

2.1 Existing Reticulated Networks

Far North District Council (FNDC) GIS mapping indicates that no existing public three waters infrastructure or reticulated networks are present within Range Road and Settlement Road or the site boundaries. This report has been prepared with the goal of the subdivision and future development being self-sufficient for the provision of wastewater, stormwater, and potable water supply.

2.2 Geological Setting

Available geological mapping[3] indicates the site to be directly underlain by Hukerenui Mudstone (Mangakahia Complex) of the Northland Allochthon described as weakly to moderately indurated, alternating thin to thick-bedded, quartzo-feldspathic sandstone and mudstone. The Northland Allochthon geology extends away from the site in all directions.

2.3 Existing Geotechnical Information

Existing ground investigations were not made available to Geologix at the time of writing. Furthermore, a review of available GIS databases, including the New Zealand Geotechnical Database,[4] did not indicate borehole records within 500 m of the site.

3 SURFACE WATER FEATURES AND OVERLAND FLOWPATHS

During our site walkover and desktop appraisal of GIS topographic data, Geologix have developed an understanding of the surface water features and overland flow paths influencing the site. This is summarised in the following sections.

3.1 Surface Water Features

The site is at the upper elevations of a larger catchment. Stormwater will flow westwards across the site towards a stream that flows to the north towards the Kawakawa River.

There is a mapped flood hazard just within the southwestern corner of the site, with the 1% and 2% AEP (50 year and 100 year) flood plain extending into the Proposed Lot 5 (balance lot).

Additionally, there is a manmade irrigation pond within the southwestern quadrant of the site.

3.2 Sensitive Receptors

Based on GIS data, national topographic maps and survey data provided at the time of writing we do not understand there to be sensitive receptors such as wetlands at the site. However, we have not been engaged to provide an ecological assessment of the site or surface water features.

3.3 Overland Flow Paths

Overland flow paths are not evident within the proposed Lot 1-4 boundaries with stormwater generally flowing as sheet flow towards the west across the site. Within the

[3] *Geological & Nuclear Science, 1:250,000 scale Geological Map, Sheet 2, Whangarei, 2009.*
[4] *https://www.nzgd.org.nz/*

balance Lot 5 there is a well-defined overland flow path running east to west approximately 100 m to the north of the proposed Lot 1.

Our walkover survey was undertaken in late February during a relatively dry period and noted no flow through overland flow paths.

4 GROUND INVESTIGATION

A site-specific walkover survey and intrusive ground investigation was undertaken by Geologix on 23 August 2024. The ground investigation was scoped to confirm the desktop assessment findings (where possible) and to provide parameters for the wastewater assessment. The ground investigation comprised the following:

- Four hand augered boreholes designated BH01 to BH04 inclusive, formed within suitable areas for wastewater disposal fields on each proposed residential lot with a target depth of 1.2 m below ground level (bgl).

4.1 Site Walkover Survey

A visual walkover survey of the property confirmed the following:

- The topographical understanding of the site developed from our desktop study, as outlined in Section 2, is in general accordance with that observed on site.
- Suitable building envelopes[5] can be formed on gently sloping land <10°.
- Range Road defines the eastern site boundary. Nearby land in all directions includes similar rural properties with open pasture.
- Overland flow paths extend throughout the lots and are predominantly covered by reed grasses in wet areas.
- Range Road's western edge swale discharges into the lot boundaries at some locations with resultant flows appearing to be suitably dispersed and not causing considerable scour or erosion.
- No structures or suitably formed roads are present within the site boundary.

4.2 Ground Conditions

Arisings recovered from the exploratory boreholes were logged by a suitably qualified geotechnical engineering professional in general accordance with New Zealand Geotechnical Society guidelines[6]. Engineering borehole logs specifically related to the concept proposed wastewater field positions are presented as Appendix B to this report and approximate

[5] *Measuring 30 m x 30 m according to FNDC District Plan Rule 13.7.2.2.*
[6] *New Zealand Geotechnical Society, Field Description of Soil and Rock, 2005.*

borehole positions recorded on Drawing No. 100 within Appendix A. It is noted that additional ground investigation data is presented within the corresponding Geotechnical Investigation Report[7]. Strata identified during the ground investigation can be summarised as follows:

- **Topsoil encountered to 0.2 m bgl.** Described as generally dark brown organic silt, trace rootlets, dry to moist with low plasticity.
- **Northland Allochthon Residual Soil to depths between 0.2 and <1.2 m bgl.** The residual soil was typically cohesive, described as clayey silt or silty clay, stiff to very stiff, light yellow mottled white and orange, low to high plasticity and moist.

A summary of the ground investigation data is presented below as Table 2.

Table 2: Summary of Ground Investigation

Hole ID	Lot	Hole Depth	Topsoil Depth	Groundwater[2]	Wastewater Category[4]
BH02	1	1.2 m	0.2 m	NE	6 – slow draining
BH04	2	1.2 m	0.2 m	NE	6 – slow draining
BH06	3	1.2 m	0.2 m	NE	6 – slow draining
BH10	4	1.0 m	0.2 m	NE	6 – slow draining

1. *All depths recorded in m bgl unless stated.*
2. *Groundwater measurements taken on day of drilling.*
3. *NE – Not Encountered.*
4. *Wastewater category in accordance with Auckland Council TP58[8].*

5 WASTEWATER ASSESSMENT

The scope of this wastewater assessment comprised a ground investigation to ascertain a lot-specific wastewater disposal classification for concept design of suitable systems for a probable future rural residential development. Relevant design guideline documents adopted include:

- Auckland Council, Technical Publication 58, On-site Wastewater Systems: Design and Management Manual, 2004.
- NZS1547:2012, On-site Domestic Wastewater Management.

The concept rural residential development within this report assumes that the proposed new lot may comprise up to a five-bedroom dwelling with a peak occupancy of eight people[9]. This considers the uncertainty of potential future Building Consent designs. The number of usable bedrooms within a residential dwelling must consider that proposed offices, studies,

[7] *Geotechnical Investigation Report, C0589-G-01, April 2025, prepared by Geologix*
[8] *Auckland Council, Technical Publication 58, On-site Wastewater Systems: Design and Management Manual, 2004, Table 5.1.*
[9] *TP58 Table 6.1.*

gyms, or other similar spaces may be considered a potential bedroom by the Consent Authority.

5.1 Existing Wastewater Systems

No existing wastewater treatment or disposal systems have been identified or surveyed within the site boundaries.

5.2 Wastewater Generation Volume

In lieu of potable water infrastructure servicing the site, roof rainwater collection within on-lot tanks has been proposed for this assessment. The design water volume for roof water tank supply is estimated at 160 litres/ person/ day[10]. This assumes standard water saving fixtures[11] being installed within the proposed future development. This should be reviewed for each proposed lot at the Building Consent stage.

For the concept wastewater design, this provides a total daily wastewater generation of 1,280 litres/ day per proposed lot.

5.3 Treatment System

Selection of a wastewater treatment system will be provided by future developers at Building Consent stage. This will be a function of a refined design peak occupancy.

It is recommended within the concept solution provided that to meet suitable minimum treated effluent output, secondary treatment systems are accounted for across the site. The concept solution is detailed further in the following sections.

In the Building Consent design phase, a higher treated effluent output standard such as UV disinfection to tertiary quality may be required should specifically controlled zones such as the prescribed offsets of this report are encroached upon. Moreover, a primary treatment solution may also be considered for the Lot development, provided that the system complies with the proposed Northland Regional Plan. Specifically, controlling rules include:

- Rule C.6.1.3 6), discharge of wastewater from primary systems is to slopes less than 10°.
- Rule C.6.1.3 9)a), 100 % reserve disposal area where the wastewater has received primary treatment.
- Table 9, exclusion areas and setback distances for primary treated domestic type wastewater.

[10] TP58 Table 6.2, AS/ NZS 1547:2012 Table H3.

[11] Low water consumption dishwashers and no garbage grinders.

No specific treatment system design restrictions and manufacturers are currently in place. However, the developer will be required to specify the treatment system proposed at the Building Consent stage.

5.4 Land Disposal System

To provide even distribution, evapotranspiration assistance and to minimise effluent runoff, it is recommended that treated effluent is conveyed to land disposal via Pressure Compensating Dripper Irrigation (PCDI) systems, a commonplace method of wastewater disposal.

The proposed PCDI systems may be surface laid and covered with a minimum of 150 mm mulch and planted with specific evapotranspiration species with a minimum of 80 % species canopy cover or subsurface laid with a minimum 200 mm thickness of topsoil and planted with lawn grass. Site-won topsoil stripped during development from buildings and/ or driveway footprints may be used in the area of land disposal systems to increase minimum thicknesses. Specific requirements of the land disposal system include the following which have been complied with for this report.

Table 3: Disposal Field Design Criteria

Design Criteria	Site Conditions
Topography at the disposal areas shall not exceed 25°. Exceedances will require a Discharge Consent.	Concept design complies
On shallower slopes <25 ° but >10 °, compliance with Northland Regional Plan (NRP) rule C.6.1.3(6) is required.	Concept design complies for Lot 1 and 2, disposal fields sited on slopes >10 ° but Lot 3 and 4 require cut-off drains.
On all terrain irrigation lines should be laid along contours.	Concept design complies
Disposal system situated no closer than 600 mm (vertically) from the winter groundwater table (secondary treated effluent).	Concept design complies
Separation from surface water features such as stormwater flow paths (including road and kerb channels), rivers, lakes, ponds, dams, and natural wetlands according to Table 9, Appendix B of the NRP.	Concept design complies.
The effluent is treated and disposed of on-site such that each site has its own treatment and disposal system no part of which shall be located closer than 30 m from the boundary of any river, lake, wetland, or the boundary of the coastal marine area. FNDC rule 12.7.6.1.4	Concept design complies.

5.4.1 Soil Loading Rate

Based on the results of the ground investigation, the shallow soils are inferred to meet the drainage characteristics of TP58 Category 6, sandy clay, non-swelling clay and silty clay – slowly draining. This correlates to NZS1547 Category 5, poorly drained described as light

clays. For a typical PCDI system, a Soil Loading Rate (SLR) of 2-3 mm/ day is recommended within NZS1547 Table 5.2 and TP58 Table 9.2.

To achieve the above SLR, technical guidance documents require the following compliance within the final design.

- 100 to 150 mm minimum depth of good quality topsoil (NZS1547 Table M1, note 1) to slow the soakage and assist with nutrient reduction.
- Minimum 50 % reserve disposal field area (TP58 Table 9.2, note 3) to adopt 3 mm/day, rather than 2mm/day SLR.

The proposed concept design adopts 3.0mm /day SLR, utilising a 50% reserve disposal field area.

5.4.2 Disposal Areas

The sizing of wastewater system disposal areas is a function of soil drainage, the loading rate and topographic relief. For each proposed lot, a primary and reserve disposal field is required as follows. The recommendations below are presented on Drawing No. 100 - 102.

- **Primary Disposal Field.** A minimum PCDI primary disposal field of 427 m^2 laid parallel to the natural contours.
- **Reserve Disposal Field.** NRP rule C.6.1.3(9)(b) requires a minimum reserve disposal field equivalent to 30 % of the primary disposal field for secondary or tertiary treatment systems. As discussed above in Section 5.4.1, the proposed concept design presents a 50% reserve disposal field area. Therefore, each proposed lot provides a 214 m^2 reserve disposal area to be laid parallel to the natural contours.
- Disposal fields discharging secondary treated effluent are to be set at the 20-year ARI (5 % AEP) flood inundation height to comply with the above NRP rule. Flood hazard potential has only been identified just entering within the south-eastern corner of the site and as such the site can provide freeboard above the 1 % AEP flood height to comply with this rule.

5.5 Summary of Concept Wastewater Design

Based on the above design assumptions a concept wastewater design is presented in Table 4 and presented schematically upon Drawing No. 100 (Appendix A). It is recommended that each lot is subject to Building Consent specific review and design amendment according to final development plans.

Table 4: Concept Wastewater Design Summary

Design Element	Specification
Concept development	Five-bedroom, peak occupancy of 8 (per lot)
Design generation volume	160 litres/ person/ day
Water saving measures	Standard. Combined use of 11 litre flush cisterns, automatic washing machine & dishwasher, no garbage grinder[1]
Water meter required?	No
Min. Treatment Quality	Secondary
Soil Drainage Category	TP58 Category 6, NZS1547 Category 5
Soil Loading Rate	3.0 mm/ day
Primary disposal field	Surface/ subsurface laid PCDI, min. 427 m^2
Reserve disposal field	Surface/ subsurface laid PCDI, min. 50 % or 214 m^2
Dosing Method	Pump with high water level visual and audible alarm. Minimum 24-hour emergency storage volume.
Stormwater Control	Divert surface/ stormwater drains away from disposal fields. Cut off drains required for Lots 3 & 4 .

1. Unless further water saving measures are included.

5.6 Assessment of Environmental Effects

An Assessment of Environmental Effects (AEE) is required to address two aspects of wastewater disposal. These include the effect of treated wastewater disposal for an individual lot and the cumulative or combined effect of multiple lots discharging treated wastewater to land as a result of subdivision.

The scale of final development is unknown at the time of writing and building areas, impervious areas including driveways, ancillary buildings, landscaped gardens, and swimming pools may reduce the overall area for on-site wastewater disposal. For the purpose of this report, the above impervious features are considered to be comprised within the conceptual 30 x 30 m square building envelope indicated on Drawing 100, Appendix A. The conceptual wastewater disposal field areas are clear of this indicative building envelope area.

It is recommended that the AEE is reviewed at the time of Building Consent once specific development plans, final disposal field locations and treatment systems are established. The TP58 guideline document provides a detailed AEE for Building Consent applications. Based on the proposed scheme, ground investigation, walkover inspection and Drawing No. 100, a site-specific AEE is presented as Appendix C to demonstrate the proposed wastewater disposal concept will have a less than minor effect on the environment.

6 STORMWATER ASSESSMENT

Considering the nature of rural subdivision and residential development, increased storm water runoff occurs as pervious surfaces such as pasture are converted to impervious features such as roads or future on-lot buildings and driveways.

6.1 Impervious Surfaces and Activity Status

A summary of the impervious areas of the proposed lots is provided as Table 5 below which has been developed from our observations and the provided Scheme Plan. For the proposed lots, this has been taken as conceptual maximum probable development of typical rural residential scenarios. Refer Section 6.2.

The activity status reflected in Table 5 is with respect to Operative FNDC Plan Section 8.6.5.1.3 only. Refer Appendix C for further stormwater assessment of effects that may provide support to the subdivision consent application depending on its overall activity status.

Table 5: Summary of Impervious Surfaces

Surface	Proposed Lot 1		Proposed Lot 2		Proposed Lot 3		Proposed Lot 4		Proposed Lot 5	
Existing Condition	**NA**		**NA**		**NA**		**NA**		**(417,491 m²)**	
Roof (house & surround)									0 m²	0.0 %
Driveway									0 m²	0.0 %
Total impervious									0 m²	0.0 %
Proposed Condition	**(22,000m²)**		**(23,600 m²)**		**(24,000 m²)**		**(24,400 m²)**		**(369,674 m²)**	
Roof (house & surround)	300 m²	1.4 %	300 m²	1.3 %	300 m²	1.3 %	300 m²	1.2 %	0 m²	0.0 %
Driveway	200 m²	0.9 %	200 m²	0.8 %	200 m²	0.8 %	200 m²	0.8 %	0 m²	0.0 %
Total	500 m²	2.3 %	500 m²	2.1 %	500 m²	2.1 %	500 m²	2.0 %	0 m²	0.0 %
Activity Status	Permitted		Permitted		Permitted		Permitted		Permitted	

6.2 Stormwater Management Concept

The stormwater management concept considered in this report has been prepared to meet the requirements of the local and regional consent authorities considering the design storm event as follows:

- **Probable Future Development (Lot 1, 2, 3, 4).** The proposed application includes subdivision formation only and not lot-specific residential development at this stage. However, a conservative model of probable future on-lot development has been developed for this assessment considering variation of scale in typical rural residential development. The probable future on-lot development concept includes up to 300 m² potential roof area and up to 200 m² potential driveway or parking areas. The latter has been modelled as an offset within lot-specific attenuation devices.

- **Subdivision Development.** Access to each proposed lot will be established by individual vehicle crossings to the boundary from Range Road or Settlement Road. These impervious surfaces will produce an insignificant increase in runoff, with less than minor adverse effect on environment, therefore requiring no attenuation.

6.3 Design Storm Event

Relevant design rainfall intensity and depths have been ascertained for the site location from the NIWA HIRDS meteorological model[12]. The NIWA HIRDS rainfall data is presented in full within Appendix D. Provision for climate change has been adopted by means of applying a factor of 20 % to rainfall intensities, in accordance with FNDC Engineering Standards 2023.

Noting the risk of flood hazard downstream of the site as discussed in Section 3.1, this assessment has been modelled to provide stormwater attenuation up to and including 80 % of the pre-development condition for the 1 % AEP storm event which is recommended for the site including any future activities to comply with FNDC Engineering Standard Table 4-1.

This provides additional conservatism over the 10 % AEP pre-development requirement to comply with NRP Rule C6.4.2(2) and also with the Operative District Plan 13.7.3.4 (a). Attenuation modelling under this scenario avoids exacerbating downstream flooding and provides for sufficient flood control as presented in the FNDC Engineering Standards.

Furthermore, the Table 4-1 stipulates that flow attenuation controls reduce the post-development peak discharge to 80 % of the pre-development condition for the 50 % and 20 % AEP storm event. To be compliant with the above rules, the attenuation modelling within this report has been undertaken for all of the above storm events. The results are summarised in Table 7 with calculations provided in full in Appendix D.

Outlet dispersion devices have been designed to manage the 1% AEP event to reduce scour and erosion at discharge locations. These are detailed further in Section 6.4.1 of this report.

6.4 Concept Stormwater Attenuation

Based on the design storm events indicated above and the corresponding modelling results (in Appendix D) an attenuation concept to suit the maximum storage requirement has been provided. In this case the concept limits the post-development peak discharge to 80% of the pre-development condition for the 1% AEP storm event. This is achievable by installing specifically sized low-flow orifices into the attenuation devices.

The rational method has been adopted by Geologix with run-off coefficients as published by FNDC Engineering Standards[13] to provide a suitable concept attenuation design to limit post-

[12] NIWA High Intensity Rainfall Data System, https://hirds.niwa.co.nz.
[13] FNDC Engineering Standards 2023, Version 0.6, Issued May 2023.

development peak flows to 80% of pre-development conditions. The proposed devices with the concept design are listed below:

- Roof Runoff Tanks

Conceptual storage and outlet requirements within the tanks are included in Appendix D and a typical schematic retention/ detention tank arrangement detail is presented as Drawing No. 400 within Appendix A.

Table 6: Summary of Concept Stormwater Attenuation

Item	Pre-development Impervious Area	Post-development Impervious Area	Proposed Concept Attenuation Method
Future Concept Development (Lot 1, 2, 3, 4)			
Potential buildings	0 m^2	300 m^2	Detention within roof water tanks
Potential driveways	0 m^2	200 m^2	Off-set detention in roof water tanks
Total	**0 m^2**	**500 m^2**	

Calculations to support the concept design are presented as Appendix D to this report. A summary of the probable future development attenuation concept design is presented as Table 7. As above, it is recommended that this concept design is refined at the Building Consent stage once final development plans are available.

Table 7: Probable Future Development Attenuation Concept - Tanks

Design Parameter	Flow Attenuation: 50 % AEP (80 % of pre dev)	Flow Attenuation: 20 % AEP (80 % of pre dev)	Flood Control: 10 % AEP	Flood Control: 1 % AEP (80 % of pre dev)
Proposed Lot 1, 2, 3, 4				
Regulatory Compliance	FNDC Engineering Standards Table 4-1	FNDC Engineering Standards Table 4-1	NRC Proposed Regional Plan	FNDC Engineering Standards Table 4-1
Pre-development peak flow	6.71 l/s	8.70 l/s	10.14 l/s	15.08 l/s
80 % pre-development peak flow	5.37 l/s	6.96 l/s	NA	12.06 l/s
Post-development peak flow	10.91 l/s	14.15 l/s	16.50 l/s	24.52 l/s
Total Storage Volume Required	5,511 litres	7,184 litres	4,190 litres	12,735 litres
Concept Summary:	- Attenuation storage calculation accounts for offset flow from 200 m^2 driveway (not indicated explicitly indicated in summary above. Refer Appendix D for calcs in full) - Attenuation to 80 % of pre-development condition for 1 % AEP storm represents maximum storage requirement and is adopted for the concept design tank storage. - 2 x 25,000 litre tank is sufficient for attenuation (12,735 l) + domestic water storage (37,265 l)			

- 1 % AEP attenuation (in isolation) requires a 50 mm orifice 0.66 m below overflow. However regulatory requirements are to consider an additional orifice/s to control the 50 %, 20 % and 1 % AEP events specifically. We note this may vary the concept orifice indicated above. This should be provided with detailed design for building consent approval.

6.4.1 *On-Lot Discharge Dispersion*

The direct discharge of rainwater tank overflow in a concentrated manner can cause scour and erosion in addition to saturation of shallow soils. It is recommended that overflow from rainwater detention tanks is conveyed in sealed pipes to a designated discharge point with suitable dispersion devices that are downslope of proposed building footprints and wastewater disposal fields. A concept design accommodating this is presented within Appendix A on Drawing No. 411.

It is recommended that the conceptually sized dispersion devices are subject to specific assessment at the Building Consent stage to limit scour and erosion from tank overflows.

Typical rural residential developments construct either above or below ground discharge dispersion pipes. Feeding pipes can be either buried or pinned to the surface as desired. It is recommended that all pipes are designed to accommodate the maximum tank overflow. A concept dispersion pipe or trench length is presented as Table 8. Calculations to derive this are presented within Appendix D, based on the Auckland Council TR2013/018 document, a widely adopted standard for this application in New Zealand.

Table 8: Summary of Concept Dispersion Devices

Concept Impervious Area to Tank	Velocity at single spreader orifices	Tank outlet pipe diameter	Spreader pipe diameter	Dispersion Pipe/ Trench Length	Spreader orifice size	Concept
Proposed Lot 1, 2, 3, 4						
500 m^2 (300m^2 direct and 200m^2 offset)	0.87 m/s	0.1 m	0.15 m	8.55 m	20 mm, spaced at 150 mm intervals	Above ground dispersion device or in-ground dispersion trench.

6.5 Subdivision Development Management

There are no stormwater conveyance features required to be formed as part of the subdivision development.

It has been considered whether RC pipe culverts should be provided at each proposed lot vehicle crossings of Range Road, however there it appears that there are no formal drains along the site-side of the roads, with road runoff discharging into the lots as a dispersed sheet flow.

6.6 Stormwater Quality

The proposed application is for a rural residential subdivision and future development. The key contaminant risks in this setting include:

- Sediments and minor contaminants washed from impervious surfaces.
- Leaf matter, grass, and other organic debris.

Stormwater treatment requirements are minor to maintain good quality stormwater discharge. Stormwater quality will be provided by:

- Leaf guards on roof guttering/ first flush devices on roof guttering and downpipes.
- Rainwater tank for potable use onsite only to be filled by roof runoff.
- Room for sedimentation (minimum 150 mm recommended as per Auckland Council GD01) within the base of the stormwater attenuation roof runoff tanks as dead storage volume.
- Stormwater discharges directed towards roading swale drains where possible.
- Grassed swale drains from rainwater inception (road surfaces) to discharge points.

The risk of other contaminants being discharged out of the site boundaries (hydrocarbons, metals etc.,) as a result of the proposed activities once stormwater has been processed through the above measures that will affect the downstream water quality is considered low.

7 POTABLE WATER & FIRE FIGHTING

In the absence of potable water infrastructure within Range Road and Settlement Road or within the site, it is recommended that roof runoff water tanks are adopted for potable water supply with appropriate filtration and UV disinfection at point of use. The volume of potable water supply on each lot should consider the required stormwater detention volume identified within Table 7.

Furthermore, the absence of potable water infrastructure and fire hydrants within Range Road and Settlement Road require provision of the on-lot roof water supply tanks to be used for firefighting purposes (if required). Specific analysis and calculations for firefighting is outside the scope of this report and may require specialist input. Supply for firefighting should be made in accordance with SNZ PAS4509:2008.

8 EARTHWORKS

The following earthworks provisions are anticipated for subdivision formation and for future development within the proposed lots:

- **Vehicle crossings (Lot 1, 2, 3, 4).** Cut/ fill earthworks for construction of the vehicle crossing to Council Engineering Standards. Required at subdivision formation.

Proposed earthwork volumes are well within a 5,000 m^3 Permitted Activity volume limit outlined by FNDC District Plan Rule 12.3.6.1.1(a) and the maximum cut and fill height is <3 m to comply with 12.3.6.1.1(b).

Rule C.8.3.1, Table 15 of the Proposed Regional Plan outlines a Permitted Activity as 5,000 m^2 of exposed earth at any time for 'other areas'. Proposed earthwork areas to form the subdivision, are anticipated to comply with the Permitted Activity standard for other areas.

8.1 General Recommendations

Bulk fill with site-won earth can be moderately sensitive to disturbance when exposed to rain or runoff which may cause saturation or vehicle movements and trafficking during earthworks. Accordingly, care should be taken during construction, including probable future developments to minimise degradation of any earth fill due to construction traffic and to minimise machinery on site.

Any areas of proposed bulk fill which are required to meet specific subgrade requirements within should be subject to a specific earthwork specification prepared by a professional Engineer such as Geologix.

Due to the scope of work and topography of the site, significant excavations are not anticipated. However, to reduce the risk of instability of excavations during construction, it is recommended that **temporary** unsupported excavations have a maximum vertical height of 0.5 m. Excavations >0.5 m should be battered at 1V:1H or 45°. Permanent batter slopes may require a shallower angle to maintain long term stability and if proposed these should be assessed at the Building Consent stage within a specific geotechnical investigation report.

Temporary batters should be covered with polythene sheets secured to the surface with pins or batons to prevent saturation. All works within close proximity to excavations should be undertaken in accordance with Occupational Safety and Health regulations.

All earthworks should be carried out in periods of fine weather within the typical October to April earthwork season. Consent conditions commonly prescribe working restrictions.

8.2 Erosion and Sediment Control

Specific erosion and sediment control measures are required to control sediment runoff from areas of proposed earthworks within the scope of this application. It is recommended that specific on-lot development is assessed at the time of Building Consent by the future developer. To form the subdivision the following erosion and sediment control measures are recommended:

• Silt fence around the downslope face of the proposed vehicle crossing at each lot.

• Clean water diversion of any concentrated flows from Range Road that may otherwise flow through the earthworks area (vehicle crossing).

9 NATURAL HAZARD ASSESSMENT

To satisfy the Resource Management Act, 1991 the proposed subdivision must plan for and manage the risk from natural hazards to reduce the potential adverse effects to less than minor. Regulatory assessment of natural hazards at the site location are managed under the jurisdiction of the FNDC District Plan[14], Northland Regional Council (NRC) Proposed Regional Plan for Northland[15] and Regional Water and Soil Plan for Northland. Following our ground investigation and considering the measures presented in this report, a summary of the proposed activities against defined natural hazards is presented as Table 9.

Table 9: Summary of Natural Hazards

Natural Hazard	Applicability	Mitigation & Effect on Environment
Erosion	Yes	Mitigation provided by means of stormwater dispersion control and erosion and sediment control measures; resultant effects are less than minor.
Overland flow paths, flooding, inundation	Yes	Mitigation provided by means of flood control attenuation; resultant effects are less than minor.
Landslip	Yes	Refer Geotechnical Investigation Report[16]
Rockfall	NA	No mitigation required, less than minor.
Alluvion	NA	No mitigation required, less than minor.
Avulsion	NA	No mitigation required, less than minor.
Unconsolidated fill	NA	No mitigation required, less than minor.
Soil contamination	NA	No mitigation required, less than minor.
Subsidence	NA	No mitigation required, less than minor.
Fire hazard	NA	No mitigation required, less than minor.
Sea level rise	NA	No mitigation required, less than minor.

NA – Not Applicable.

10 LIMITATIONS

This report has been prepared for K & M Trust as our Client. It may be relied upon by our Client and their appointed Consultants, Contractors and for the purpose of Consent as outlined by the specific objectives in this report. This report and associated

[14] *Operative District Plan Rule 13.7.3.2.*
[15] *Proposed Regional Plan for Northland, Appeals Version, July 2021, Chapter D.6.*
[16] *Geotechnical Investigation Report, C0589-G-01, April 2025, prepared by Geologix*

recommendations, conclusions or intellectual property is not to be relied upon by any other party for any purpose unless agreed in writing by Geologix Consulting Engineers Ltd and our Client. In any case the reliance by any other party for any other purpose shall be at such parties' sole risk and no reliability is provided by Geologix Consulting Engineers Ltd.

The opinions and recommendations of this report are based on plans, specifications and reports provided to us at the time of writing, as referenced. Any changes, additions or amendments to the project scope and referenced documents may require an amendment to this report and Geologix Consulting Engineers should be consulted. Geologix Consulting Engineers Ltd reserve the right to review this report and accompanying plans.

The recommendations and opinions in this report are based on arisings extracted from exploratory boreholes at discrete locations and any available existing borehole records. The nature and continuity of subsurface conditions, interpretation of ground condition and models away from these specific ground investigation locations are inferred. It must be appreciated that the actual conditions may vary from the assumed ground model. Differences from the encountered ground conditions during subdivision construction may require an amendment to the recommendations of this report.

APPENDIX A

Drawings

NOTES:

- CONTOUR INTERVAL IS 20 m MAJOR, 5 m MINOR EXTRACTED FROM LINZ
- AERIAL PHOTOGRAPH, EXTRACTED FROM GRIP
- HORIZONTAL DATUM IN MT EDEN CIRCUIT 2000
- VERTICAL DATUM IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016
- EXISTING SITE BOUNDARIES EXTRACTED FROM GRIP.CO.NZ
- PROPOSED BOUNDARIES PROVIDED BY THOMSON SURVEY PLAN 10519 DATED AUGUST 2023

LEGEND:

- —75.0— MAJOR CONTOUR
- — — — MINOR CONTOUR
- SUBJECT LOT
- PROPOSED LOTS
- EXISTING ROAD RESERVE BOUNDARY
- EXISTING ABUTTAL LOT BOUNDARY
- PROPOSED PRIMARY WASTE DISPOSAL FIELD
- PROPOSED SECONDARY WASTE DISPOSAL FIELD
- CONCEPT BUILDING ENVELOPE (30m x 30m)
- CONCEPT 2 x 25,000 LITRE WATER TANK ATTENUATING TO DISPERSION DEVICE TO CONTROL 500m² AREA
- HAXX GEOLOGIX HAND AUGER
- CONCEPTUAL PALISADE WALL

SETTLEMENT ROAD

3 DP 142543

3 DP 184846

PART SEC 49 BLK XVI KAWAKAWA SD

REFER DRAWING C0589-S-101

Lot 1 2.20ha

Lot 2 2.36ha

Lot 3 2.40ha

Lot 4 2.44ha

Lot 5 36.9674ha

RANGE ROAD

REFER DRAWING C0589-S-102

SEC 79 BLK XVI KAWAKAWA SD

1 DP 545590

GENERAL NOTES

1. DRAWING REPRODUCED FROM THOMSON SURVEY PROPOSED SCHEME PLAN REF. 10519, DATED AUGUST 2023.
3. HORIZONTAL CO ORDINATE SYSTEM = NZTM.
4. VERTICAL DATUM = NZVD.
5. MAJOR INTERVALS 5.0 m.
6. MINOR INTERVALS 1.0 m.
7. FOR INDICATION ONLY, NOT FOR CONSTRUCTION.

CONCEPT WASTEWATER DESIGN

CONCEPT DEVELOPMENT	5 BEDROOM
CONCEPT NO. OF OCCUPANTS	8 PERSONS
DAILY WASTEWATER GEN.	160 LITRES/PERSON/ DAY
TOTAL WASTEWATER GEN.	1,280 LITRES/ DAY
SOIL CATEGORY (TP58)	CATEGORY 6
SOIL CATEGORY (NZS1547)	CATEGORY 5
SOIL LOADING RATE	3.0 mm/ DAY
TREATMENT SYSTEM	NO - SUBJECT TO BUILDING CONSENT DESIGN
PRIMARY DISPOSAL AREA	427 m²
RESERVE DISPOSAL AREA	214 m² (50 %)
FINAL DESIGN	NO - SUBJECT TO BUILDING CONSENT DESIGN
CUT OFF DRAINS LOT 1 & 2	NO
CUT OFF DRAINS LOT 3 & 4	YES
DISCHARGE CONSENT	NO

Meters 50 0 50 100

1:5000

Revision	Issue	Date
A	CONSENT	28/02/25

geologix consulting engineers

AUCKLAND | NORTHLAND

Project Name and Address

RANGE ROAD
KAWAKAWA
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client

K & M TRUST

Sheet Title

SITE SUITABILITY OVERALL LAYOUT

Sheet

100

FILE PATH: Z:\Geologix Files\Projects\C0500-C0599\C0589 - Range Road, Kawakawa\07 - Technical & Drawings\Drawings\C0589-S-100-411-A.dwg\C0589-S-100-411-A.dwg

PLOTTED: 03/04/2022

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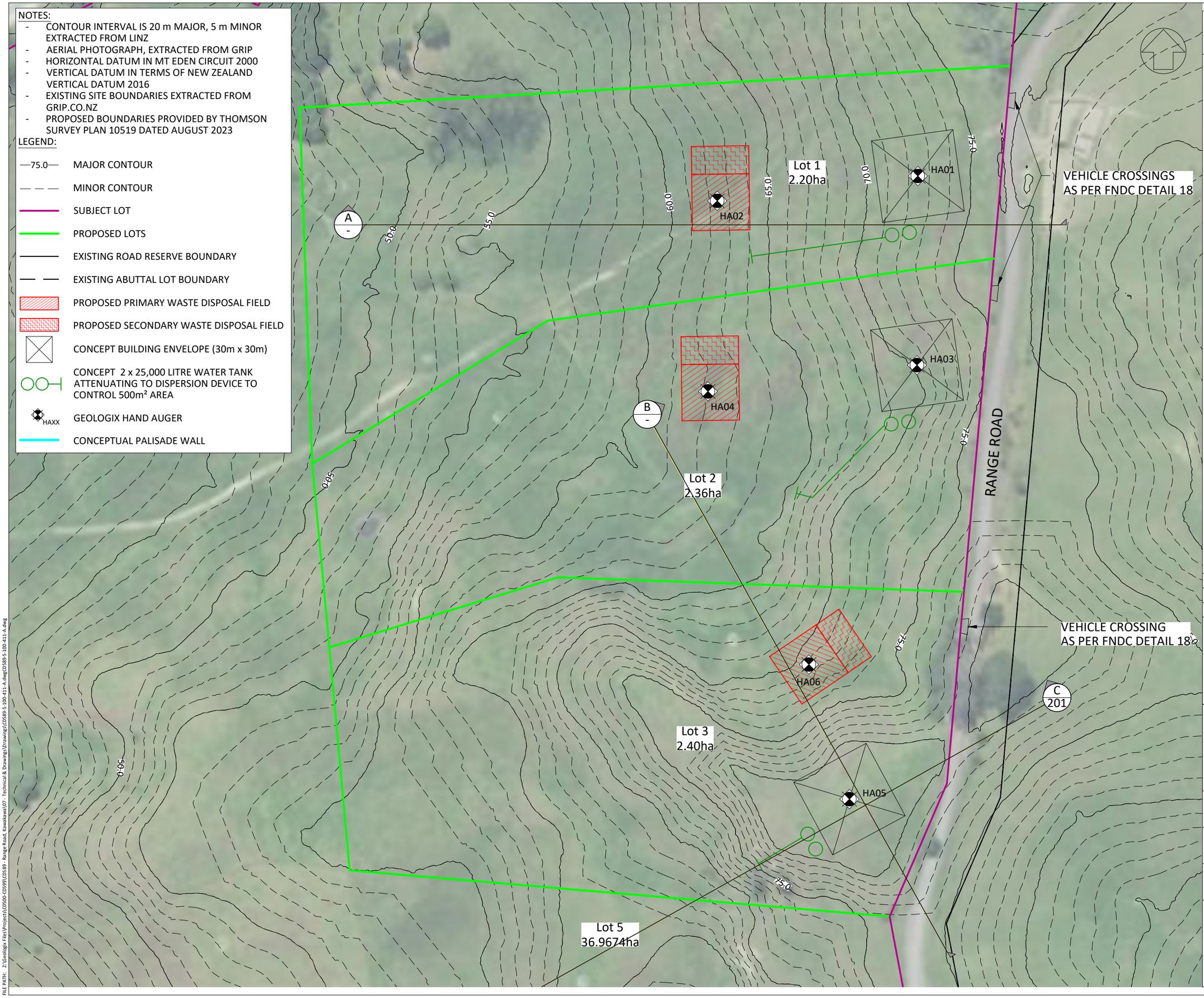

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FINAL DESIGN	NO - SUBJECT TO BUILDING CONSENT DESIGN
CUT OFF DRAINS LOT 1 & 2	NO
CUT OFF DRAINS LOT 3 & 4	YES
DISCHARGE CONSENT	NO

Meters
12.5 0 12.5 25
1:1250

Revision	Issue	Date
A	CONSENT	28/02/25

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AUCKLAND | NORTHLAND

Project Name and Address
RANGE ROAD
KAWAKAWA
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client
K & M TRUST

Sheet Title
SITE SUITABILITY ENLARGED SHEET 1

Sheet
101

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PLOTTED: 03/04/2025

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- HAXX GEOLOGIX HAND AUGER
- CONCEPTUAL PALISADE WALL

Lot 5
36.9674ha

Lot 4
2.44ha

1
DP 545590

RANGE ROAD

50.0

75.0

HA10

HA08

HA07

HA09

D
202

CONCEPTUAL
PALISADE WALL

VEHICLE CROSSING
AS PER FNDC DETAIL 18

GENERAL NOTES

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CUT OFF DRAINS LOT 1 & 2	NO
CUT OFF DRAINS LOT 3 & 4	YES
DISCHARGE CONSENT	NO

Meters
12.5 0 12.5 25
1:1250

A	CONSENT	28/02/25
Revision	Issue	Date

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consulting engineers
AUCKLAND | NORTHLAND

Project Name and Address
RANGE ROAD
KAWAKAWA
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client
K & M TRUST

Sheet Title
SITE SUITABILITY ENLARGED SHEET 2

Sheet
102

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PLOTTED: 03/04/2022

PROPOSED TANK PLAN VIEW

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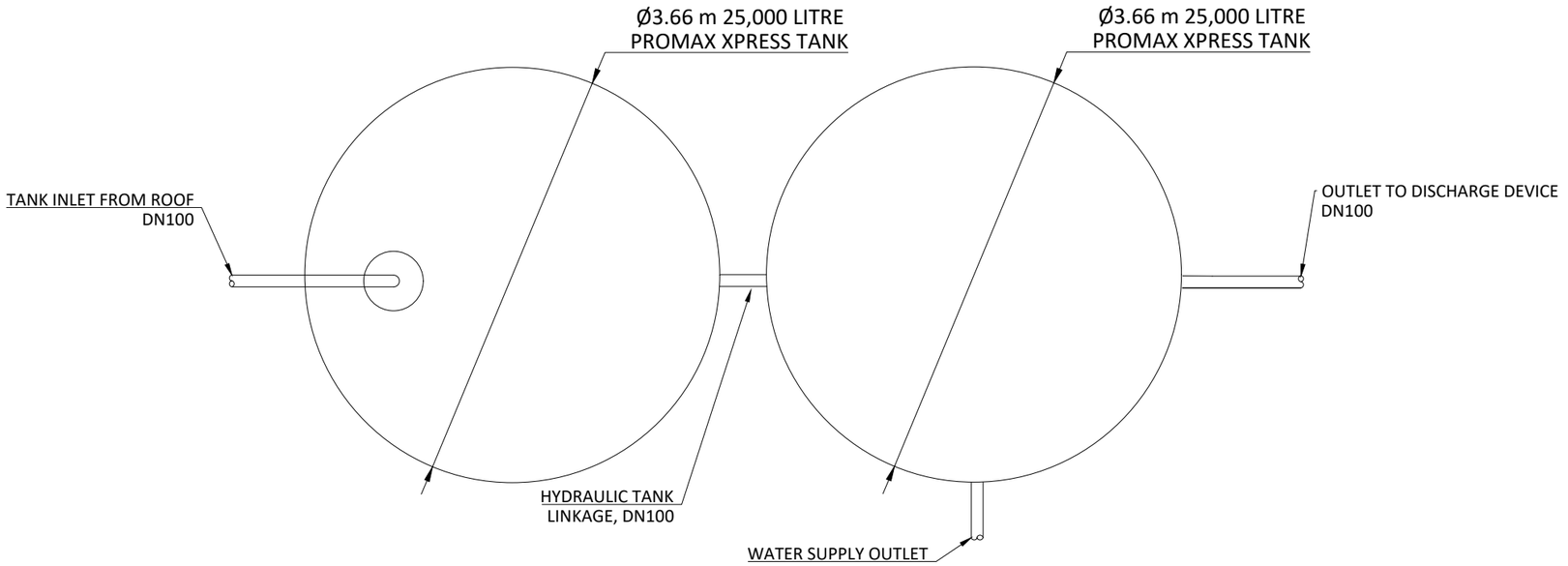

PROPOSED TANK SIDE VIEW

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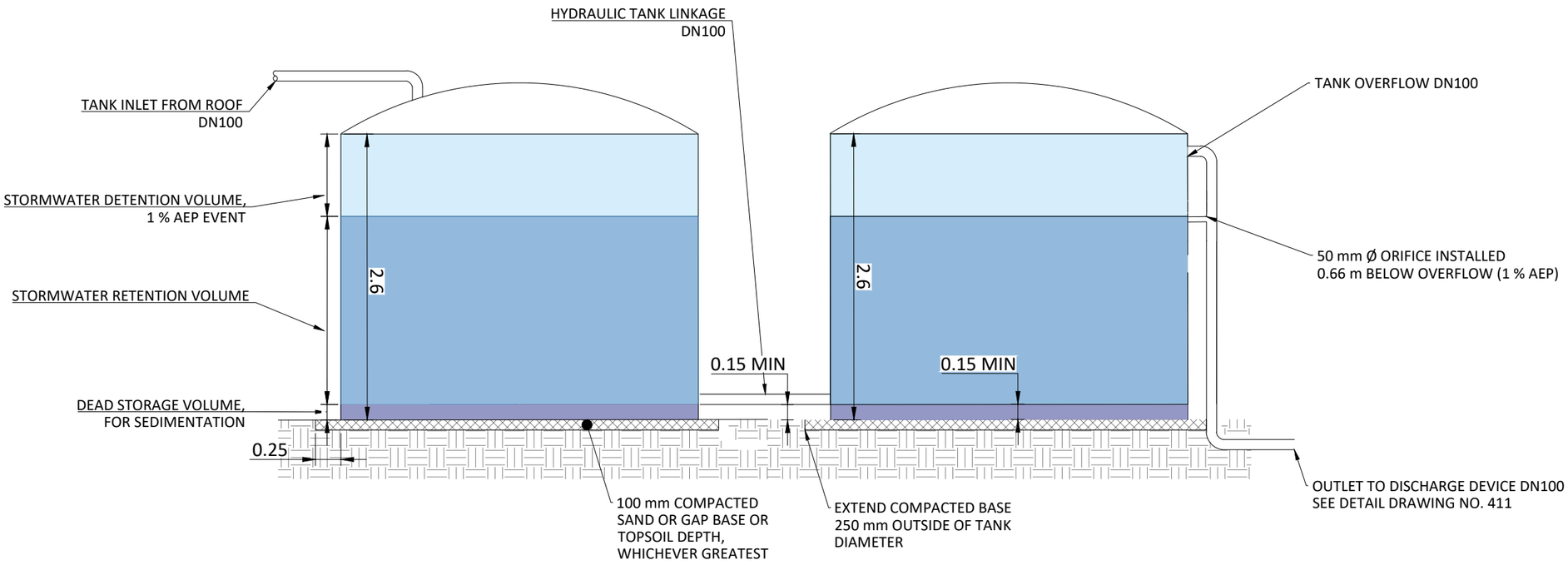

GENERAL NOTES

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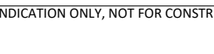

A	CONSENT	28/02/25
Revision	Issue	Date

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AUCKLAND | NORTHLAND

Project Name and Address

RANGE ROAD
KAWAKAWA
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client

K & M TRUST

Sheet Title

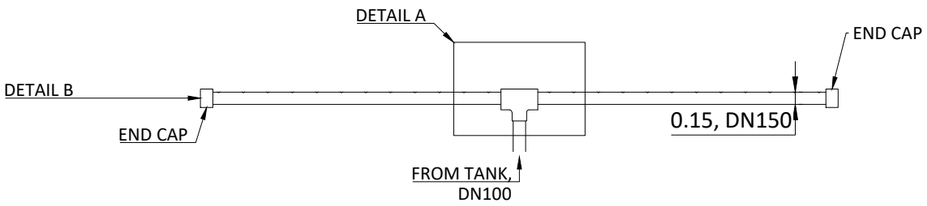
STORMWATER TANK DETAILS

Sheet

400

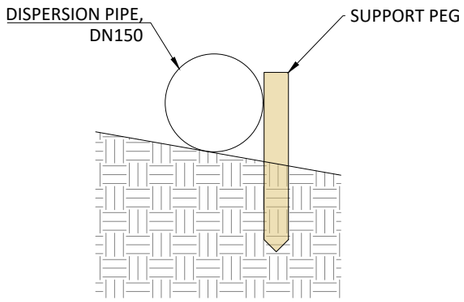
OPTION 1: DISPERSION VIA ABOVE GROUND PIPE

NOT TO SCALE



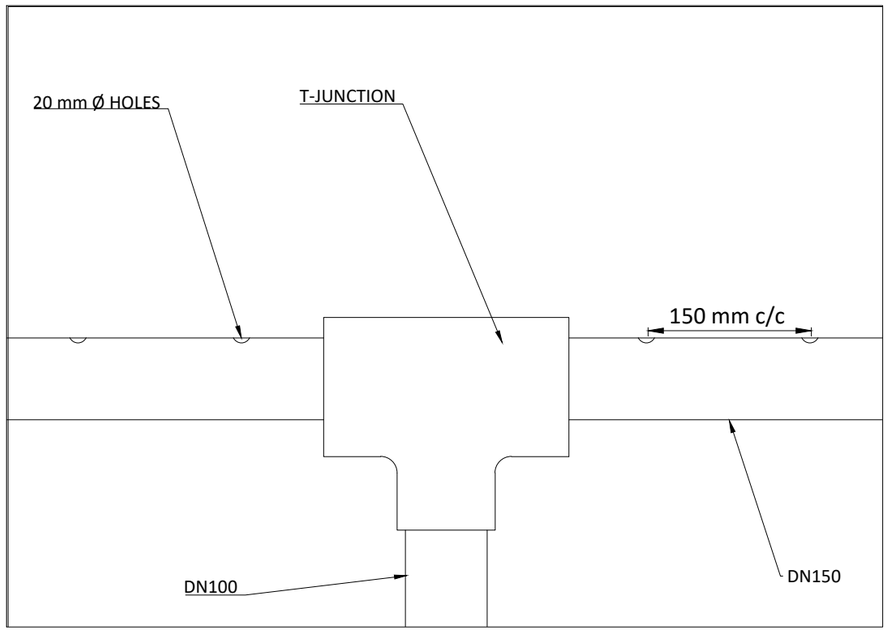
DETAIL B - SIDE VIEW

NOT TO SCALE



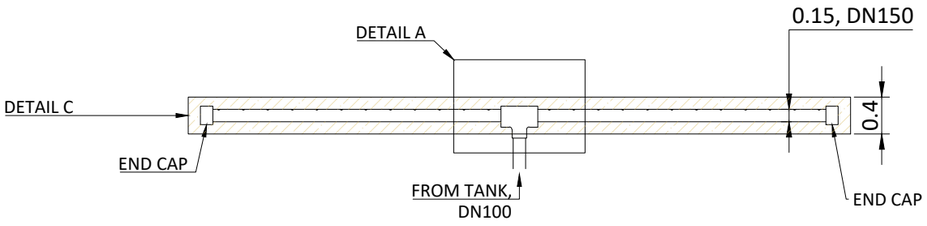
DETAIL A - T JUNCTION AND PERFORATIONS

NOT TO SCALE



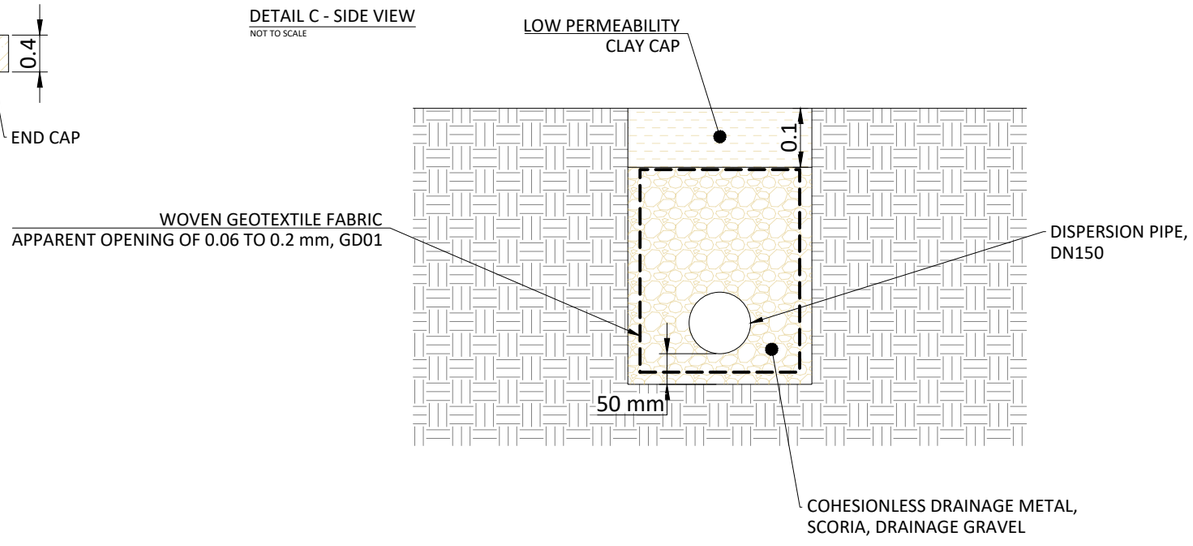
OPTION 2: DISPERSION VIA BELOW GROUND TRENCH

NOT TO SCALE



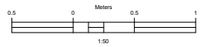
DETAIL C - SIDE VIEW

NOT TO SCALE



GENERAL NOTES

1. FOR INDICATION ONLY, NOT FOR CONSTRUCTION.



A	CONSENT	28/02/25
Revision	Issue	Date

geologix consulting engineers

AUCKLAND | NORTHLAND

Project Name and Address

RANGE ROAD
KAWAKAWA
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client

K & M TRUST

Sheet Title

STORMWATER DETAILS

Sheet

411

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APPENDIX B

Engineering Borehole Records

INVESTIGATION LOG

HOLE NO.: HA02

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

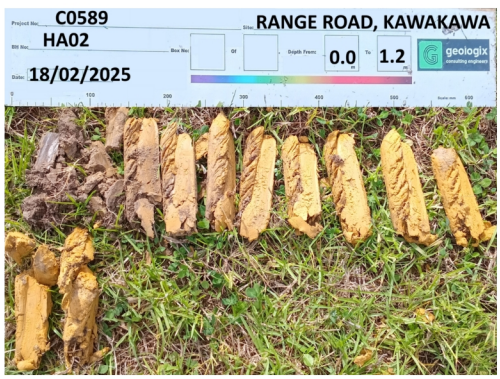
SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696412mE, 6082584mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger
DRILLER: GB/TW
LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
TOPSOIL comprising of organic silt with trace rootlets; dark brown. Moist; low plasticity.		0.0	TS				Groundwater Not Encountered
Clayey SILT; orange with brown mottles. Moist; low plasticity; [Northland Allochthon Residual Soils] .		0.2			195	195	
		0.4			64	64	
		0.6			124	124	
		0.8			78	78	
		1.0			108	108	
		1.2			66	66	
End Of Hole: 1.20m		1.4			101	101	
		1.6			48	48	
		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					

SCALA PENETROMETER (Blows / 0mm): 2 4 6 8 10 12 14 16 18

VANE SHEAR STRENGTH (kPa): 50 100 150 200

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.2m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA04

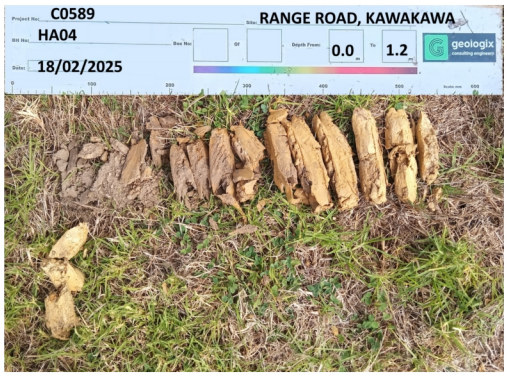
CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696406mE, 6082531mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger
DRILLER: GB/TW
LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets; brown; dry; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Clayey SILT; orange brown mottled brown. Hard to very stiff; wet; low plasticity; [Northland Allochthon Residual Soils].		0.2				203+	
		0.4				-	
		0.6				116	
		0.8				58	
0.9m: Becoming stiff.		1.0				96	
SILT, with some clay; brown mottled greyish brown and orange brown. Moist; low plasticity; [Northland Allochthon Residual Soils].		1.2				52	
End Of Hole: 1.20m		1.4				87	
		1.6				58	
		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					

Groundwater Not Encountered

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.2m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA06

CLIENT: K&M Trust

PROJECT: Range Road, Kawakawa

JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa

START DATE: 18/02/2025

CO-ORDINATES: 1696402mE, 6082404mN

ELEVATION: Ground

END DATE: 18/02/2025

CONTRACTOR: Internal

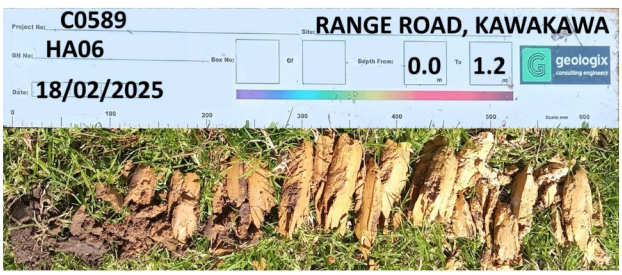
RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets; dark blackish brown; moist; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		Groundwater Not Encountered
Clayey SILT; orange brown with dark orange mottles . Hard to very stiff; moist; low plasticity; [Northland Allochthon Residual Soils].		0.2				203 - 174 87	
		0.4					
		0.6					
		0.8				UTP -	
Clayey SILT, with trace clasts. Hard; moist; low plasticity; fine to medium clasts; [Northland Allochthon Residual Soils].		1.0					
End Of Hole: 1.20m		1.2				UTP -	
		1.4					
		1.6					
		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.2m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA10

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

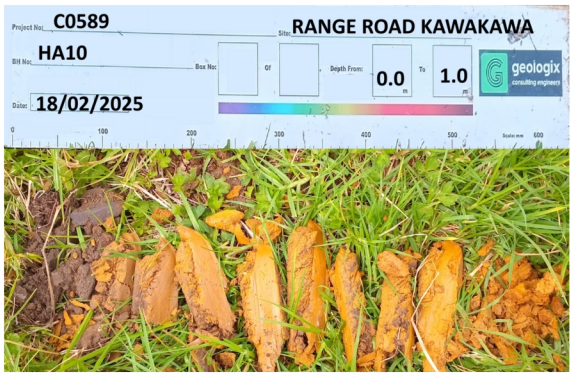
SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696381mE, 6082062mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger
DRILLER: GB/TW
LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets dark brown; dry to moist; friable.		0.0	TS				Groundwater Not Encountered
Clayey SILT; orange. Hard; moist; low plasticity; [Northland Allochthon Residual Soils] .		0.2			202+	202+	
		0.4					
		0.6			202+	202+	
		0.8					
SILT, with some clay, with trace gravel; orange with dark orange mottled. Hard; moist; low plasticity; gravel, fine; [Northland Allochthon Completely Weathered Parent Rock].		1.0			202+	202+	
End Of Hole: 1.00m		1.2					
		1.4					
		1.6					
		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					

SCALA PENETROMETER (Blows / 0mm): 2 4 6 8 10 12 14 16 18

VANE SHEAR STRENGTH (kPa) Vane: 3467: 50 100 150 200

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.0m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

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APPENDIX C

Assessment of Environmental Effects and Assessment Criteria

Table 10: Wastewater Assessment of Environmental Effects

Item	NRC Separation Requirement[2]	FNDC Separation Requirement	Site Assessment[3]
Individual System Effects			
Flood Plains	Above 5 % AEP	NR	Complies according to available GIS data and visual assessment.
Stormwater Flowpath[4]	5 m	NR	Complies, see annotations on Drawing No. 100.
Surface water feature[5]	15 m	30 m	Complies.
Coastal Marine Area	15 m	30 m	Complies, site is inland.
Existing water supply bore.	20 m	NR	Complies. None recorded within or within 20 m of the site boundaries.
Property boundary	1.5 m	1.5	Complies. Including proposed subdivision boundaries.
Winter groundwater table	0.6 m	0.6 m	Complies.
Topography			Ok – chosen disposal areas are flat and level to <10°.
Cut off drain required?			No.
Discharge Consent Required?			No.
	TP58	**NZS1547**	
Cumulative Effects			
Biological Oxygen Demand	≤20 g/m^3		Complies – secondary treatment.
Total Suspended Solids	≤30 g/m^3		Complies – secondary treatment.
Total Nitrogen	10 – 30 g/m^3	15 – 75 g/m^3	Complies – secondary treatment.
Phosphorous	NR	4 – 10 g/m^3	Complies – secondary treatment.
Ammonia	NR	Negligible	Complies – secondary treatment.
Nitrites/ Nitrates	NR	15 – 45 g/m^3	Complies – secondary treatment.
Conclusion: Effects are less than minor on the environment.			

1. AEE based on proposed secondary treated effluent.
2. Northland Regional Plan Table 9.
3. Based on the recommendations of this report and Drawing No. 100.
4. Including any formed road with kerb and channel, and water-table drain that is down-slope of the disposal area.
5. River, lake, stream, pond, dam, or natural wetland.

AEP Annual Exceedance Probability.
NR No Requirement.

Table 11: Operative FNDC Subdivision Stormwater Assessment Criteria, to rule 13.10.4

Assessment Criteria	Comments
(a) Whether the application complies with any regional rules relating to any water or discharge permits required under the Act, and with any resource consent issued to the District Council in relation to any urban drainage area stormwater management plan or similar plan.	Complies.
(b) Whether the application complies with the provisions of the Council's "Engineering Standards and Guidelines" (2004) - Revised March 2009 (to be used in conjunction with NZS 4404:2004).	Concept design complies and has adopted latest FNDC engineering standards (2023) for runoff curves and proposed area within all undeveloped lots will be attenuated to 80 % of pre-development levels for specified design storms by FNDC standards and NRP.
(c) Whether the application complies with the Far North District Council Strategic Plan - Drainage.	Complies.
(d) The degree to which Low Impact Design principles have been used to reduce site impermeability and to retain natural permeable areas.	Proposed impervious areas within subdivision proposal are limited to necessity only. Access to each proposed lot will be established by individual vehicle crossings to the boundary from Range Road. These impervious surfaces will produce an insignificant increase in runoff, with less than minor adverse effect on environment. All other impervious areas to be attenuated by on site storage devices.
(e) The adequacy of the proposed means of disposing of collected stormwater from the roof of all potential or existing buildings and from all impervious surfaces.	Low impact design adopted – attenuation within on-site tanks for undeveloped proposed Lot 1, 2, 3 and 4. Efficient and controlled discharge outlets.
(f) The adequacy of any proposed means for screening out litter, the capture of chemical spillages, the containment of contamination from roads and paved areas, and of siltation.	Stormwater quality devices included in design to accommodate a rural residential subdivision.
(g) The practicality of retaining open natural waterway systems for stormwater disposal in preference to piped or canal systems and adverse effects on existing waterways.	Surface drainage is generally by sheet flow westwards across the site. No adverse effects anticipated on downstream environment.
(h) Whether there is sufficient capacity available in the Council's outfall stormwater system to cater for increased run-off from the proposed allotments.	No connection to public stormwater proposed.
(i) Where an existing outfall is not capable of accepting increased run-off, the adequacy of proposals and solutions for disposing of run-off.	NA.
(j) The necessity to provide on-site retention basins to contain surface run-off where the capacity of the outfall is incapable of accepting flows, and where the outfall has limited capacity, any need to restrict the rate of discharge from the subdivision to the same rate of discharge that existed on the land before the subdivision takes place.	Attenuation provided through storage tanks.
(k) Any adverse effects of the proposed subdivision on drainage to, or from, adjoining properties and mitigation measures proposed to control any adverse effects.	No adverse effects anticipated on neighbouring properties or downstream environment.

(l) In accordance with sustainable management practices, the importance of disposing of stormwater by way of gravity pipelines. However, where topography dictates that this is not possible, the adequacy of proposed pumping stations put forward as a satisfactory alternative.	All devices adopt and are designed for gravity flows.
(m) The extent to which it is proposed to fill contrary to the natural fall of the country to obtain gravity outfall; the practicality of obtaining easements through adjoining owners' land to other outfall systems; and whether filling or pumping may constitute a satisfactory alternative.	No fill is required for the stormwater management purpose.
(n) For stormwater pipes and open waterway systems, the provision of appropriate easements in favour of either the registered user or in the case of the Council, easements in gross, to be shown on the survey plan for the subdivision, including private connections passing over other land protected by easements in favour of the user.	No stormwater pipes and devices are proposed within easements as shown in scheme plan.
(o) Where an easement is defined as a line, being the centre line of a pipe already laid, the effect of any alteration of its size and the need to create a new easement.	NA.
(p) For any stormwater outfall pipeline through a reserve, the prior consent of the Council, and the need for an appropriate easement.	NA.
(q) The need for and extent of any financial contributions to achieve the above matters.	TBC.
(r) The need for a local purpose reserve to be set aside and vested in the Council as a site for any public utility required to be provided.	NA.

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APPENDIX D

Stormwater Calculations

Project Ref:	C0589		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	RANGE ROAD KAWAKAWA			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**50 % AEP STORM EVENT, 80 % OF PRE DEVELOPMENT**	
Date:	21 February 2025	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF CLIMATE CHANGE (20% FACTOR AS PER 2023 FNDC ENGINEERING STANDARDS).
PRE-DEVELOPMENT RUNOFF IS FACTORED BY 80% TO SUIT FNDC STANDARDS
RUNOFF COEFFICIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PRE DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
IMPERVIOUS A			
IMPERVIOUS B	0	0	
IMPERVIOUS C	0	0	
EX. PERVIOUS	500	0.67	PASTURE
TOTAL	**500**	TYPE D	

POST DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
TO TANK	300	0.96	ROOF
OFFSET	200	0.83	DRIVEWAY - METAL
PERVIOUS	0	0	
EX. CONSENTED	0	0	
TOTAL	**500**	TYPE D	

RAINFALL INTENSITY, 50% AEP, 10MIN DURATION

50 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	72.1	mm/hr
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	20	%
50 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	86.52	mm/hr

* CLIMATE CHANGE FACTOR OF 20% APPLIED IN ACCORDANCE WITH FNDC ENGINEERING STANDARDS 4.3.9.1. NIWA HISTORIC RAINFALL INTENSITY DATA, 10MIN, IS MULTIPLIED BY CLIMATE CHANGE FACTOR.

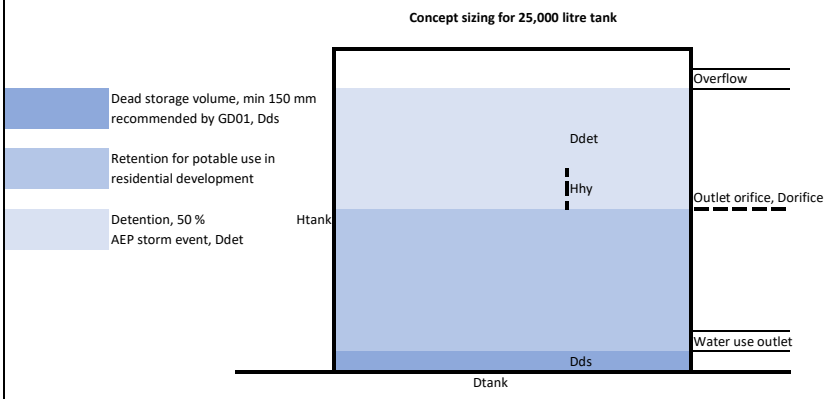
PRE AND POST-DEVELOPMENT RUNOFF, 50%AEP, VARIOUS DURATIONS

DURATION, min	INTENSITY, mm/hr	CC FACTOR	INTENSITY WITH CC, mm/hr	POST DEV RUNOFF, Qpost, l/s	PRE DEV RUNOFF, Qpre, l/s	80% of PRE DEV RUNOFF, Qpre(80%), l/s	COMMENTS
10	72.10	1.2	86.52	10.91	6.71	5.37	*Critical duration (time of concentration) for the catchments is 10min*
20	52.20	1.2	62.64	7.90	4.86	3.89	
30	42.90	1.2	51.48	6.49	3.99	3.19	
60	30.30	1.2	36.36	4.59	2.82	2.26	
120	20.90	1.2	25.08	3.16	1.94	1.56	*Pre-dev calculated on Intensity without CC factor*
360	11.00	1.2	13.20	1.66	1.02	0.82	
720	7.07	1.2	8.48	1.07	0.66	0.53	
1440	4.38	1.2	5.26	0.66	0.41	0.33	
2880	2.62	1.2	3.14	0.40	0.24	0.20	
4320	1.90	1.2	2.28	0.29	0.18	0.14	

ATTENUATION ANALYSIS, VARIOUS DURATIONS

DURATION, min	OFFSET FLOW, Qoff, l/s	TANK INFLOW , Qin, l/s	ALLOWABLE TANK OUTFLOW, Qpre(80%) - Qoff, l/s	SELECTED TANK OUTFLOW, Qout, l/s	DIFFERENCE (Qin - Qout), l/s	Required Storage, litres	
10	3.99	6.92	1.38	1.38	5.54	3326	*Selected Tank Outflow is selected for critical duration (time of concentration).*
20	2.89	5.01	1.00	1.38	3.63	4360	
30	2.37	4.12	0.82	1.38	2.74	4933	
60	1.68	2.91	0.58	1.38	1.53	5511	
120	1.16	2.01	0.40	1.38	0.63	4525	*select largest required storage , regardless of duration, to avoid overflow for event of any duration*
360	0.61	1.06	0.21	1.38	No Att. Req.	0	
720	0.39	0.68	0.14	1.38	No Att. Req.	0	
1440	0.24	0.42	0.08	1.38	No Att. Req.	0	
2880	0.14	0.25	0.05	1.38	No Att. Req.	0	
4320	0.11	0.18	0.04	1.38	No Att. Req.	0	

ATTENUATION TANK DESIGN OUTPUT



SPECIFICATION

TOTAL STORAGE REQUIRED	5.511	m3	Select largest storage as per analysis
TANK HEIGHT, Htank	2.6	m	Concept sizing for 25,000 litre tank
TANK DIAMETER, Dtank	3.5	m	No. of Tanks 2
TANK AREA, Atank	19.24	m2	Area of TWO tanks
TANK MAX STORAGE VOLUME, Vtank	50030	litres	
REQUIRED STORAGE HEIGHT, Ddet	0.29	m	Below overflow
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum
TOTAL WATER DEPTH REQUIRED	0.44	m	
SELECTED TANK OUTFLOW, Qout, l/s	0.00138	m3/s	Selected tank outflow
AVERAGE HYDRAULIC HEAD, Hhy	0.14	m	
AREA OF ORIFICE, Aorifice	1.33E-03	m2	
ORIFICE DIAMETER, Dorifice	41	mm	
VELOCITY AT ORIFICE	2.37	m/s	At max. head level

Project Ref:	C0589		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	RANGE ROAD KAWAKAWA			
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Date:	21 February 2025	REV 1		

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RUNOFF COEFFICIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PRE DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
IMPERVIOUS A	0	0	
IMPERVIOUS B	0	0	
IMPERVIOUS C	0	0	
EX. PERVIOUS	500	0.67	PASTURE
TOTAL	**500**	TYPE D	

POST DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
TO TANK	300	0.96	ROOF
OFFSET	200	0.83	DRIVEWAY - METAL
PERVIOUS	0	0	
EX. CONSENTED	0	0	
0	0	0	
TOTAL	**500**	TYPE D	

RAINFALL INTENSITY, 20% AEP, 10MIN DURATION

20 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	93.5	mm/hr
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	20	%
20 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	112.2	mm/hr

* CLIMATE CHANGE FACTOR OF 20% APPLIED IN ACCORDANCE WITH FNDC ENGINEERING STANDARDS 4.3.9.1. NIWA HISTORIC RAINFALL INTENSITY DATA, 10MIN, IS MULTIPLIED BY CLIMATE CHANGE FACTOR.

PRE AND POST-DEVELOPMENT RUNOFF, 20%AEP, VARIOUS DURATIONS

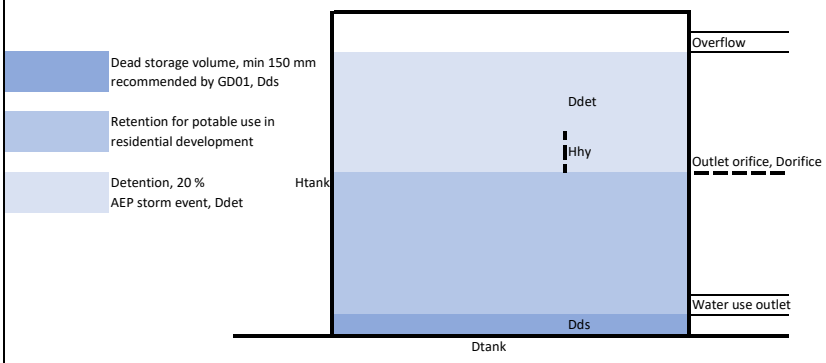
DURATION, min	INTENSITY, mm/hr	CC FACTOR	INTENSITY WITH CC, mm/hr	POST DEV RUNOFF, Qpost, l/s	PRE DEV RUNOFF, Qpre, l/s	80% of PRE DEV RUNOFF, Qpre(80%), l/s	COMMENTS
10	93.50	1.2	112.20	14.15	8.70	6.96	*Critical duration (time of concentration) for the catchments is 10min*
20	67.80	1.2	81.36	10.26	6.31	5.05	
30	55.80	1.2	66.96	8.44	5.19	4.15	
60	39.40	1.2	47.28	5.96	3.67	2.93	
120	27.20	1.2	32.64	4.12	2.53	2.02	*Pre-dev calculated on Intensity without CC factor*
360	14.40	1.2	17.28	2.18	1.34	1.07	
720	9.26	1.2	11.11	1.40	0.86	0.69	
1440	5.75	1.2	6.90	0.87	0.54	0.43	
2880	3.44	1.2	4.13	0.52	0.32	0.26	
4320	2.50	1.2	3.00	0.38	0.23	0.19	

ATTENUATION ANALYSIS, VARIOUS DURATIONS

DURATION, min	OFFSET FLOW, Qoff, l/s	TANK INFLOW , Qin, l/s	ALLOWABLE TANK OUTFLOW, Qpre(80%) - Qoff, l/s	SELECTED TANK OUTFLOW, Qout, l/s	DIFFERENCE (Qin - Qout), l/s	Required Storage, litres	
10	5.17	8.98	1.79	1.79	7.19	4313	*Selected Tank Outflow is selected for critical duration (time of concentration).*
20	3.75	6.51	2.56	1.79	4.72	5666	
30	3.09	5.36	2.10	1.79	3.57	6426	
60	2.18	3.78	1.49	1.79	2.00	7184	
120	1.51	2.61	1.03	1.79	0.82	5935	*select largest required storage , regardless of duration, to avoid overflow for event of any duration*
360	0.80	1.38	0.54	1.79	No Att. Req.	0	
720	0.51	0.89	0.35	1.79	No Att. Req.	0	
1440	0.32	0.55	0.22	1.79	No Att. Req.	0	
2880	0.19	0.33	0.13	1.79	No Att. Req.	0	
4320	0.14	0.24	0.09	1.79	No Att. Req.	0	

ATTENUATION TANK DESIGN OUTPUT

Concept sizing for 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	7.184	m3	Select largest storage as per analysis
TANK HEIGHT, Htank	2.6	m	Concept sizing for 25,000 litre tank
TANK DIAMETER, Dtank	3.5	m	No. of Tanks 2
TANK AREA, Atank	19.24	m2	Area of TWO tanks
TANK MAX STORAGE VOLUME, Vtank	50030	litres	
REQUIRED STORAGE HEIGHT, Ddet	0.37	m	Below overflow
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum
TOTAL WATER DEPTH REQUIRED	0.52	m	
SELECTED TANK OUTFLOW, Qout, l/s	0.00179	m3/s	Selected tank outflow
AVERAGE HYDRAULIC HEAD, Hhy	0.19	m	
AREA OF ORIFICE, Aorifice	1.51E-03	m2	
ORIFICE DIAMETER, Dorifice	44	mm	
VELOCITY AT ORIFICE	2.71	m/s	At max. head level

Project Ref:	C0589		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	RANGE ROAD KAWAKAWA			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**10 % AEP STORM EVENT, TO PRE-DEVELOPMENT FLOW**	
Date:	21 February 2025	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF CLIMATE CHANGE (20% FACTOR AS PER 2023 FNDC ENGINEERING STANDARDS). THE 10% AEP SCENARIO IS PROVIDED TO SATISFY FNDC DISTRICT PLAN RULE 13.7.3.4 (FOR CONTROLLED ACTIVITY). PRE-DEVELOPMENT RUNOFF REMAINS UNFACTORED IN THIS SCENARIO.
RUNOFF COEFFICIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PRE DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
IMPERVIOUS A	0	0	
IMPERVIOUS B	0	0	
IMPERVIOUS C	0	0	
EX. PERVIOUS	500	0.67	PASTURE
0	0	0	
TOTAL	**500**	TYPE D	

POST DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
TO TANK	300	0.96	ROOF
OFFSET	200	0.83	DRIVEWAY - METAL
PERVIOUS	0	0	
EX. CONSENTED	0	0	
0	0	0	
TOTAL	**500**	TYPE D	

RAINFALL INTENSITY, 10% AEP, 10MIN DURATION

10 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	109.0	mm/hr
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	20	%
10 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	130.8	mm/hr

* CLIMATE CHANGE FACTOR OF 20% APPLIED IN ACCORDANCE WITH FNDC ENGINEERING STANDARDS 4.3.9.1. NIWA HISTORIC RAINFALL INTENSITY DATA, 10MIN, IS MULTIPLIED BY CLIMATE CHANGE FACTOR.

PRE AND POST-DEVELOPMENT RUNOFF, 10%AEP, VARIOUS DURATIONS

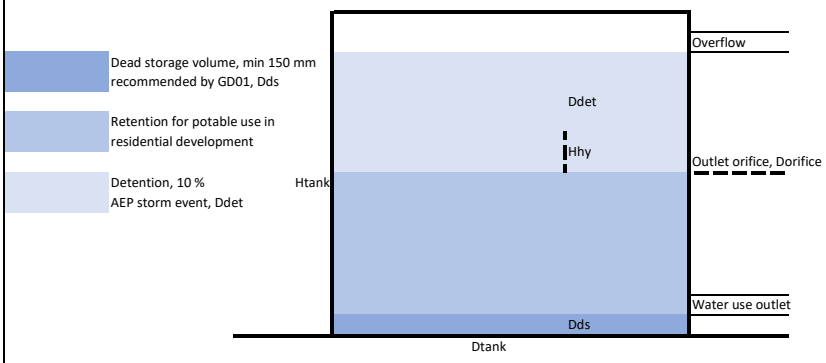
DURATION, min	INTENSITY, mm/hr	CC FACTOR	INTENSITY WITH CC, mm/hr	POST DEV RUNOFF, Qpost, l/s	PRE DEV RUNOFF, Qpre, l/s		COMMENTS
10	109.00	1.2	130.80	16.50	10.14		*Critical duration (time of concentration) for the catchments is 10min*
20	79.20	1.2	95.04	11.99	7.37		
30	65.20	1.2	78.24	9.87	6.07		
60	46.10	1.2	55.32	6.98	4.29		
120	31.90	1.2	38.28	4.83	2.97		*Pre-dev calculated on Intensity without CC factor*
360	16.90	1.2	20.28	2.56	1.57		
720	10.90	1.2	13.08	1.65	1.01		
1440	6.77	1.2	8.12	1.02	0.63		
2880	4.06	1.2	4.87	0.61	0.38		
4320	2.95	1.2	3.54	0.45	0.27		

ATTENUATION ANALYSIS, VARIOUS DURATIONS

DURATION, min	OFFSET FLOW, Qoff, l/s	TANK INFLOW , Qin, l/s	ALLOWABLE TANK OUTFLOW, Qpre - Qoff, l/s	SELECTED TANK OUTFLOW, Qout, l/s	DIFFERENCE (Qin - Qout), l/s	Required Storage, litres	
10	6.03	10.46	4.11	4.11	6.35	3811	*Selected Tank Outflow is selected for critical duration (time of concentration).*
20	4.38	7.60	2.99	4.11	3.49	4190	
30	3.61	6.26	2.46	4.11	2.15	3865	
60	2.55	4.43	1.74	4.11	0.31	1130	
120	1.77	3.06	1.20	4.11	No Att. Req.	0	*select largest required storage , regardless of duration, to avoid overflow for event of any duration*
360	0.94	1.62	0.64	4.11	No Att. Req.	0	
720	0.60	1.05	0.41	4.11	No Att. Req.	0	
1440	0.37	0.65	0.26	4.11	No Att. Req.	0	
2880	0.22	0.39	0.15	4.11	No Att. Req.	0	
4320	0.16	0.28	0.11	4.11	No Att. Req.	0	

ATTENUATION TANK DESIGN OUTPUT

Concept sizing for 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	4.190	m3	Select largest storage as per analysis
TANK HEIGHT, Htank	2.6	m	Concept sizing for 25,000 litre tank
TANK DIAMETER, Dtank	3.5	m	No. of Tanks 2
TANK AREA, Atank	19.24	m2	Area of TWO tanks
TANK MAX STORAGE VOLUME, Vtank	50030	litres	
REQUIRED STORAGE HEIGHT, Ddet	0.22	m	Below overflow
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum
TOTAL WATER DEPTH REQUIRED	0.37	m	
SELECTED TANK OUTFLOW, Qout, l/s	0.00411	m3/s	Selected tank outflow
AVERAGE HYDRAULIC HEAD, Hhy	0.11	m	
AREA OF ORIFICE, Aorifice	4.54E-03	m2	
ORIFICE DIAMETER, Dorifice	76	mm	
VELOCITY AT ORIFICE	2.07	m/s	At max. head level

Project Ref:	C0589		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	RANGE ROAD KAWAKAWA			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**1 % AEP STORM EVENT, 80 % OF PRE DEVELOPMENT**	
Date:	21 February 2025	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF CLIMATE CHANGE (20% FACTOR AS PER 2023 FNDC ENGINEERING STANDARDS).
PRE-DEVELOPMENT RUNOFF IS FACTORED BY 80% TO SUIT FNDC STANDARDS
RUNOFF COEFFICIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PRE DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
IMPERVIOUS A	0	0	
IMPERVIOUS B	0	0	
IMPERVIOUS C	0	0	
EX. PERVIOUS	500	0.67	PASTURE
0	0	0	
TOTAL	**500**	TYPE D	

POST DEVELOPMENT CATCHMENT PARAMETERS

ITEM	AREA, A, m2	COEFFICIENT, C	DESCRIPTION
TO TANK	300	0.96	ROOF
OFFSET	200	0.83	DRIVEWAY - METAL
PERVIOUS	0	0	
EX. CONSENTED	0	0	
0	0	0	
TOTAL	**500**	TYPE D	

RAINFALL INTENSITY, 1% AEP, 10MIN DURATION

1 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	162.0	mm/hr
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	20	%
1 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	194.4	mm/hr

* CLIMATE CHANGE FACTOR OF 20% APPLIED IN ACCORDANCE WITH FNDC ENGINEERING STANDARDS 4.3.9.1. NIWA HISTORIC RAINFALL INTENSITY DATA, 10MIN, IS MULTIPLIED BY CLIMATE CHANGE FACTOR.

PRE AND POST-DEVELOPMENT RUNOFF, 1%AEP, VARIOUS DURATIONS

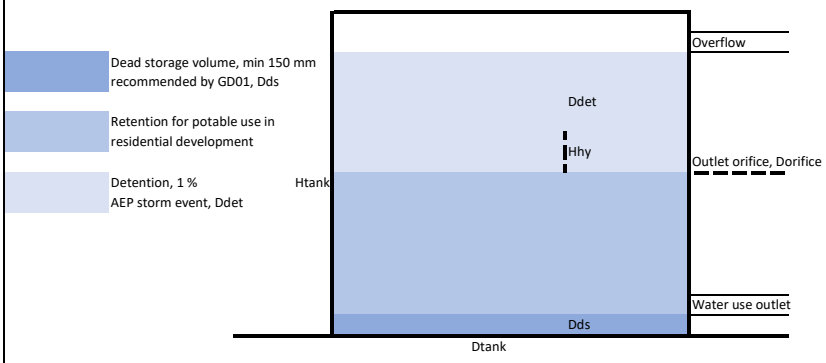
DURATION, min	INTENSITY, mm/hr	CC FACTOR	INTENSITY WITH CC, mm/hr	POST DEV RUNOFF, Qpost, l/s	PRE DEV RUNOFF, Qpre, l/s	80% of PRE DEV RUNOFF, Qpre(80%), l/s	COMMENTS
10	162.00	1.2	194.40	24.52	15.08	12.06	*Critical duration (time of concentration) for the catchments is 10min*
20	118.00	1.2	141.60	17.86	10.98	8.78	
30	97.30	1.2	116.76	14.72	9.05	7.24	
60	69.10	1.2	82.92	10.46	6.43	5.14	
120	48.00	1.2	57.60	7.26	4.47	3.57	*Pre-dev calculated on Intensity without CC factor*
360	25.50	1.2	30.60	3.86	2.37	1.90	
720	16.50	1.2	19.80	2.50	1.54	1.23	
1440	10.30	1.2	12.36	1.56	0.96	0.77	
2880	6.20	1.2	7.44	0.94	0.58	0.46	
4320	4.52	1.2	5.42	0.68	0.42	0.34	

ATTENUATION ANALYSIS, VARIOUS DURATIONS

DURATION, min	OFFSET FLOW, Qoff, l/s	TANK INFLOW , Qin, l/s	ALLOWABLE TANK OUTFLOW, Qpre(80%) - Qoff, l/s	SELECTED TANK OUTFLOW, Qout, l/s	DIFFERENCE (Qin - Qout), l/s	Required Storage, litres	
10	8.96	15.55	3.10	3.10	12.46	7474	*Selected Tank Outflow is selected for critical duration (time of concentration).*
20	6.53	11.33	2.26	3.10	8.23	9878	
30	5.38	9.34	1.86	3.10	6.24	11241	
60	3.82	6.63	1.32	3.10	3.54	12735	
120	2.66	4.61	0.92	3.10	1.51	10886	*select largest required storage , regardless of duration, to avoid overflow for event of any duration*
360	1.41	2.45	0.49	3.10	No Att. Req.	0	
720	0.91	1.58	0.32	3.10	No Att. Req.	0	
1440	0.57	0.99	0.20	3.10	No Att. Req.	0	
2880	0.34	0.60	0.12	3.10	No Att. Req.	0	
4320	0.25	0.43	0.09	3.10	No Att. Req.	0	

ATTENUATION TANK DESIGN OUTPUT

Concept sizing for 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	12.735	m3	Select largest storage as per analysis
TANK HEIGHT, Htank	2.6	m	Concept sizing for 25,000 litre tank
TANK DIAMETER, Dtank	3.5	m	No. of Tanks 2
TANK AREA, Atank	19.24	m2	Area of TWO tanks
TANK MAX STORAGE VOLUME, Vtank	50030	litres	
REQUIRED STORAGE HEIGHT, Ddet	0.66	m	Below overflow
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum
TOTAL WATER DEPTH REQUIRED	0.81	m	
SELECTED TANK OUTFLOW, Qout, l/s	0.00310	m3/s	Selected tank outflow
AVERAGE HYDRAULIC HEAD, Hhy	0.33	m	
AREA OF ORIFICE, Aorifice	1.96E-03	m2	
ORIFICE DIAMETER, Dorifice	50	mm	
VELOCITY AT ORIFICE	3.60	m/s	At max. head level

Project Ref:	C0589	STORMWATER DISPERSION PIPE/ TRENCH	geologix consulting engineers
Project Address:	RANGE ROAD KAWAKAWA		
Design Case:	CONCEPT FUTURE DEVELOPMENT	CONCEPT DISCHARGE DEVICE - LEVEL SPREADER OR TRENCH	
Date:	21 February 2025 REV 1		

DESIGN BASED ON REFERENCED DEVELOPMENT PLANS TO PROVIDE A MINIMUM LENGTH OF ABOVE OR BELOW GROUND STORMWATER TANK OVERFLOW DISCHARGE DISPERSION DEVICE. IN GENERAL ACCORDANCE WITH AUCKLAND COUNCIL TR2013/018, ADOPTING AN ORIFICE AND BROAD-CRESTED WEIR ANALYSIS CHECK

DESIGN STORM EVENT **1%** AEP EVENT

SLOPE BETWEEN SOURCE & DISPERSION DEVICE

ELEVATION	h	CHAINAGE, x	Δ x	h bar	Δ A
m	m	m	m	m	m2
70.5	0	0	0	0	0
61	9.5	50	50	4.75	237.5
	TOTALS	50	50		237.5
	SLOPE, Sc	0.190	m/m		

MANNINGS PIPE FLOW - INCOMING PIPE

Dia, m	d/D	α, rad	P, m	A, m^2	R	1:S	n	V, m/s	Q, m^3/s	Q, l/s	
0.1	0.000	6.283	0.0000	0.0000	0.000	5.26315789	0.009	0.000	0.0000	0.000	**0 % full**
0.100	0.050	5.381	0.0451	0.0001	0.003	5.263157895	0.009	1.064	0.0002	0.156	
0.100	0.100	4.996	0.0644	0.0004	0.006	5.263157895	0.009	1.661	0.0007	0.679	
0.100	0.150	4.692	0.0795	0.0007	0.009	5.263157895	0.009	2.140	0.0016	1.581	
0.100	0.200	4.429	0.0927	0.0011	0.012	5.263157895	0.009	2.547	0.0028	2.848	
0.100	0.250	4.189	0.1047	0.0015	0.015	5.263157895	0.009	2.901	0.0045	4.455	
0.100	0.300	3.965	0.1159	0.0020	0.017	5.263157895	0.009	3.214	0.0064	6.369	
0.100	0.350	3.751	0.1266	0.0024	0.019	5.263157895	0.009	3.491	0.0086	8.551	
0.100	0.400	3.544	0.1369	0.0029	0.021	5.263157895	0.009	3.736	0.0110	10.960	
0.100	0.450	3.342	0.1471	0.0034	0.023	5.263157895	0.009	3.952	0.0135	13.547	
0.100	0.500	3.142	0.1571	0.0039	0.025	5.263157895	0.009	4.141	0.0163	16.261	**50 % full**
0.100	0.550	2.941	0.1671	0.0044	0.026	5.263157895	0.009	4.304	0.0190	19.049	
0.100	0.600	2.739	0.1772	0.0049	0.028	5.263157895	0.009	4.441	0.0218	21.850	
0.100	0.650	2.532	0.1875	0.0054	0.029	5.263157895	0.009	4.552	0.0246	24.600	
0.100	0.700	2.319	0.1982	0.0059	0.030	5.263157895	0.009	4.637	0.0272	27.229	
0.100	0.750	2.094	0.2094	0.0063	0.030	5.263157895	0.009	4.694	0.0297	29.657	
0.100	0.800	1.855	0.2214	0.0067	0.030	5.263157895	0.009	4.720	0.0318	31.790	
0.100	0.850	1.591	0.2346	0.0071	0.030	5.263157895	0.009	4.710	0.0335	33.513	
0.100	0.900	1.287	0.2498	0.0074	0.030	5.263157895	0.009	4.656	0.0347	34.662	
0.100	0.950	0.902	0.2691	0.0077	0.029	5.263157895	0.009	4.534	0.0349	34.946	
0.100	1.000	0.000	0.3142	0.0079	0.025	5.263157895	0.009	4.141	0.0325	32.523	**Flowing full**

DISPERSION SPECIFICATION

INCOMING PIPE PROPERTIES:

TANK OUTFLOW, 1 % AEP	15.55	l/s		
MAXIMUM PIPE FLOW	34.95	l/s		
SUFFICIENT CAPACITY IN PIPE	YES			
LONGITUDINAL SLOPE	0.190	m/m		
DESIGN VELOCITY, Dv	4.720	m/s		

LEVEL SPREADER SPECIFICATIONS:

PIPE DIAMETER, m	0.15	m		
MANNINGS PIPE ROUGHNESS	0.009			
NUMBER OF ORIFICES	58	No.		
DIA. OF ORIFICE, D	20	mm		
ORIFICE INTERVALS, C/C	150	mm		
DISPERSION PIPE LENGTH, L	**8.55**	**m**		

ORIFICE DESIGN FLOW CHECK:

AREA OF SINGLE ORIFICE, A	0.00031	m2		
FLOW OUT OF 1 ORIFICE	0.000272829	m3/s	0.27 l/s	
FLOW OUT OF ALL ORIFICES	0.01582410	m3/s	15.82 l/s	**DESIGN OK**
VELOCITY FROM SINGLE ORIFICE	0.87	m/s		

BROAD CRESTED WEIR DESIGN FLOW CHECK:

FLOW DEPTH, h	0.1	m	I.e position orifices at one third of pipe diameter, above the invert	
BASE WIDTH = L	8.55	m		
FLOW AREA	0.86	m2		
WEIR FLOW	0.01595	m3/s	15.95 l/s	**DESIGN OK**
WEIR VELOCITY	0.019	m/s		

INCOMING PIPE & SPREADER SUMARY:

	LOT 1 (CONCEPT)		
INCOMING PIPE DIAMETER, m	0.100	m	
SPREADER PIPE DIAMETER, m	0.150	m	
MANNINGS PIPE ROUGHNESS	0.009		
NUMBER OF ORIFICES	58	No.	
DIA. OF ORIFICE, D	20	mm	Position orifices at one third of pipe diameter, above the invert
ORIFICE INTERVALS, C/C	150	mm	
DISPERSION PIPE LENGTH, L	**8.55**	**m**	

HIRDS V4 Intensity-Duration-Frequency Results
Sitename: Custom Location
Coordinate system: WGS84
Longitude: 174.0593
Latitude: -35.3973

DDF Model Parameters:	c	d	e	f	g	h	i
Values:	0.002232	0.48028	-0.02226	-0.0018	0.255696	-0.01222	3.317614

Example:	Duration (h	ARI (yrs)	x	y	Rainfall Rate (mm/hr)
	24	100	3.178054	4.600149	10.31449

Rainfall intensities (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	65.8	47.6	39.1	27.6	19	10	6.43	3.99	2.38	1.73	1.36	1.13
2	0.5	72.1	52.2	42.9	30.3	20.9	11	7.07	4.38	2.62	1.9	1.5	1.24
5	0.2	93.5	67.8	55.8	39.4	27.2	14.4	9.26	5.75	3.44	2.5	1.98	1.64
10	0.1	109	79.2	65.2	46.1	31.9	16.9	10.9	6.77	4.06	2.95	2.33	1.93
20	0.05	125	90.8	74.8	52.9	36.7	19.5	12.5	7.81	4.69	3.41	2.7	2.24
30	0.033	134	97.6	80.5	57	39.5	21	13.5	8.44	5.06	3.69	2.92	2.42
40	0.025	141	103	84.5	59.9	41.5	22.1	14.2	8.88	5.33	3.88	3.07	2.55
50	0.02	146	106	87.7	62.1	43.1	22.9	14.8	9.23	5.55	4.04	3.2	2.65
60	0.017	150	109	90.2	64	44.4	23.6	15.2	9.52	5.72	4.16	3.3	2.73
80	0.013	157	114	94.2	66.9	46.4	24.7	16	9.97	5.99	4.36	3.46	2.87
100	0.01	162	118	97.3	69.1	48	25.5	16.5	10.3	6.2	4.52	3.58	2.97
250	0.004	182	133	110	78	54.3	29	18.7	11.7	7.06	5.15	4.08	3.39

Intensity standard error (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	7.2	4.5	3.5	2.5	1.8	1.1	0.77	0.59	0.37	0.28	0.22	0.19
2	0.5	7.9	4.9	3.8	2.8	1.9	1.2	0.84	0.66	0.42	0.31	0.25	0.21
5	0.2	11	7.2	5.6	3.9	2.7	1.7	1.2	0.9	0.56	0.42	0.34	0.29
10	0.1	15	9.7	7.6	5.1	3.6	2.1	1.4	1.1	0.67	0.51	0.41	0.34
20	0.05	19	13	10	6.7	4.7	2.8	1.8	1.3	0.79	0.6	0.49	0.4
30	0.033	23	15	12	7.9	5.6	3.3	2.1	1.4	0.87	0.67	0.53	0.44
40	0.025	25	17	13	8.8	6.3	3.7	2.4	1.5	0.93	0.71	0.57	0.47
50	0.02	27	19	15	9.6	6.9	4	2.6	1.6	0.98	0.75	0.6	0.5
60	0.017	29	20	16	10	7.4	4.3	2.8	1.6	1	0.79	0.63	0.52
80	0.013	32	23	17	12	8.3	4.9	3.1	1.8	1.1	0.84	0.67	0.55
100	0.01	35	24	19	13	9.1	5.3	3.4	1.9	1.1	0.89	0.71	0.58
250	0.004	48	34	26	18	13	7.6	4.9	2.3	1.4	1.1	0.88	0.72

Rainfall intensities (mm/hr) :: RCP2.6 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	70.5	51	41.9	29.5	20.3	10.6	6.73	4.15	2.46	1.78	1.4	1.16
2	0.5	77.3	56	46	32.4	22.3	11.6	7.42	4.57	2.71	1.96	1.55	1.28
5	0.2	101	72.9	60	42.4	29.2	15.3	9.76	6.02	3.58	2.59	2.04	1.69
10	0.1	118	85.3	70.3	49.7	34.3	18	11.5	7.1	4.23	3.06	2.42	2
20	0.05	135	97.9	80.7	57.1	39.5	20.7	13.3	8.19	4.89	3.54	2.8	2.31
30	0.033	145	105	86.8	61.5	42.5	22.4	14.3	8.85	5.28	3.83	3.02	2.5
40	0.025	152	111	91.2	64.6	44.7	23.5	15.1	9.32	5.56	4.04	3.19	2.64
50	0.02	158	115	94.6	67.1	46.4	24.4	15.7	9.69	5.79	4.2	3.32	2.75
60	0.017	162	118	97.4	69.1	47.8	25.2	16.1	9.99	5.97	4.33	3.42	2.83
80	0.013	169	123	102	72.2	50	26.4	16.9	10.5	6.26	4.54	3.59	2.97
100	0.01	175	127	105	74.6	51.7	27.3	17.5	10.8	6.48	4.7	3.72	3.08
250	0.004	197	144	119	84.3	58.4	30.9	19.9	12.3	7.37	5.36	4.23	3.51

Rainfall intensities (mm/hr) :: RCP2.6 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	70.5	51	41.9	29.5	20.3	10.6	6.73	4.15	2.46	1.78	1.4	1.16
2	0.5	77.3	56	46	32.4	22.3	11.6	7.42	4.57	2.71	1.96	1.55	1.28
5	0.2	101	72.9	60	42.4	29.2	15.3	9.76	6.02	3.58	2.59	2.04	1.69
10	0.1	118	85.3	70.3	49.7	34.3	18	11.5	7.1	4.23	3.06	2.42	2
20	0.05	135	97.9	80.7	57.1	39.5	20.7	13.3	8.19	4.89	3.54	2.8	2.31
30	0.033	145	105	86.8	61.5	42.5	22.4	14.3	8.85	5.28	3.83	3.02	2.5
40	0.025	152	111	91.2	64.6	44.7	23.5	15.1	9.32	5.56	4.04	3.19	2.64
50	0.02	158	115	94.6	67.1	46.4	24.4	15.7	9.69	5.79	4.2	3.32	2.75
60	0.017	162	118	97.4	69.1	47.8	25.2	16.1	9.99	5.97	4.33	3.42	2.83
80	0.013	169	123	102	72.2	50	26.4	16.9	10.5	6.26	4.54	3.59	2.97
100	0.01	175	127	105	74.6	51.7	27.3	17.5	10.8	6.48	4.7	3.72	3.08
250	0.004	197	144	119	84.3	58.4	30.9	19.9	12.3	7.37	5.36	4.23	3.51

Rainfall intensities (mm/hr) :: RCP4.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	71.6	51.8	42.6	30	20.6	10.7	6.81	4.19	2.48	1.79	1.41	1.17
2	0.5	78.6	56.9	46.8	33	22.7	11.8	7.51	4.62	2.74	1.98	1.56	1.29
5	0.2	102	74.2	61.1	43.1	29.7	15.5	9.89	6.09	3.61	2.62	2.06	1.7
10	0.1	120	86.9	71.5	50.6	34.9	18.2	11.6	7.18	4.27	3.09	2.44	2.01
20	0.05	137	99.7	82.2	58.2	40.2	21.1	13.4	8.29	4.94	3.58	2.82	2.33
30	0.033	148	107	88.5	62.6	43.3	22.7	14.5	8.96	5.34	3.87	3.05	2.52
40	0.025	155	113	92.9	65.8	45.5	23.9	15.3	9.44	5.62	4.08	3.22	2.66
50	0.02	161	117	96.4	68.3	47.3	24.8	15.9	9.81	5.85	4.24	3.35	2.77
60	0.017	165	120	99.2	70.4	48.7	25.6	16.4	10.1	6.03	4.38	3.45	2.86
80	0.013	173	126	104	73.6	50.9	26.8	17.1	10.6	6.32	4.59	3.62	3
100	0.01	178	130	107	76	52.6	27.7	17.7	11	6.55	4.75	3.75	3.1
250	0.004	200	146	121	85.8	59.5	31.4	20.1	12.5	7.45	5.41	4.27	3.54

Rainfall intensities (mm/hr) :: RCP4.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	75.3	54.5	44.8	31.6	21.6	11.2	7.05	4.32	2.55	1.83	1.44	1.19
2	0.5	82.8	59.9	49.3	34.7	23.8	12.3	7.79	4.77	2.81	2.03	1.59	1.32
5	0.2	108	78.3	64.4	45.5	31.3	16.2	10.3	6.3	3.72	2.69	2.11	1.75
10	0.1	126	91.8	75.6	53.4	36.8	19.1	12.1	7.44	4.4	3.18	2.5	2.07
20	0.05	145	105	86.8	61.5	42.4	22.1	14	8.59	5.1	3.68	2.9	2.39
30	0.033	156	113	93.5	66.2	45.7	23.8	15.1	9.28	5.51	3.99	3.14	2.59
40	0.025	164	119	98.2	69.6	48	25.1	15.9	9.79	5.81	4.2	3.31	2.73
50	0.02	170	124	102	72.3	49.9	26	16.6	10.2	6.04	4.37	3.44	2.84
60	0.017	175	127	105	74.4	51.4	26.9	17.1	10.5	6.23	4.51	3.55	2.93
80	0.013	183	133	110	77.9	53.8	28.1	17.9	11	6.53	4.73	3.72	3.08
100	0.01	189	137	113	80.4	55.6	29.1	18.5	11.4	6.77	4.9	3.86	3.19
250	0.004	212	155	128	90.8	62.9	33	21	12.9	7.7	5.58	4.4	3.64

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	71.2	51.5	42.3	29.8	20.5	10.7	6.78	4.18	2.47	1.79	1.41	1.16
2	0.5	78.1	56.5	46.5	32.8	22.5	11.7	7.47	4.6	2.73	1.97	1.55	1.28
5	0.2	102	73.7	60.6	42.8	29.5	15.4	9.84	6.06	3.6	2.61	2.05	1.7
10	0.1	119	86.3	71	50.2	34.6	18.1	11.6	7.14	4.25	3.08	2.43	2.01
20	0.05	136	99	81.6	57.7	39.9	20.9	13.4	8.25	4.92	3.56	2.81	2.33
30	0.033	146	107	87.8	62.2	43	22.6	14.4	8.91	5.32	3.85	3.04	2.52
40	0.025	154	112	92.2	65.3	45.2	23.8	15.2	9.39	5.6	4.06	3.2	2.65
50	0.02	159	116	95.7	67.8	46.9	24.7	15.8	9.76	5.82	4.23	3.33	2.76
60	0.017	164	119	98.5	69.8	48.3	25.4	16.3	10.1	6.01	4.36	3.44	2.85
80	0.013	171	125	103	73	50.6	26.6	17	10.5	6.3	4.57	3.61	2.99
100	0.01	177	129	106	75.5	52.3	27.5	17.6	10.9	6.52	4.73	3.74	3.09
250	0.004	199	145	120	85.2	59.1	31.2	20	12.4	7.42	5.39	4.26	3.53

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	78.6	56.9	46.7	32.9	22.5	11.5	7.27	4.44	2.6	1.87	1.47	1.21
2	0.5	86.5	62.6	51.5	36.3	24.9	12.8	8.04	4.9	2.88	2.07	1.63	1.34
5	0.2	113	81.9	67.4	47.6	32.7	16.9	10.6	6.49	3.82	2.76	2.16	1.78
10	0.1	132	96.1	79.1	56	38.5	19.9	12.6	7.67	4.52	3.26	2.56	2.11
20	0.05	152	110	91	64.4	44.3	23	14.5	8.86	5.24	3.78	2.97	2.45
30	0.033	164	119	98	69.4	47.8	24.8	15.7	9.58	5.67	4.09	3.22	2.65
40	0.025	172	125	103	73	50.3	26.1	16.5	10.1	5.97	4.31	3.39	2.8
50	0.02	178	130	107	75.8	52.2	27.1	17.2	10.5	6.21	4.49	3.53	2.91
60	0.017	183	133	110	78	53.8	28	17.7	10.8	6.41	4.63	3.64	3
80	0.013	192	140	115	81.7	56.3	29.3	18.6	11.3	6.72	4.86	3.82	3.15
100	0.01	198	144	119	84.4	58.2	30.3	19.2	11.8	6.96	5.03	3.96	3.27
250	0.004	222	162	134	95.3	65.8	34.4	21.8	13.4	7.92	5.73	4.51	3.72

Rainfall intensities (mm/hr) :: RCP8.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	72.5	52.5	43.1	30.4	20.8	10.8	6.86	4.22	2.5	1.8	1.42	1.17
2	0.5	79.6	57.6	47.4	33.4	23	11.9	7.58	4.65	2.75	1.99	1.57	1.29
5	0.2	104	75.2	61.9	43.7	30.1	15.7	9.98	6.14	3.64	2.63	2.07	1.71
10	0.1	121	88	72.5	51.2	35.3	18.4	11.8	7.24	4.3	3.11	2.45	2.03
20	0.05	139	101	83.3	58.9	40.7	21.3	13.6	8.36	4.97	3.6	2.84	2.35
30	0.033	150	109	89.6	63.5	43.8	23	14.7	9.03	5.38	3.9	3.07	2.54
40	0.025	157	114	94.1	66.7	46.1	24.2	15.4	9.52	5.67	4.11	3.24	2.68
50	0.02	163	118	97.7	69.3	47.9	25.1	16	9.89	5.89	4.27	3.37	2.79
60	0.017	167	122	101	71.3	49.3	25.9	16.5	10.2	6.08	4.41	3.48	2.87
80	0.013	175	127	105	74.6	51.6	27.1	17.3	10.7	6.37	4.62	3.64	3.02
100	0.01	181	132	109	77.1	53.3	28	17.9	11.1	6.6	4.79	3.78	3.12
250	0.004	203	148	122	87	60.3	31.8	20.3	12.6	7.51	5.45	4.3	3.56

Rainfall intensities (mm/hr) :: RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	86	62.3	51.2	36	24.5	12.4	7.75	4.71	2.74	1.95	1.53	1.26
2	0.5	94.8	68.6	56.4	39.8	27.2	13.8	8.61	5.2	3.03	2.17	1.7	1.4
5	0.2	124	90.2	74.2	52.4	35.9	18.3	11.5	6.91	4.04	2.9	2.27	1.87
10	0.1	146	106	87.3	61.7	42.3	21.6	13.5	8.19	4.79	3.45	2.69	2.22
20	0.05	168	122	100	71.1	48.8	25	15.7	9.47	5.56	3.99	3.13	2.57
30	0.033	181	131	108	76.7	52.7	27	17	10.2	6.02	4.32	3.39	2.79
40	0.025	190	138	114	80.6	55.4	28.5	17.9	10.8	6.34	4.57	3.57	2.94
50	0.02	197	143	118	83.8	57.6	29.6	18.6	11.2	6.6	4.75	3.72	3.06
60	0.017	203	147	122	86.2	59.3	30.6	19.2	11.6	6.81	4.91	3.84	3.16
80	0.013	212	154	127	90.3	62.1	32	20.1	12.2	7.15	5.14	4.03	3.32
100	0.01	219	159	132	93.3	64.2	33.1	20.8	12.6	7.4	5.32	4.18	3.44
250	0.004	246	180	148	105	72.6	37.5	23.6	14.3	8.43	6.06	4.76	3.92

HIRDS V4 Depth-Duration-Frequency Results
Sitename: Custom Location
Coordinate system: WGS84
Longitude: 174.0593
Latitude: -35.3973

DDF Model Parameters:	c	d	e	f	g	h	i
Values:	0.002232	0.48028	-0.02226	-0.0018	0.255696	-0.01222	3.317614

Example:	Duration (h	ARI (yrs)	x	y	Rainfall Depth (mm)
	24	100	3.178054	4.600149	247.5477

Rainfall depths (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	11	15.9	19.6	27.6	38	60.1	77.1	95.7	114	124	131	135
2	0.5	12	17.4	21.5	30.3	41.8	66	84.8	105	126	137	144	149
5	0.2	15.6	22.6	27.9	39.4	54.5	86.3	111	138	165	180	190	197
10	0.1	18.2	26.4	32.6	46.1	63.8	101	131	163	195	212	224	232
20	0.05	20.8	30.3	37.4	52.9	73.4	117	151	188	225	246	259	268
30	0.033	22.4	32.5	40.2	57	79	126	162	202	243	265	280	290
40	0.025	23.5	34.2	42.3	59.9	83.1	132	171	213	256	280	295	306
50	0.02	24.3	35.4	43.8	62.1	86.2	137	178	222	266	291	307	318
60	0.017	25	36.5	45.1	64	88.8	142	183	228	274	300	316	328
80	0.013	26.1	38.1	47.1	66.9	92.8	148	192	239	288	314	332	344
100	0.01	27	39.3	48.7	69.1	96	153	198	248	298	325	344	356
250	0.004	30.4	44.3	54.9	78	109	174	225	281	339	371	392	406

Depth standard error (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	1.2	1.5	1.7	2.5	3.5	6.3	9.5	15	19	21	23	23
2	0.5	1.3	1.7	1.9	2.8	3.9	7	10	17	21	23	25	26
5	0.2	1.9	2.4	2.8	4	5.5	9.9	15	22	29	31	34	35
10	0.1	2.5	3.3	3.7	5.2	7.3	13	18	27	35	38	40	41
20	0.05	3.2	4.3	5	6.9	9.6	17	23	32	41	45	47	48
30	0.033	3.7	5	5.8	8.2	11	19	27	35	45	49	52	53
40	0.025	4.1	5.6	6.5	9.2	13	22	30	37	48	52	55	56
50	0.02	4.4	6.1	7.1	10	14	24	32	39	51	55	58	59
60	0.017	4.7	6.5	7.6	11	15	25	34	40	53	57	60	62
80	0.013	5.2	7.3	8.5	12	17	28	38	43	56	61	63	65
100	0.01	5.7	7.9	9.2	13	18	31	41	45	59	64	66	69
250	0.004	7.7	11	13	19	25	44	58	55	72	79	80	84

Rainfall depths (mm) :: RCP2.6 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	11.7	17	20.9	29.5	40.6	63.4	80.8	99.6	118	128	135	139
2	0.5	12.9	18.7	23	32.4	44.6	69.8	89	110	130	141	148	153
5	0.2	16.8	24.3	30	42.4	58.4	91.7	117	144	172	187	196	203
10	0.1	19.6	28.4	35.1	49.7	68.6	108	138	170	203	221	232	240
20	0.05	22.4	32.6	40.3	57.1	78.9	124	159	197	235	255	268	278
30	0.033	24.1	35.1	43.4	61.5	85	134	172	212	254	276	290	300
40	0.025	25.3	36.9	45.6	64.6	89.4	141	181	224	267	291	306	317
50	0.02	26.3	38.3	47.3	67.1	92.8	147	188	233	278	302	318	329
60	0.017	27	39.4	48.7	69.1	95.6	151	194	240	286	312	328	340
80	0.013	28.2	41.1	50.9	72.2	100	158	203	251	300	327	344	356
100	0.01	29.1	42.5	52.6	74.6	103	164	210	260	311	339	357	369
250	0.004	32.8	47.9	59.3	84.3	117	186	238	296	354	386	407	421

Rainfall depths (mm) :: RCP2.6 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	11.7	17	20.9	29.5	40.6	63.4	80.8	99.6	118	128	135	139
2	0.5	12.9	18.7	23	32.4	44.6	69.8	89	110	130	141	148	153
5	0.2	16.8	24.3	30	42.4	58.4	91.7	117	144	172	187	196	203
10	0.1	19.6	28.4	35.1	49.7	68.6	108	138	170	203	221	232	240
20	0.05	22.4	32.6	40.3	57.1	78.9	124	159	197	235	255	268	278
30	0.033	24.1	35.1	43.4	61.5	85	134	172	212	254	276	290	300
40	0.025	25.3	36.9	45.6	64.6	89.4	141	181	224	267	291	306	317
50	0.02	26.3	38.3	47.3	67.1	92.8	147	188	233	278	302	318	329
60	0.017	27	39.4	48.7	69.1	95.6	151	194	240	286	312	328	340
80	0.013	28.2	41.1	50.9	72.2	100	158	203	251	300	327	344	356
100	0.01	29.1	42.5	52.6	74.6	103	164	210	260	311	339	357	369
250	0.004	32.8	47.9	59.3	84.3	117	186	238	296	354	386	407	421

Rainfall depths (mm) :: RCP4.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	11.9	17.3	21.3	30	41.2	64.3	81.7	101	119	129	135	140
2	0.5	13.1	19	23.4	33	45.4	70.8	90.1	111	131	142	150	154
5	0.2	17.1	24.7	30.5	43.1	59.4	93.1	119	146	174	188	198	204
10	0.1	19.9	29	35.8	50.6	69.8	109	140	172	205	223	234	242
20	0.05	22.9	33.2	41.1	58.2	80.3	126	161	199	237	258	271	280
30	0.033	24.6	35.8	44.2	62.6	86.6	136	174	215	256	279	293	303
40	0.025	25.8	37.6	46.4	65.8	91	143	183	226	270	294	309	319
50	0.02	26.8	39	48.2	68.3	94.5	149	191	235	281	305	321	332
60	0.017	27.5	40.1	49.6	70.4	97.3	154	197	243	290	315	331	343
80	0.013	28.8	41.9	51.9	73.6	102	161	206	254	304	330	347	360
100	0.01	29.7	43.3	53.6	76	105	166	213	263	314	342	360	372
250	0.004	33.4	48.8	60.4	85.8	119	188	242	299	358	390	410	425

Rainfall depths (mm) :: RCP4.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	12.6	18.2	22.4	31.6	43.2	66.9	84.6	104	122	132	138	143
2	0.5	13.8	20	24.6	34.7	47.7	73.8	93.5	114	135	146	153	158
5	0.2	18	26.1	32.2	45.5	62.6	97.3	123	151	179	194	203	209
10	0.1	21.1	30.6	37.8	53.4	73.6	115	146	178	211	229	240	248
20	0.05	24.2	35.1	43.4	61.5	84.7	132	168	206	245	265	278	287
30	0.033	26	37.8	46.8	66.2	91.4	143	182	223	265	287	301	311
40	0.025	27.3	39.7	49.1	69.6	96	151	191	235	279	303	318	328
50	0.02	28.3	41.2	51	72.3	99.8	156	199	244	290	315	331	341
60	0.017	29.1	42.4	52.5	74.4	103	161	205	252	299	325	341	352
80	0.013	30.4	44.3	54.9	77.9	108	169	215	264	314	341	357	369
100	0.01	31.4	45.8	56.7	80.4	111	175	222	273	325	353	371	383
250	0.004	35.3	51.6	63.9	90.8	126	198	252	311	370	402	422	436

Rainfall depths (mm) :: RCP6.0 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	11.9	17.2	21.2	29.8	40.9	63.9	81.3	100	119	129	135	140
2	0.5	13	18.8	23.2	32.8	45.1	70.4	89.7	110	131	142	149	154
5	0.2	16.9	24.6	30.3	42.8	59	92.5	118	145	173	188	197	204
10	0.1	19.8	28.8	35.5	50.2	69.3	109	139	171	204	222	233	241
20	0.05	22.7	33	40.8	57.7	79.8	126	160	198	236	257	270	279
30	0.033	24.4	35.5	43.9	62.2	86	135	173	214	255	278	292	302
40	0.025	25.6	37.3	46.1	65.3	90.4	143	182	225	269	293	308	318
50	0.02	26.6	38.7	47.8	67.8	93.8	148	190	234	280	304	320	331
60	0.017	27.3	39.8	49.2	69.8	96.6	153	195	242	288	314	330	342
80	0.013	28.6	41.6	51.5	73	101	160	205	253	302	329	346	358
100	0.01	29.5	43	53.2	75.5	105	165	212	262	313	341	359	371
250	0.004	33.2	48.4	60	85.2	118	187	240	298	356	388	409	423

Rainfall depths (mm) :: RCP6.0 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	13.1	19	23.4	32.9	45	69.3	87.2	107	125	135	141	145
2	0.5	14.4	20.9	25.7	36.3	49.7	76.6	96.5	118	138	149	156	161
5	0.2	18.8	27.3	33.7	47.6	65.4	101	128	156	183	198	207	214
10	0.1	22.1	32	39.6	56	76.9	119	151	184	217	235	246	254
20	0.05	25.3	36.8	45.5	64.4	88.7	138	174	213	251	272	285	294
30	0.033	27.3	39.7	49	69.4	95.6	149	188	230	272	294	309	318
40	0.025	28.6	41.6	51.5	73	101	157	199	242	287	311	325	336
50	0.02	29.7	43.2	53.5	75.8	104	163	206	252	298	323	339	349
60	0.017	30.5	44.5	55	78	108	168	213	260	308	334	349	360
80	0.013	31.9	46.5	57.6	81.7	113	176	223	272	323	350	366	378
100	0.01	33	48	59.5	84.4	116	182	231	282	334	362	380	392
250	0.004	37.1	54.1	67	95.3	132	206	262	321	380	412	433	447

Rainfall depths (mm) :: RCP8.5 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	12.1	17.5	21.6	30.4	41.7	64.9	82.4	101	120	130	136	141
2	0.5	13.3	19.2	23.7	33.4	45.9	71.5	90.9	112	132	143	150	155
5	0.2	17.3	25.1	30.9	43.7	60.2	94.1	120	147	175	190	199	206
10	0.1	20.2	29.3	36.2	51.2	70.7	111	141	174	206	224	235	243
20	0.05	23.2	33.7	41.6	58.9	81.3	128	163	201	239	259	273	282
30	0.033	24.9	36.3	44.8	63.5	87.7	138	176	217	258	281	295	305
40	0.025	26.2	38.1	47.1	66.7	92.2	145	185	228	272	296	311	322
50	0.02	27.1	39.5	48.9	69.3	95.7	151	192	237	283	308	323	334
60	0.017	27.9	40.6	50.3	71.3	98.6	155	199	245	292	317	334	345
80	0.013	29.2	42.5	52.6	74.6	103	163	208	256	306	333	350	362
100	0.01	30.1	43.9	54.3	77.1	107	168	215	266	317	345	363	375
250	0.004	33.9	49.4	61.2	87	121	191	244	302	360	392	413	427

Rainfall depths (mm) :: RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	14.3	20.8	25.6	36	49	74.7	93	113	131	141	147	151
2	0.5	15.8	22.9	28.2	39.8	54.4	82.7	103	125	146	156	163	168
5	0.2	20.7	30.1	37.1	52.4	71.8	110	137	166	194	209	218	224
10	0.1	24.3	35.3	43.6	61.7	84.6	130	163	196	230	248	259	266
20	0.05	28	40.6	50.2	71.1	97.6	150	188	227	267	287	300	309
30	0.033	30.1	43.8	54.1	76.7	105	162	203	246	289	311	325	334
40	0.025	31.6	46	56.9	80.6	111	171	215	259	304	329	343	353
50	0.02	32.8	47.8	59.1	83.8	115	178	223	270	317	342	357	367
60	0.017	33.8	49.2	60.8	86.2	119	183	230	278	327	353	369	379
80	0.013	35.3	51.4	63.7	90.3	124	192	241	292	343	370	386	398
100	0.01	36.5	53.1	65.8	93.3	128	199	250	302	355	383	401	412
250	0.004	41	59.8	74.1	105	145	225	283	344	404	437	457	470

Appendix 6

Geotechnical Assessment

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GEOTECHNICAL INVESTIGATION REPORT

RANGE ROAD, KAWAKAWA

K&M TRUST

C0589-G-01
MAY 2025
REVISION 2

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DOCUMENT MANAGEMENT

Document Title	Geotechnical Investigation Report
Site Reference	Range Road, Kawakawa
Client	K&M Trust
Geologix Reference	C0589-G-01
Issue Date	15 May 2025
Revision	02
Prepared	Dominic Becher-Tatnell Geotechnical Engineer
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Approved	Edward Collings Managing Director, CPEng, CMEngNZ, CEnvP, MPhys (Hons)
File Reference	*Z:\Geologix Files\Projects\C0500-C0599\C0589 - Range Road, Kawakawa\06 - Reports\C0589-G-01.docx*

REVISION HISTORY

Date	Issue	Prepared	Reviewed	Approved
May 2025	Revision – For Consent	DBT	AW	EC
April 2025	First Issue – For Consent	DBT	AW	EC

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1 INTRODUCTION

This Geotechnical Investigation Report has been prepared by Geologix Consulting Engineers Ltd (Geologix) for K&M Trust as our Client in accordance with our standard short form agreement and general terms and conditions of engagement.

The purpose of this report is to assist with Building Consent application in relation to the proposed subdivision at Range Road, Kawakawa, the 'site'. Specifically, this report provides interpretation of a site-specific ground investigation and geotechnical assessment to provide concept recommendations for the proposed building sites.

1.1 Proposed Subdivision

A proposed scheme plan was presented to Geologix at the time of writing, prepared by Thompson Survey[1] and presented within Appendix A. It is understood the Client proposes to subdivide the site into five lots. Conceptual building sites are proposed on lots 1 to 4.

This understanding has been established from the proposed scheme plan supplied to Geologix at the time of writing. Amendments to the referenced development plans may require an update to the scope and/ or recommendations of this report.

2 SITE DESCRIPTION

The site is presented within a typical rural area to the west of Range Road covered mostly by grass and small to large trees. The site is legally described as Part Section 30 Block XVI Kawakawa SD, Section 77 Block XVI Kawakawa SD and is irregular in shape with a gross site area of approximately 463,674 m2. The site is accessed from Range Road at the eastern boundary.

Topographically the site is gently sloping on the northern part of the site with a slope of approximately 8-15° in the area of lots 1 & 2. The ground becomes moderately steep in thearea of lots 3 & 4 starting flat on the east of the site, becoming steeper to the west with a slope of up to 25° for lot 3 and 28° for lot 4. The property is in a rural area.

The site has no existing structures or retaining walls. Most of the site was noted to be covered by grass with some tree's downslope and at the property boundaries. The site setting is presented schematically as Figure 1 below.

[1] *Proposed Subdivision of Section 77 Blk Kawakawa SD & Pt Section 30 Blk Xvi Kawakawa Sd, Dated 17th August 2023.*

Figure 1: Site Setting[2]

3 DESKTOP APPRAISAL

To assist with our geotechnical appraisal, we have undertaken a detailed desktop review of available information with a specific focus upon geotechnical influences.

3.1 Infrastructure Review

Available infrastructure information is provided by Far North District Council GIS system. According to the available data, no existing Council infrastructure is present within the site boundaries.

3.2 Overland Flow Path and Flood Plains

Available GIS information indicates no indicated flood potential under the 1 % AEP event to influence the building platform.

The risk of encountering low-strength alluvial deposits over the building footprint is

[2] *Source: https://nrcgis.maps.arcgis.com/apps/webappviewer/index.html*

considered low.

3.3 Geology and Geomorphology

Available geological mapping[3] indicates the site to be underlain by Melange of Northland Allochthon. These deposits are described as Melange, comprising a matrix of sheared mudstone with included tectonic blocks of Northland Allochthon, Te Kuiti Group and Waitemata Group lithologies.

3.4 Existing Geotechnical Information

A review of available GIS databases, including the New Zealand Geotechnical Database[4] (NZGD) identified no records within 1000 m of the site. To improve the NZGD, exploratory records from our ground investigation were uploaded to the system.

3.5 Ground Investigation

A site-specific walkover survey and intrusive ground investigation was undertaken by Geologix on 18th February 2025 in locations indicated on Drawing No. 101 & 102 within Appendix A. The ground investigation was scoped to confirm the findings of the above information and to provide site-specific parameters for this geotechnical assessment and ground model, supplementary to the historic ground investigation works. The ground investigation comprised:

- Six hand augered boreholes designated HA01, HA03, HA05, HA07-HA09, inclusive, formed across available soft landscaped areas of the site within proposed structural footprints to a target depth of 5.0 m below ground level (bgl).
- Four hand augered boreholes designated HA02, HA04, HA06 & HA10, formed within suitable areas for wastewater disposal fields on each proposed residential lot with a target depth of 1.2 m bgl.
- Dynamic Cone Penetration (DCP) testing was carried out from the base of HA01, HA03, HA05, HA07 & HA08 until final refusal i.e. 20 blows per 100 mm penetration or once reaching 5.0m bgl. Refusals were encountered upon hard strata within boreholes ranging from 1.1 m to 5.1 m bgl.

3.6 Site Walkover Survey

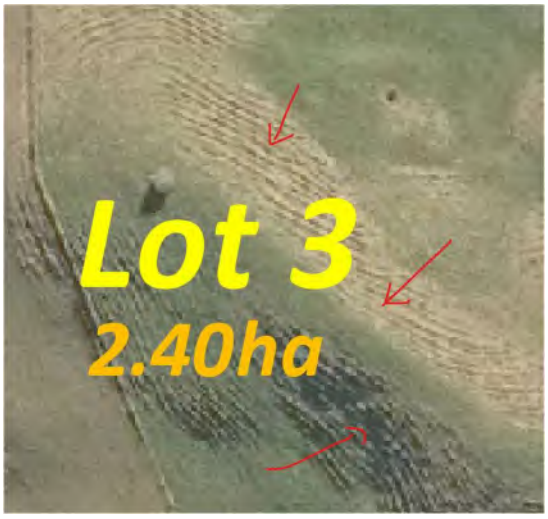
A visual walkover survey of the property confirmed:

[3] *Geological & Nuclear Science, 1:250,000 scale Geological Map, Sheet 2, Whangarei, 2009.*

[4] https://www.nzgd.org.nz/

- Topography is in general accordance with that outlined in Section 2 and the available GIS/ topographic contours. The topographic profile comprises a moderately steep profile, becoming steeper toward the northern part of the site.
- No existing retaining walls or supporting structures were noted during our walkover survey.
- There were signs of shallow creep around the site in areas where the ground became steep as shown below. Bowl shaped features were observed for lots 3 & 4 potentially indicating historic slips in this area.

Figure 2: Shallow creep



- The site is presented as mainly pastureland with trees at the edge of the property. Adjacent properties in all directions were generally rural residential/ lifestyle properties of various sizes.

3.7 Ground Conditions

Arisings recovered from the exploratory boreholes were logged by a qualified geotechnical engineering professional in accordance with New Zealand Geotechnical Society guidelines[5]. Engineering borehole logs are presented as Appendix B to this report and approximate borehole positions recorded on Drawing No. 101 & 102 within Appendix A. A detailed ground model has been derived from the investigation and is presented as Drawing No. 201 & 202 within Appendix A.

Strata identified during the ground investigation can be summarised as follows:

[5] *New Zealand Geotechnical Society, Field Description of Soil and Rock, 2005.*

- **Topsoil encountered within all boreholes up to 0.3 m bgl.** Topsoil was locally encountered as a shallow surface veneer of organic silt with trace rootlets or gravels. The unit was dark brown to blackish brown, dry to moist and of low plasticity.

- **Northland Allochthon Residual Soil to depths ranging from 0.5 m to 4.3 m bgl.** The residual soils were described as orange-brown, light grey and brown, clayey silt or silt with some clay, gravel or sand. The unit was detailed as dry to moist and low plasticity.

  The Northland Allochthon was found to be variable in strength. In total, fifty-four in-situ field vane tests recorded vane shear strengths ranging from 87 to 203 kPa, indicative of variable stiff to very stiff soils and a characteristic unit vane shear strength of 176 kPa was determined at 95 % confidence.

- **Hard Northland Allochthon Residual Soil to depths ranging from 1.1 m to 4.7 m bgl.** Hard Northland Allochthon was conservatively inferred within boreholes HA01, HA03, HA05, HA07 & HA08 where vane shear strengths were consistently above 200 kPa or DCP blow counts consistently returned values above 6 per 100 mm penetration.

- **Dense Northland Allochthon Residual Soil to depths >1.1 m to >4.7 m bgl.** Dense Northland Allochthon was inferred within boreholes HA03, HA05, HA07 & HA08 from where Scala penetrometer values exceeded 20 blows per 100mm.

A summary of the above information is presented as Table 1.

Table 1: Summary of Ground Investigation

Hole ID	Hole Depth	Residual Soil Depth Range	Hard Soil Depth Range	Groundwater	Refusal Depth
HA01	5.1 m	0.25 – 4.3 m	4.3 – 5.1 m	NE	5.1 m
HA02*	1.2 m	0.2 – >1.2 m	NE	NE	NE
HA03	4.7 m	0.2 – 3.9 m	3.9 – 4.7 m	NE	4.7 m
HA04*	1.2 m	0.2 – >1.2 m	NE	NE	NE
HA05	1.1 m	0.2 – 0.5 m	0.5 – 1.1 m	NE	1.1 m
HA06*	1.2 m	0.2 – >1.2 m	NE	NE	NE
HA07	2.2 m	0.3 – 2.0 m	2.0 – 2.2 m	NE	2.2 m
HA08	1.8 m	0.15 – 1.5 m	1.5 – 1.8 m	NE	1.8 m
HA09	1.0 m	0.3 – 1.0 m	NE	NE	NE
HA10*	1.0 m	0.2 – 1.0 m	NE	NE	NE

** Hand Augers for the proposed wastewater fields.*
All depths in m below ground level unless stated otherwise

3.7.1 Groundwater

The ground investigation was undertaken during summer and formed exploratory boreholes to maximum depths that can be achieved with hand tools. Groundwater levels were monitored utilising a groundwater dip meter on the day of drilling.

During our ground investigation, no groundwater was encountered. However, groundwater

levels commonly fluctuate according to the season and rainfall events. As such, groundwater levels may vary and be identified at higher levels than monitored during this ground investigation.

4 GEOTECHNICAL ASSESSMENT

Based on the results of the desktop appraisal, a site walkover survey, and the ground investigation, Geologix have undertaken a site-specific geotechnical assessment relevant to the proposed development concept.

4.1 Geotechnical Design Parameters

Geotechnical design parameters are presented in Table 2 below. They have been developed based on our ground investigation, the results of in-situ testing, laboratory analysis and experience with similar materials and refinement by back analysis within the slope stability model to develop an accurate ground model to the conditions observed on site.

Table 2: Geotechnical Effective Stress Parameters

Geological Unit	Unit Weight, kN/m³	Effective Friction Angle, °	Effective Cohesion, kPa	Undrained shear strength, kPa
Northland Allochthon Residual Soil	18	29	4	140 *
Hard Northland Allochthon Residual Soil	19	32	7	203+
Dense Northland Allochthon Residual Soil	20	34	9	203+

** Adopting Bjerrum correction factor of 0.8 from characteristic vane shear strength.*

4.2 Site Subsoil Class

The site has been designated as Site Subsoil Class C according to the provisions of NZS1170:2004[6].

4.3 Seismic Hazard

New Zealand Standard NZS1170.5:2004 Clause 2.1.4 specifies that to meet the requirements of the New Zealand Building Code, design of structures is to allow for two earthquake scenarios:

1. *Ultimate Limit State (ULS) shall provide for… "avoidance of collapse of the structural system…or loss of support to parts… damage to non-structural systems necessary for emergency building evacuation that renders them inoperable."*

2. *Serviceability Limit State (SLS) are to avoid damage to… "the structure and non-structural*

[6] *NZS1170.5:2004, Structural Design Actions Part 5: Earthquake Actions Clause 3.1.3.*

components that would prevent the structure from being used as originally intended without repair after the SLS earthquake…."

The seismic hazard in terms of Peak Ground Acceleration (PGA) has been assessed based on the NZGS Module 1[7]. Table 3 presents the return periods for earthquakes with ULS and SLS 'unweighted' PGAs and design earthquake loads for the corresponding magnitude. The PGAs were determined using building Importance Level (IL) 2, defined by NZS1170.5:2004. Reference should be made to the structural designer's assessment for the final determination of building importance level.

Table 3: Summary of Seismic Hazard Parameters

Limit State	Effective Magnitude	Return Period (years)	Unweighted PGA
ULS	6.5	500	0.19 g
SLS	5.8	25	0.03 g

4.4 Site Stability

At the time of writing, no obvious indications of major deep-seated instability were identified at the site, and the risk of such deep-seated instability developing as a result of the development proposal is low.

Within the scope of this ground investigation Geologix have undertaken a digitally modelled slope stability analysis through the critical section of the site topography and proposed development platform. The cross-section alignment is presented on Drawing No. 200 within Appendix A and the developed ground model as Drawing No. 201 & 202.

The slope was analysed within propriety software Slide 2 version 9.034, developed by RocScience Inc. The purpose of the stability assessment was to:

- Ensure development concepts are feasible.
- Provide a working, accurate ground model in relation to site stability refined according to observed conditions and the results of this ground investigation.
- Develop a proposed retaining concept, if required, with any specific geotechnical stability requirements.
- Inform the requirements of Consent, developed architectural design and further engineering works.

Limit equilibrium stability analysis was adopted in the analysis to express the results as a Factor of Safety (FS). When FS = 1.0, the represented mechanism is in equilibrium with the disturbing, active forces equal to the resisting, stabilising forces. A lower FS indicates that

[7] *New Zealand Geotechnical Society, Earthquake Geotechnical Engineering Practice, Module 1, November 2021, Appendix A, Table A1.*

instability could occur under the modelled scenario whereas a higher FS demonstrates a margin of safety in respect of stability. Minimum FS criteria have been developed for use in residential development by Auckland Council[8] which are widely adopted in the Far North region. Modelling three separate event scenarios the accepted minimum FS are summarised as follows:

- Minimum FS = 1.5 for static, normal groundwater conditions.
- Minimum FS = 1.3 for elevated groundwater conditions (storm events).
- Minimum FS = 1.0 for dynamic, seismic events.

4.4.1 Stability Analysis Results

Slope stability analysis results are presented in full as Appendix C and summarised below as Table 4.

Table 4: Summary of Stability Analysis Results

Profile	Scenario	Global Min.	Development Footprint (min FS)	Result
Section A				
Existing	Static[1]	2.813	>1.5	Pass
	Elevated GW[2]	2.150	>1.3	Pass
	Seismic[3]	1.380	>1.0	Pass
Proposed	Static[1]	2.387	>1.5	Pass
	Elevated GW[2]	2.151	>1.3	Pass
	Seismic[3]	1.384	>1.0	Pass
Section B				
Existing	Static[1]	1.680	>1.5	Pass
	Elevated GW[2]	1.296	>1.3	Pass
	Seismic[3]	1.089	>1.0	Pass
Proposed	Static[1]	1.680	>1.5	Pass
	Elevated GW[2]	1.296	>1.3	Pass
	Seismic[3]	1.089	>1.0	Pass
Section C				
Existing	Static[1]	1.259	>1.5	Pass
	Elevated GW[2]	0.935	>1.3	Pass
	Seismic[3]	0.870	>1.0	Pass
Proposed	Static[1]	1.259	>1.5	Pass
	Elevated GW[2]	0.934	>1.3	Pass
	Seismic[3]	0.871	>1.0	Pass
Section D				
Existing	Static[1]	1.343	>1.5	Pass

[8] *Auckland Council, Code of Practice for Land Development and Subdivision, Section 2 Earthworks and Geotechnical Requirements, Version 2.*

	Elevated GW[2]	1.021	>1.3	Pass
	Seismic[3]	0.930	>1.0	Pass
Proposed	Static[1]	1.343	>1.5	Pass
	Elevated GW[2]	1.023	>1.3	Fail
	Seismic[3]	0.929	>1.0	Pass
Palisade Wall	Static[1]	1.344	>1.5	Pass
	Elevated GW[2]	1.024	>1.3	Pass
	Seismic[3]	0.931	>1.0	Pass
Restriction Line	Static[1]	1.342	>1.5	Pass
	Elevated GW[2]	1.024	>1.3	Pass
	Seismic[3]	0.929	>1.0	Pass

1. *Static, normal groundwater minimum FS = 1.5*
2. *Static, elevated groundwater minimum FS = 1.3*
3. *Dynamic, seismic conditions minimum FS = 1.0*

4.4.2 Stability Analysis Conclusions

The developed slope stability model is considered to be a reasonable representation of the observed conditions on site. No detailed architectural plans or earthworks plans are available during the preparation of this report. Slope stability analyses shall be subject to revision and enhancement once final development and earthworks extents are known on each lot.

From the current modelled slope stability analysis computation, factors of safety are satisfactory for the existing site conditions and the current building platforms for Lots 1-3.

The assessment results are expressed as a Factor of Safety (F_S). When F_S equals 1.0, the represented mechanism is in equilibrium with the disturbing, active forces equal to the resisting, stabilising forces. A lower F_S indicates that instability could occur under the modelled scenario whereas a higher F_S demonstrates a margin of safety in respect of stability.

The effective stress parameters of the Northland Allochthon deposits were developed by back analysing. The areas near slope failure were identified by the location of the features on site and then analysed with a F_S of marginally above 1.0 under an extreme groundwater scenario. The results were calibrated with our recent investigation results and knowledge of local geology, to reflect the site-specific condition.

Within lot 4 failure mechanisms below the required factor of safety occur within the and earth stabilization is an option for development in the location shown on Drawing No. 102 within Appendix A. Alternatively, the building platform can be moved further away from the slope to the East to remove the need for stabilisation. As such, a building restriction line is detailed in section 5.1.1 and shown on Drawing No. 102 within Appendix A.

4.5 Soil Expansivity

Clay soil may undergo appreciable volume change in response to changes in moisture content and be classed as expansive. The reactivity and the typical range of movement that can be expected from potentially expansive soils underlying any given building site depends on the amount of clay present, the clay mineral type, and the proportion, depth, and distribution of clay throughout the soil profile. Clay soils typically have a high porosity and low permeability causing moisture changes to occur slowly and produce swelling upon wetting and shrinkage upon drying. Apart from seasonal moisture changes (wet winters and dry summers) other factors that can influence soil moisture content include:

- Influence of garden watering and site drainage.
- The presence of mature vegetation.
- Initial soil moisture conditions at the time of construction.

Based on our experience and lab results of similar soils, for design of residential dwelling foundation, site subsoil shall design for minimum Highly Expansive, or Expansive Soil Class H, as per New Zealand Building Code. In accordance with New Zealand Building Code[9], Class H or Highly Expansive soils typically have a soil stability index (I_{ss}) range of 3.8 to 6.5% and a 500-year design characteristic surface movement return (y_s) of 78 mm. A quantification of the expansive soil class assumptions can be made by geotechnical laboratory analysis.

4.6 Liquefaction Potential

Liquefaction occurs when excess pore pressures are generated within loose, saturated, and generally cohesionless soils (typically sands and silty sands with <30 % fines content) during earthquake shaking. The resulting high pore pressures can cause the soils to undergo a partial to complete loss of strength. This can result in settlement and/ or horizontal movement (lateral spread) of the soil mass.

The Geologix ground investigation indicates the site to be predominantly underlain by fine-grained Northland Allochthon soils. Based on the materials strength and consistency, and our experience with these materials, there is no liquefaction potential / risk in a design level earthquake event.

5 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical recommendations have been developed based on the plans and details supplied to us at the time of writing. Amendments or revisions to the plans detailed in this report may require a review of the following recommendations.

[9] *New Zealand Building Code, Structure B1/AS1 (Amendment 20, November 2021), Clause 7.5.13.1.2*

5.1 Conceptual Foundations

The development platforms are understood to be formed by a minor topsoil strip to exposure natural Northland Allochthon soils. It is recommended that any non-engineered fill, underlying soft spots (Su <60 kPa) and any other unsuitable or deleterious materials (such as relic foundations, driveway hardstanding etc.) are sub-excavated and replaced with suitably selected and compacted materials such as GAP65 hard fill.

Based on the natural formation having an average undrained shear strength of 100kPa with 100 – 300mm layer of compacted GAP65 on this formation then it is expected that either shallow standard raft or strip footing foundations can be adopted for future dwellings provided they are located upslope of the building restriction line or stabilized by a palisade wall should they extend below the BRL. Alternatively, the dwellings may be founded on shallow pile foundations. Such foundations may be designed by a professional structural engineer adopting an Ultimate Bearing Capacity of 300 kPa for a highly expansive soil type and a geotechnical reduction factor of 0.5. The use of widespread deep piled foundations is not considered necessary.

Construction monitoring requirements of the above recommendations are detailed in Section 5.5 of this report.

5.1.1 Building Restriction Line

Due to the moderately steep slope in proximity to the lot 4 building platform, we propose a building restriction line. Any structures downslope of the building restriction line will require a palisade wall as per section 5.1.2, if the structure is restricted to the East of the line then no stabilisation is recommended at this stage.

5.1.2 Conceptual Palisade Wall

For foundations downslope of the building restriction line we recommend a palisade wall designed to extend at least 3x pile diameters deep into Dense Northland Allochthon Residual Soil as identified in Table 1 to provide 20kN of stabilizing shear force on the eastern side of the site. This structure shall be detailed in the building consent stage and the location of this wall shown on Drawing No. 102 within Appendix A.

5.2 Earthworks and Methodology

No earthwork concepts were provided to us at the time of writing. If additional earthworks are required, due to the nature of the underlying Northland Allochthon Residual Soil, it is recommended that all excavations are formed at a permanent batter slope of 1V:3H up to a maximum height of 0.5 m. Above this height, it is recommended that cut batters are supported by specifically engineered retaining walls.

5.2.1 Temporary Works

To reduce the risk of temporary excavation instability, it is recommended that unsupported excavations have a maximum vertical height of 1.0 m. Temporary unsupported excavations

above this height shall be battered at 1V:1H or 45 °. It is expected that the above temporary works can be undertaken within the property boundaries.

All works within proximity to excavations should be undertaken in accordance with Occupational Health and Safety regulations. In addition, it is recommended that all earthworks are carried out in periods of fine weather within the typical October to April earthwork season. Consent conditions commonly prescribe working restrictions.

5.2.2 Fills

It is recommended earthwork fills are kept to a minimum to reduce the load on the moderately steep slope in proximity to the proposed building platform. Earthwork fills greater than 600mm deep will require approval by a chartered professional engineer or support by fully engineered retaining walls.

5.3 Retaining Walls

In general, it is expected that retaining walls may be required. It is recommended that all proposed retaining walls are subject to specific engineering design.

It is recommended that all retaining walls are designed by a professional engineer familiar with the findings and geotechnical parameters of this report. Timber pole retaining walls are considered a feasible solution for these concept structures.

Based on the results of the ground investigation and for flat backslopes, earth pressure parameters for design are presented within Table 5.

Table 5: Earth Pressure Parameters

Strata	At Rest Pressure Coefficient, K_O	Active Pressure Coefficient, K_A	Passive Pressure Coefficient, K_P
Northland Allochthon Residual Soil	0.515	0.309	5.622
Hard Northland Allochthon Residual Soil	0.47	0.275	7.371
Dense Northland Allochthon Residual Soil	0.441	0.254	9.007

1. *Adopts soil/ wall friction coefficient of 0.67 for timber according to NZBC B1/VM4 Table 2. Refinement required for alternative materials.*
2. *Considers 0 ° backslope only. Parameters to be modified by design engineer.*

It is recommended that a 100 mm diameter perforated drain coil and cohesionless backfill (minimum 300 mm wide) is installed behind all retaining walls including any block walls to control any temporary hydrostatic pressures.

5.4 Driveways

For any proposed driveways and car parking. It is recommended that all unsuitable and deleterious materials such as topsoil, vegetation, shallow fill, and any existing foundations/

concrete hardstanding is removed from the driveway area prior to filling. By doing so, it is expected that the shallow natural residual soils will achieve a typical subgrade CBR value of 4 % or greater according to Austroads Standards.

For driveway and parking areas it is recommended that carriageways include a minimum total thickness of 250 mm, comprising a minimum 150 mm sub-basecourse, typically AP65 or approved similar and minimum 100 mm basecourse, typically finer AP40 or approved similar.

5.5 Future Geotechnical Works

After the resource consent is approved and the project moves to the building consent stage, we recommend site specific geotechnical investigation and reports for each of the proposed lots.

5.6 Construction Monitoring

During site development works it is recommended that specific construction monitoring is undertaken by a professional engineer in accordance with the recommendations of this report, the investigations and design recommendations developed during Building Consent and any consent conditions

The above items are considered to be capable under CM2 level construction monitoring accompanied by appropriate Producer Statements. Monitoring should be undertaken or supervised by a chartered professional engineer.

6 LIMITATIONS

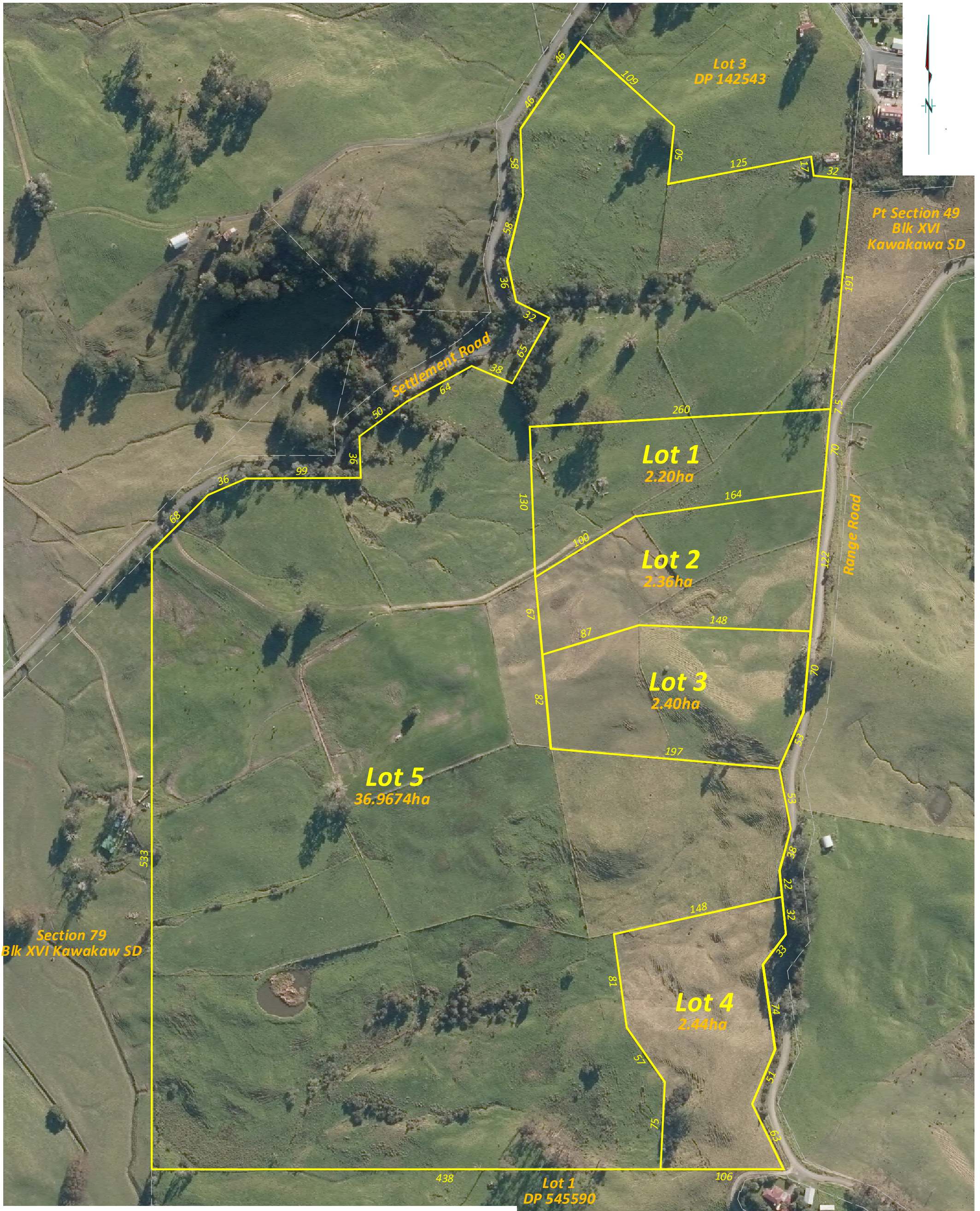
This report has been prepared for K&M Trust as our Client. It may be relied upon by our Client and their appointed Consultants, Contractors and for the purpose of Consent as outlined by the specific objectives in this report. This report and associated recommendations, conclusions or intellectual property is not to be relied upon by any other party for any purpose unless agreed in writing by Geologix Consulting Engineers Ltd and our Client. In any case the reliance by any other party for any other purpose shall be at such parties' sole risk and no reliability is provided by Geologix Consulting Engineers Ltd.

The opinions and recommendations of this report are based on plans, specifications and reports provided to us at the time of writing, as referenced. Any changes, additions or amendments to the project scope and referenced documents may require an amendment to this report and Geologix Consulting Engineers should be consulted. Geologix Consulting Engineers Ltd reserve the right to review this report and accompanying plans.

The recommendations and opinions in this report are based on arisings extracted from exploratory boreholes at discrete locations and any available existing borehole records. The nature and continuity of subsurface conditions, interpretation of ground condition and models away from these ground investigation locations are inferred. It must be appreciated that the actual conditions may vary from the assumed ground model. Difference from the encountered ground conditions during construction may require an amendment to the recommendations of this report.

APPENDIX A

Drawings



Local Authority: Far North District Council
Comprised in: NA879/87
Total Area: 46.3674ha
Zoning: Rural Production
Resource features: NIL

AREAS AND MEASUREMENTS ARE SUBJECT TO FINAL SURVEY

TOPOGRAPHICAL DETAIL IS APPROXIMATE ONLY AND SCALED FROM AERIAL PHOTOGRAPHY

This plan and accompanying report(s) have been prepared for the purpose of obtaining a Resource Consent only and for no other purpose. Use of this plan and/or information on it for any other purpose is at the user's risk.

0 30 150 300m

Bar Scale 1:3000 @ A3

THOMSON SURVEY LIMITED
315 Kerikeri Rd
P.O. Box 372 Kerikeri
Email: kerikeri@tsurvey.co.nz
Ph: (09) 4077360
www.tsurvey.co.nz
Registered Land Surveyors, Planners & Land Development Consultants

PROPOSED SUBDIVISION OF SECTION 77 BLK XVI KAWAKAWA SD & PT SECTION 30 BLK XVI KAWAKAWA SD

RANGE ROAD, KAWAKAWA

PREPARED FOR: K & M TRUST

	Name	Date
Survey		
Design		
Drawn	KY	30.06.23
Approved		
Rev	KY	17.08.23

10519 Scheme 20230817

ORIGINAL
SCALE 1:3000
SHEET SIZE A3

Surveyors Ref. No: 10519

NOTES:

- CONTOUR INTERVAL IS 20 m MAJOR, 5 m MINOR EXTRACTED FROM LINZ
- AERIAL PHOTOGRAPH, EXTRACTED FROM GRIP
- HORIZONTAL DATUM IN MT EDEN CIRCUIT 2000
- VERTICAL DATUM IN TERMS OF NEW ZEALAND VERTICAL DATUM 2016
- EXISTING SITE BOUNDARIES EXTRACTED FROM GRIP.CO.NZ
- PROPOSED BOUNDARIES PROVIDED BY THOMSON SURVEY PLAN 10519 DATED AUGUST 2023

LEGEND:

- —75.0— MAJOR CONTOUR
- — — — MINOR CONTOUR
- SUBJECT LOT
- PROPOSED LOTS
- EXISTING ROAD RESERVE BOUNDARY
- EXISTING ABUTTAL LOT BOUNDARY
- PROPOSED PRIMARY WASTE DISPOSAL FIELD
- PROPOSED SECONDARY WASTE DISPOSAL FIELD
- CONCEPT BUILDING ENVELOPE (30m x 30m)
- CONCEPT 2 x 25,000 LITRE WATER TANK ATTENUATING TO DISPERSION DEVICE TO CONTROL 500m² AREA
- HAXX GEOLOGIX HAND AUGER
- CONCEPTUAL PALISADE WALL

SETTLEMENT ROAD

3
DP 142543

3
DP 184846

PART SEC 49 BLK XVI
KAWAKAWA SD

REFER DRAWING C0589-S-101

Lot 1
2.20ha

Lot 2
2.36ha

Lot 3
2.40ha

RANGE ROAD

REFER DRAWING C0589-S-102

Lot 5
36.9674ha

Lot 4
2.44ha

SEC 79
BLK XVI
KAWAKAWA SD

1
DP 545590

50.0 75.0

Meters
50 0 50 100
1:5000

GENERAL NOTES

1. DRAWING REPRODUCED FROM THOMSON SURVEY PROPOSED SCHEME PLAN REF. 10519, DATED AUGUST 2023.
3. HORIZONTAL CO ORDINATE SYSTEM = NZTM.
4. VERTICAL DATUM = NZVD.
5. MAJOR INTERVALS 20.0 m.
6. MINOR INTERVALS 5.0 m.
7. FOR INDICATION ONLY, NOT FOR CONSTRUCTION.

CONCEPT WASTEWATER DESIGN

CONCEPT DEVELOPMENT	5 BEDROOM
CONCEPT NO. OF OCCUPANTS	8 PERSONS
DAILY WASTEWATER GEN.	160 LITRES/PERSON/ DAY
TOTAL WASTEWATER GEN.	1,280 LITRES/ DAY
SOIL CATEGORY (TP58)	CATEGORY 6
SOIL CATEGORY (NZS1547)	CATEGORY 5
SOIL LOADING RATE	3.0 mm/ DAY
TREATMENT SYSTEM	NO - SUBJECT TO BUILDING CONSENT DESIGN
PRIMARY DISPOSAL AREA	427 m²
RESERVE DISPOSAL AREA	214 m² (50 %)
FINAL DESIGN	NO - SUBJECT TO BUILDING CONSENT DESIGN
CUT OFF DRAINS LOT 1 & 2	NO
CUT OFF DRAINS LOT 3 & 4	YES
DISCHARGE CONSENT	NO

Revision	Issue	Date
A	CONSENT	28/02/25

geologix
consulting engineers
AUCKLAND | NORTHLAND

Project Name and Address
OKORO ROAD
ŌKAIHAU
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client
K & M TRUST

Sheet Title
SITE SUITABILITY OVERALL LAYOUT

Sheet
100

FILE PATH: D:\SynologyDrive\Projects\C0500-C0599\C0589 - Range Road, Kawakawa\07 - Technical & Drawings\Drawings\C0589-S-100-411-A.dwg

PLOTTED: 03/04/2025

NOTES:
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- HORIZONTAL DATUM IN MT EDEN CIRCUIT 2000
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LEGEND:

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- CONCEPT 2 x 25,000 LITRE WATER TANK ATTENUATING TO DISPERSION DEVICE TO CONTROL 500m² AREA
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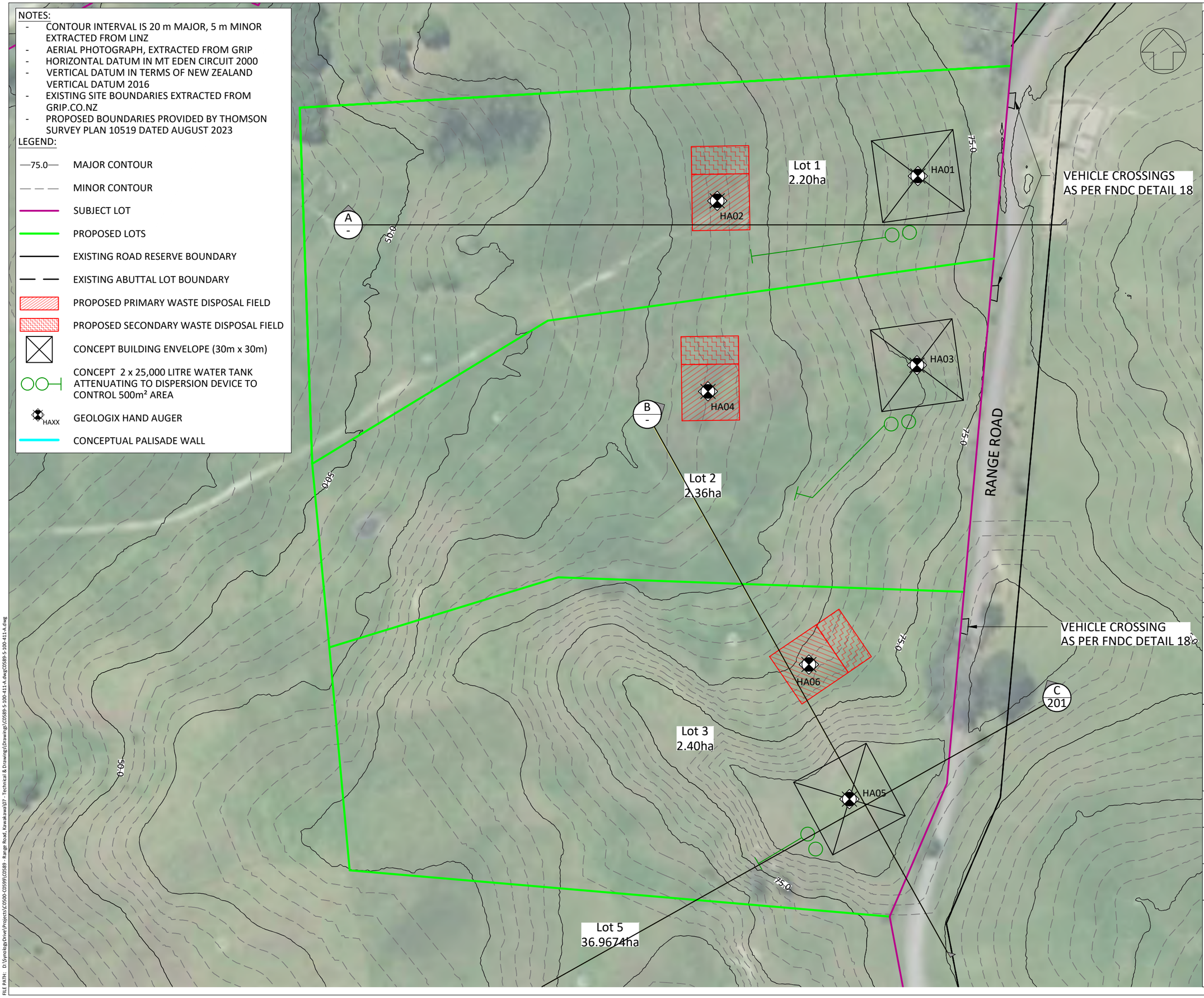
- CONCEPTUAL PALISADE WALL



GENERAL NOTES

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FINAL DESIGN	NO - SUBJECT TO BUILDING CONSENT DESIGN
CUT OFF DRAINS LOT 1 & 2	NO
CUT OFF DRAINS LOT 3 & 4	YES
DISCHARGE CONSENT	NO

Meters
12.5 0 12.5 25
1:1250

A	CONSENT	28/02/25
Revision	Issue	Date

geologix
consulting engineers
AUCKLAND | NORTHLAND

Project Name and Address
OKORO ROAD
ŌKAIHAU
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client
K & M TRUST

Sheet Title
SITE SUITABILITY ENLARGED SHEET 1

Sheet
101

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PLOTTED: 03/04/2022

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LEGEND:

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— — — MINOR CONTOUR

SUBJECT LOT

PROPOSED LOTS

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CONCEPT 2 x 25,000 LITRE WATER TANK ATTENUATING TO DISPERSION DEVICE TO CONTROL 500m² AREA

HAXX GEOLOGIX HAND AUGER

CONCEPTUAL PALISADE WALL

Lot 5
36.9674ha

50.0

OKORO ROAD

HA10

ALTERNATIVE SITE LAYOUT BEHIND BUILDING RESTRICTION LINE AND WITHOUT NEED FOR PALISADE WALL

Lot 4
2.44ha

7.5

HA08

HA07

D
202

HA09

BUILDING RESTRICTION LINE OPTION ALTERNATIVE TO PALISADE WALL. EAST OF LINE REQUIRES NO STABILISATION

CONCEPTUAL PALISADE WALL OPTION IF BUILING RESTRICTION LINE IS NOT ADOPTED

VEHICLE CROSSING
AS PER FNDC DETAIL 18

1
DP 545590

GENERAL NOTES

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DISCHARGE CONSENT	NO

Meters
12.5 0 12.5 25
1:1250

A	CONSENT	28/02/25
Revision	Issue	Date

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consulting engineers
AUCKLAND | NORTHLAND

Project Name and Address
OKORO ROAD
ŌKAIHAU
SEC 77 BLK XVI & PRT SEC 30 BLK XVI

Project	Drawn By
C0589	BN

Client
K & M TRUST

Sheet Title
SITE SUITABILITY ENLARGED SHEET 2

Sheet
102

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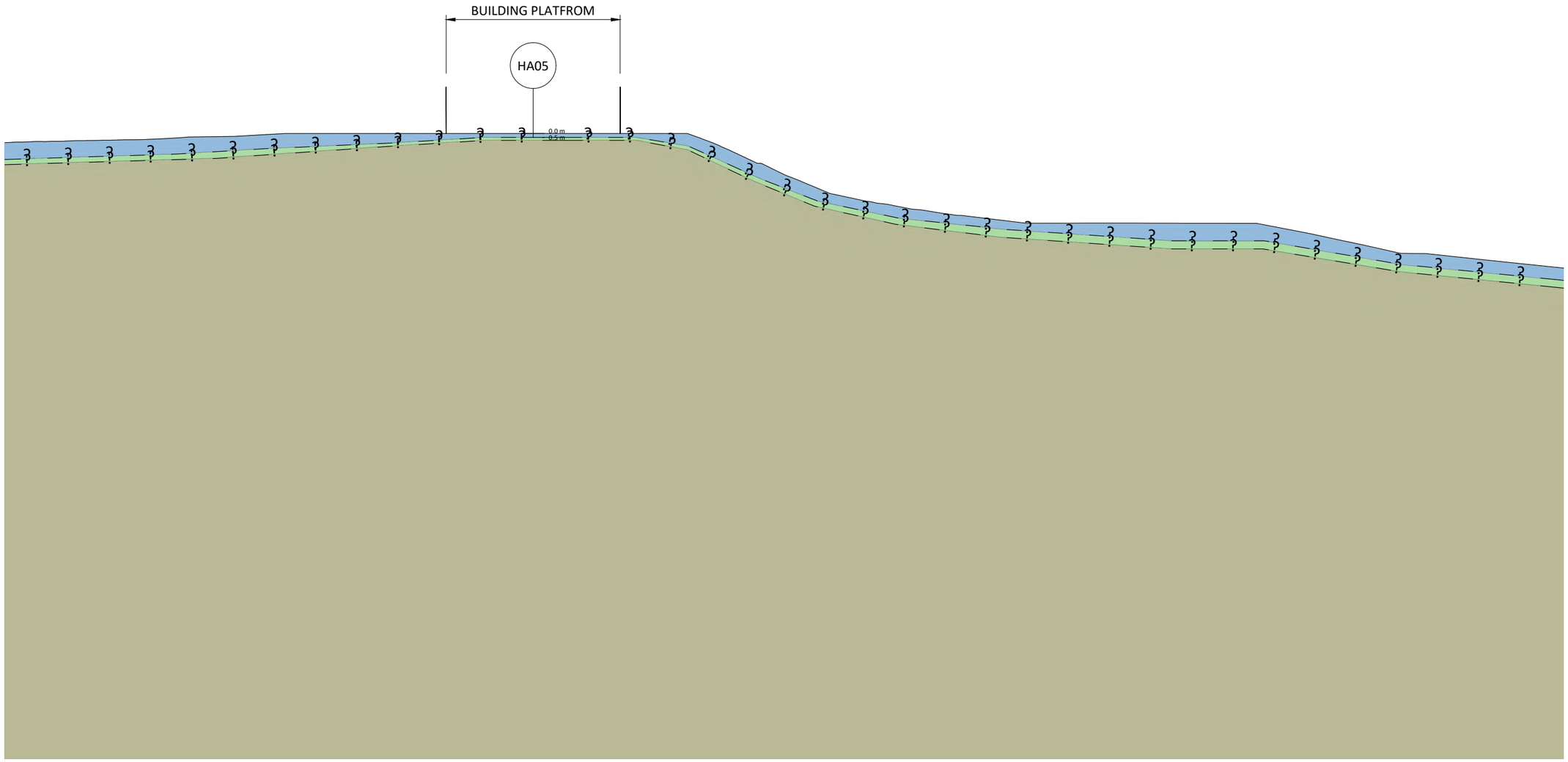
PLOTTED: 03/04/2025

LEGEND:

- STRATA BOUNDARY
- NORTHLAND ALLOCHTHON RESIDUAL SOIL
- HARD NORTHLAND ALLOCHTHON RESIDUAL SOIL
- DENSE NORTHLAND ALLOCHTHON RESIDUAL SOIL



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	SIGNED	DATE
DRAWN	BN	17/03/25
VERIFIED	DB	17/03/25
APPROVED	EC	17/03/25

REV.	DATE	REVISION DETAILS	BY	APP.
A	17/03/2025	FOR RESOURCE CONSENT	DB	EC

CLIENT: K & M TRUST

PROJECT: OKORO ROAD, ŌKAIHAU, NORTLAND, SEC 77 BLK XVI & PRT SEC 30 BLK XVI

DRAWING TITLE: GEOTECHNICAL SECTION C FOR RESIDENTIAL RESOURCE CONSENT

STATUS: FINAL
NOT FOR CONSTRUCTION

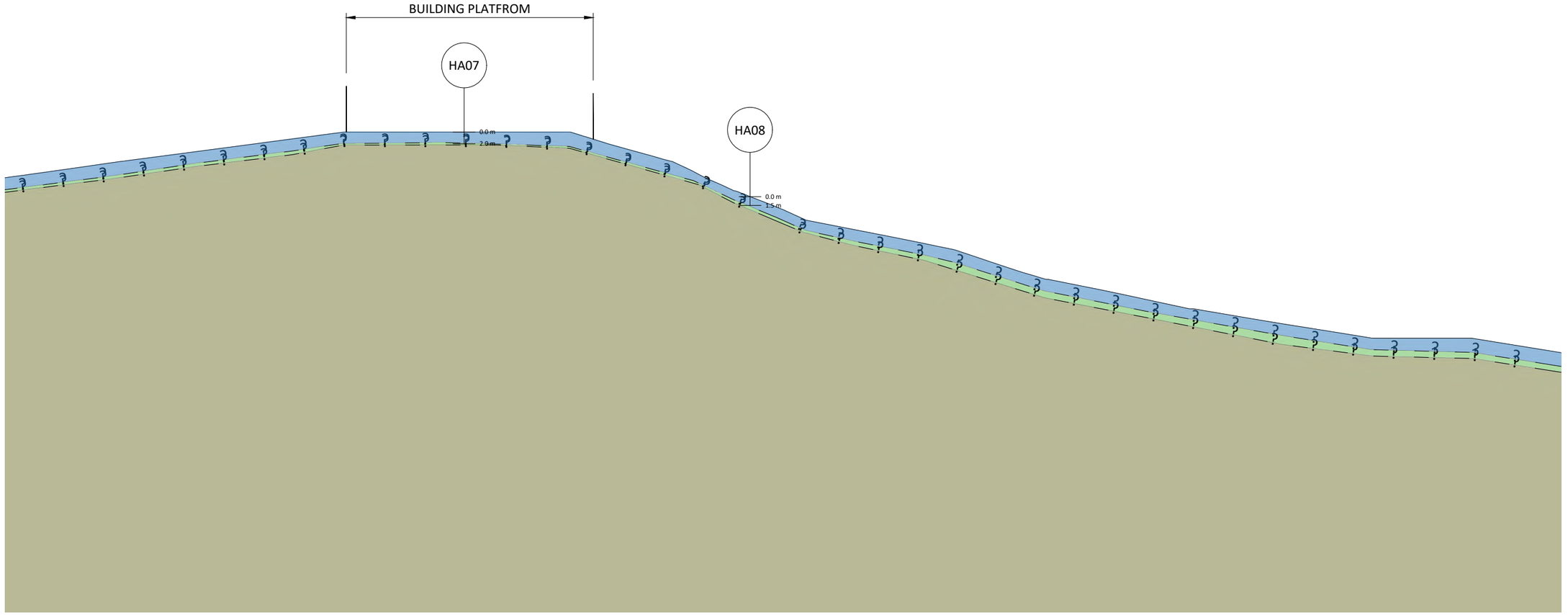
SCALE: 1:1000

SHEET SIZE: A3

PROJECT NO.	TYPE.	CLASS.	SHEET NO.	REV.
C0589	RC	G	201	A

LEGEND:

- STRATA BOUNDARY
- NORTHLAND ALLOCHTHON RESIDUAL SOIL
- HARD NORTHLAND ALLOCHTHON RESIDUAL SOIL
- DENSE NORTHLAND ALLOCHTHON RESIDUAL SOIL



geologix consulting engineers

	SIGNED	DATE
DRAWN	BN	17/03/25
VERIFIED	DB	17/03/25
APPROVED	EC	17/03/25

REV.	DATE	REVISION DETAILS	BY	APP.
A	17/03/2025	FOR RESOURCE CONSENT	DB	EC

CLIENT: K & M TRUST

PROJECT: OKORO ROAD, ŌKAIHAU, NORTLAND, SEC 77 BLK XVI & PRT SEC 30 BLK XVI

DRAWING TITLE: GEOTECHNICAL SECTION D FOR RESIDENTIAL RESOURCE CONSENT

STATUS: FINAL
NOT FOR CONSTRUCTION

SCALE	SHEET SIZE.
1:1000	A3

PROJECT NO.	TYPE.	CLASS.	SHEET NO.	REV.
C0589	RC	G	202	A

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APPENDIX B

Exploratory Hole Records

INVESTIGATION LOG

HOLE NO.: HA01

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696447mE, 6082586mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger + DCP
DRILLER: GB/TW
LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	WATER
TOPSOIL comprising of organic silt with trace rootlets; dark brown. Moist; low plasticity.		0.0	TS			
Clayey SILT; orange with light grey and dark orange mottles. Very stiff; moist; low plasticity; [Northland Allochthon Residual Soils] .		0.2			188 / 75	
		0.4			130 / 75	
		0.6			142 / 69	
		0.8			166 / 81	
		1.0			173 / 84	
		1.2			186 / 104	
		1.4			137 / 87	
		1.6			202+ / -	
		1.8			182 / 92	
		2.0			159 / 78	
		2.2			195 / 69	
		2.4			202+ / -	
2.4m: Becoming hard		2.6			UTP / -	
		2.8				
		3.0				
		3.2				
		3.4				
		3.6				
3.6m - 3.9m: Becoming hard 3.7m - 3.9m: Becoming grey.		3.8				
End Of Hole: 3.90m		4.0		5		
		4.2		5		
		4.4		5		
		4.6		6		
		4.8		7		
		5.0		9		
				9		
				11		
				15		
				17		
				17		

Groundwater Not Encountered

PHOTO(S)

REMARKS

1. Hand auger terminated at 3.9m bgl due to dense strata.
2. Continued with DCP from 3.9m bgl until refusal at 5.1m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

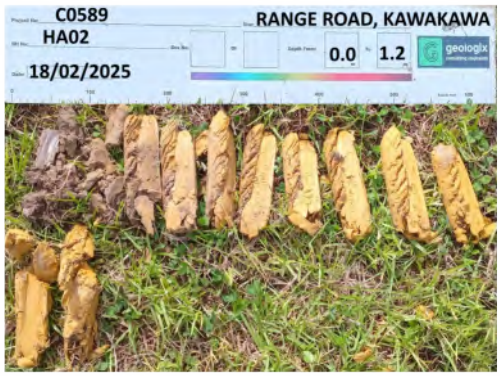
HOLE NO.: HA02

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696412mE, 6082584mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger
DRILLER: GB/TW
LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
TOPSOIL comprising of organic silt with trace rootlets; dark brown. Moist; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Clayey SILT; orange with brown mottles. Moist; low plasticity; [Northland Allochthon Residual Soils] .		0.2				195 64	
		0.4					
		0.6				124 78	
		0.8					
		1.0				108 66	
		1.2				101 48	
End Of Hole: 1.20m		1.4					Groundwater Not Encountered
		1.6					
		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.2m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA03

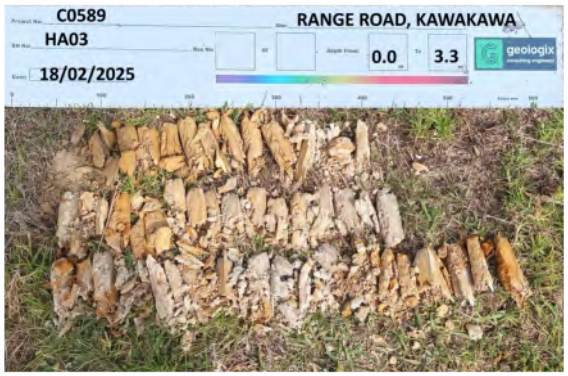
CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696440mE, 6082538mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger + DCP
DRILLER: GB/TW
LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	WATER
TOPSOIL comprising organic SILT; with trace rootlets; brown; dry; low plasticity.		0.0	TS			
Clayey SILT, with trace rootlets; orange brown. Hard; dry; low plasticity; [Northland Allochthon Residual Soils] .		0.2			203+ -	
		0.4			203+ -	
SILT, with some clay; orange brown with light grey clasts. Hard; moist; low plasticity; [Northland Allochthon Residual Soils] .		0.6			UTP -	
		0.8				
Clayey SILT; orange brown mottled dark orange brown and light grey. Very stiff to hard; moist; low plasticity; [Northland Allochthon Residual Soils] .		1.0			160 76	
		1.2			203+ -	
1.8m - 2.2m: Becoming light grey mottled dark orange.		1.4			UTP -	
		1.6			203+ -	
		1.8			203+ -	
		2.0			UTP -	
		2.2				
		2.4				
		2.6				
		2.8				
End Of Hole: 3.00m		3.0		4		
		3.2		11 13 12		
		3.4		5 4		
		3.6		9 5 5		
		3.8		7 10 8		
		4.0		9 11 9		
		4.2		10 22 >>		
		4.4				
		4.6				
		4.8				

Groundwater Not Encountered

PHOTO(S)



REMARKS

1. Hand auger terminated at 3.0m bgl due to dense strata.
2. Continued with DCP from 3.0m bgl until refusal at 4.7m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA04

CLIENT: K&M Trust

PROJECT: Range Road, Kawakawa

JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa

START DATE: 18/02/2025

CO-ORDINATES: 1696406mE, 6082531mN

ELEVATION: Ground

END DATE: 18/02/2025

CONTRACTOR: Internal

RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets; brown; dry; low plasticity.		0.0	TS				
Clayey SILT; orange brown mottled brown. Hard to very stiff; wet; low plasticity; [Northland Allochthon Residual Soils].		0.2				203+	Groundwater Not Encountered
		0.4				-	
		0.6				116	
		0.8				58	
0.9m: Becoming stiff.		1.0				96	
SILT, with some clay; brown mottled greyish brown and orange brown. Moist; low plasticity; [Northland Allochthon Residual Soils].		1.2				52	
End Of Hole: 1.20m						87	
						58	

PHOTO(S)

REMARKS

1. Hand auger completed at target depth 1.2m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA05

CLIENT: K&M Trust

PROJECT: Range Road, Kawakawa

JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa

START DATE: 18/02/2025

CO-ORDINATES: 1696411mE, 6082359mN

ELEVATION: Ground

END DATE: 18/02/2025

CONTRACTOR: Internal

RIG: 50 mm Auger + DCP

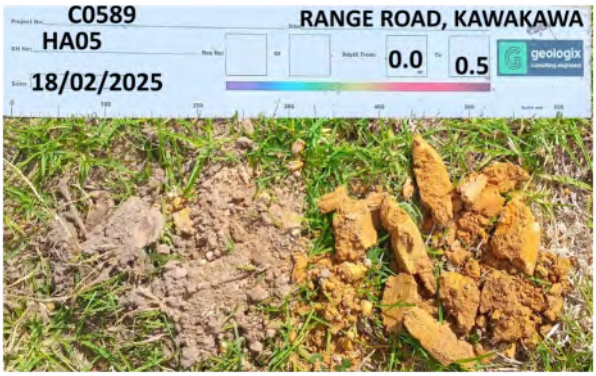
DRILLER: GB/TW

LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	WATER
TOPSOIL comprising of organic silt with trace rootlets; dark brown. Dry; friable.		0.0	TS			
SILT, with minor sand, with trace gravel; brown with orange mottles. Hard; dry; sand, fine; gravel, fine; friable [Northland Allochthon].		0.2		8	UTP	
SILT, with some clay, with minor gravel; brownish orange with darl orange mottles. Hard; moist; low plasticity; gravel, fine; [Northland Allochthon Completely Weathered Parent Rock].		0.4		4	-	
End Of Hole: 0.50m		0.6		15		
		0.8		18		
		1.0		12		
		1.2		17		
		1.4		15		
		1.6		20		
		1.8				
		2.0				
		2.2				
		2.4				
		2.6				
		2.8				
		3.0				
		3.2				
		3.4				
		3.6				
		3.8				
		4.0				
		4.2				
		4.4				
		4.6				
		4.8				

Groundwater Not Encou

PHOTO(S)



REMARKS

1. Hand auger terminated at 0.5m bgl due to dense strata.
2. Continued with DCP from 0.3m bgl until refusal at 1.1m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA06

CLIENT: K&M Trust

PROJECT: Range Road, Kawakawa

JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa

START DATE: 18/02/2025

CO-ORDINATES: 1696402mE, 6082404mN

ELEVATION: Ground

END DATE: 18/02/2025

CONTRACTOR: Internal

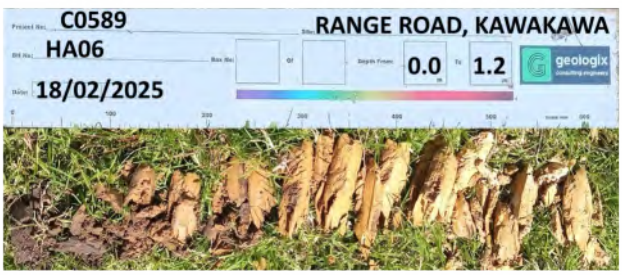
RIG: 50 mm Auger

DRILLER: GB/TW

LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	Values	WATER
TOPSOIL comprising organic SILT; trace rootlets; dark blackish brown; moist; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		Groundwater Not Encountered
Clayey SILT; orange brown with dark orange mottles . Hard to very stiff; moist; low plasticity; [Northland Allochthon Residual Soils].		0.2				203 - 174 87	
Clayey SILT, with trace clasts. Hard; moist; low plasticity; fine to medium clasts; [Northland Allochthon Residual Soils].		1.2				UTP - UTP -	
End Of Hole: 1.20m		1.4					
		1.6					
		1.8					
		2.0					
		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					
		4.4					
		4.6					
		4.8					

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.2m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA07

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696377mE, 6082032mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger + DCP
DRILLER: GB/TW
LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	WATER
TOPSOIL comprising organic SILT; with medium to course gravels; dark brown; dry; friable.		0.0	TS		UTP	Groundwater Not Encountered
Clayey SILT; orange brown mottled brown. Hard; moist; low plasticity; [Northland Allochthon Residual Soils].		0.4			UTP	
		0.8			UTP	
		1.2			UTP	
Clayey SILT; orange brown mottled dark blackish brown with minor white clasts. Hard; moist; low plasticity; [Northland Allochthon Residual Soils].		1.6			203+	
SILT, with some clay; orange brown mottled light grey. Hard; moist; low plasticity; [Northland Allochthon Completely Weathered Parent Rock].		2.0		17 / 28 >>	UTP	
End Of Hole: 2.00m		2.2				

PHOTO(S)

REMARKS

1. Hand auger terminated at 2.0m bgl due to dense strata.
2. Continued with DCP from 2.0m bgl until refusal at 2.2m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

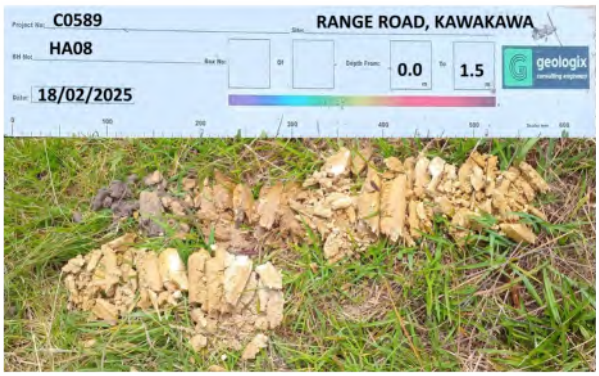
HOLE NO.: HA08

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
START DATE: 18/02/2025
CO-ORDINATES: 1696348mE, 6082026mN
ELEVATION: Ground
END DATE: 18/02/2025
CONTRACTOR: Internal
RIG: 50 mm Auger + DCP
DRILLER: GB/TW
LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	WATER
TOPSOIL comprising of organic silt with trace rootlets; dark brown. Dry; friable.		0.0	TS			
SILT, with some clay, with trace gravel; brownish light orange with light grey mottles. Hard; moist; low plasticity; gravel, fine; [Northland Allochthon Completely Weathered Parent Rock].		0.4		7	202+	Groundwater Not Encountered
1.3m: Trace fine to medium gravels.		1.2		17	UTP	
End Of Hole: 1.50m		1.5		24 >>	UTP / 202+ / UTP	

PHOTO(S)



REMARKS

1. Hand auger terminated at 1.5m bgl due to dense strata.
2. Continued with DCP from 1.5m bgl until refusal at 1.8m bgl.
3. Groundwater not encountered at the time of drilling.

WATER

- ▼ Standing Water Level
- ▷ Out flow
- ◁ In flow

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

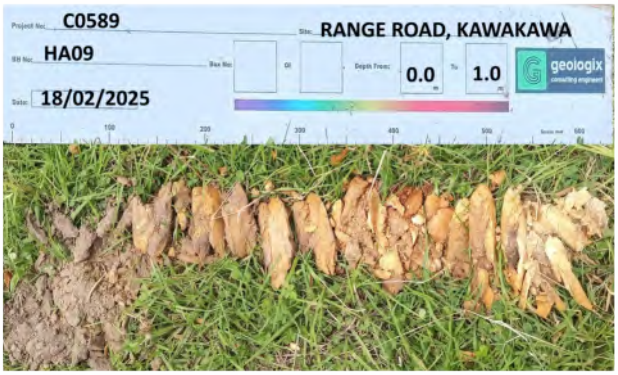
HOLE NO.: HA09

CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
CO-ORDINATES: 1696380mE, 6082005mN
ELEVATION: Ground
CONTRACTOR: Internal
RIG: 50 mm Auger
DRILLER: GB/TW
START DATE: 18/02/2025
END DATE: 18/02/2025
LOGGED BY: TW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3282	WATER
TOPSOIL comprising organic SILT; brown; dry; friable.		0.0 – 0.2	TS	2 4 6 8 10 12 14 16 18	50 100 150 200 Values: UTP -	Groundwater Not Encountered
Clayey SILT; orange brown. Hard; moist; low plasticity; [Northland Allochthon Residual Soils].		0.2 – 0.4				
SILT, with some clay; orange brown mottle dark brown. Hard; moist; low plasticity; [Northland Allochthon Completely Weathered Parent Rock] .		0.4 – 1.0			UTP - UTP UTP -	
End Of Hole: 1.00m		1.0 – 4.8				

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.0m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

INVESTIGATION LOG

HOLE NO.: HA10

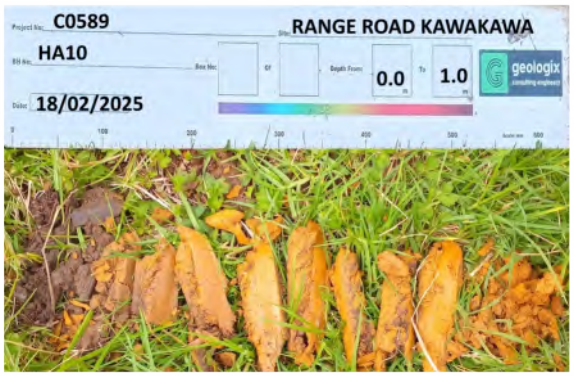
CLIENT: K&M Trust
PROJECT: Range Road, Kawakawa
JOB NO.: C0589

SITE LOCATION: Range Road, Kawakawa
CO-ORDINATES: 1696381mE, 6082062mN
CONTRACTOR: Internal
RIG: 50 mm Auger
ELEVATION: Ground
DRILLER: GB/TW
START DATE: 18/02/2025
END DATE: 18/02/2025
LOGGED BY: GB

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	WATER
TOPSOIL comprising organic SILT; trace rootlets dark brown; dry to moist; friable.		0.0	TS			Groundwater Not Encountered
Clayey SILT; orange. Hard; moist; low plasticity; [Northland Allochthon Residual Soils] .		0.2			202+ -	
		0.4				
		0.6			202+ -	
		0.8				
SILT, with some clay, with trace gravel; orange with dark orange mottled. Hard; moist; low plasticity; gravel, fine; [Northland Allochthon Completely Weathered Parent Rock].		1.0			202+ -	
End Of Hole: 1.00m		1.2				
		1.4				
		1.6				
		1.8				
		2.0				
		2.2				
		2.4				
		2.6				
		2.8				
		3.0				
		3.2				
		3.4				
		3.6				
		3.8				
		4.0				
		4.2				
		4.4				
		4.6				
		4.8				

Scala penetrometer: 2 4 6 8 10 12 14 16 18
Vane shear strength (kPa): 50 100 150 200
Values

PHOTO(S)



REMARKS

1. Hand auger completed at target depth 1.0m bgl.
2. Groundwater not encountered at the time of drilling.

WATER

- Standing Water Level
- Out flow
- In flow

INVESTIGATION TYPE

- [x] Hand Auger
- [ ] Test Pit

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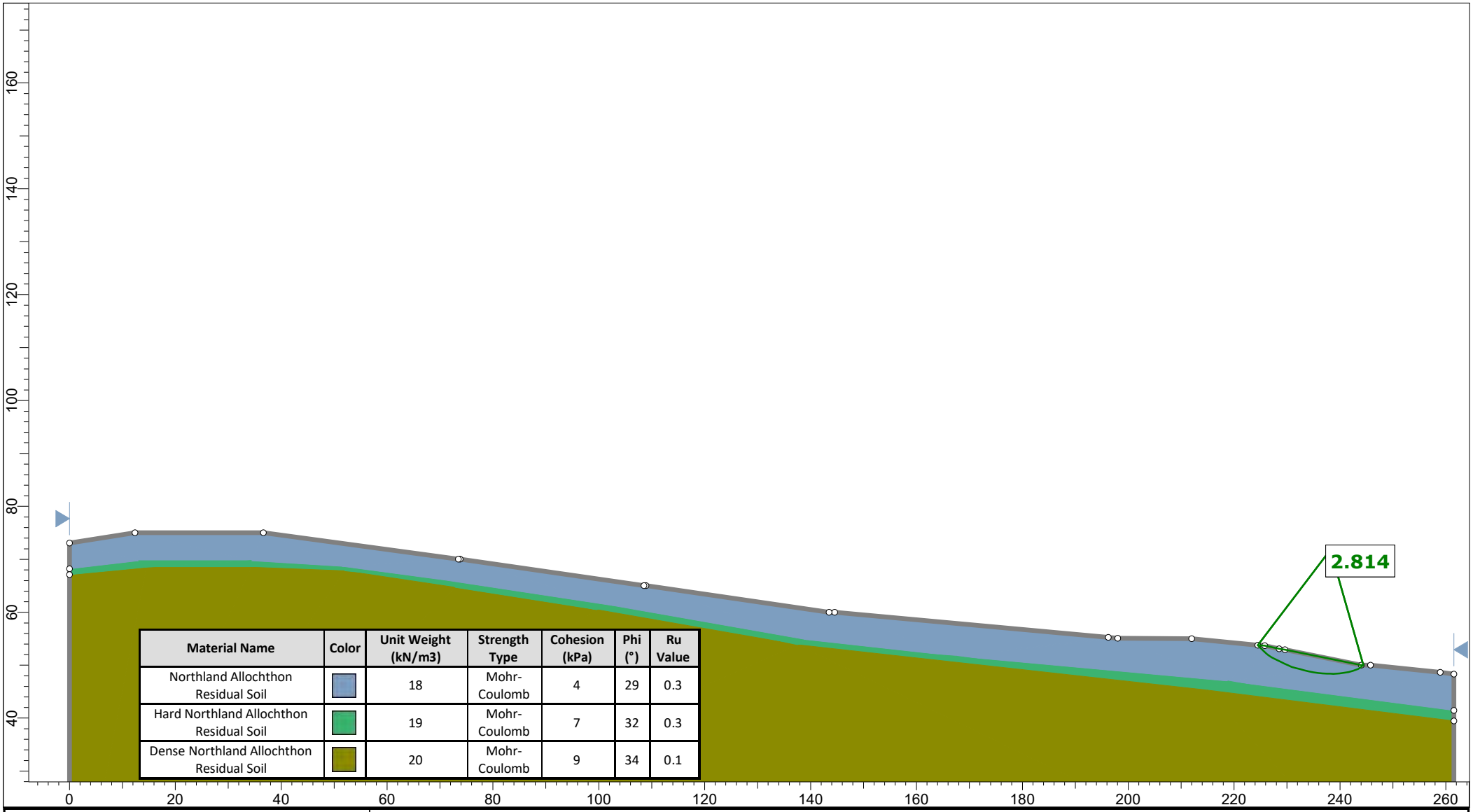
APPENDIX C

Slope Stability Assessment



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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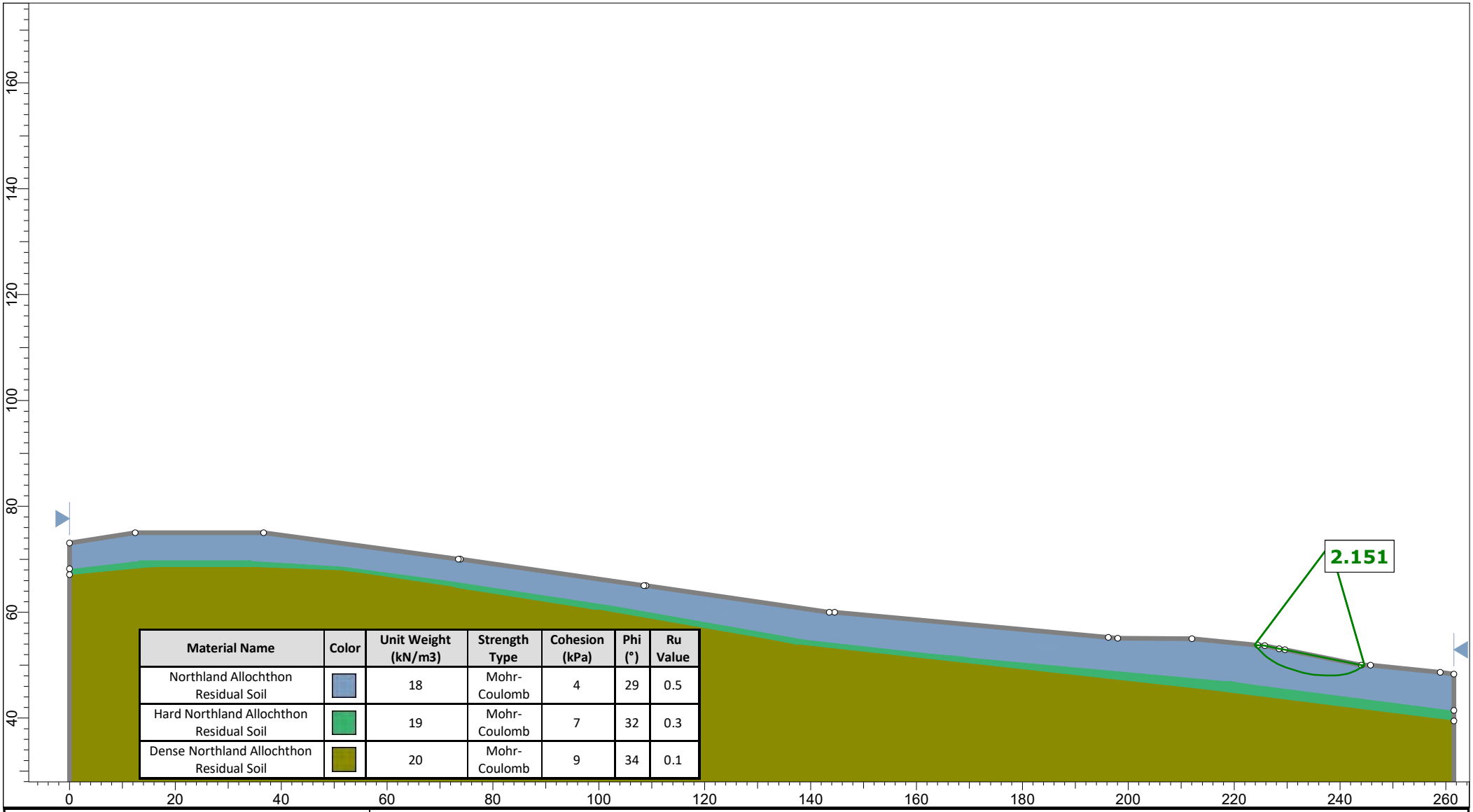
SLIDEINTERPRET 9.034

Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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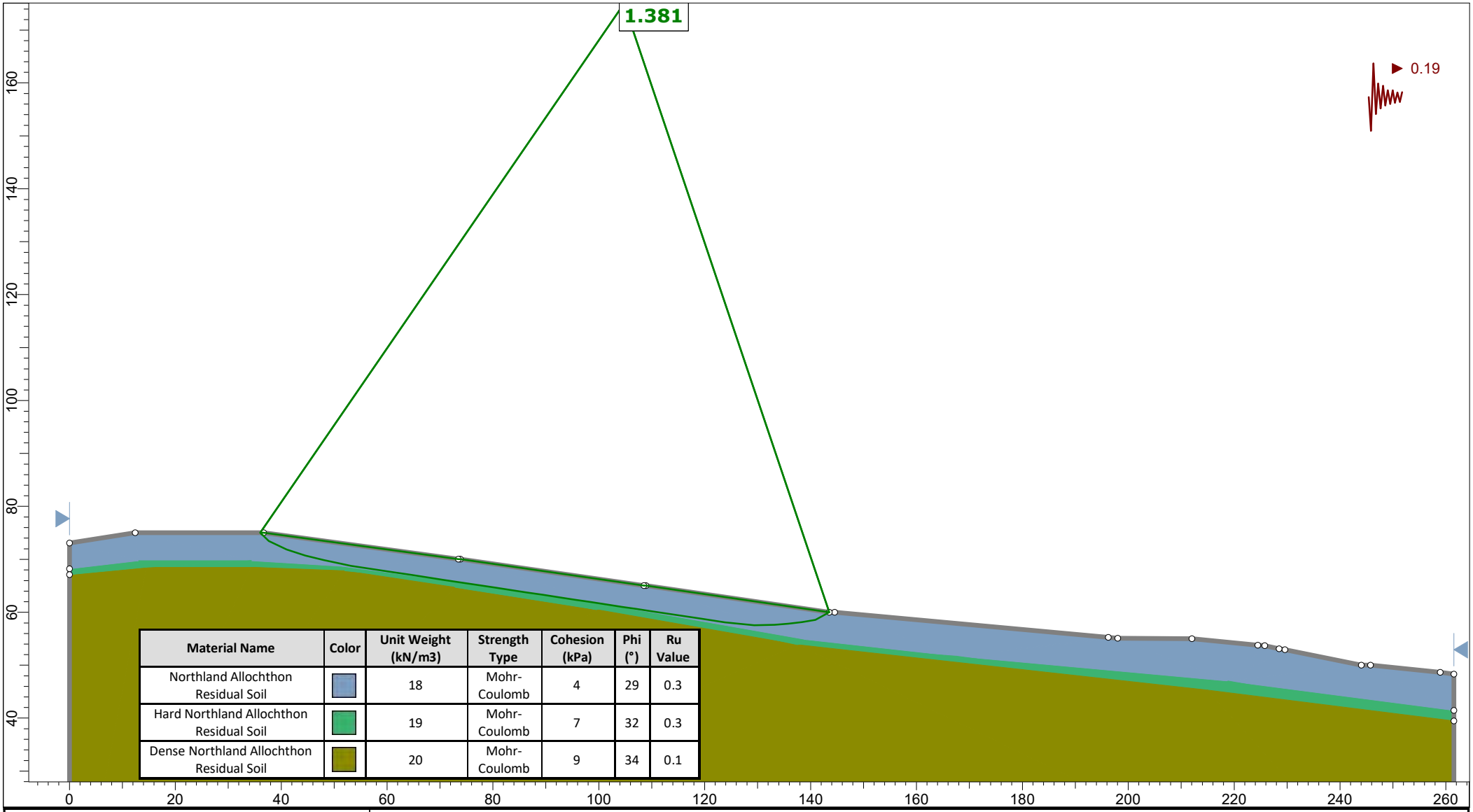
SLIDEINTERPRET 9.034

Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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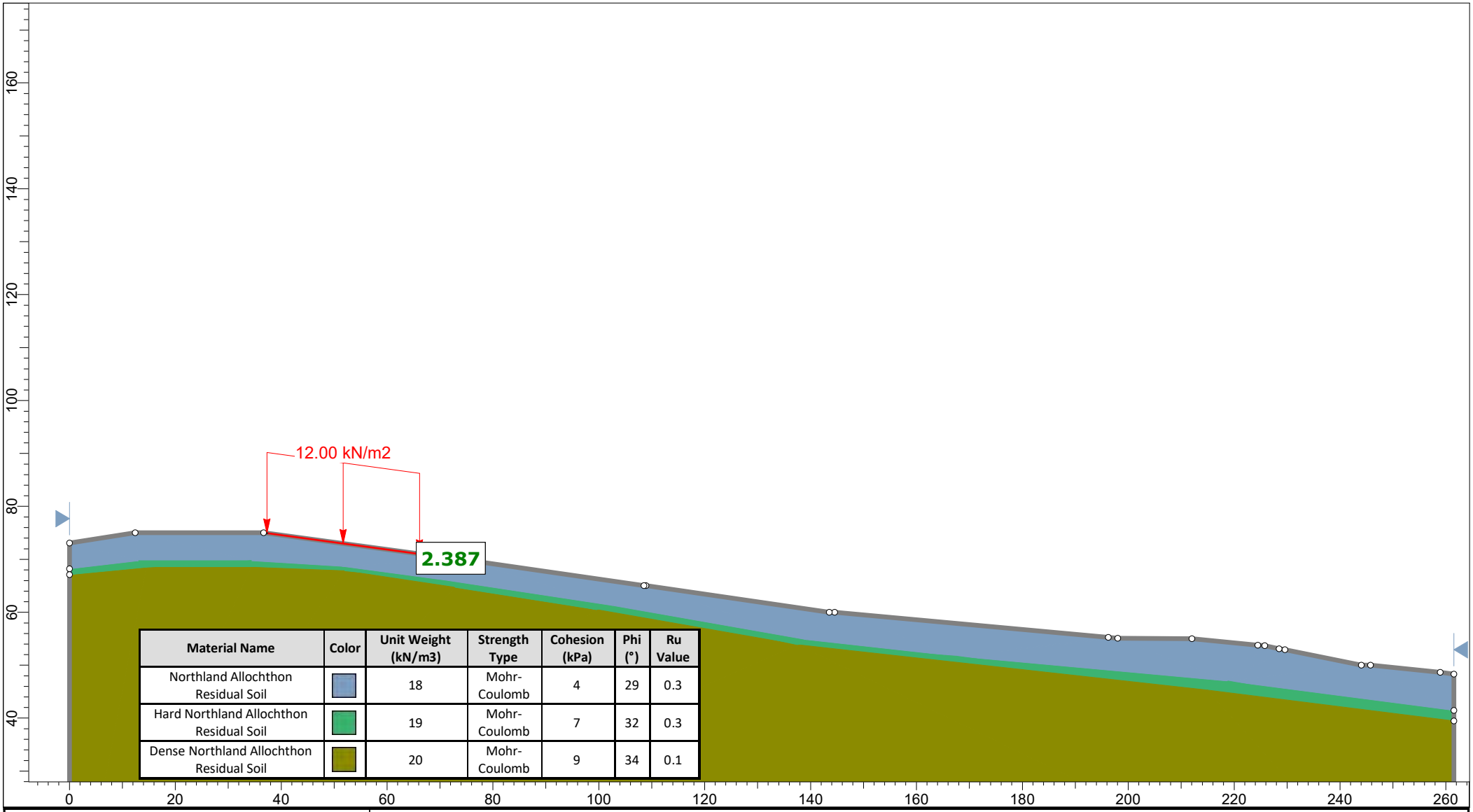
SLIDEINTERPRET 9.034

Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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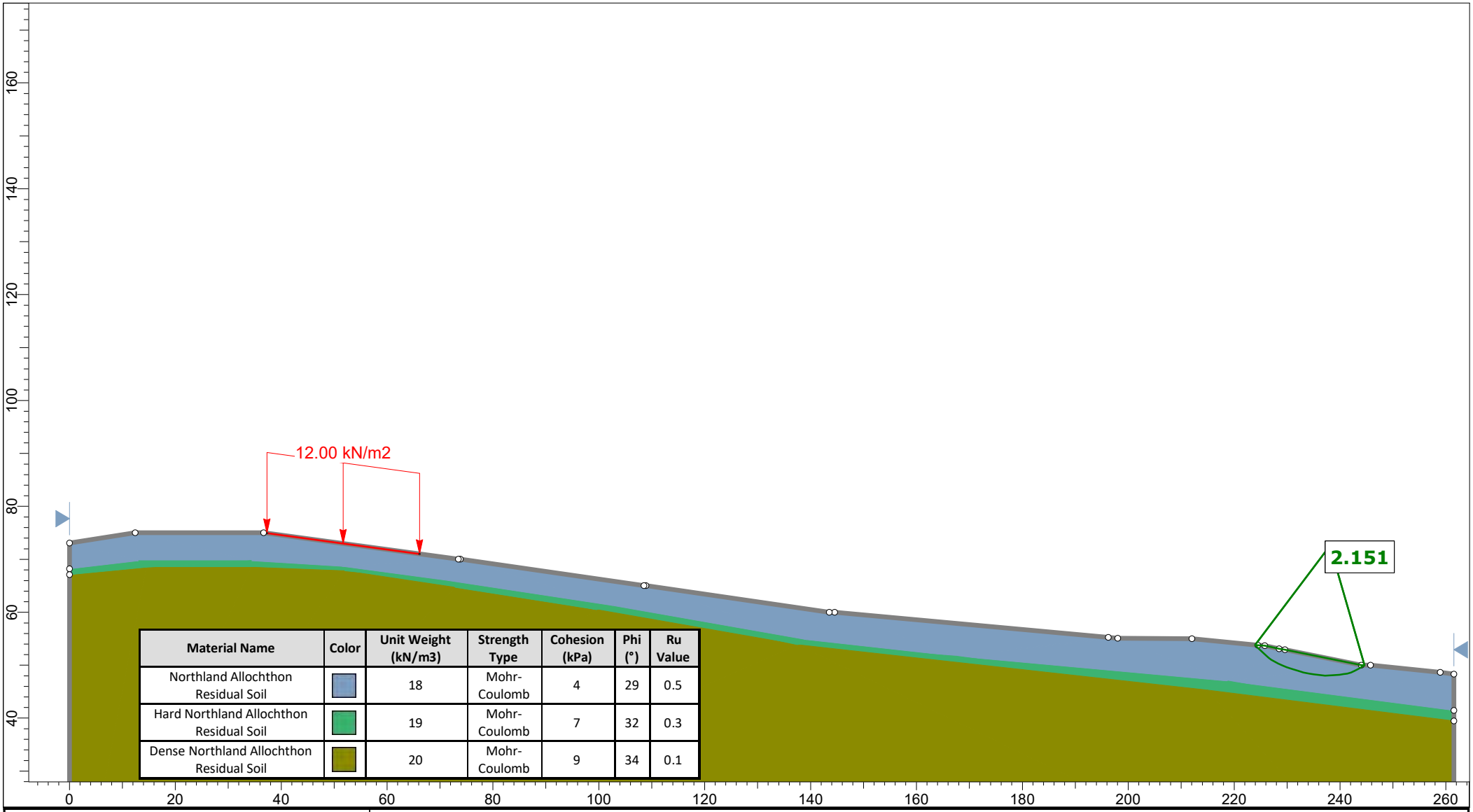
SLIDEINTERPRET 9.034

Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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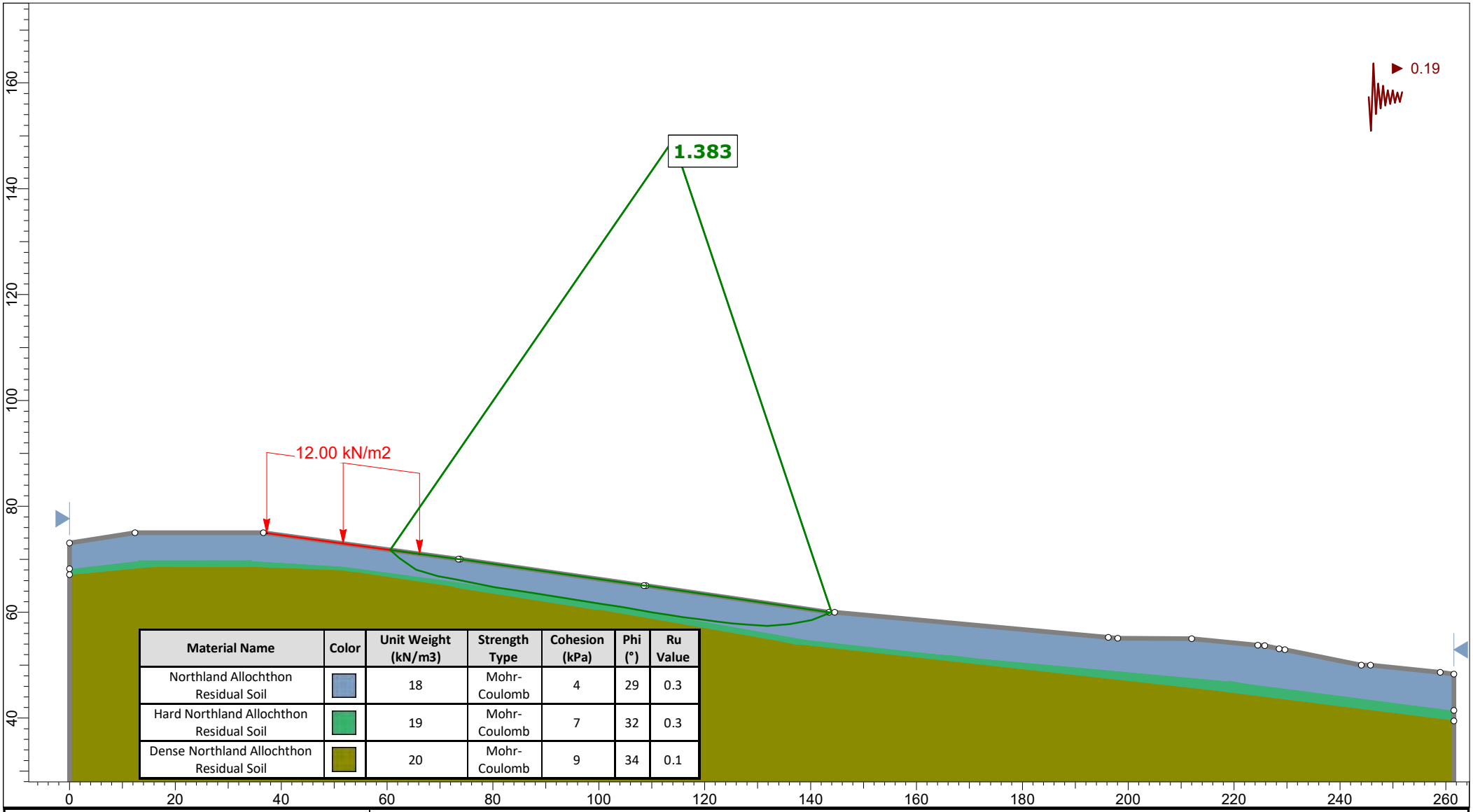
SLIDEINTERPRET 9.034

Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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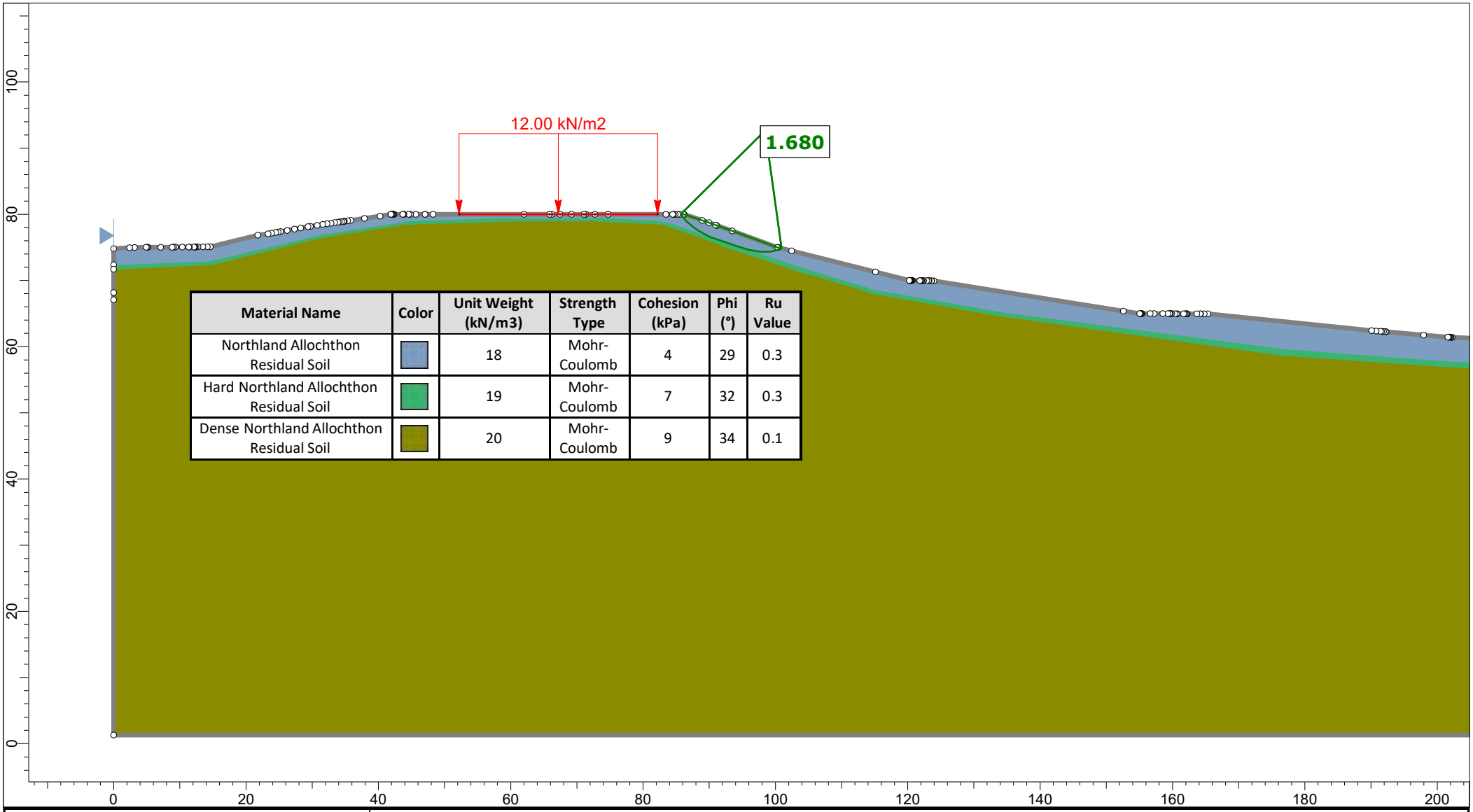
SLIDEINTERPRET 9.034

Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section A.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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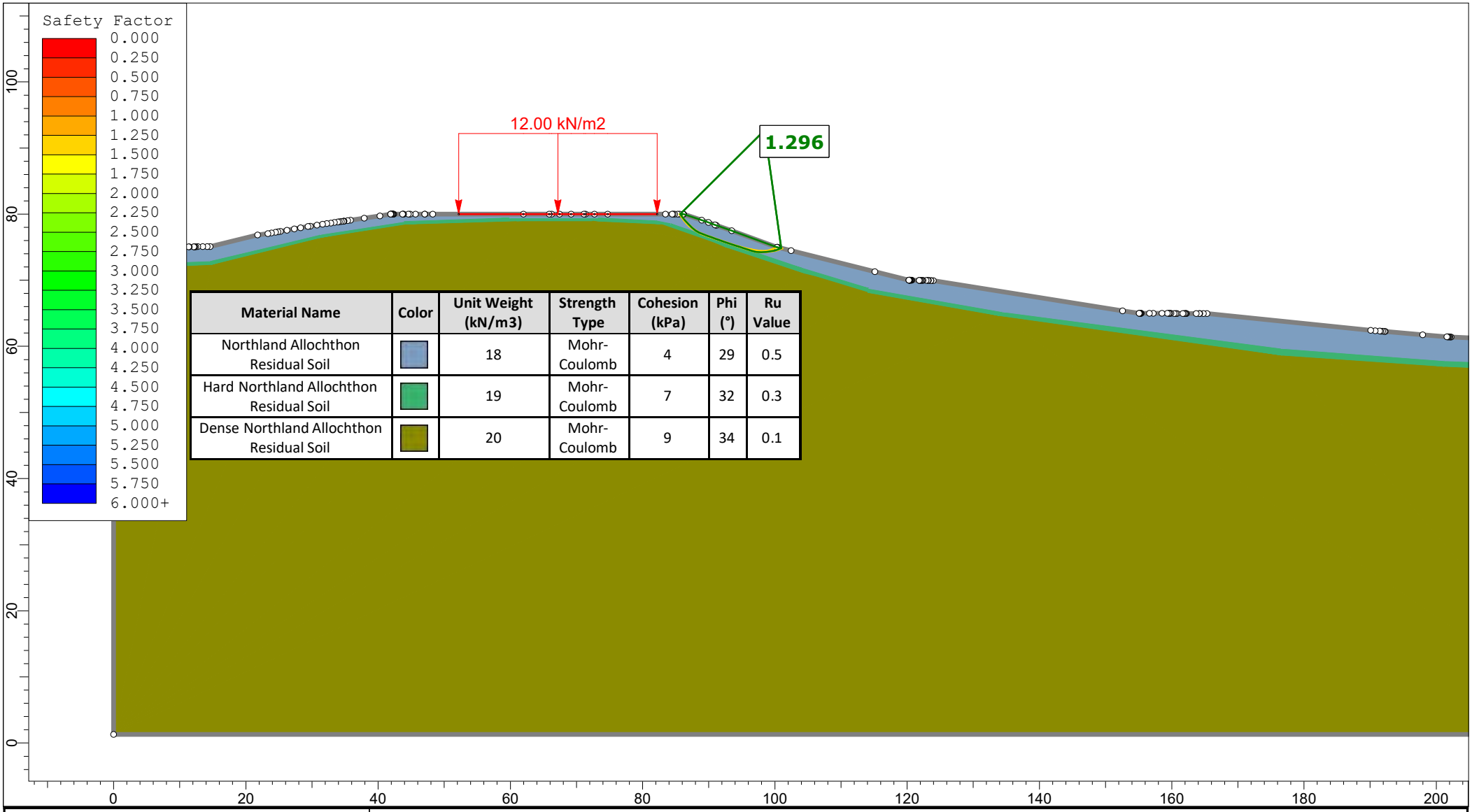
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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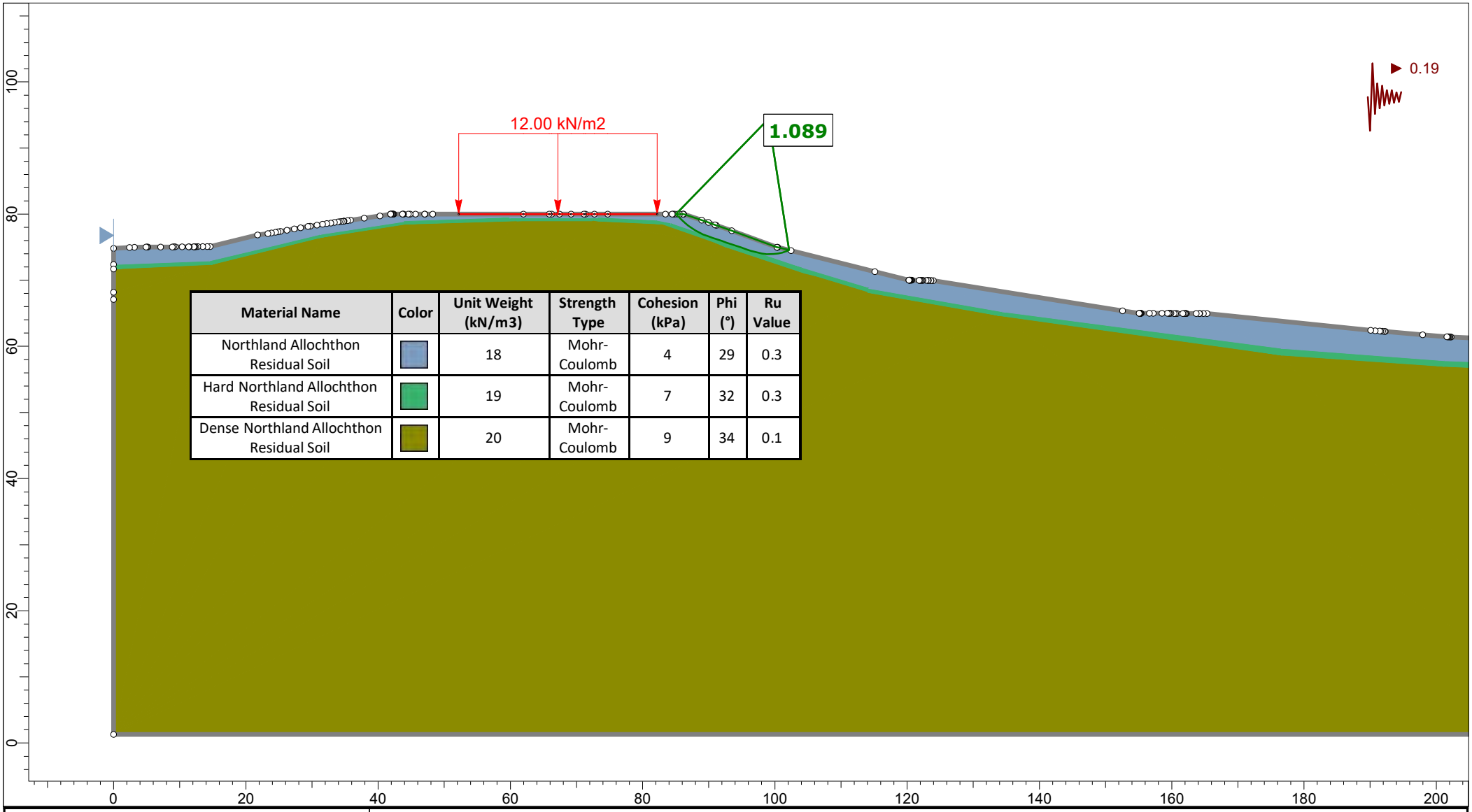
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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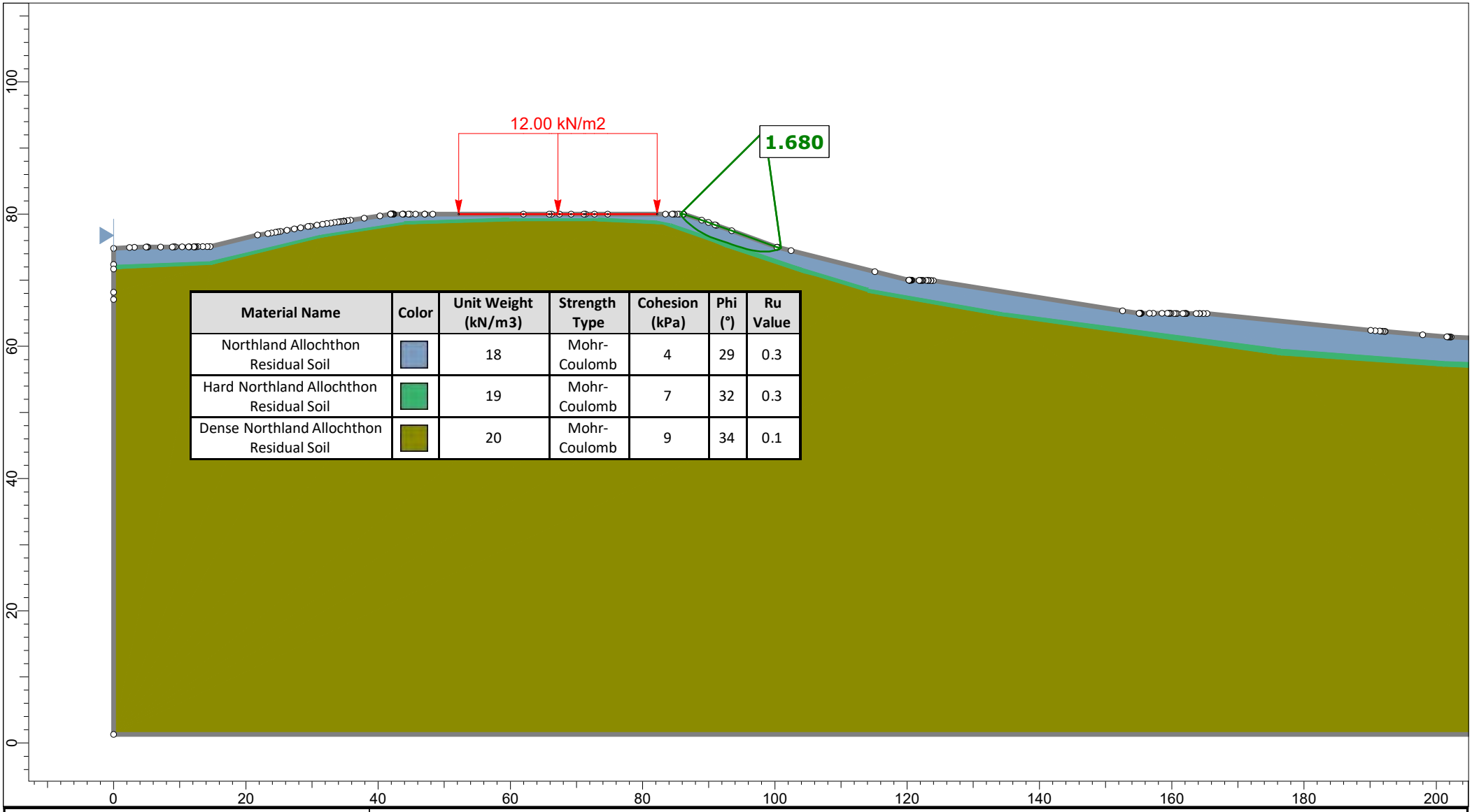
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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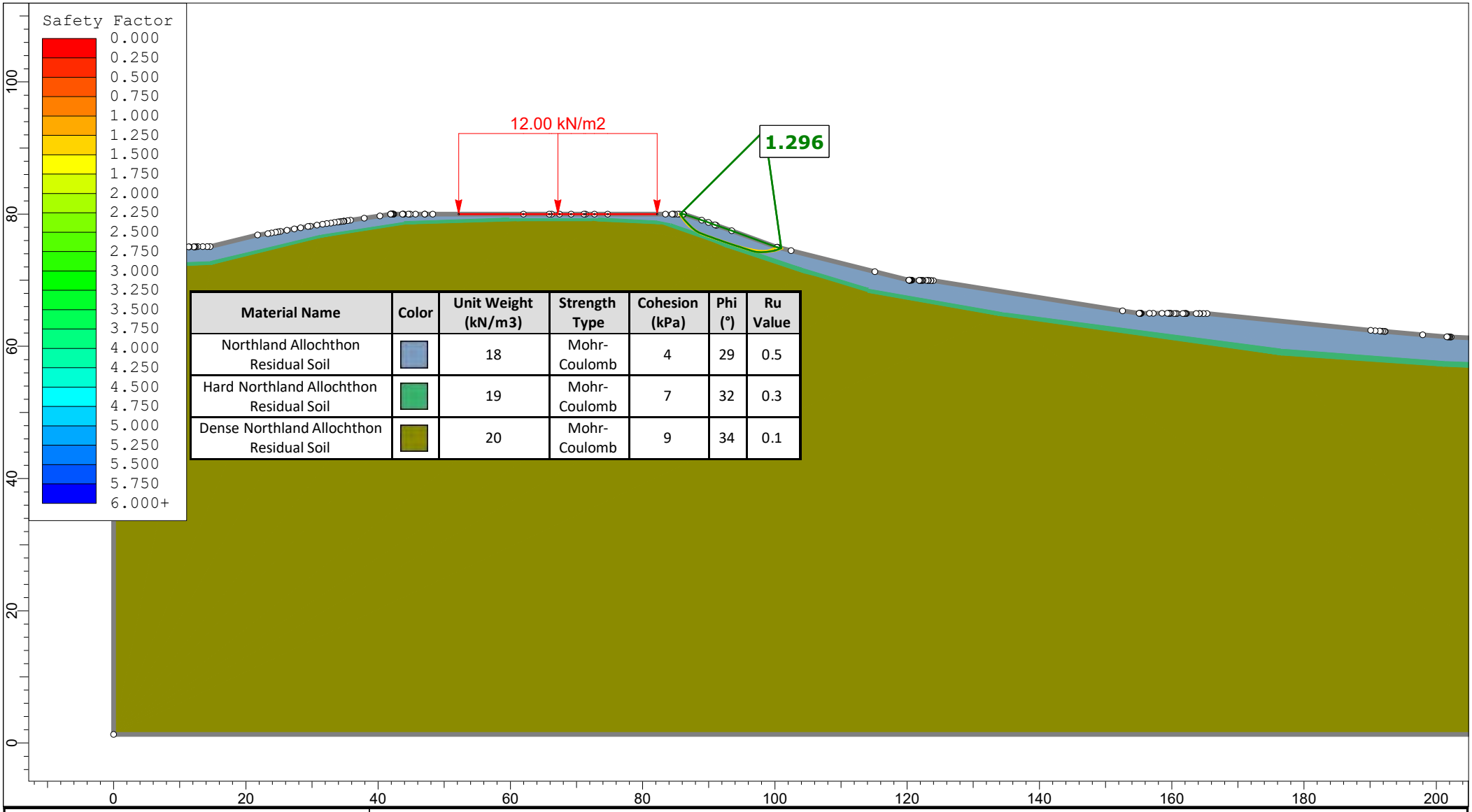
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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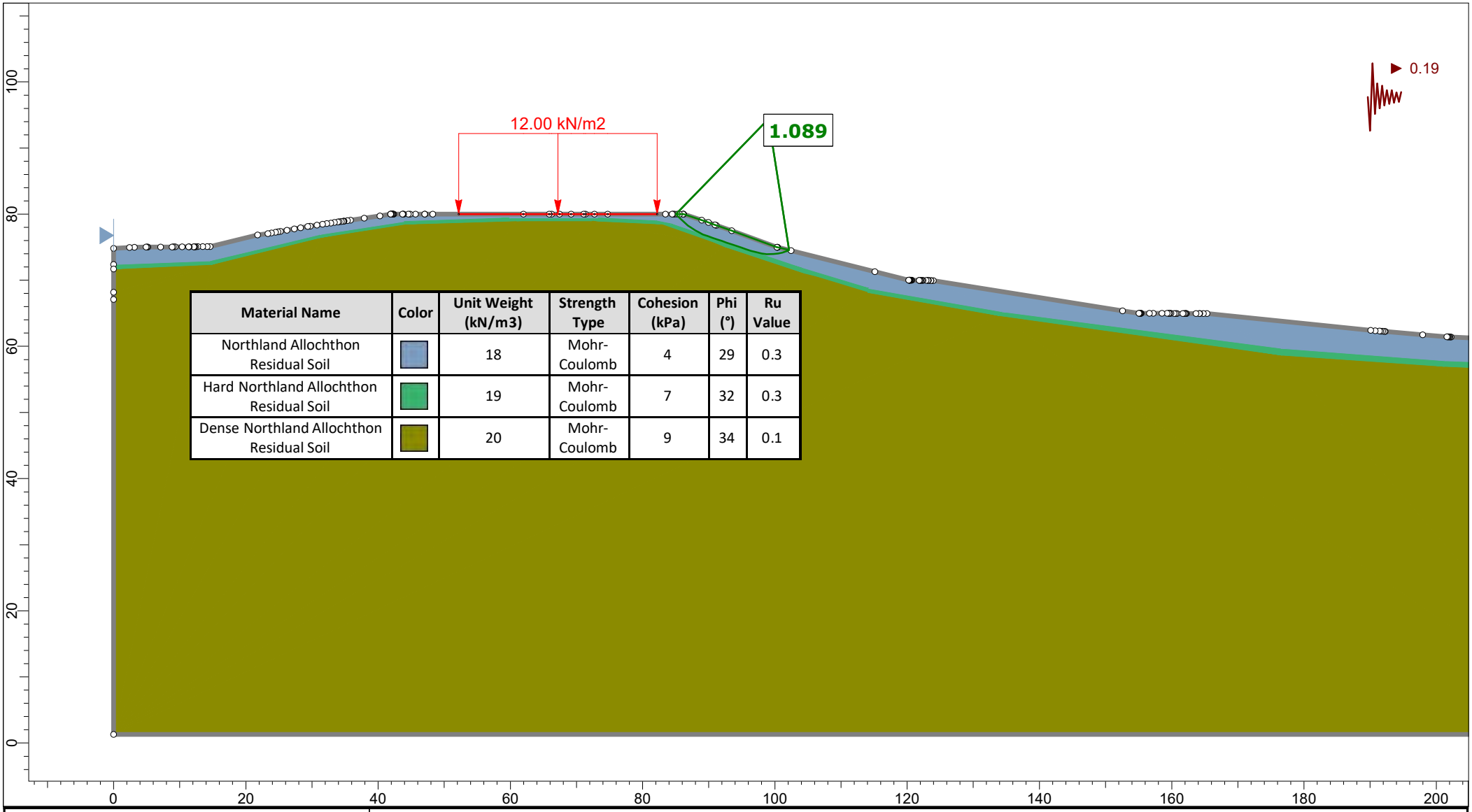
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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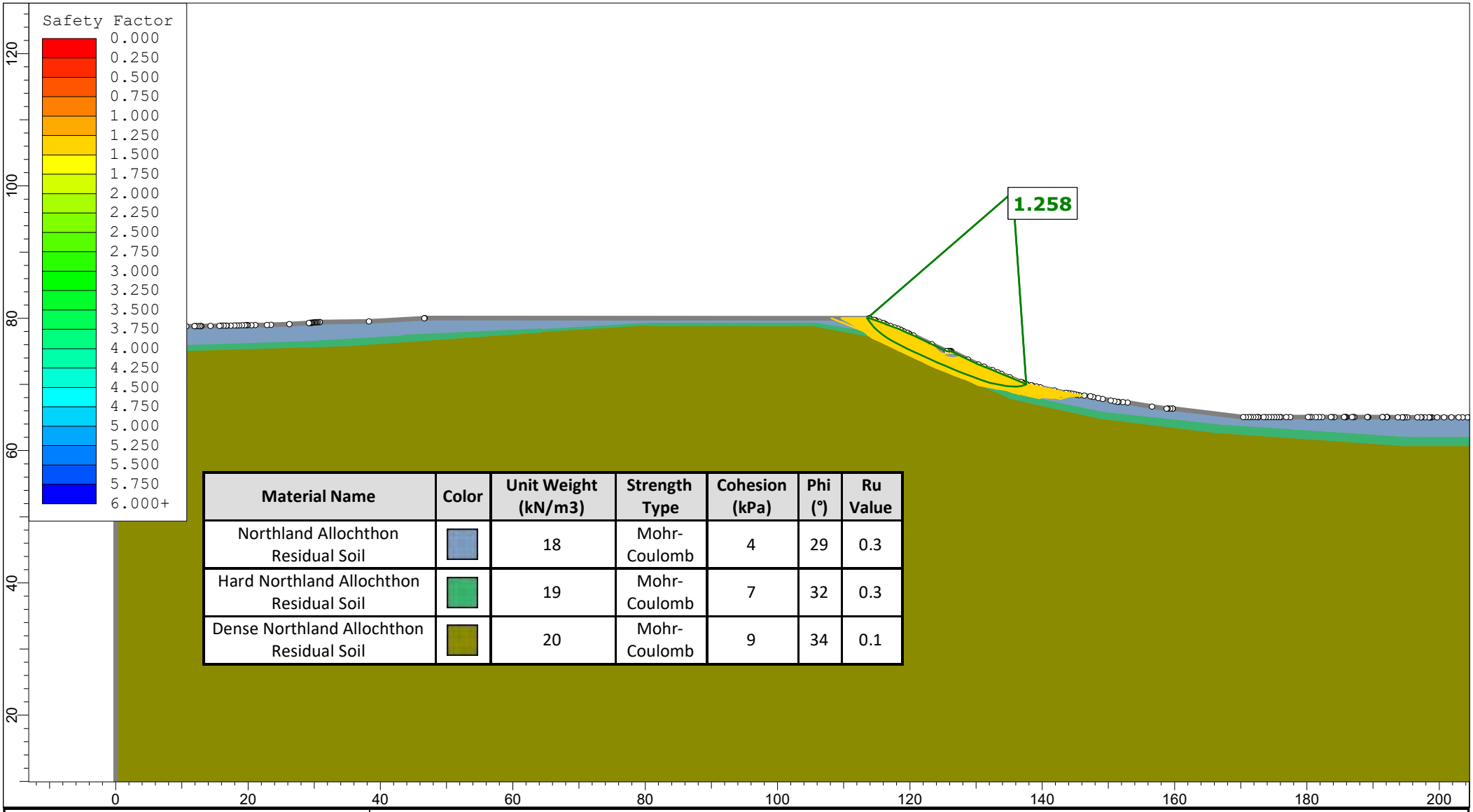
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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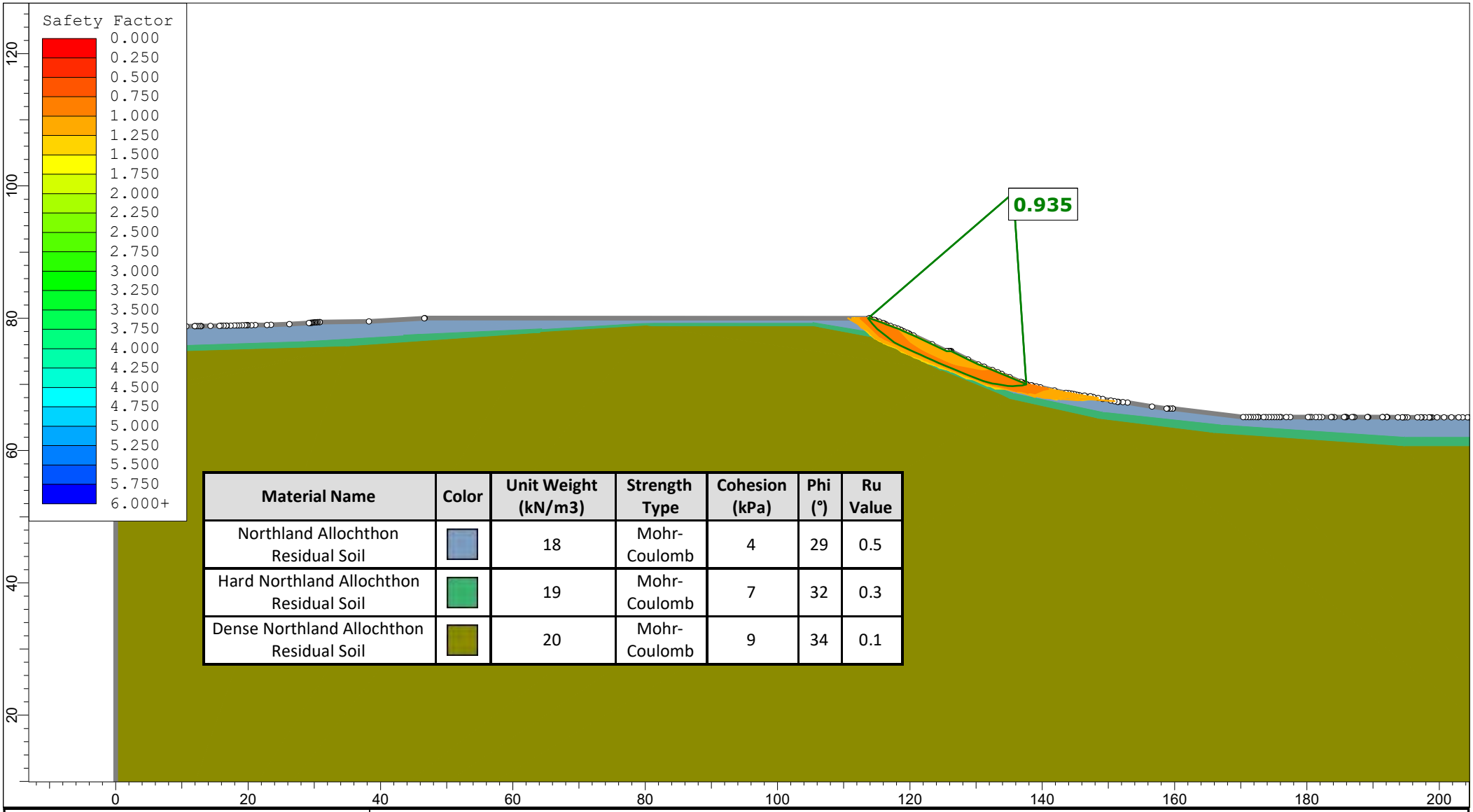
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section C.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
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Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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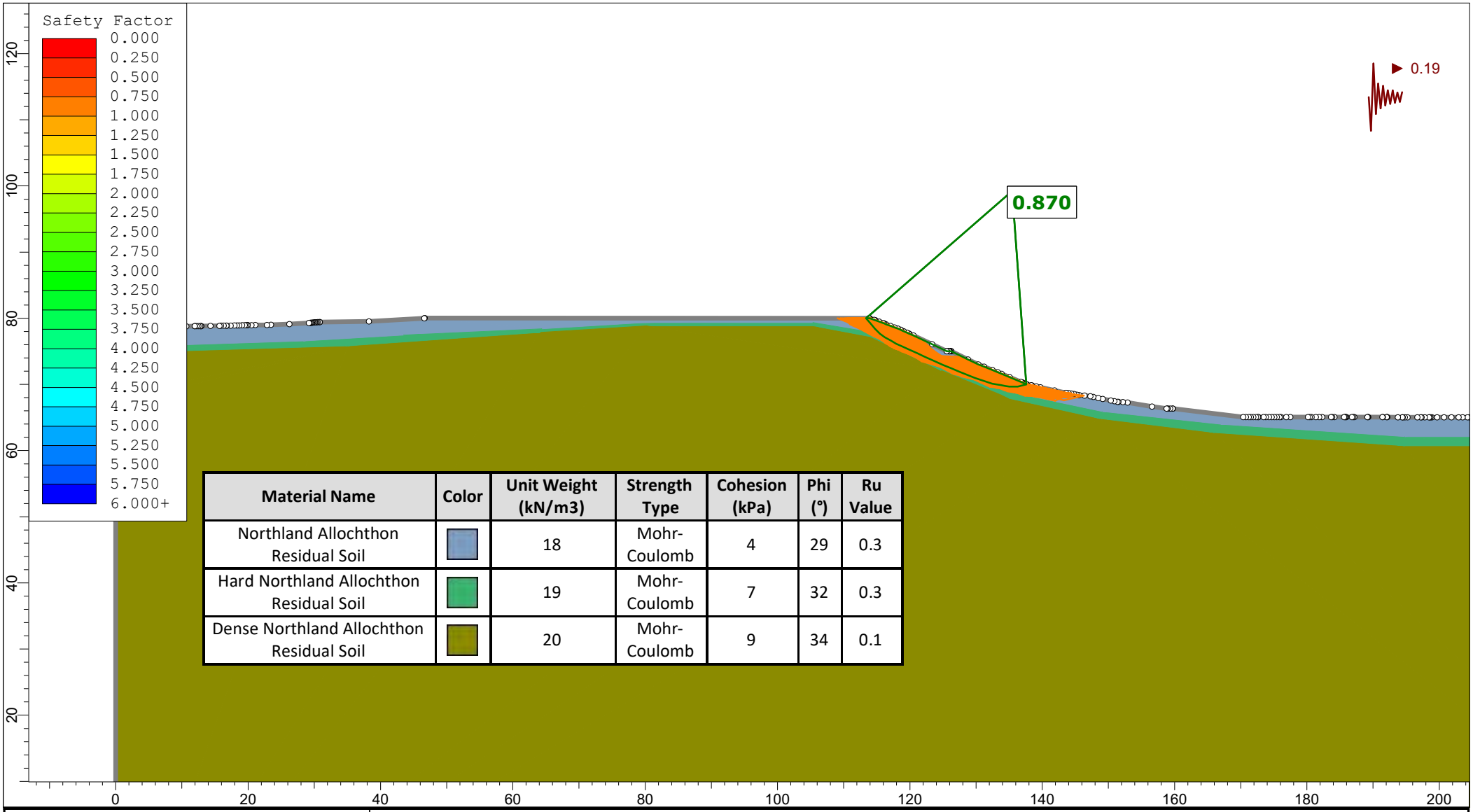
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section C.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
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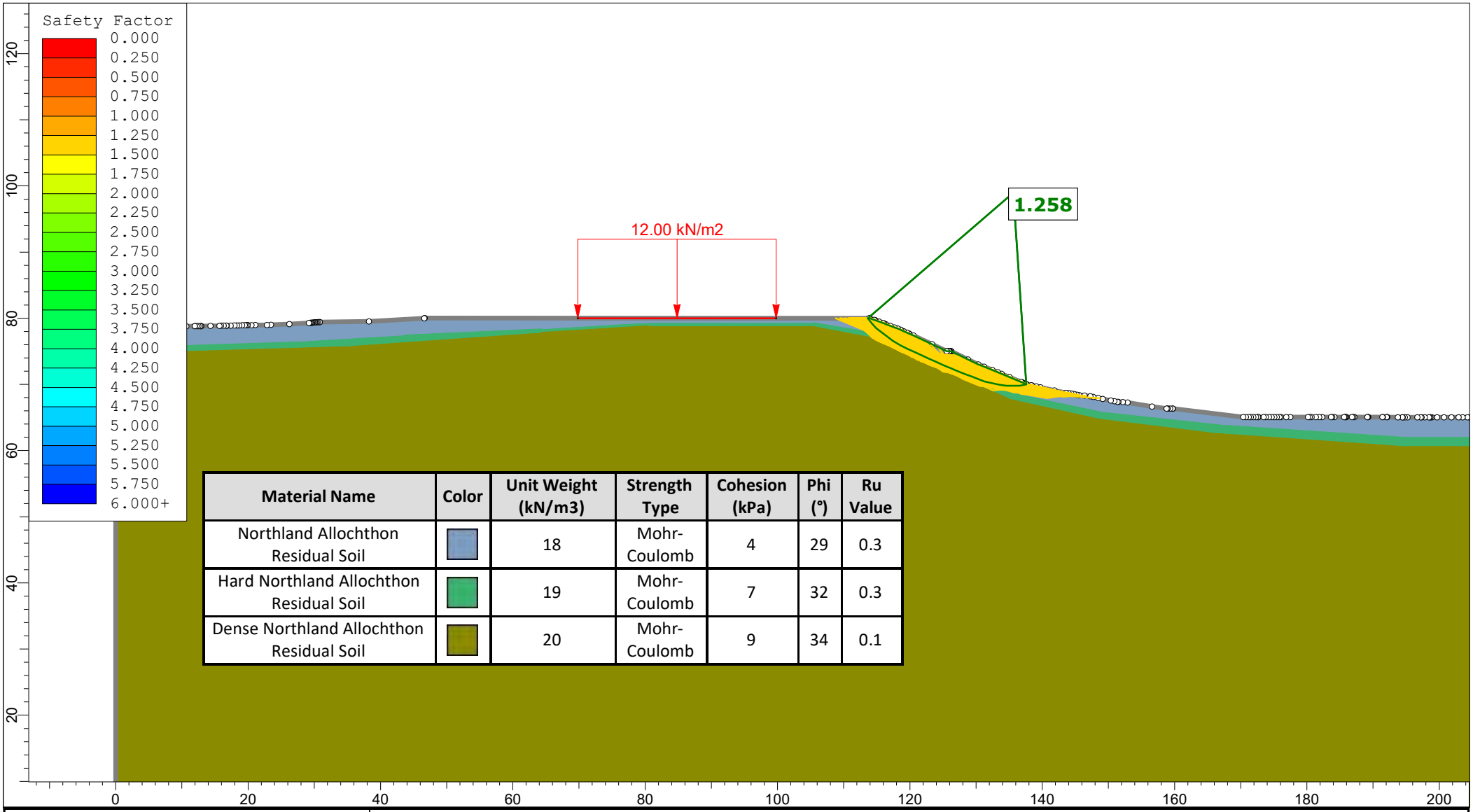
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section C.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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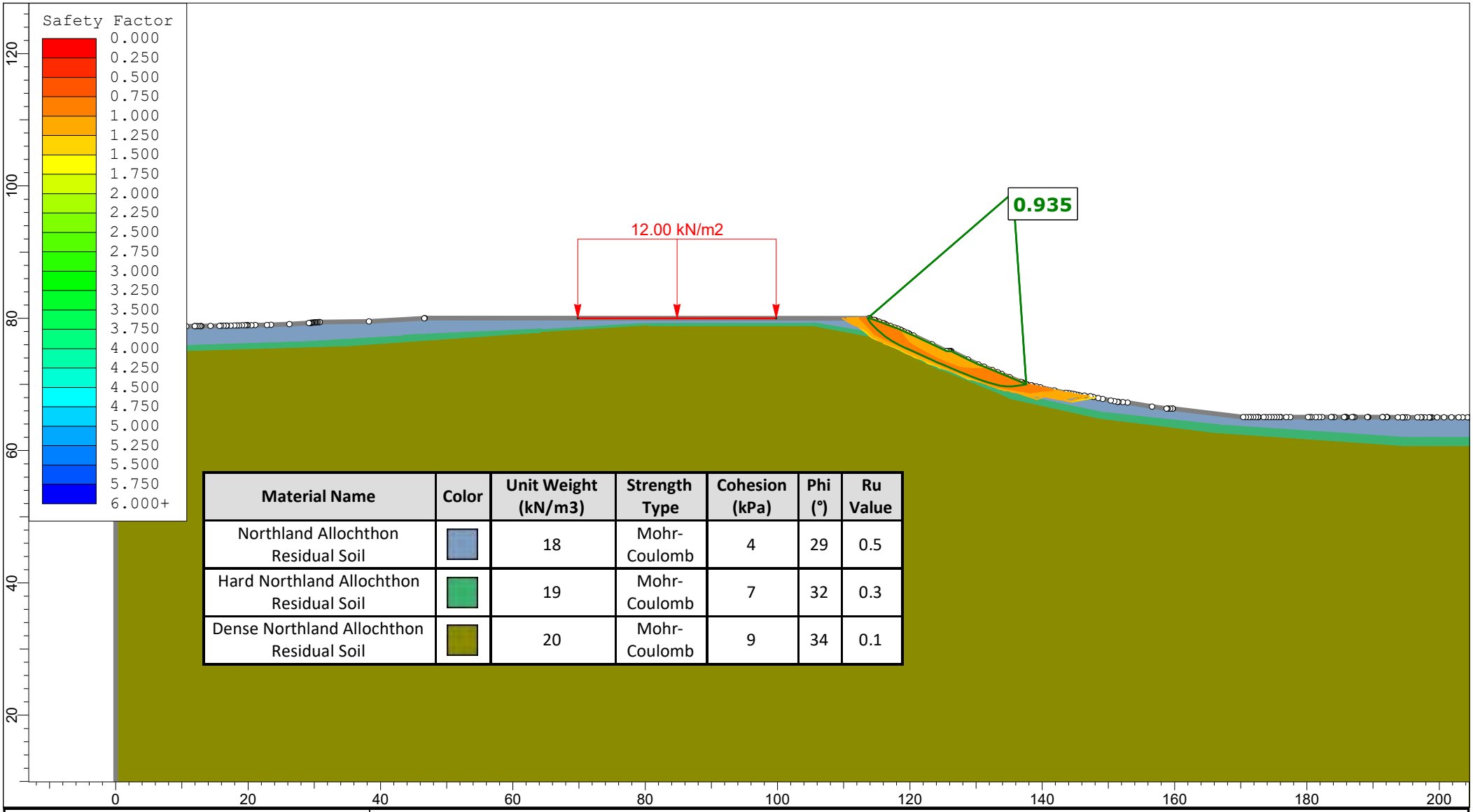
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section C.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
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Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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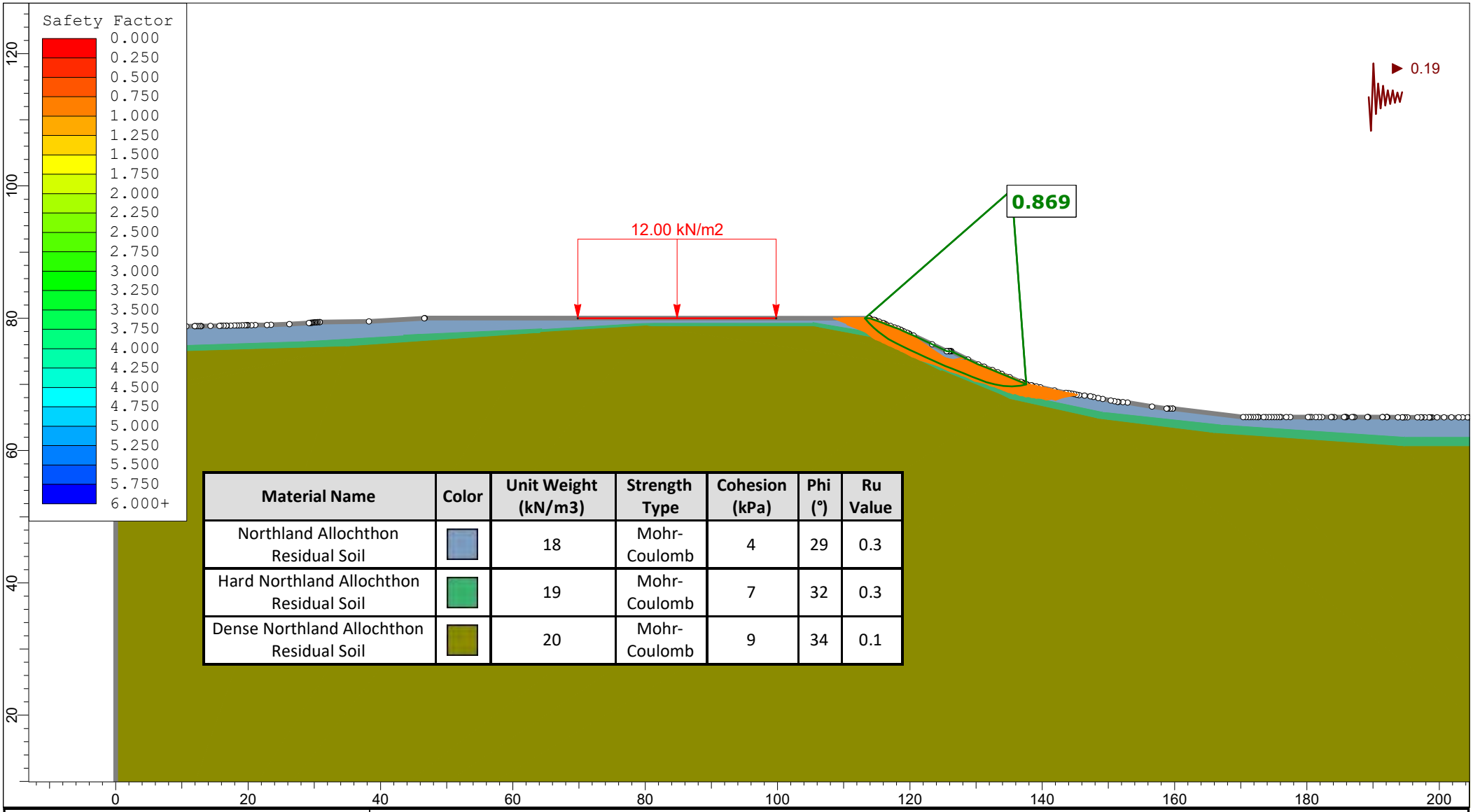
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section C.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
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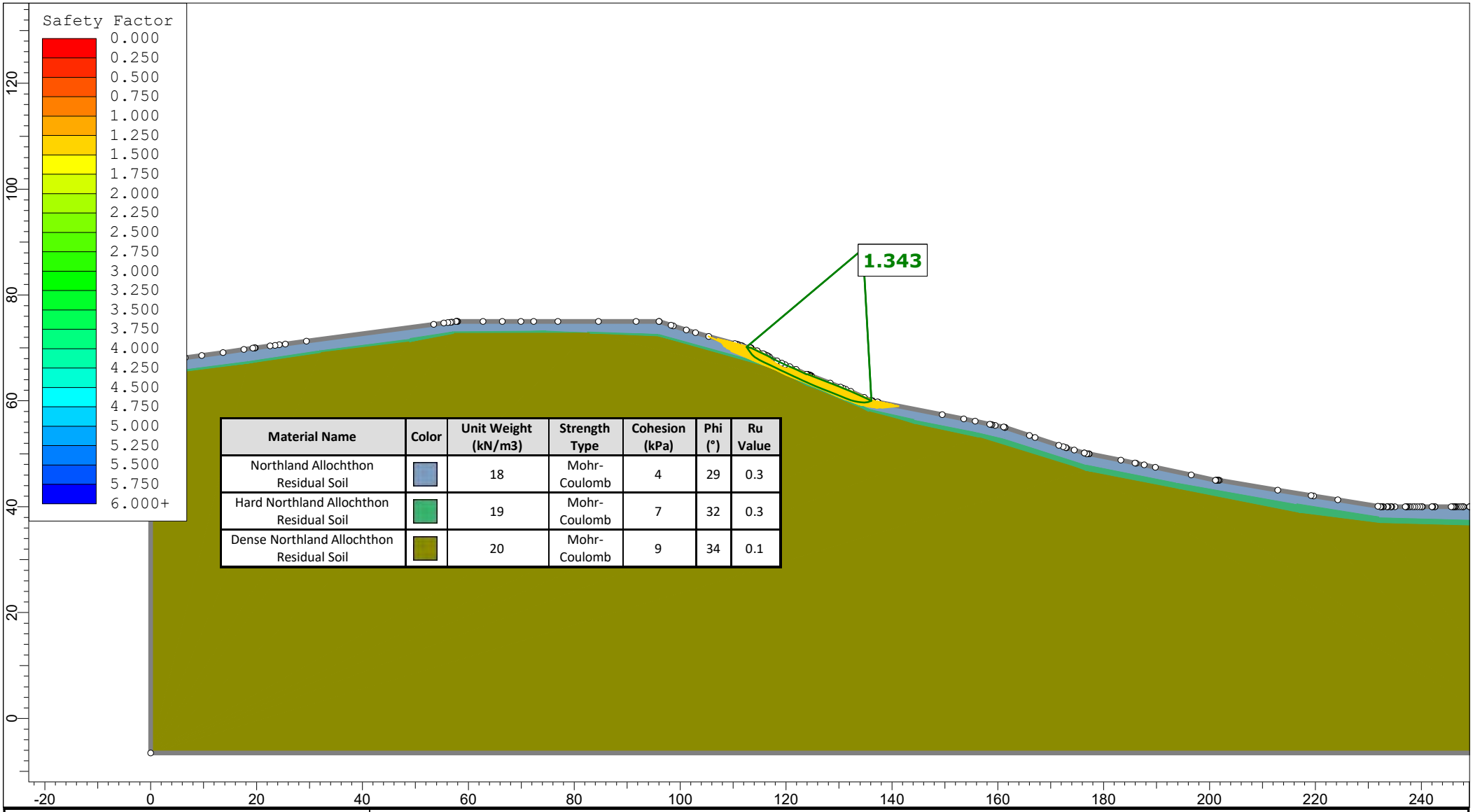
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section C.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
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Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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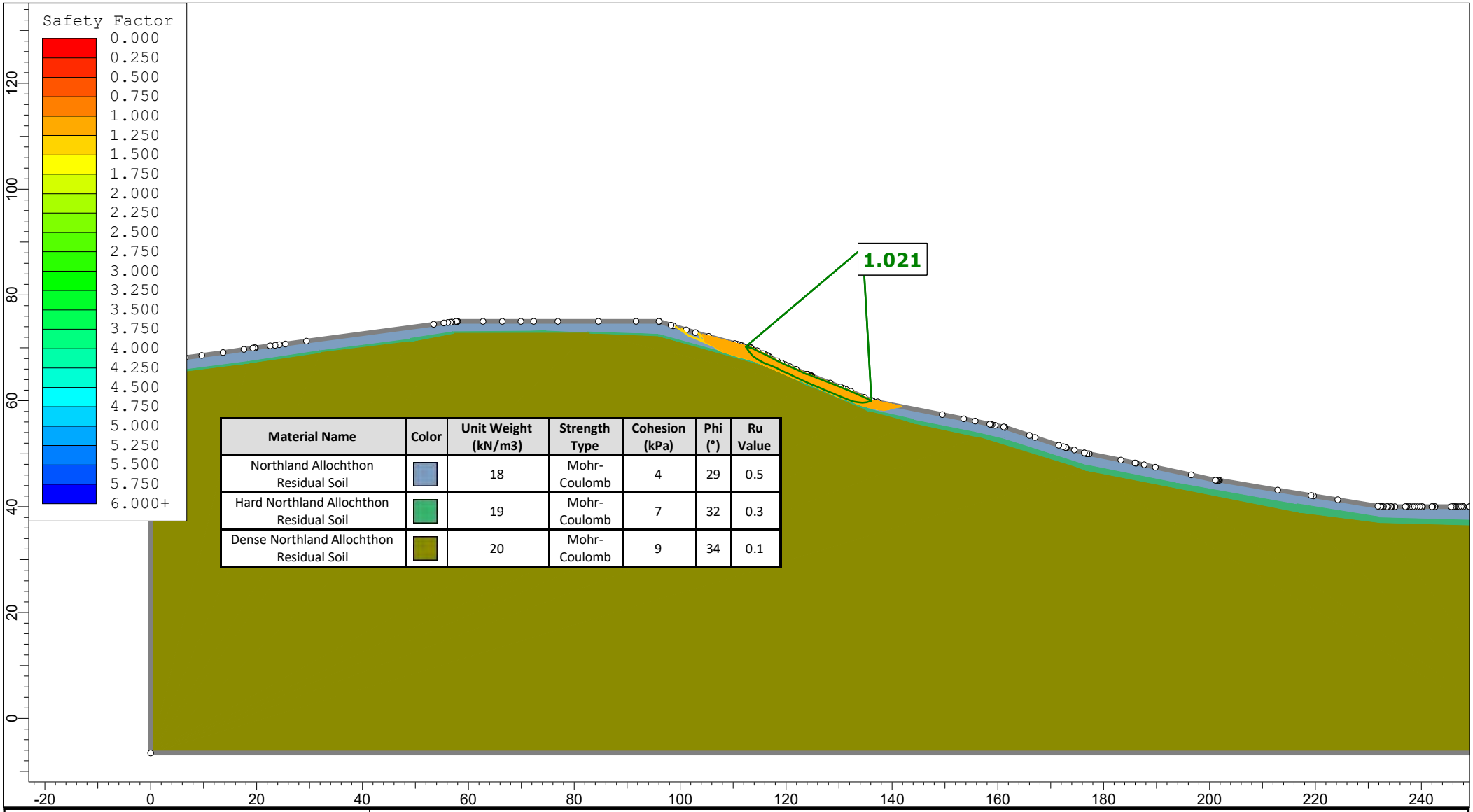
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
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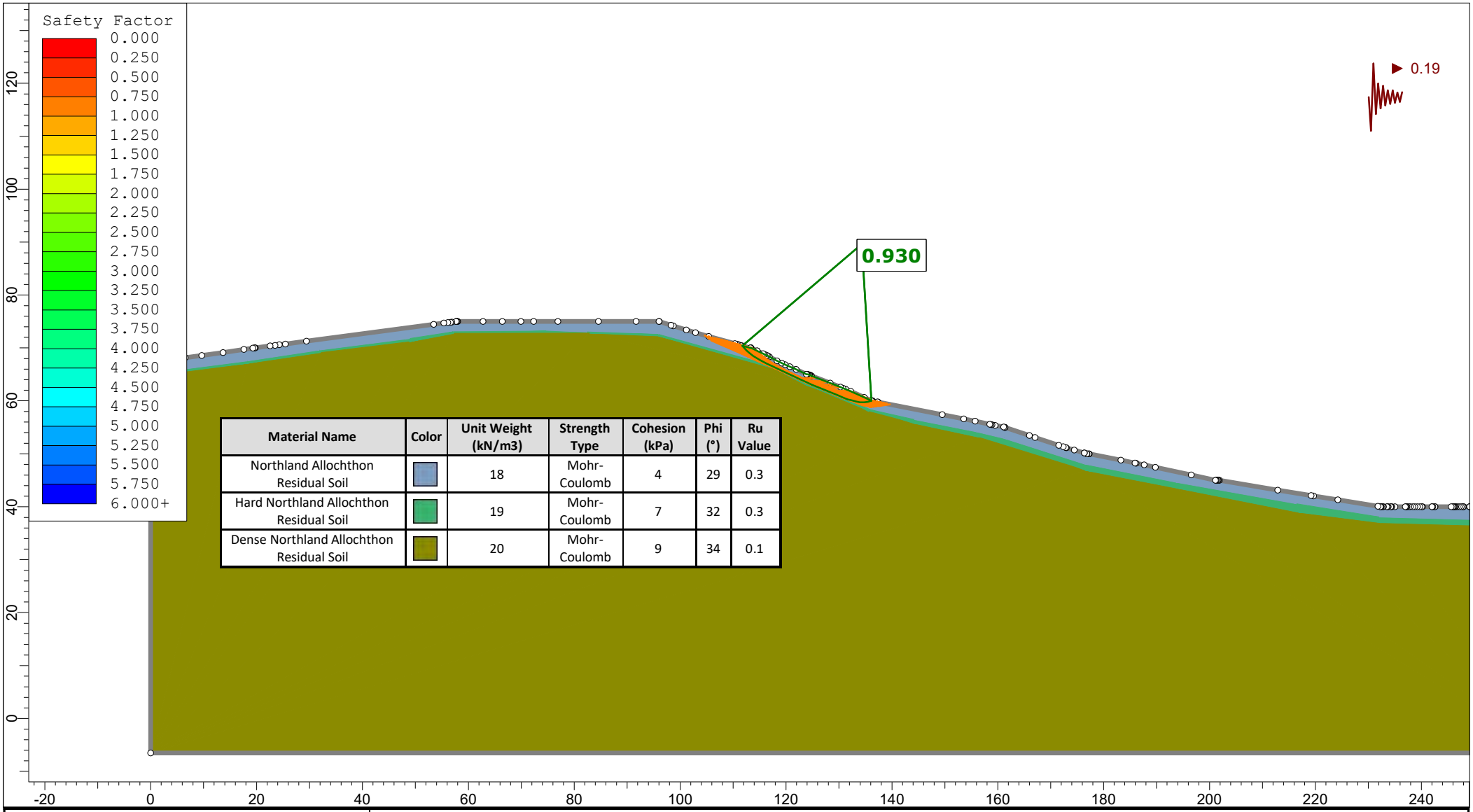
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



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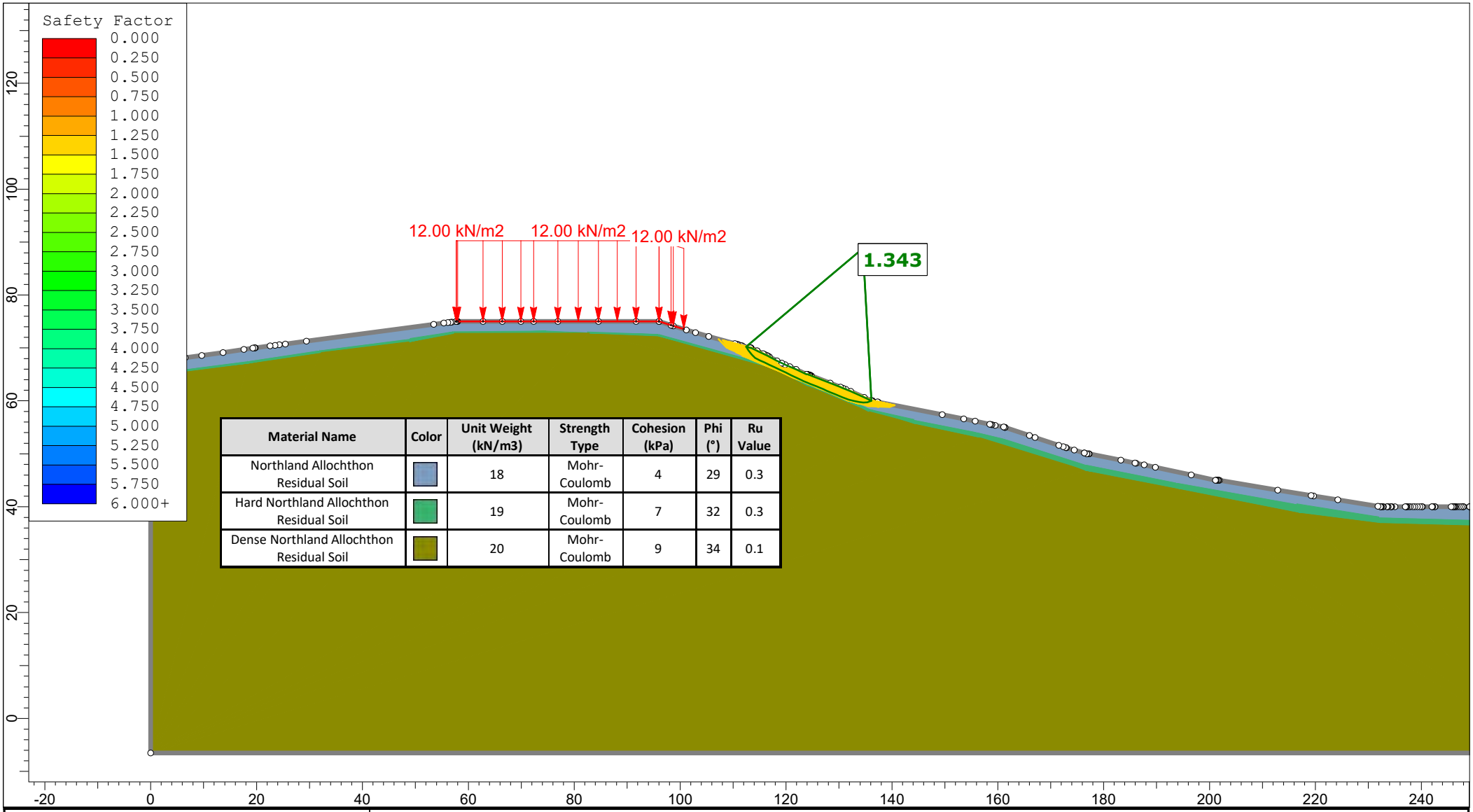
Project	Range Road Kawakawa		
Group	Existing Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
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Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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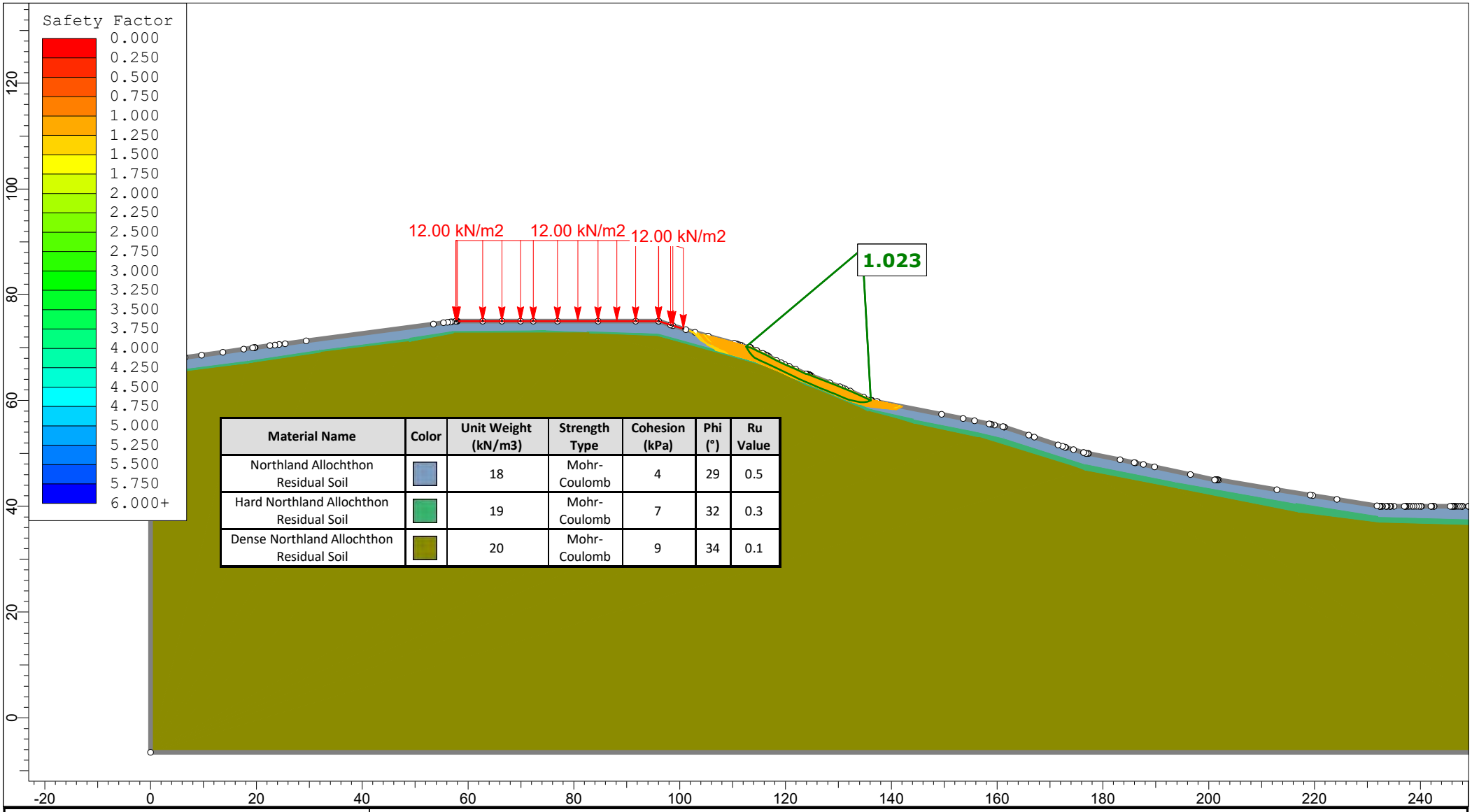
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
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Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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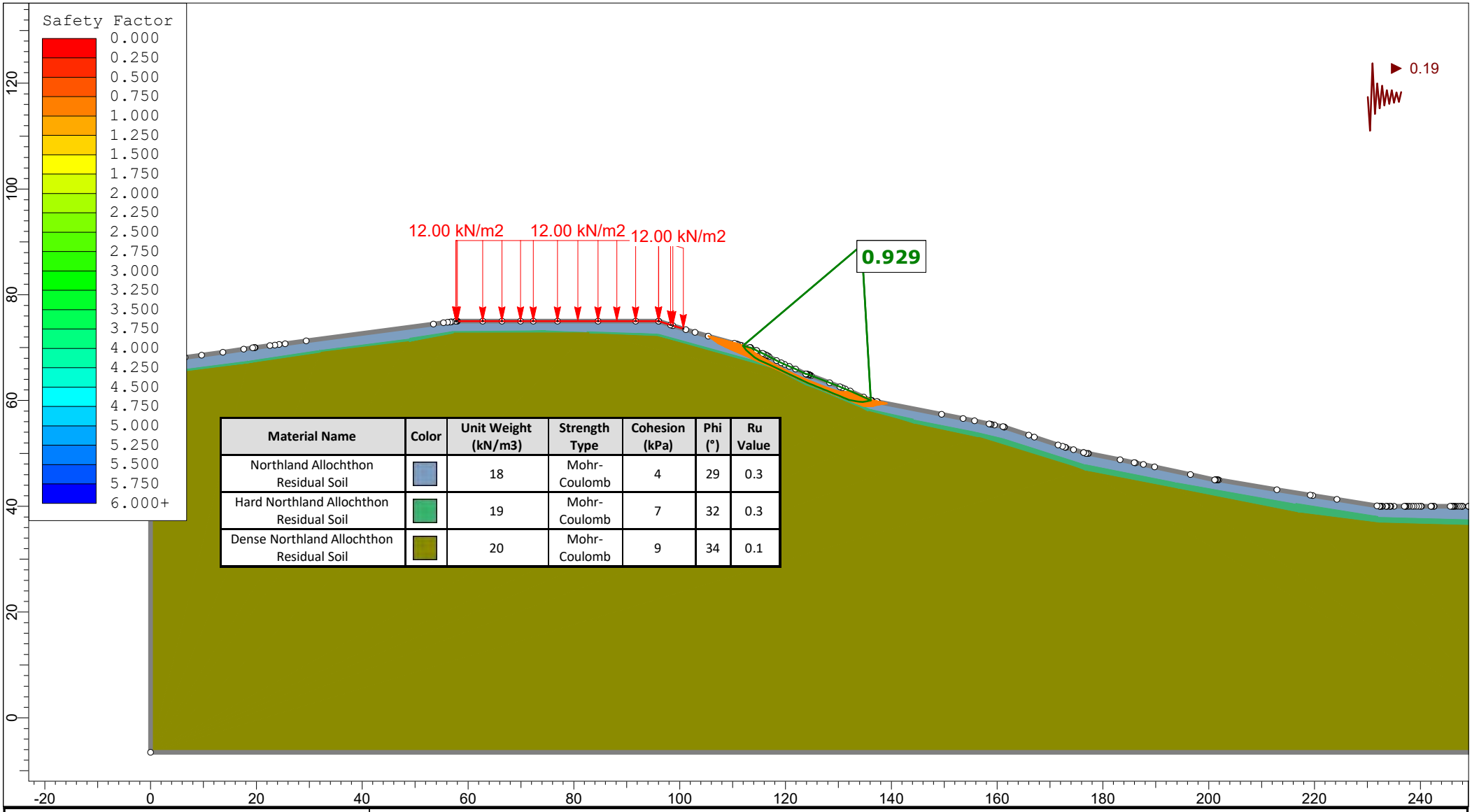
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
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Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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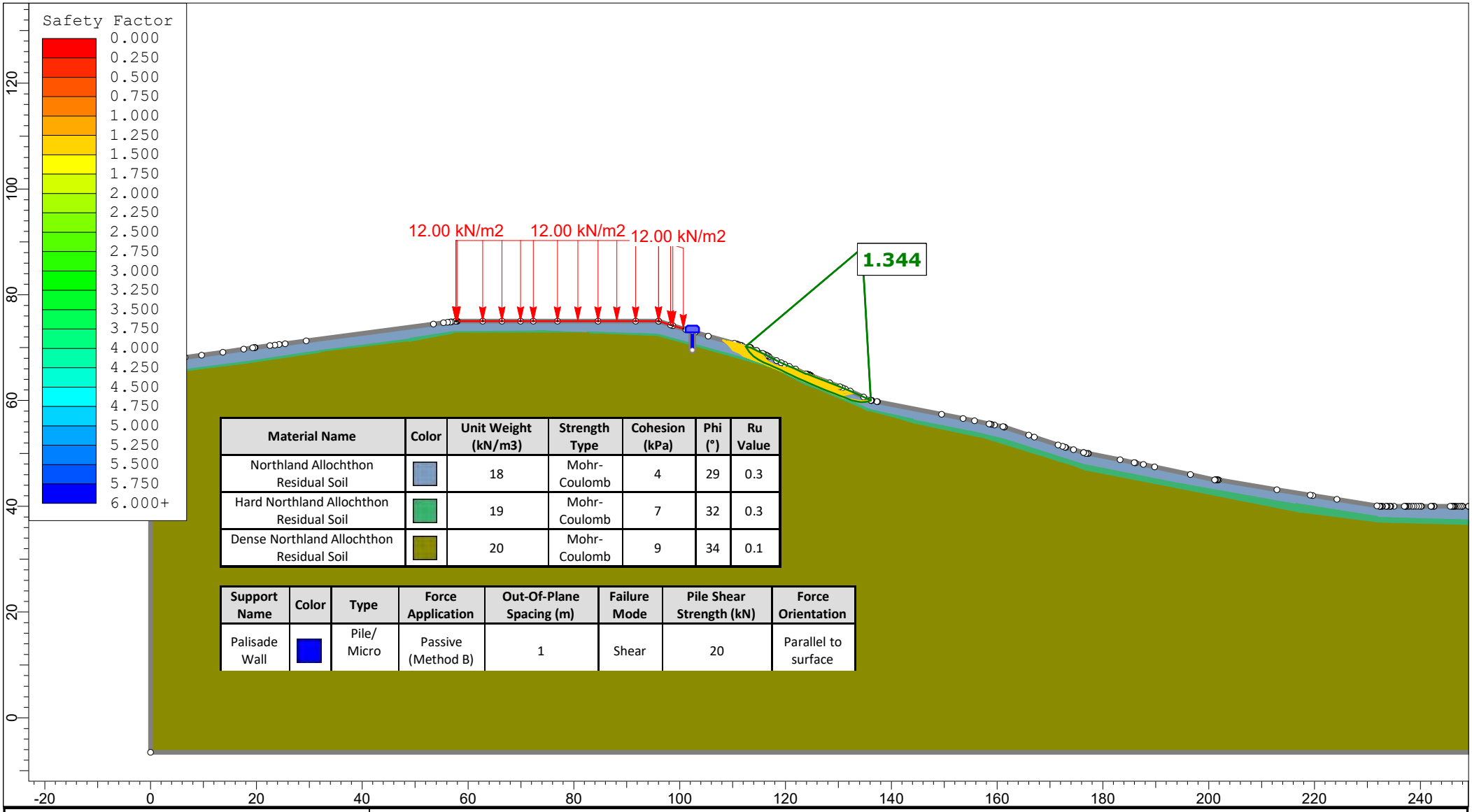
Project	Range Road Kawakawa		
Group	Proposed Condition	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Palisade Wall		Pile/ Micro	Passive (Method B)	1	Shear	20	Parallel to surface

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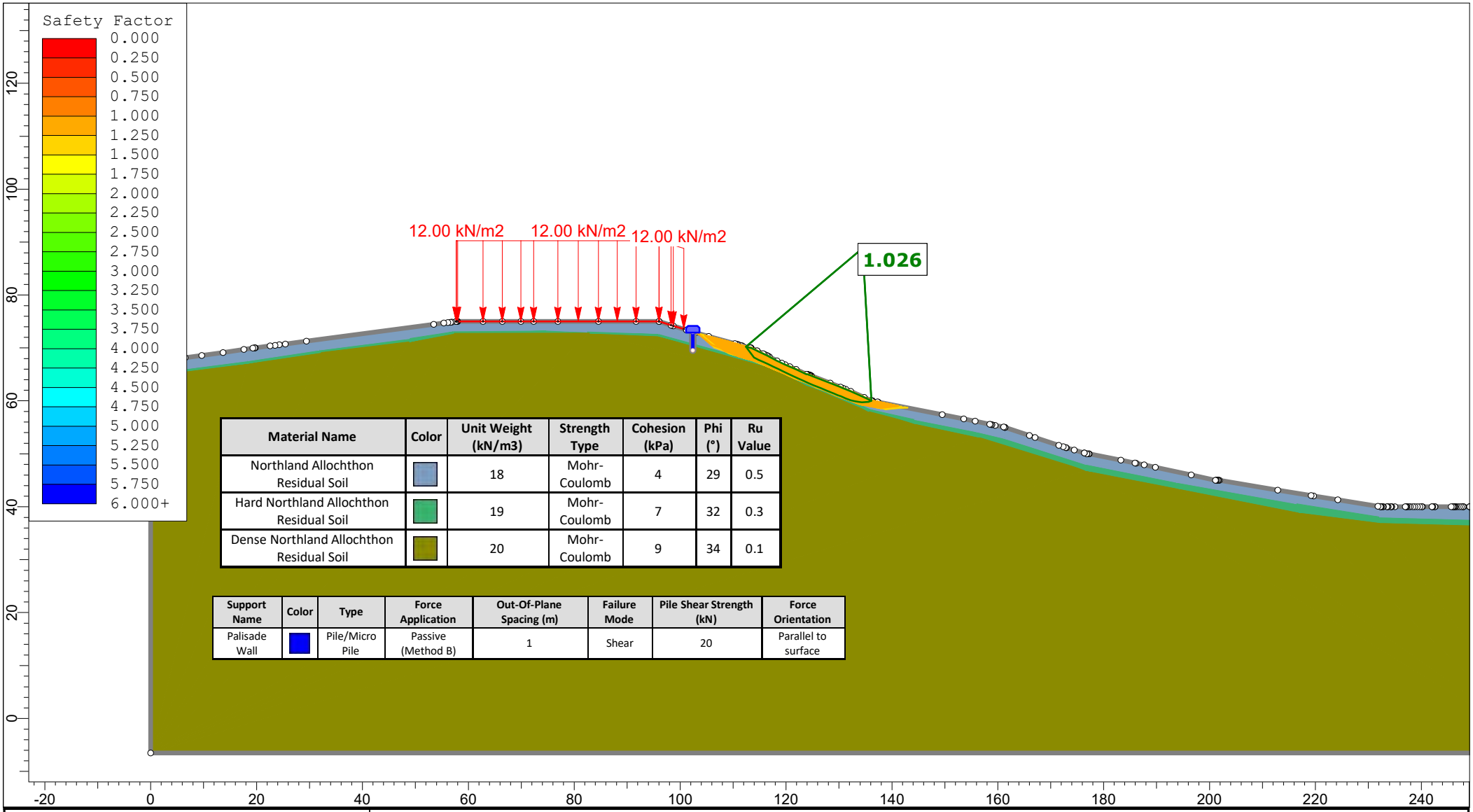
Project	Range Road Kawakawa		
Group	Palisade Wall	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Palisade Wall		Pile/Micro Pile	Passive (Method B)	1	Shear	20	Parallel to surface

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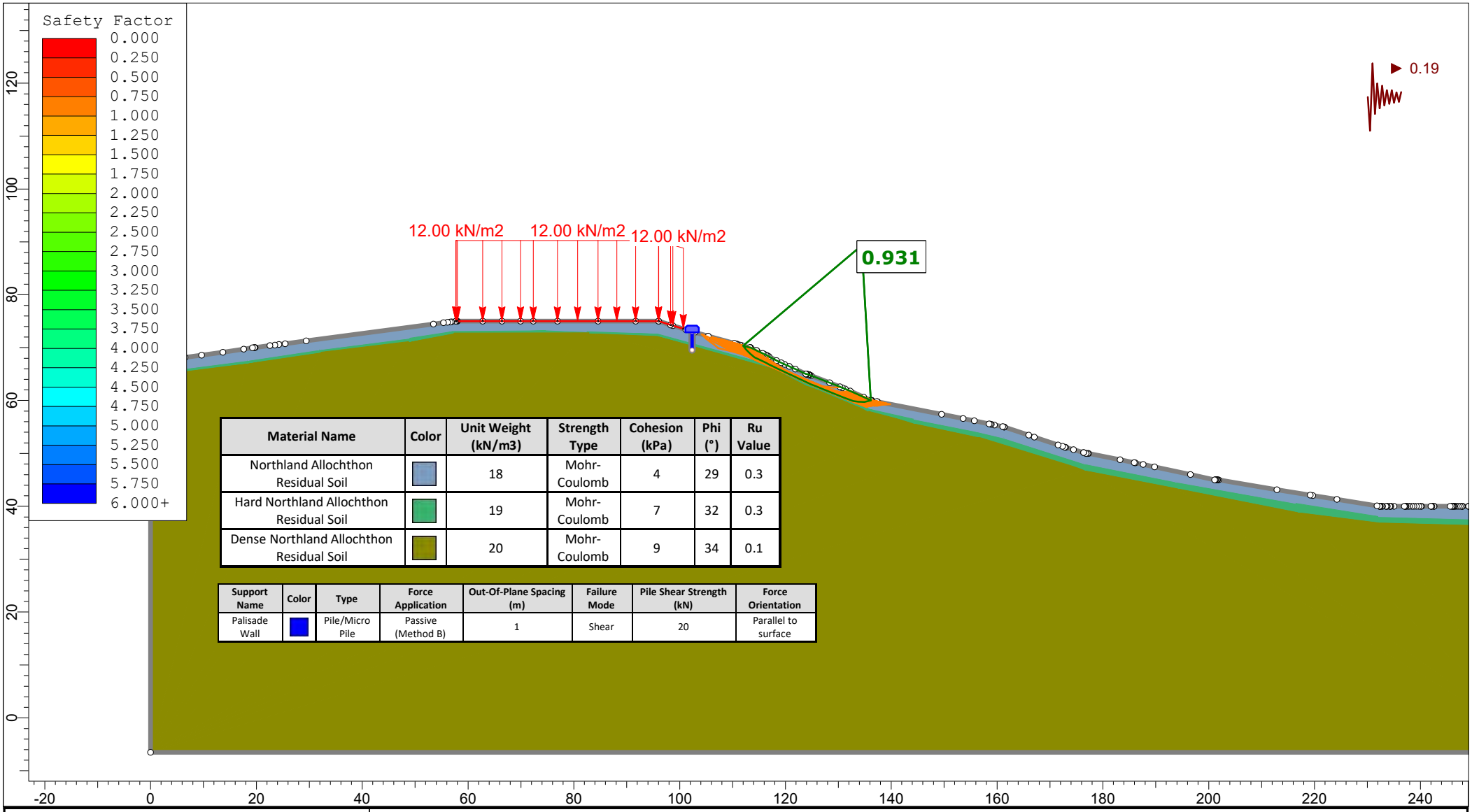
Project	Range Road Kawakawa		
Group	Palisade Wall	*Scenario*	Elevated GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Palisade Wall		Pile/Micro Pile	Passive (Method B)	1	Shear	20	Parallel to surface

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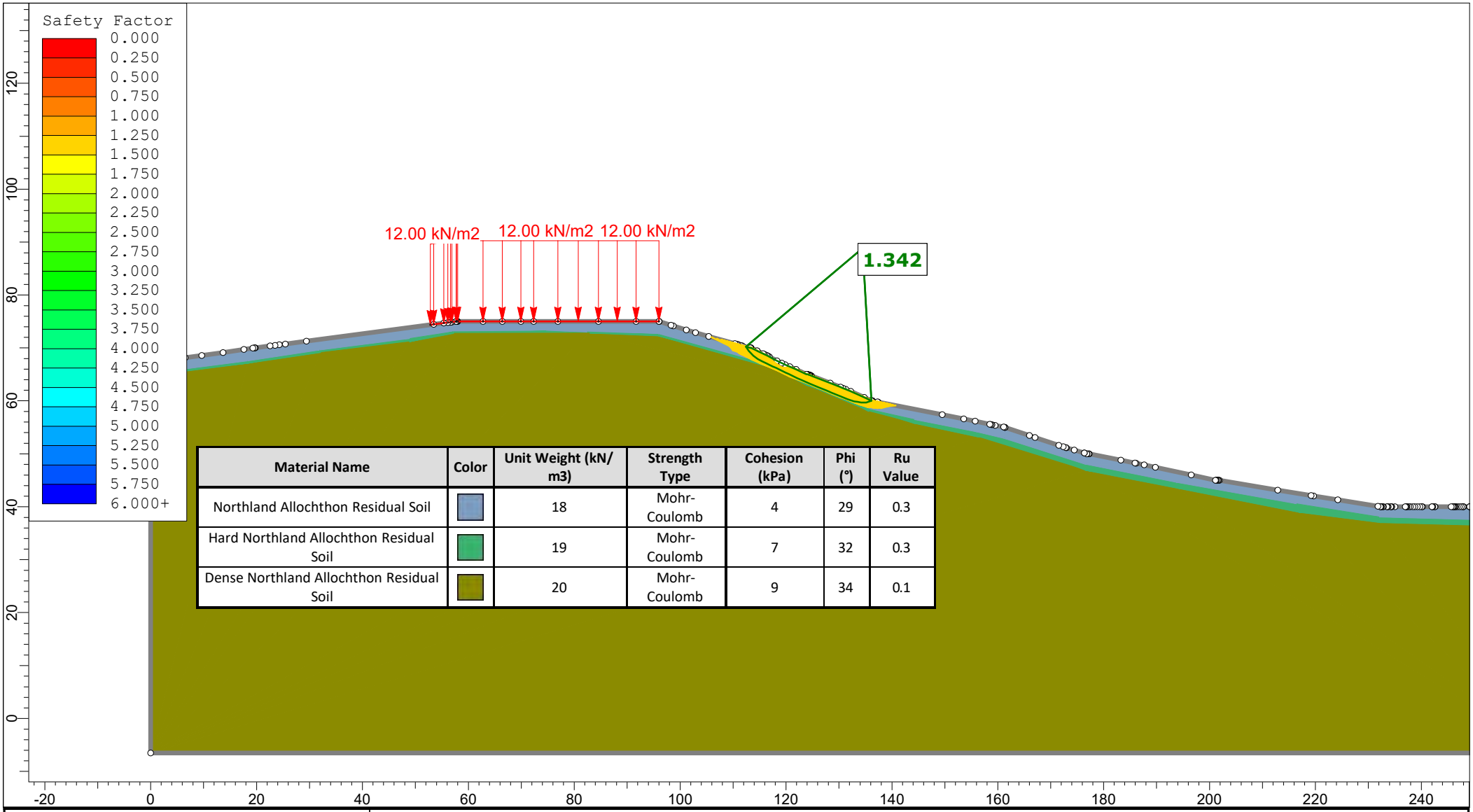
Project	Range Road Kawakawa		
Group	Palisade Wall	*Scenario*	Seismic
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.3
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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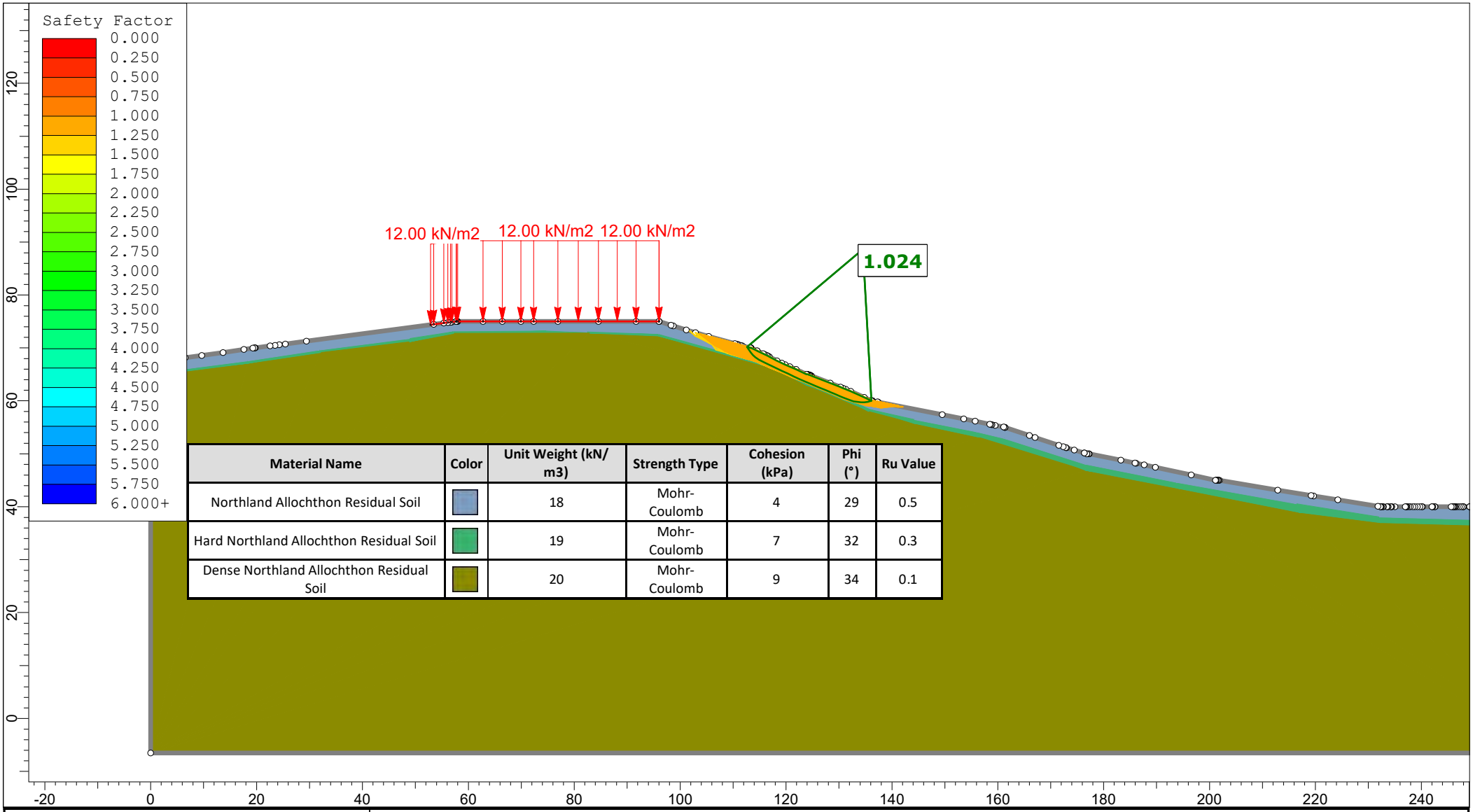
Project	Range Road Kawakawa		
Group	Building Restriction	*Scenario*	Normal GW
Drawn By	DBT	*Company*	Geologix
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
Northland Allochthon Residual Soil		18	Mohr-Coulomb	4	29	0.5
Hard Northland Allochthon Residual Soil		19	Mohr-Coulomb	7	32	0.3
Dense Northland Allochthon Residual Soil		20	Mohr-Coulomb	9	34	0.1

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Project	Range Road Kawakawa		
Group	Building Restriction	*Scenario*	Elevated GW
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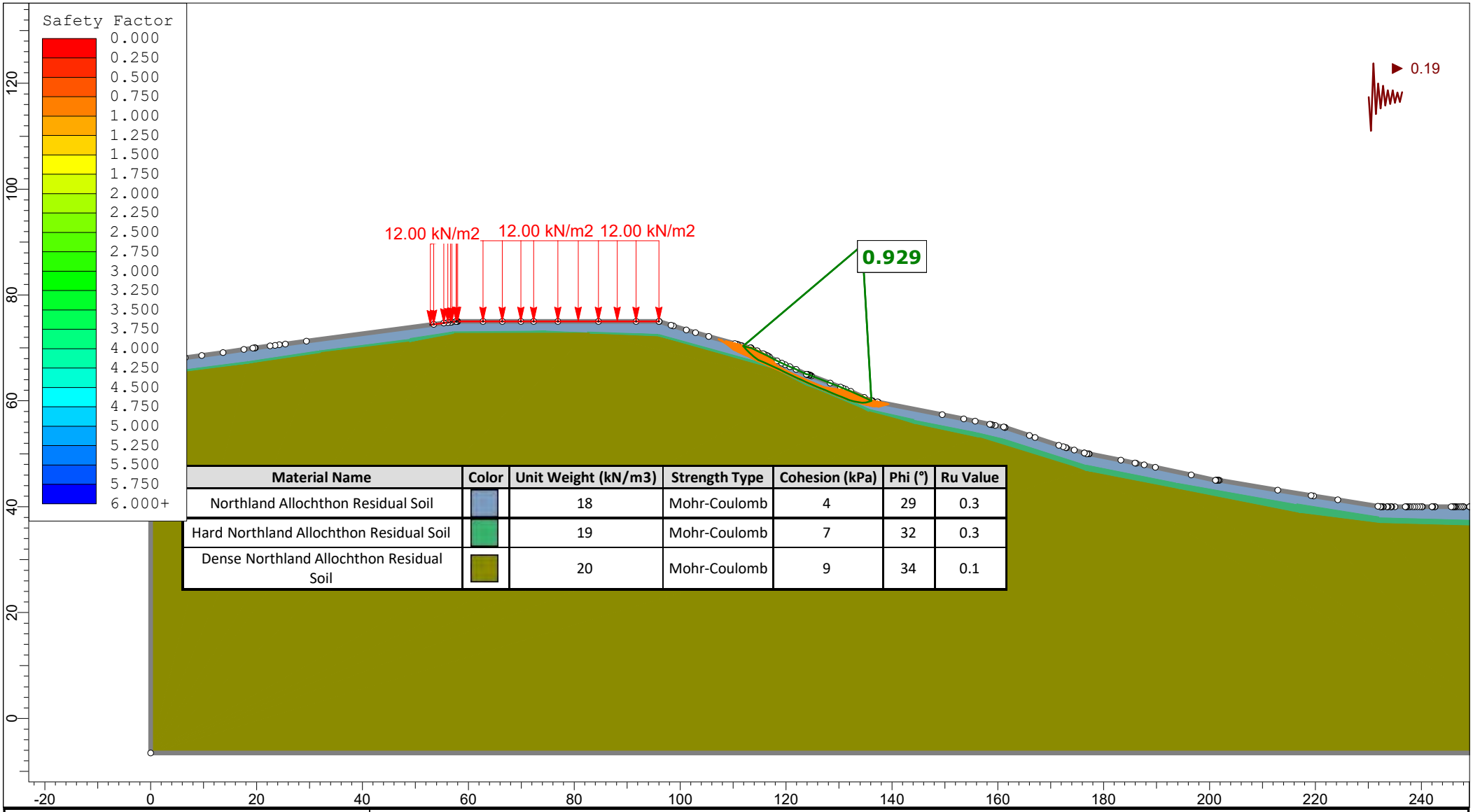
Date	7/03/2025, 9:08:20 am	*File Name*	Section D.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Ru Value
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Project	Range Road Kawakawa		
Group	Building Restriction	*Scenario*	Seismic
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