Far North District Council

Office Use Only
Application Number:

Private Bag 752, Memorial Ave
Kaikohe 0440, New Zealand
Freephone: 0800 920 029
Phone: (09) 401 5200
Fax: (09) 401 2137
Email: ask.us@fndc.govt.nz
Website: www.fndc.govt.nz

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 Form 9)

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):

O Land Use O Fast Track Land Use* ✓ Subdivision O Discharge

O Extension of time (s.125) O Change of conditions (s.127) O Change of Consent Notice (s.221(3))

O Consent under National Environmental Standard (e.g. Assessing and Managing Contaminants in Soil)

O Other (please specify) _____

***The fast track for simple land use consents is restricted to consents with a controlled activity status and requires you provide an electronic address for service.**

3. Would you like to opt out of the Fast Track Process? Yes / No

4. Applicant Details:

Name/s: [redacted]

Electronic Address for Service (E-mail): [redacted]

Phone Numbers: Work: _____ Home: _____

Postal Address: (*or* alternative method of service under section 352 of the Act) _____

_____ Post Code: _____

5. Address for Correspondence: *Name and address for service and correspondence (if using an Agent write their details here).*

Name/s: Jessica Meyst

Electronic Address for Service (E-mail): jesse@reyburnandbryant.co.nz

Phone Numbers: Work: _____ Home: 09 438 0251

Postal Address: (*or* alternative method of service under section 352 of the Act) PO Box 191
Whangarei

Post Code: 0140

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

6. 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: _____

_____

Property Address/: Location _____

_____

_____

7. Application Site Details:

Location and/or Property Street Address of the proposed activity:

Site Address/ Location: 546 Waiotemarama Gorge Road
Opononi

Legal Description: Section 20 BLK ~~XXXXX~~ Val Number: _____
Hokianga SD

Certificate of Title: NA1660/140

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.

The site is accessed via a farm track from Waiotemarama Gorge Road.

8. Description of the Proposal:

Please enter a brief description of the proposal here. Attach a detailed description of the proposed activity and drawings (to a recognized scale, e.g. 1:100) to illustrate your proposal. Please refer to Chapter 4 of the District Plan, and Guidance Notes, for further details of information requirements.

To undertake a 3-lot subdivision of one existing title

If this is an application for an Extension of Time (s.125); Change of Consent Conditions (s.127) or 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) or extension being sought, with reasons for requesting them.

9. Would you like to request Public Notification

Yes/No

10. Other Consent required/being applied for under different legislation (more than one circle can be ticked):

O Building Consent (BC ref # if known)

O Regional Council Consent (ref # if known)

O National Environmental Standard consent

O Other (please specify)

11. 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 (further information in regard to this NES is available on the Council's planning web pages):

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)

O yes ✓ no O don't know

Is the proposed activity an activity covered by the NES? (If the activity is any of the activities listed below, then you need to tick the 'yes' circle).

O yes ✓ no O don't know

O Subdividing land

O Changing the use of a piece of land

O Disturbing, removing or sampling soil

O Removing or replacing a fuel storage system

12. 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.

Please attach your AEE to this application.

13. 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 all names in full) [redacted]

Email:

Postal Address: [redacted]

Post Code:

Phone Numbers: Work: [redacted] Home: Fax:

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: [redacted] (please print)

Signature: (signature of bill payer – **mandatory**) Date: 12.11.203

14. 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.

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

Name: [redacted] (please print)

Signature [redacted] (signature) Date: 10/11/2023

(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)
- ✓ 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.

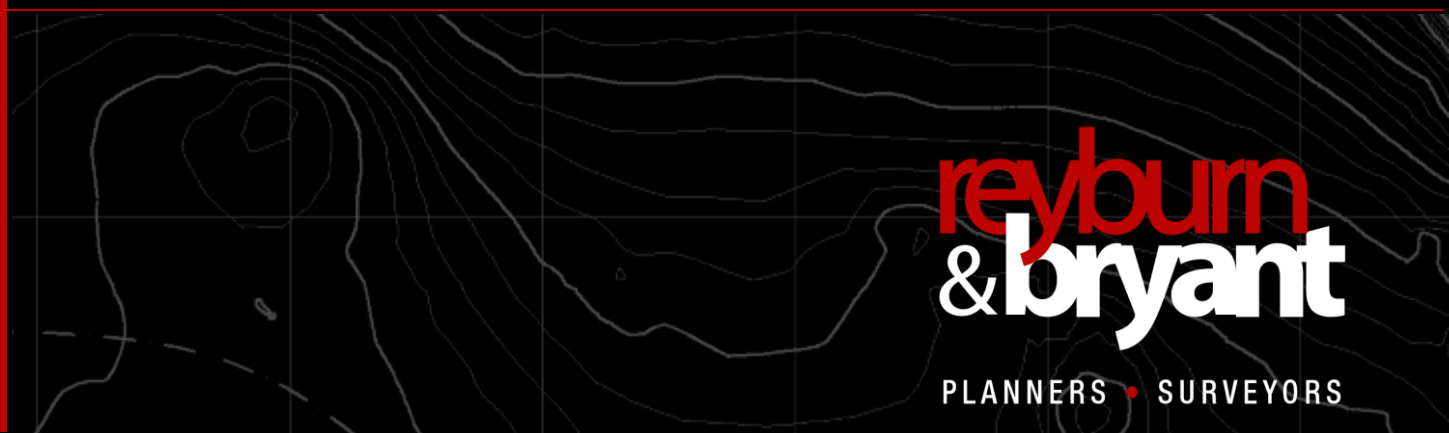
Only one copy of an application is required, but please note for copying and scanning purposes, documentation should be:

UNBOUND **SINGLE SIDED** **NO LARGER THAN A3 in SIZE**

Subdivision consent application

JASON & PENELOPE BILL FAMILY TRUST

Waiotemarama Gorge Road, Omapere



reyburn & bryant

PLANNERS • SURVEYORS

Subdivision consent application

JASON & PENELOPE BILL FAMILY TRUST

Waiotemarama Gorge Road, Omapere

Report prepared for:	Jason & Penelope Bill Family Trust
Author	Jessica Meyst, *Planner*
Reviewed by:	Joseph Henehan, *Senior Planner*
Consent Authority:	Far North District Council
Report reference:	17606
Report Status:	Final
Date:	November 2023

Reyburn and Bryant
P.O. Box 191
Whangarei 0140
Telephone: (09) 438 3563

FORM 9

APPLICATION FOR RESOURCE CONSENT UNDER SECTION 88 OF THE RESOURCE MANAGEMENT ACT 1991

To: Far North District Council
Memorial Avenue
Private Bag 752
Kaikohe 0440

1. The **Jason & Penelope Bill Family Trust** apply for subdivision consent to create three lots from one existing title.

2. The applicants are the owners of the site.

3. The location of the proposed activity is Waiotemarama Gorge Road, Omapere.

4. There are no other activities to which this application relates.

5. Section 243 approval is required in order to part-cancel an existing right of way easement in so far as it relates to Lots 2 and 3.

6. We attach an assessment of effects on the environment that:

   (a) includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and

   (b) addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and

   (c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

7. We attach an assessment of the proposed activity against the matters set out in Part 2 of the Resource Management Act 1991.

8. We attach an assessment of the proposed activity against any relevant provisions of a document referred to in section 104(1)(b) of the Resource Management Act 1991, including information required by clause 2(2) of Schedule 4 of that Act.

9. No other information is required to be included in the district or regional plan(s) or regulations.

14 November 2023

Date

Address for service:	Reyburn and Bryant 1999 Ltd PO Box 191, Whangarei
Telephone:	(09) 438 3563
Email:	jess@reyburnandbryant.co.nz
Contact person:	Jessica Meyst

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ABBREVIATIONS

AEE	Assessment of Environmental Effects
FNDC	Far North District Council
HAIL	Hazardous Activities and Industries List
LUC	Land Use Register
NES-SC	National Environmental Standard – Soil Contamination
NPS-HPL	National Policy Statement for Highly Productive Land
NPS-IB	National Policy Statement for Indigenous Biodiversity
NRC	Northland Regional Council
FNDP	Far North District Plan
PDP	Proposed Far North District Plan
PNA	Protected Natural Area
RMA	Resource Management Act, 1991
RPZ	Rural Production Zone
SNA	Significant Natural Area

1. INTRODUCTION

1.1 Report basis

This report has been prepared for Jason & Penelope Bill Family Trust in support of an application to undertake a three-lot subdivision of an existing title at Waiotemarama Gorge Road, Omapere.

The application has been prepared in accordance with Section 88 and the Fourth Schedule of the Resource Management Act, 1991 (RMA). Section 88 of the RMA requires that resource consent applications be accompanied by an Assessment of Environmental Effects (AEE) in accordance with the Fourth Schedule.

The report also includes an analysis of the relevant provisions of the district, regional and national planning documents that are pertinent to the assessment and decision required under s104 of the RMA.

1.2 Proposal summary

The proposal seeks to undertake a three-lot subdivision of an existing title at Waiotemarama Gorge Road, Omapere.

The site is zoned 'Rural Production' (RPZ) under the Far North District Plan (FNDP).

The Far North District Council (FNDC) notified the Proposed District Plan (PDP) on 27 July 2022. The property is zoned 'Rural Production' in this plan and a small portion of the site is subject to the 'River Flood Hazard Zone'.

Resource consent is required for a **restricted discretionary activity** from the FNDC under Rule 13.8.1(b).

1.3 Property details

Applicant and landowner	Jason & Penelope Bill Family Trust
Site location	Waiotemarama Gorge Road, Omapere
Record of title	RT NA1660/40
Legal description	Section 20 Blk VII Hokianga SD
Total site area	257.7847ha
Operative District Plan	Far North District Plan (FNDP)
Operative District Plan Zoning	Rural Production Zone
Other Operative District Plan Notations	None

Proposed District Plan	Proposed Far North District Plan (PDP)
Proposed District Plan Zoning	Rural Production Zone
Other Proposed District Plan Notations	River Flood Hazard Zone (100 Year ARI Event)

Table 1: Property details.

1.4 Relevant title memorials

The site is held within a single record of title being RT NA1660/40. The title is subject to the following memorials:

- 5412693.1 – Right of way easement.
- Section 59 of Land Act 1948. This instrument has no relevance to the proposal.

The title and the associated memorial are attached in **Appendix 1**.

1.5 Other approvals required

Section 243 part-cancellation of easement

Pursuant to Section 243(e) of the RMA 1991 the Far North District Council is to cancel the conditions as to the creation of the right of way marked 'A' on DP 126672, over Section 15 Blk VI Hokianga SD (RT NA86D/947) created by 5412693.1 as it relates to Lots 2 and 3 hereon. The reason for this cancellation is that Lots 1 and 2 hereon are severed from this right of way and will gain access elsewhere.

1.6 Processing requests

Prior to the issue of any decision for this consent, please forward the draft conditions for our review and comment.

1.7 Statutory context

Resource consent is required as a restricted discretionary activity under the FNDP. Section 104C of the RMA sets out specific requirements for the determination of restricted discretionary activities. These requirements are:

Section 104C Determination of applications for restricted discretionary activities

(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.

(2) The consent authority may grant or refuse the application.

(3) However, 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.

Section 104(1) of the RMA sets out the matters that a consent authority must, subject to Part 2, have regard to when considering an application for resource consent.

104 Consideration of applications

(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2 and section 77M, have regard to–

(a) any actual and potential effects on the environment of allowing the activity; and

(ab) any measure proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity; and

(b) any relevant provisions of—

(i) a national environmental standard:

(ii) other regulations:

(iii) a national policy statement:

(iv) a New Zealand coastal policy statement:

(v) a regional policy statement or proposed regional policy statement:

(vi) a plan or proposed plan; and

(c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.

(2) *When forming an opinion for the purposes of subsection (1)(a), a consent authority may disregard an adverse effect of the activity on the environment if* a national environmental *standard or the plan permits an activity with that effect.*

(2A) When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.

(2B) When considering a resource consent application for an activity 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, a consent authority must have regard to any resource management matters set out in that planning document.

(2C) Subsection (2B) applies until such time as the regional council, in the case of a consent authority that is a regional council, has completed its obligations in relation to its regional planning documents under section 93 of the Marine and Coastal Area (Takutai Moana) Act 2011.

(2D) When considering a resource consent application that relates to a wastewater network, as defined in section 5 of the Water Services Act 2021, a consent authority—

(a) must not grant the consent contrary to a wastewater environmental performance standard made under section 138 of that Act; and

(b) must include, as a condition of granting the consent, requirements that are no less restrictive than is necessary to give effect to the wastewater environmental performance standard.

(3) *A consent authority must* not,—

(a) when considering an application, have regard to—

(i) trade competition or the effects of trade competition; or

(ii) any effect on a person who has given written approval to the application:

(b) [Repealed]

(c) grant a resource consent contrary to—

(i) section 107, 107A, or 217:

(ii) an Order in Council in force under section 152:

(iii) any regulations:

(iv) wāhi tapu conditions included in a customary marine title order or agreement:

(v) section 55(2) of the Marine and Coastal Area (Takutai Moana) Act 2011:

(d) grant a resource consent if the application should have been notified and was not.

(3A) See also section 103(3) of the Urban Development Act 2020 (which relates to resource consents in project areas in transitional periods for specified development projects (as those terms are defined in section 9 of that Act)).

(4) A consent authority considering an application must ignore subsection (3)(a)(ii) if the person withdraws the approval in a written notice received by the consent authority before the date of the hearing, if there is one, or, if there is not, before the application is determined.

(5) A consent authority may grant a resource consent on the basis that the activity is a controlled activity, a restricted discretionary activity, a discretionary activity, or a non-complying activity, regardless of what type of activity the application was expressed to be for.

(6) A consent authority may decline an application for a resource consent on the grounds that it has inadequate information to determine the application.

(7) In making an assessment on the adequacy of the information, the consent authority must have regard to whether any request made of the applicant for further information or reports resulted in further information or any report being available.

This report focuses on the relevant matters in s104(1), and specifically:

- The actual and potential environmental effects (s104(1)(a)).
- The relevant provisions of the NES-SC (s104(1)(b)(i)).
- The relevant provisions of the NPS-HPL (s104(1)(b)(iii)).
- The relevant provisions of the NPS-IB (s104(1)(b)(iii)).
- The relevant provisions of the FNDP (s104(1)(b)(vi)).

2. THE SITE AND SURROUNDING ENVIRONMENT

2.1 Site description

Location

The subject site consists of a large land holding of approximately 257.7847ha (see Figure 1 below). The site is located to the west of Waiotemarama Gorge Road which follows the eastern boundary of the site.

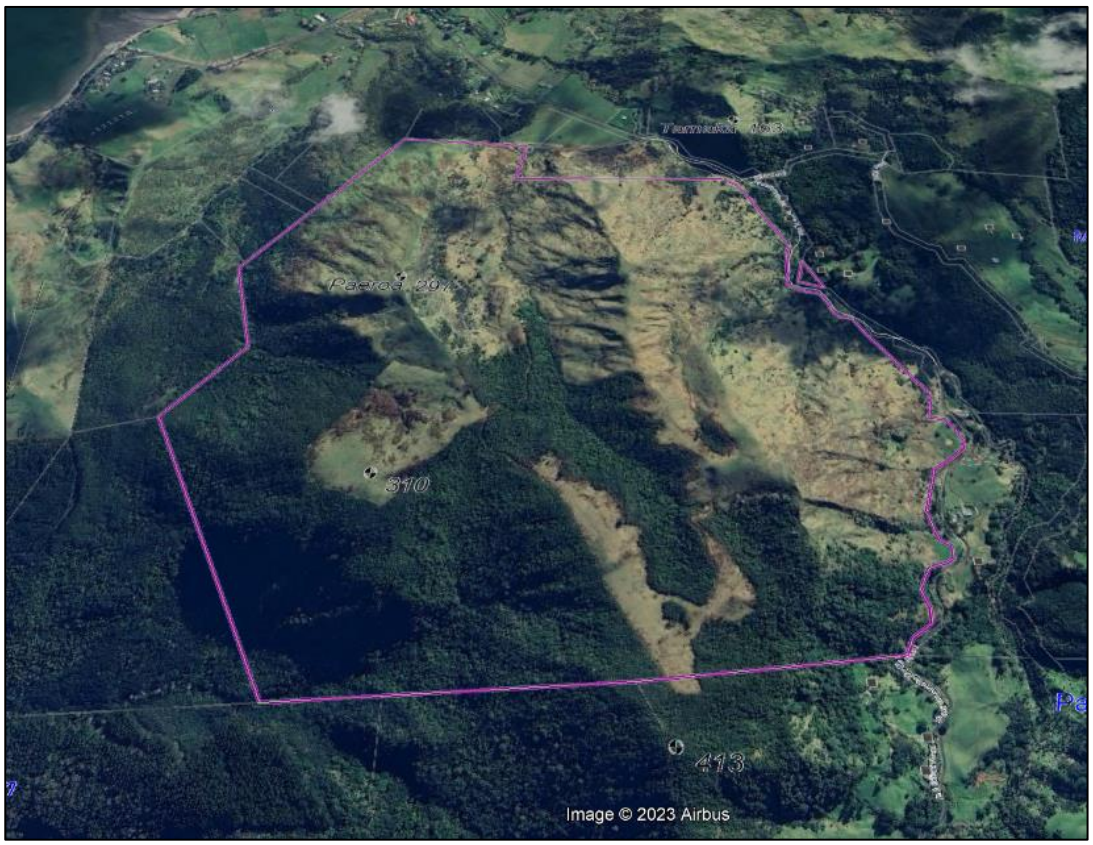


Figure 1: Location map (Source: Google Earth).

Built development and access

The site has no existing development.

The site has no formal access arrangements and currently gains access to Waiotemarama Gorge Road via a farm track.

Waiotemarama Gorge Road has a metal formation.

Topography

The topography of the site is steeply undulating. There is a distinct ridgeline in the centre of the site which runs north to south. There are multiple hummocks and gullies associated with the land.

Ground cover and vegetation

The site has an equal mix of pasture and mature forest. The forest is subject to a Protected Natural Area overlay (PNA).

Land Use Capability (LUC) Soil Classification

The Our Environment maps identify the soils at the site as being class 6, 7 and 8 under the LUC system. Refer to Figure 2 below.

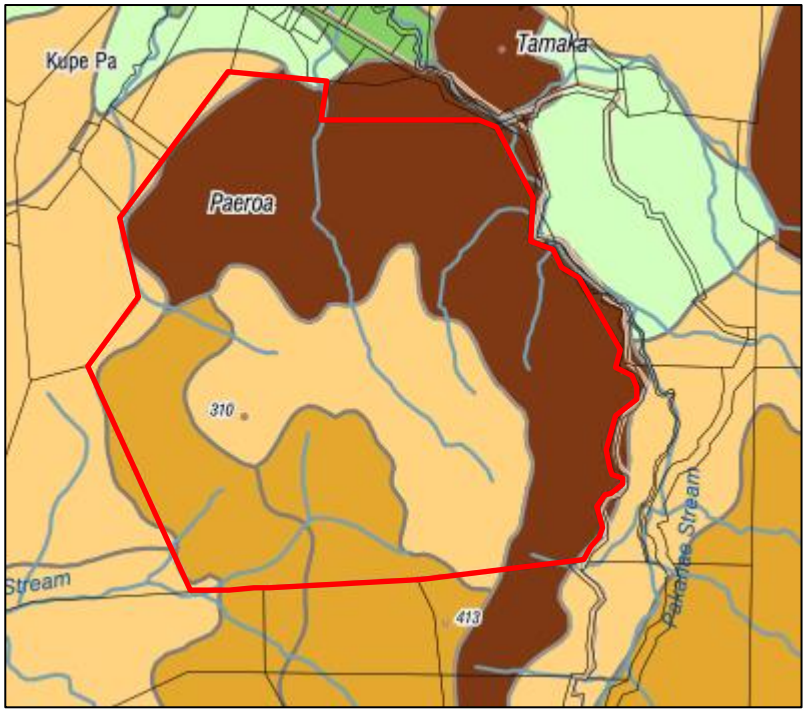


Figure 2: LUC Soil Classification. (Source: Our Environment).

2.2 Surrounding environment

The site is located approximately 1.5km from the coastal township of Opononi and the Hokianga Harbour.

The immediate vicinity is predominantly in large landholdings used for rural production activities and a low density of residential development.

The Pakanae Stream follows Waiotemarama Gorge Road to the east.

3. THE PROPOSAL

3.1 General

The proposal seeks to undertake a three-lot subdivision of an existing title at Waiotemarama Gorge Road, Omapere.

The proposed lot configuration is shown on the scheme plan attached in **Appendix 2** and is summarised as follows:

Lot number	Area	Comments
Lot 1	256.1738ha	The balance lot containing the majority of the rural productive land. There is no residential unit on this lot.
Lot 2	1.1300ha	Vacant lot.
Lot 3	4,810m²	Vacant lot.

Table 2: Proposed allotment details.

The areas shown above are approximate and are subject to final survey.

3.2 Site suitability

Geologix Consulting Engineers (Geologix) have prepared a site suitability report (attached in **Appendix 3**) which identifies building sites on proposed Lots 2 and 3. Their report recommends a series of engineering solutions aimed at ensuring that the building sites on Lots 2 and 3 are suitable for development (noting specifically that measures will need to be incorporated at building consent stage in order to avoid potential natural hazard effects resulting from dislodged boulders on the slopes above the building sites). Subject to compliance with the recommendations of their report, Geologix conclude that the sites are suitable for development pursuant to s106 of the RMA.

It is anticipated that the recommendations of the Geologix suitability report will be encapsulated within the conditions of this subdivision consent.

3.3 Stormwater disposal arrangements

Proposed Lot 1 will continue its rural productive use following the completion of the subdivision. Should the site be developed in future, there is sufficient room to manage stormwater runoff.

The management of stormwater on proposed Lots 2 and 3 was specifically considered by Geologix in their site suitability report. As there is no Council reticulation available in this location stormwater will be managed on-site.

Geologix recommend that rainwater overflows from detention tanks are discharged downslope from the future dwellings. Runoff from driveways will be discharged towards swale drains.

It is anticipated that the recommendations of the Geologix report will be encapsulated within the conditions of this consent.

3.4 Wastewater disposal arrangements

Proposed Lot 1 will continue its rural productive use following the completion of the subdivision. Should the site be developed in future, there is sufficient room to provide for onsite wastewater disposal.

The management of wastewater on proposed Lots 2 and 3 was specifically considered by Geologix in their site suitability report. As there is no Council wastewater reticulation in this location, wastewater associated with future dwellings on these lots will be managed on site.

Geologix have recommended the installation of a secondary treatment system with drip line land application. The system will need to be designed to cater for a maximum daily loading of 1,280L.

It is anticipated that the recommendations of the Geologix report will be encapsulated within the conditions of consent.

3.5 Water supply

Proposed Lot 1 will continue its rural productive use following the completion of the subdivision. Water will be collected and stored on site if the site is developed in the future.

There is no Council water reticulation in this location. The water tanks detailed in Section 3.3 will provide a potable water supply for the future dwellings on proposed Lots 2 and 3.

These arrangements will be established by future owners at the time of applying for building consents.

It is noted that fire fighting water supplies will be established at building consent stage in accordance with SNZ PAS4509:2008 (or as otherwise agreed to by Fire and Emergency NZ).

3.6 Electricity and telecommunications

The proposed lots will not be provided with an electricity and telecommunication connections as part of this subdivision. The sites will instead rely on alternative wireless/solar options for the provision of these services.

3.7 Access arrangements

Access to proposed Lot 1 will continue in the same manner it currently does via the existing farm crossing. No changes are proposed.

Proposed Lots 2 and 3 will be provided with separate vehicle crossings direct to Waiotemarama Gorge Road. These vehicle crossings will be constructed in accordance with the FNDC Engineering Standards (ES) 2009 at building consent stage.

It is noted that both Lots 2 and 3 have locations where compliant crossings can be constructed in accordance with the standards set out in the FNDC ES 2009 as shown on the scheme plan attached at **Appendix 2**. In terms of sight distances, the assumed vehicle operating speed along Waiotemarama Gorge Road is 50km/h due to the metal formation and the topography of the road, as well as the fact that there are several tight corners in the vicinity of Lots 2 and 3. Considering this, the sight distances are compliant with the requirements set out in the FNDC ES 2009.

4. RULE ASSESSMENT

4.1 Relevant planning notations

The site is zoned 'Rural Production' and is not subject to any resource areas identified under the FNDP.

The FNDC notified the PDP on 27 July 2022. The property is zoned 'Rural Production' in this plan.

The relevant planning maps are attached in **Appendix 3**.

4.2 FNDP rule assessment

The proposal is a **restricted discretionary activity** under Rule 13.8.1(b). The matters to which discretion is restricted listed in Section 13.8.1(c)(ii) are as follows:

- 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.

4.3 PDP rule assessment

The FNDC notified on the PDP on 27 July 2022. In accordance with s86B(3) of the RMA, the rules that would ordinarily apply to this proposal do not currently have legal effect.

In this case, it is assessed that non-complying resource consent would be required under Rule SUB-R3 – '*Subdivision of land to create a new allotment*' where proposed Lots 2 and 3 do not comply with the minimum lot size requirements for the zone under SUB-S1. However, due to the fact that the PDP is still in a relatively early stage of the plan change process, this rule does not currently have legal effect under s86B of the RMA. As such, consent under this rule is not required. Notwithstanding this, the objectives and policies of the PDP do have legal weight, and consequentially have been assessed in section 6.2 of this report.

4.4 Overall activity status

The proposal is a **restricted discretionary activity** overall.

5. ASSESSMENT OF ENVIRONMENTAL EFFECTS

5.1 Statutory context

As the proposal is a restricted discretionary activity, the only matters that can be considered are those set out in 13.8.1(c)(ii). These matters form the basis for the following assessment.

5.2 Existing environment

Section 104(1)(a) of the RMA requires a consideration of any actual and potential effects on the environment of allowing an activity. The existing environment has been described in Section 2 of this report.

5.3 Permitted baseline

Section 104(2) of the RMA allows a consent authority to disregard any adverse effects of an activity on the environment if a plan (the FNDP in this instance) permits an activity with that effect. This is commonly referred to as the permitted baseline. While there is no permitted baseline for subdivision, it is permitted to construct one dwelling per 12ha on the existing title (RT NA1660/40).

5.4 Effects on the conservation estate (s13.8.1(c)(ii))

There is no conservation land administered by the Department of Conservation within 500m of the site. As such, there is no effect on conservation estate.

5.5 Effects on significant indigenous flora and fauna (s13.8.1(c)(ii))

The proposed subdivision will not result in the removal of any indigenous vegetation. Any areas of native bush will remain entirely contained within the balance site proposed by this application (Lot 1) and no native vegetation removal will be necessary to facilitate the completion of this subdivision. As such, any effects on indigenous flora and fauna will be negligible.

5.6 Fire hazards (s13.8.1(c)(ii))

The proposed subdivision will not have any adverse effects relating to fire hazards as any future dwellings on the proposed lots will be well setback from existing vegetation.

5.7 Adverse effects conclusion

Overall, relative to the matters of discretion listed under section 13.8.1, the adverse effects associated with this proposal will be less than minor.

6. PLANNING ASSESSMENT

6.1 FNDP objectives and policies assessment

The objectives and policies of the FNDP is relevant to the extent that they assist in clarifying any ambiguity in the restricted discretionary matters. In this case, there is no ambiguity in the restricted discretionary matters, and so no specific consideration of the objectives and policies is required.

6.2 PDP objectives and policies assessment

The following PDP objectives and policies are particularly relevant to this proposal:

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.

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.

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

1. *enabling primary production activities as the predominant land use;*
2. *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.*

RPROZ-P5 - Avoid land use that:

a) *is incompatible with the purpose, character and amenity of the Rural Production zone;*

b) *does not have a functional need to locate in the Rural Production zone and is more appropriately located in another zone;*

c) *would result in the loss of productive capacity of highly productive land;*

d) *would exacerbate natural hazards; and*

e) *cannot provide appropriate on-site infrastructure.*

Assessment

It has been determined that the proposal would be a non-complying activity if the provisions of this zone were to have legal effect. The subdivision is not contrary to the objectives and policies of the RPROZ as it prevents the loss of rural productive land by retaining the majority of the land within the balance site (Lot 1). In addition to this, the rural productive capacity will be maintained as Lot 1 will continue to be used for rural productive purposes.

Notwithstanding the assessment provided above, the PDP is still in a relatively early stage of the plan change process, with a large number of submissions having been received on a wide range of topics (including the RPROZ provisions).

Given the wide-ranging nature of some of these submissions, little weight should be applied to the provisions of the PDP at this stage.

6.3 NES – Soil Contamination

All applications that involve subdivision, an activity that changes the use of a piece of land, or earthworks are subject to the provisions of the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health Regulations 2011 (NES). The regulation sets out the requirements for considering the potential for soil contamination, based on the HAIL (Hazardous Activities and Industries List) and the risk that this may pose to human health as a result of the proposed subdivision.

A review of aerial photographs and the Northland Regional Council 'selected land-use sites' database was undertaken, which confirmed that no HAIL activities are present or have ever taken place on the subject 'piece of land' - refer to the map attached in **Appendix 5**. Accordingly, the NES does not apply to this application.

6.4 NPS – Indigenous Biodiversity

The NPS-IB came into effect on 4 August 2023. It contains specific requirements relating to indigenous biodiversity within terrestrial Significant Natural Areas (SNAs).

The subdivision is consistent with Section 3.10 of the NPS-IB as there will be no adverse effect on an SNA as a result of the subdivision. Specifically, the subdivision will not result in the fragmentation of an SNA as the balance site (Lot 1) will wholly contain the indigenous vegetation that is subject to a PNA.

Furthermore, the residential lots (Lots 2 and 3) have been positioned on vacant areas of pasture to avoid the incorporation of indigenous vegetation within them. As such, no indigenous vegetation will be required to be removed when the sites are developed for residential use following the completion of the subdivision.

Considering the above, the proposal will not result in the loss or disruption of any ecosystem. Accordingly, the proposal is consistent with the policy direction set out in the NPS-IB.

6.5 NPS – Highly Productive Land

The National Policy Statement for Highly Productive Land (NPS-HPL) aims to ensure the availability New Zealand's most favourable soils for food and fibre

production, now and for future generations. In this case, it is assessed that the NPS-HPL is not relevant to the proposal due to the restricted discretionary activity status (noting that discretion is not limited to the productive use of soils) and also because the soils are Class 6, 7 and 8.

6.6 Part 2 assessment

An assessment of Part 2 matters is not required unless there are issues of invalidity, incomplete coverage, or uncertainty in the planning provisions.[1] In this case, there is no invalidity, incomplete coverage, or uncertainty amongst the various documents. In that regard, no assessment of the application is required under Part 2.

[1] *R J Davidson Family Trust the Marlborough District Council* [2018] NZCA 316

7. NOTIFICATION

Pursuant to sections 95A and 95B of the RMA, Section 5 of this report concludes that any adverse effects associated with the proposal will be less than minor. Furthermore, there are no special circumstances associated with the application, the applicant has not requested notification, and there is no rule or national environmental standard that requires notification of this application. Consequentially, public notification is not necessary.

The assessment of environmental effects in Section 5 of this report confirms that no parties are considered to be adversely affected by the proposal. Consequentially, limited notification is not necessary.

Having considered the above, the proposal can proceed on a non-notified basis.

8. CONCLUSION

The proposal seeks to undertake a three-lot subdivision of an existing title at Waiotemarama Gorge Road, Omapere.

The proposal requires consent as a restricted discretionary activity under the provisions of the FNDP.

The environmental effects associated with the proposal (confined to the scope provided by the matters for discretion) have been assessed in Section 5 of this report. Overall, the effects have been determined to be less than minor. Consequently, appropriate regard has been given to s104(1)(a) of the RMA.

Section 6.4 confirms that the proposal is consistent with the policy direction of the NPS-IB. Sections 6.3 and 6.5 confirm that the NES-SC and the NPS-HPL are not a relevant consideration for the proposed subdivision. Accordingly, appropriate regard has been given to s104(1)(b)(i) and s104(1)(b)(vi) of the RMA.

Having regard to the relevant matters in s104(1) and s104C of the RMA, the proposal can be approved subject to appropriate conditions of consent.

APPENDIX 1

RECORD OF TITLE AND ASSOCIATED MEMORIALS

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier	**NA1660/40**
Land Registration District	**North Auckland**
Date Issued	09 July 1959

Prior References
NAPR228/6

Estate	Fee Simple
Area	257.7848 hectares more or less
Legal Description	Section 20 Block VII Hokianga Survey District

Registered Owners
Jason and Penelope Bill Family Trustees Limited

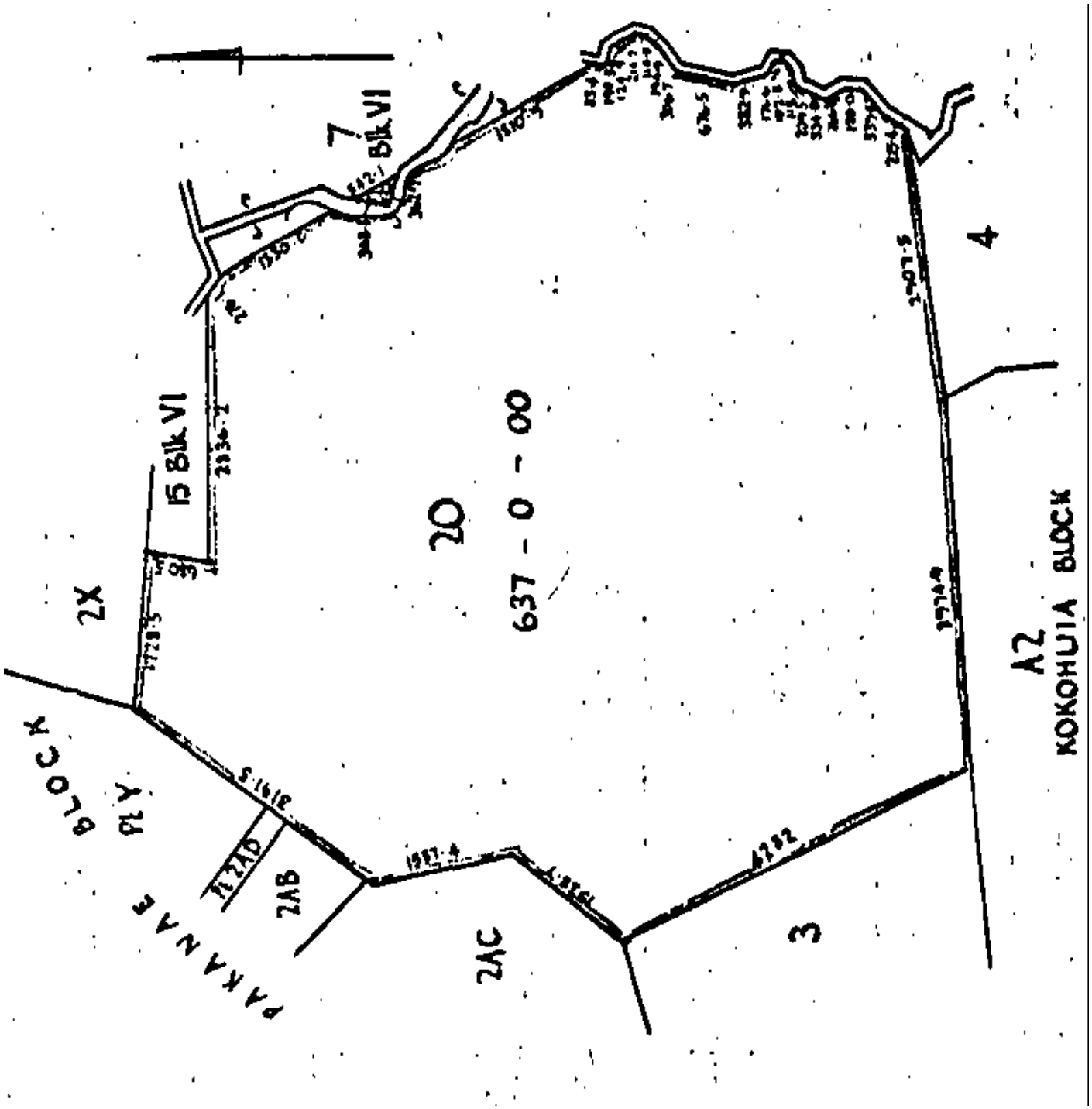
Interests

Subject to Section 59 Land Act 1948

Appurtenant hereto is a right of way created by Transfer 5412693.1 - 25.11.2002 at 9:00 am

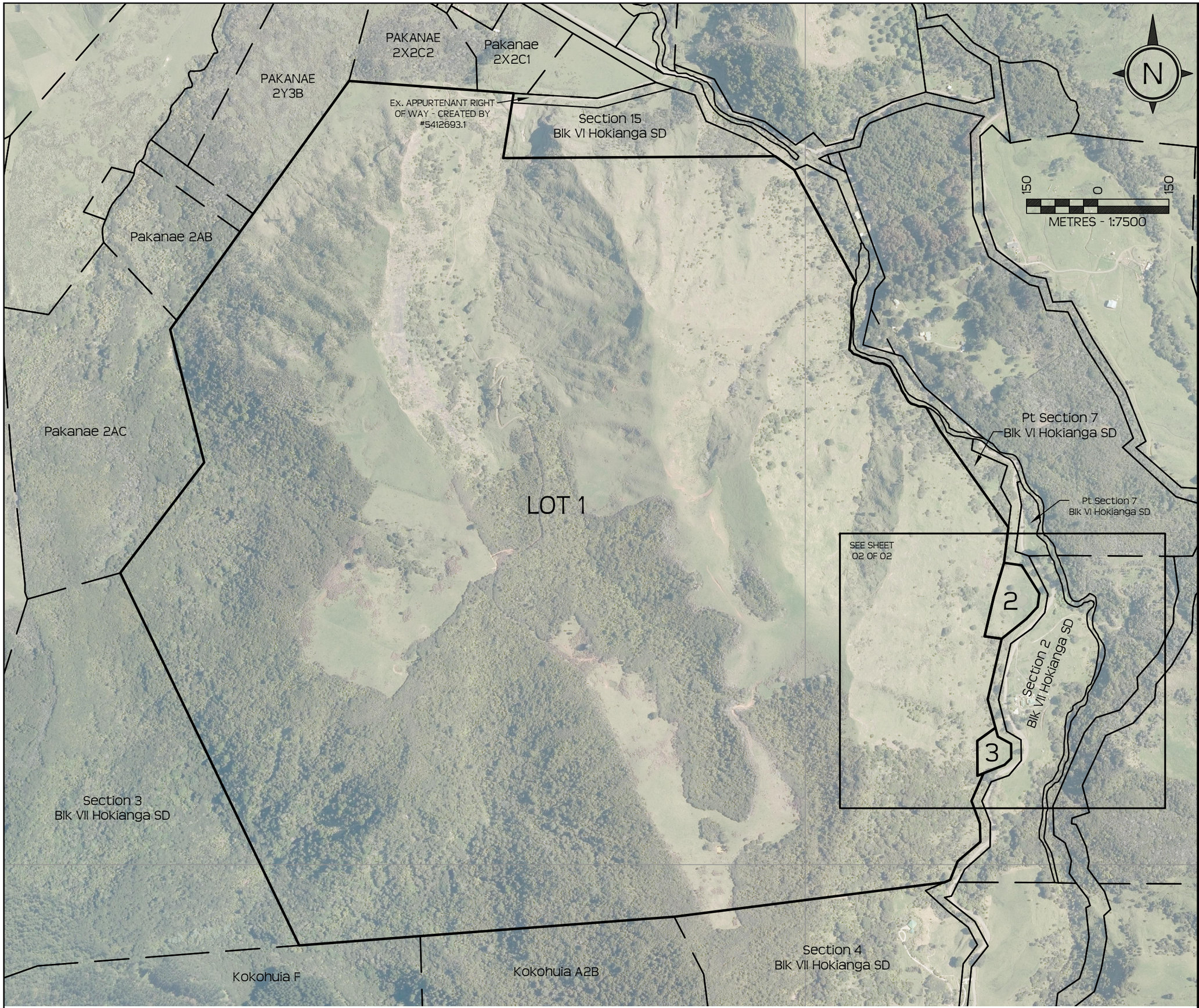
12119664.5 Mortgage to ASB Bank Limited - 2.6.2021 at 2:09 pm

12472524.1 Lease Term From 27.5.2022 to 30.6.2039 Record of Title 1076634 issued - 15.6.2022 at 7:11 am


7 Blk VI
15 Blk VI
20
637 - 0 - 00
2X
2AB
2AC
3
4
A2
KOKOHUIA BLOCK
PARANAE ROAD

APPENDIX 2

SUBDIVISION SCHEME PLAN



CAUTION:

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3. THE VENDOR & PURCHASER MUST CONTACT THE SURVEYOR IF SALE & PURCHASE AGREEMENTS ARE ENTERED INTO USING THIS PLAN.
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9. BOUNDARIES SOURCED FROM QUICKMAP. COORDINATES IN TERMS OF MOUNT EDEN 2000.

PROPOSED PART-CANCELLATION OF CONDITIONAL EASEMENTS

PURSUANT TO SECTION 243 (e) OF THE RMA 1991, THE FAR NORTH DISTRICT COUNCIL IS TO CANCEL THE CONDITIONS AS TO THE CREATION OF:

THE RIGHT OF WAY MARKED 'A' ON DP 126672; OVER SECTION 15 BLK VI HOKIANGA SD (RT: NA86D/947); CREATED BY #5412693.1; IS TO BE CANCELLED AS IT RELATES TO LOTS 2 & 3 HEREON.

REASON: LOTS 1 & 2 HEREON ARE SEVERED FROM THIS RIGHT OF WAY AND WILL GAIN ACCESS ELSEWHERE.

TOTAL AREA: 257.7848 Ha
COMPRISED IN: RT NA1660/40

THIS SITE IS ZONED ' RURAL PRODUCTION ' AND THE BUILDING SETBACKS ARE THUS:

(a) NO BUILDING SHALL BE ERECTED WITHIN 10M OF ANY SITE BOUNDARY; WITH THE FOLLOWING EXCEPTIONS;
(b) NO ACCESSORY BUILDING SHALL BE ERECTED WITHIN 3M OF BOUNDARIES OTHER THAN ROAD BOUNDARIES, ON SITES LESS THAN 5000M2;
(c) NO CROP PROTECTION STRUCTURES SHALL BE LOCATED WITHIN 3M OF BOUNDARIES;
(d) NO BUILDING SHALL BE ERECTED WITHIN 12M OF ANY ROAD BOUNDARY WITH KERIKERI ROAD ON PROPERTIES WITH A ROAD FRONTAGE WITH KERIKERI ROAD BETWEEN ITS INTERSECTION WITH SH10 AND CANNON DRIVE;
(e) NO BUILDING FOR RESIDENTIAL PURPOSES SHALL BE ERECTED CLOSER THAN 100M FROM ANY ZONE BOUNDARY WITH THE MINERALS ZONE;
(f) NO BUILDING SHALL BE ERECTED WITHIN THE BUILDING LINE RESTRICTION AREA AS MARKED IN APPENDIX 6C, LOCATED IMMEDIATELY NORTH OF THE TE WAIMATE HERITAGE PRECINCT. ANY PROPOSED BUILDING TO BE ERECTED WITHIN THIS BUILDING LINE RESTRICTION AREA SHALL BE DEEMED A DISCRETIONARY ACTIVITY AND THE HERITAGE NEW ZEALAND POUHERE TAONGA WILL BE CONSIDERED AN AFFECTED PARTY TO ANY SUCH APPLICATION MADE UNDER THIS RULE.

REV	DATE	DESCRIPTION
C	07.11.23	SIGHT LINES AND MINOR TEXT AMENDMENTS - JM/CC
B	19.10.23	BUILDING PLATFORMS AS PER ENG. REPORT - JBH/CC
A	30.05.23	FIRST ISSUE - JBH/TM

REF. DATA:

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

CLIENT
J & P BILL FAMILY TRUST
WAIOTEMARAMA GORGE ROAD, OMAPERE

TITLE
PROPOSED SUBDIVISION OF SECTION 20 BLK VII HOKIANGA SD

DATE	NOV. 2023	SCALE	1:7500 @A3	
NO.	S17606	SHEET	1/2	Rev. C

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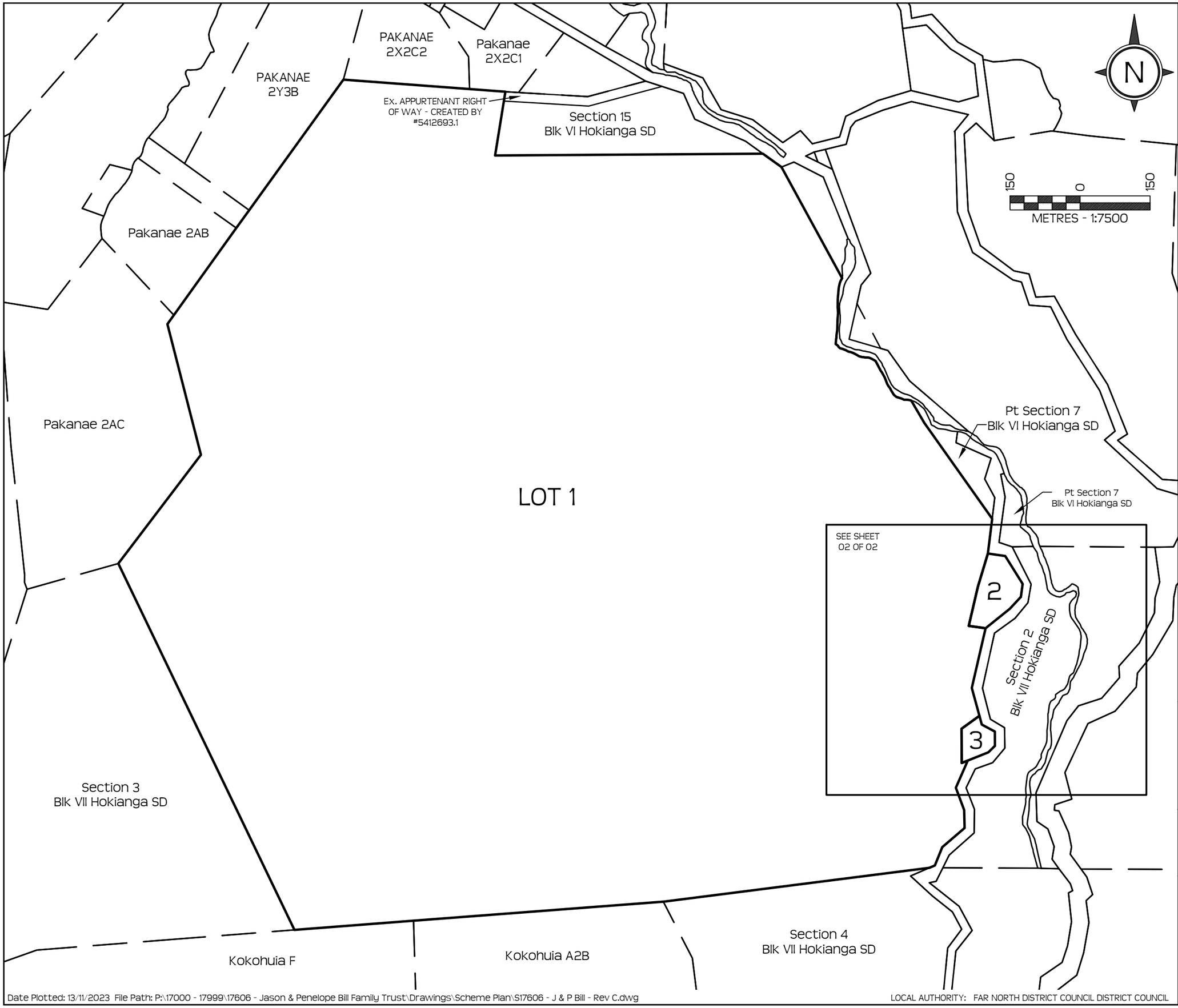
NO.	S17606	SHEET	2/2	Rev. C



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40 0 40
METRES - 1:2000

Pt Section 7
Blk VI Hokianga SD

Pt Section 7
Blk VII Hokianga SD

AWAPOKANUI STREAM

N

37.6
74.8
70.4
LOT 2
1.1300 Ha
POSSIBLE
30 X 30m
BUILDING
ENVELOPE
28.0
PROPOSED
VEHICLE
CROSSING
34.7
SIGHT DISTANCE = 68m *
85.4
66.7
36.2
SIGHT DISTANCE
= 82m *

Section 1
Blk VII Hokianga SD

LOT 1
256.1738 Ha
Section 20 Blk VII Hokianga SD
RT NA1660/40

WAIOTEMARAMA GORGE
METALLED, 20.12m WIDE

131.2

Section 2
Blk VII Hokianga SD

61.8
47.2
19.4
3
0.4810 Ha
POSSIBLE
30 X 30m
BUILDING
ENVELOPE
73.2
PROPOSED
VEHICLE
CROSSING
SIGHT DISTANCE
= 83m *
SIGHT DISTANCE
= 65m *

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DATE	NOV. 2023	SCALE	1:2000 @A3	
NO.	S17606	SHEET	2/2	Rev. C

Date Plotted: 13/11/2023 File Path: P:\17000 - 17999\17606 - Jason & Penelope Bill Family Trust\Drawings\Scheme Plan\S17606 - J & P Bill - Rev C.dwg

LOCAL AUTHORITY: FAR NORTH DISTRICT COUNCIL DISTRICT COUNCIL

APPENDIX 3

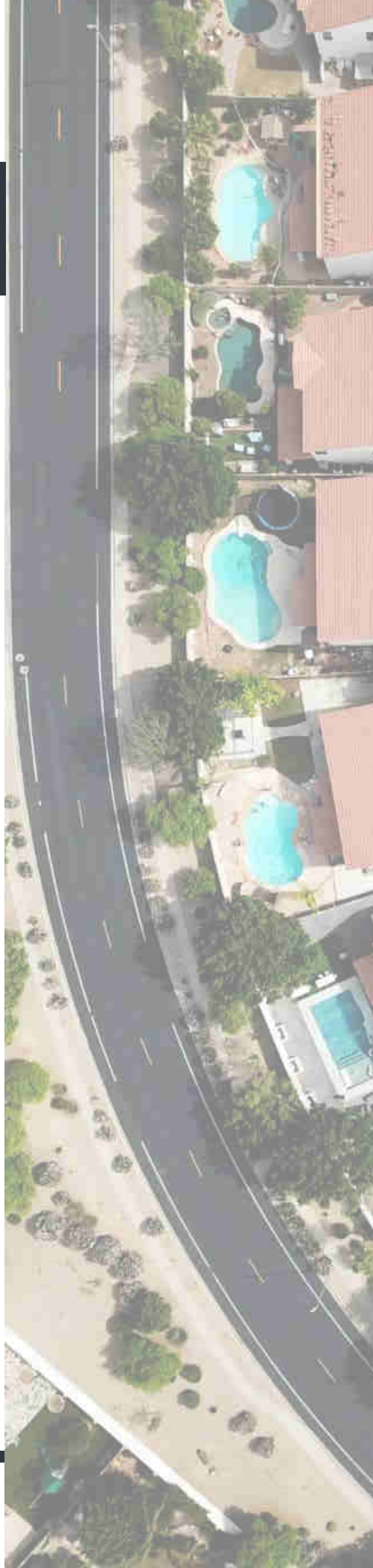
SITE SUITABILITY REPORT [GEOLOGIX CONSULTING ENGINEERS]

geologix
consulting engineers

SITE SUITABILITY ENGINEERING REPORT

LAND OFF WAIOTEMARAMA GORGE ROAD, OMAPERE (SECTION 20 BLK VII HOKIANGA SD)

J & P BILL FAMILY TRUST



C0021-S-02
OCTOBER 2023
REVISION 1

geologix
consulting engineers

DOCUMENT MANAGEMENT

Document Title	Site Suitability Engineering Report
Site Reference	Land off Waiotemarama Gorge Road, Omapere
Client	J & P Bill Family Trust
Geologix Reference	C0021-S-02
Issue Date	October 2023
Revision	01
Prepared	Edward Collings Managing Director, CPEng, CMEngNZ, CEnvP, MPhys (Hons)
Reviewed	Gerard McHardy Civil Engineer, BE (Civil)
Approved	Edward Collings Managing Director, CPEng, CMEngNZ, CEnvP, MPhys (Hons)
File Reference	*C:\Users\GeologixConsultingEn\Documents\Geologix Files\SynologyDrive\Projects\C0000-C0099\Waiotemarama Gorge Road, Opononi - C0021\06 - Reports\C0021-S-02-R01-recovered.docx*

REVISION HISTORY

Date	Issue	Prepared	Reviewed	Approved
October 2023	First Issue	EC	GM	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 J & P Bill Family 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 Resource Consent application in relation to the proposed subdivision of a rural property off Waiotemarama Gorge Road, Omapere, legally described as Section 20 Blk VII Hokianga SD, the 'site'. Specifically, this assessment addresses engineering elements of natural hazards, geotechnical, wastewater and stormwater requirements to provide safe and stable building platforms with less than minor effects on the environment as a result of the proposed activities outlined below.

1.1 Proposal

A proposed scheme plan was presented to Geologix at the time of writing, prepared by Rayburn & Bryant[1] and reproduced as Drawing No. 100 within Appendix A. It is understood the Client proposes to subdivide the site to create two new rural residential lots as outlined in Table 1. 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.

Table 1: Summary of Proposed Scheme

Proposed Lots	Size Range	Purpose
1	256.1738 ha	Balance lot
2 & 3	0.481 – 1.13 ha	New residential

Site access is provided from Waiotemarama Gorge Road along the eastern site boundary. A specific traffic engineering assessment is outside the scope of this report.

2 DESKTOP APPRAISAL

The site is located to the east of Omapere Township, formed over a single, large parent title legally described as Section 20 Block VII Hokianga SD, covering 257.7848 ha. The site is mostly utilised as rural pasture and dense bush with no existing structures.

The two proposed lots subject to the assessment constitute part of the eastern site boundary delineated in shape by Waiotemarama Gorge Road. To the western boundary of the proposed lots, land raises steeply from suitable development platforms. The proposed lots form gently dipping, hummocky pastureland with interspersed water features detailed further by this report and boulders across the surface.

[1] *Reyburn & Bryant Ltd, Scheme Plan, Ref. S17606, dated May 2023.*

In the surrounding local area, similar large rural residential and farming properties occupy the landscape with occasional single dwelling developments.

2.1 Existing Reticulated Networks

Far North District Council (FNDC) GIS mapping[2] indicates that no existing 3 water infrastructure or reticulated networks are present within Waiotemarama Gorge Road at this location or the site boundaries. This report has been prepared with the goal of the subdivision being self-sufficient for the purpose of wastewater, stormwater, and potable water management.

2.2 Geological Setting

Available geological mapping[3] undifferentiated Tangihua Complex geology of the Northland Allochthon Formation parent rock. The Northland Allochthon parent rock is described as mainly basalt pillow lava, with subvolcanic intrusives of basalt, dolerite, and gabbro. Greenschist metamorphism close to intrusives and with extensive zeolitisation. The strata is typical of the steep and hilly land terrain and is delineated on all sides by the Maungataniwha Thrust fault which has lifted the local hilly terrain through seismic activity.

Proposed building envelopes are expected to generally include northland allochthon residual soils which commonly include a relatively thin clayey soil mantle overlying mostly impermeable weathered parent rock resulting in the wetter surface horizon. Typically, these soils are known for poor drainage performance for wastewater disposal evident across the majority of proposed residential sites during our fieldworks.

2.3 Existing Geotechnical Information

Existing subdivision and/ or Building Consent ground investigations were not made available to Geologix at the time of writing. Additionally, a review of available GIS databases, including the New Zealand Geotechnical Database[4] (NZGD) did not indicate borehole records within 500 m of the site. Our ground investigation data has been submitted to the NZGD to increase the accuracy of the database.

3 SURFACE WATER FEATURES AND OVERLAND FLOWPATHS

During our site walkover and desktop appraisal of the supplied topographic data, Geologix have developed an understanding of the surface water features and overland flow paths influencing the site. The developed understanding summarised in the following sections is shown schematically on Drawing No. 100 with associated off-set requirements.

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[2] Source: FNDC Water Services GIS, https://fndc.maps.arcgis.com/apps/webappviewer/index.html?id=9b351ce681e34ec29443ae1a6468cc2c
[3] Geological & Nuclear Science, 1:250,000 scale Geological Map, Sheet 2, Whangarei, 2009.
[4] https://www.nzgd.org.nz/

3.1 Surface Water Features

Surface water features are detailed below. The CMA is not identified within 500 m of the property.

3.2 Springs.

The local geology to the site is a complex metamorphosed unit and it is generally expected that most of the steep erosion gullies and overland flow paths source from springs within or close to the site boundaries.

3.3 Ponds

The walkover survey identified a pond within the proposed new lot boundaries which has an influence upon this wastewater disposal assessment. The pond was recorded within Site 1, proposed lot 2 and site 6, proposed lot 4. Understood to have been formed for agricultural purposes.

3.4 Rivers and Streams

In general, Waiotemarama Gorge Road follows a small valley containing the Pakanae Stream. Adjacent to the site the stream is contained within a steep sided erosion gully. The stream is attributed from the east and west by many small streams from the surrounding hills and flows to the north where it discharges to the Awapokanui Stream in the lower reaches of Waiotemarama Gorge Road.

3.5 Overland Flow Paths

From the available LiDAR survey, clearly defined overland flow paths are present within the site boundaries. Many overland flow paths are present across the six sites with most of the proposed lots formed upon flatter areas, spur ridgelines and higher ground delineated by surrounding overland flow paths. Overland flow paths recorded during the walkover survey are indicated in detail on the site suitability drawings within Appendix A and mitigated against, where applicable in our concept designs.

3.6 Sensitive Receptors

No evidence of sensitive receptors such as wetlands were recorded during our site walkover survey. However, this may require confirmation by a suitably qualified expert. The site is not located within 500 m of the CMA.

4 SITE WALKOVER SURVEY

A visual walkover survey of lot 2 and 3 confirmed:

- Topography is in general accordance with that outlined in Section 2 and the available LiDAR dataset.

- The site is defined to the east by Waiotemarama Gorge Road and bound in all other directions by similar pasture and bush.
- Both lots were vegetated with short grass at the time of the investigation.
- Lot 2 contains a pond, located in the centre eastern part of the site. Lot 2 also has surface water ponding in some areas of the lot.
- There are some boulders present on the grounds surface of lot 2, to the east of the pond area.
- No existing structures area present across the site, including retaining walls.

5 GROUND INVESTIGATION

A site-specific walkover survey and intrusive ground investigation was undertaken by Geologix on 4 July 2023. The ground investigation was scoped to confirm the findings of the above information and to provide parameters for wastewater and geotechnical assessment. The ground investigation comprised:

- Six hand augured boreholes designated HA01 and HA06, formed within suitable areas of wastewater disposal fields and suitable building sites across proposed lots 2 and 3 with a target depth of 3.0 m below ground level (bgl). However, at hand augers HA01, HA03 and HA04 refusals were encountered upon dense strata at 1.4 m to 2.1 m bgl.
- HA04 was extended with scala penetrometer probing techniques to confirm the presence of dense material, proving more than 20 blows/ 100 mm at 4.0 m bgl were the scala penetrometer was terminated.
- Monitoring of groundwater levels with a groundwater dip meter on the day of drilling.

Arisings recovered from the exploratory boreholes were logged by a suitably qualified geotechnical engineering professional in general 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 within Appendix A.

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

- **Topsoil to depths of 0.1 - 0.3 m bgl.** The overlying topsoil was described as a grassed topsoil comprising organic silt, dark brownish black and moist with low plasticity, with some areas containing trace gravel.
- **Northland Allochthon Residual Soil to depths >2.5 to >4.0 m bgl.** Under the topsoil layer, Northland Allochthon residual soils were present which comprised a mixed stratum of clayey silt, sandy silt and silt with varying amounts of gravel. The strata was mostly

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

detailed as brown, brown mottled orange and dark brown, low to high plasticity and moist to wet. The residual soil became locally saturated below groundwater at HA06.

Forty-eight field vane tests within the Northland Allochthon residual soil recorded vane shear strengths ranging from 120 kPa to >198 kPa and Unable to Penetrate, or very stiff soil. This transpose to a characteristic unit vane shear strength of 183 kPa.

DCP testing was undertaken at HA04 at the termination of the hand augur to confirm dense strata at depth. DCP testing confirmed blow counts between 4 – 7 blows per 100mm through the Northland Allochthon residual soils, indicating a medium dense stratum to 3.3 m bgl. Below this, the DCP blow counts then increased to between 9 and 12 blows per 100mm to 3.9 m bgl, indicating a dense stratum. The DCP was terminated at 4.0 m bgl when blow counts of 20 blows/ 100 mm was confirmed.

The refusal of hand augering and DCP blow counts of >4 per 100 mm has been taken as a hard residual soil. Refusal of DCP probing with >20 blows pet 100 mm penetration has been accepted as a completely weathered parent rock material.

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

Table 2: Summary of Ground Investigation

Hole ID	Lot	Hole Depth	Topsoil Depth	Fill Depth	Groundwater[2]	Depth to Hard Residual Soil	Depth to CW Parent Rock	Wastewater Category[4]
HA01	3	3.0 m	0.10 m	NE	2.0 m	3.0 m	>3.0 m	6 – slow draining
HA02	3	3.0 m	0.30 m	NE	0.3 m	2.7 m	>3.0 m	6 – slow draining
HA03	3	2.1 m	0.25 m	NE	0.4 m	1.8 m	>2.1 m	6 – slow draining
HA04	2	4.0 m	0.25 m	NE	NE	1.4 m	3.9 m	6 – slow draining
HA05	2	3.0 m	0.25 m	NE	2.5 m	3.0 m	>3.0 m	6 – slow draining
HA06	2	2.5 m	0.10 m	NE	0.8 m	2.4 m	>2.5 m	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[6].
5. NA – Not Applicable

6 GEOTECHNICAL ASSESSMENT

Geotechnical design parameters are presented in Table 3 below. They have been developed based on our ground investigation, the results of in-situ testing and experience with similar materials.

[6] *Auckland Council, Technical Publication 58, On-site Wastewater Systems: Design and Management Manual, 2004.*

Table 3: Geotechnical Effective Stress Parameters

Geological Unit	Unit Weight, kN/m^3	Effective Friction Angle, °	Effective Cohesion, kPa	Undrained Shear Strength, kPa
Northland Allochthon Residual Soil	18	28	5	110*
Northland Allochthon Hard Residual Soil	18	34	5	120*

** Adopting Bjerrum correction factor of 0.6 from the characteristic vane shear strength.*

6.1 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 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 4 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 4: Summary of Seismic Hazard Parameters

Limit State	Effective Magnitude	Return Period (years)	Unweighted PGA	Horizontal Coefficient[1], K_h
ULS	6.5	500	0.19 g	0.1273 g
SLS	5.8	25	0.03 g	

K_h = PGA × 0.67 for slope stability analysis to represent pseudo static conditions.

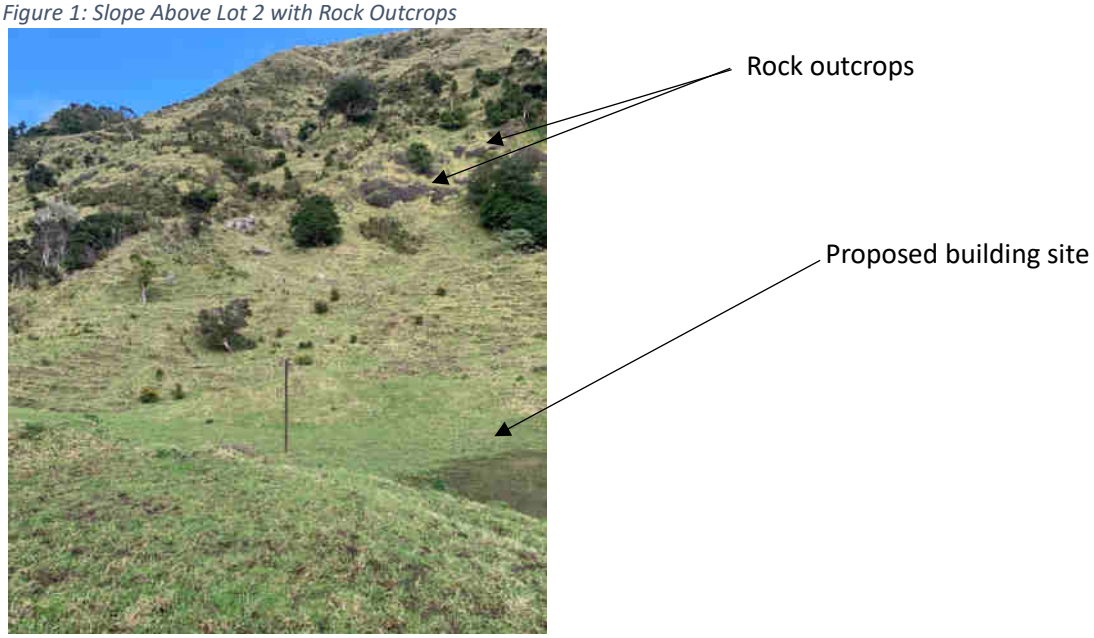
6.2 Site Stability

At the time of writing, no obvious indications of major deep-seated instability were identified over the proposed lots and the risk of such deep-seated instability developing as a result of the development proposal is low. However, larger deep seated movement is evident on the wider site, in particular upon steep gullies to the west of the site, beyond the ridgeline. In

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

particular within Section A it is evident that much of the soil slope has evacuated leaving a thin veneer of soil over exposed weak rock.

Figure 1: Slope Above Lot 2 with Rock Outcrops



Within the scope of this ground investigation Geologix have undertaken computer modelled slope stability analysis through two critical sections axis of the site topography through the proposed house locations listed below.

- **Section A** aligned through the proposed lot 2 house site and adjacent steep slope.
- **Section B** aligned through the proposed lot 3 house site and adjacent steep slope.

The slope was analysed within propriety software Slide 2 Version 9.02, developed by RocScience Inc. The purpose of the stability assessment was to:

- Ensure the proposed 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 concept development engineering solution with any specific geotechnical stability requirements or building restriction lines.

The stability analysis process was undertaken by calibrating the model to observed conditions, refining the ground investigation data to develop the effective stress parameters presented in Table 3 and applying them to the proposed condition.

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 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.

6.2.1 Stability Analysis Results

Slope stability analysis results are presented in full as **Error! Reference source not found.** and summarised below as Table 5.

Table 5: Summary of Stability Analysis Results

Profile	Scenario	Global Min FS	Development Footprint (min FS)	Result within Development Footprint
Section A				
Existing	Static[1]	1.117	>1.5	Pass with provision of geotechnical measures identified by this report installed subject to specific engineering design at the building consent stage.
	Elevated GW[2]	0.978	>1.3	
	Seismic[3]	0.939	>1.0	
Proposed	Static	1.116	>1.5	
	Elevated GW	0.977	>1.3	
	Seismic	0.939	>1.0	
Section B				
Existing	Static[1]	1.12	<1.5	Pass
	Elevated GW[2]	0.965	<1.3	Fail
	Seismic[3]	0.808	<1.0	Fail
Proposed (with support)	Static	1.12	>1.5	Pass
	Elevated GW	0.965	>1.3	
	Seismic	0.808	>1.0	

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

6.2.2 Stability Analysis Conclusions

The developed slope stability model is considered to be a reasonable representation of the observed conditions on site.

[8] *Auckland Council, Code of Practice for Land Development and Subdivision, Section 2 Earthworks and Geotechnical Requirements, Version 1.6, September 2013.*

Proposed Lot 2

Failure planes were observed through the lower portion of the slope where residual soils are expected to overlay competent parent rock. From our observations of the very steep slope above the house site includes a thin veneer of soil over shallow weathered parent rock which outcrops regularly over the entire slope profile.

As such, it is recommended that the building site is amended within proposed lot 2, as outlined by Section 6.2.3, below and indicated schematically on Drawing No. 100 within Appendix A. In addition, the building site should be protected from inundation of debris should as dislodged boulders and the thin soil veneer by a specifically engineered debris fence at the building consent stage once the final building location is confirmed.

Proposed Lot 3

Slope stability modelling indicates that shallow residual soils are prone to instability as translational movement with a slip base occurring at the interface of soil and rock. In general, instability is expected above the proposed building site with potential failure planes extending into the platform. Suitable protection measures to mitigate the instability hazard are outlined in Section 6.2.4 below.

6.2.3 Stability Control, Proposed Lot 2

The slope stability analysis indicates that the proposed development within lot 2 will require protection to negate a Section 72 notice under the Building Act 2004 for potential natural hazards comprising slippage and inundation of debris from above, entering the building site.

At this stage, and in lieu of any specific development plans for the sites the most efficient method of managing instability is a repositioning of the proposed building site to shallower ground outside of potential failure planes up to those required for residential development.

The above will require the proposed building site to be positioned over the existing pond and as such, improvements to the ground over this area will be required to achieve a suitable building platform. These, however, could be undertaken by a future developer, once specific development plans have been prepared and no specific requirement is placed upon the Client to initiate these measures at this time.

In addition, it is recommended that, indicated upon Drawing No. 100 is applied to the title as an area which is not suitable for residential development unless specific, detailed geotechnical investigation and stability modelling is undertaken at the Building Consent stage and an appropriate design is submitted with the Consent.

To prepare the man-made pond area for future residential development, the following will be required:

- **Draining of the pond.** The most efficient means of undertaking this would be to excavate a small outlet and drain small elevations at once, up to 200 mm maximum.

- **Sub-excavation of unsuitable materials.** Underlying softened materials and organic deposits, <75 kPa S_u should be undercut to waste or utilised as landscape fill within future developments. A professional geotechnical engineer should inspect the sub-grade material at the maximum undercut depth.
- **Replacement with engineered fill.** Upon completion of the above, it is recommended that either compacted hard fill or certified earth fill is placed within the pond depression and brought up to finished ground levels under supervision of a professional geotechnical engineer. Alternatively the sub-excavated depression could be left without filling, such as for a pole house undercroft, provided stormwater flows are adequately managed so that water cannot pool in this area. This may require complete removal of the downslope pond bank.
- **Installation of a debris fence.** Above the final building location it is recommended that a specifically engineered debris fence is installed to mitigate the effect of dislodged boulders which were observed around the building platform and/ or the thin veneer of soil over the steep slope from inundating the building site. This can be provisioned as a condition of consent for future development.

6.2.4 Stability Control, Proposed Lot 3

The slope stability analysis indicates that the proposed development within lot 3 will require protection to negate a Section 72 notice under the Building Act 2004 for potential natural hazards comprising slippage from above, entering the building site.

It is recommended that soldier piles subject to specific engineering design at the Building Consent stage are installed above the proposed dwelling.

Soldier piles to resist slope instability should be designed according to the following minimum geotechnical design criteria within Table 6. However, these should be taken as absolute minimums and the elements may have an additional requirement based on the retaining wall models developed in specific engineering design. The location of proposed soldier pile walls are provided on Drawing No. 102.

It is also important to note the values below do not represent vertical member flexural strengths and provide the minimum stabilising shear force to mitigate the landslide hazard.

Amendments to the concept development plans may require an amendment to these parameters. It is recommended that these are reviewed once development concepts are finalised.

Table 6: Summary of Minimum Retaining Wall Design Parameters

Wall	Minimum Embedment	Minimum Stabilising Shear Force[1]
Soldier Pile Wall (Section B, Lot 3)	4 m with toe embedment into hard residual soils	118 kN/m

1. Stabilising shear forces, not structural section shear capacity.

6.3 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 with Northland Allochthon residual soil, laboratory analysis within the strata on other projects in the local area and site observations, the shallow soils are conservatively expected to meet the requirements of a highly expansive or Class H soil type. In accordance with AS2870:2011[9] and New Zealand Building Code[10], 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.

6.4 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 and non-dilative Northland Allochthon residual 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.

[9] AS2870, Residential Slabs and Footings, 2011.
[10] New Zealand Building Code, Structure B1/AS1 (Amendment 20, November 2021), Clause 7.5.13.1.2.

6.5 Conceptual Foundations

It is considered that a timber pole foundation is suitable for the proposed lots 2 and 3 for the new dwellings adopting bored and cast-in-place piles provided the stability control measures are installed as recommended by this report. This recommendation is considered suitable provided the above geotechnical stability control measures are designed by a suitably qualified professional and monitored during construction.

All piles should be taken down through Northland Allochthon residual soils to terminate at a minimum of 3x pile diameters, (3B) into the completely weathered Northland Allochthon parent rock. It is recommended that the foundation solution is subject to specific engineering design by a professional structural engineer, adopting the parameters outlined in Table 7 for deep end-bearing piles and ignoring skin friction within the residual Northland Allochthon soil strata.

Table 7: Deep Piled Foundation Geotechnical Parameters

Strata	Geotechnical Design Parameters	
Completely Weathered Northland Allochthon Parent Rock	Ultimate end-bearing capacity[1]	990 kPa
	ULS design end-bearing capacity[2]	495 kPa
	SLS design end-bearing capacity	330 kPa
	Ultimate skin friction[1,3]	54 kPa
	ULS design skin friction[2]	27 kPa
	SLS design skin friction	18 kPa

1. *Based on S_u = 110 kPa from available data.*
2. *Adopting a geotechnical strength reduction factor of 0.5.*
3. *Adopting S_u * α.* With α determined from Figure 5 of NZBC B1/ VM4.
4. *α = 0.5 for undrained shear strength of 109 kPa.*

If groundwater is encountered within the pile holes, tremie concrete pour methodology will most likely be required to displace groundwater and an allowance should be made for this by the Contractor.

6.6 Conceptual Earthworks and Methodology

It is recommended that all proposed excavations and fills at the site are retained by specifically engineered retaining walls subject to design at the building consent stage. Any permanent earthworks and batter slopes shall be subject to specific engineering assessment at Building Consent stage.

6.6.1 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.

Temporary excavations should not be left unsupported for any length of time. Poles must be installed and backfilled against the excavated face immediately to ensure the slopes are not left unsupported.

Any retaining walls which require toe cuts to the very steep slope shall be constructed with a top-down construction methodology subject to specific engineering assessment at the building consent stage.

Temporary batters should be covered with polythene sheets secured to the surface with pins or batons to prevent saturation. 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 conducted in periods of fine weather within the typical October to April earthwork season. Consent conditions commonly prescribe working restrictions.

6.6.2 Fills

It is recommended that suitable selected GAP hard fill or certified earth filling is adopted at the site with fill batter slopes not exceeding 1V:3H or 18 °.

It is recommended that proposed fills are subject to a specific engineering specification including compaction standards and construction monitoring at regular lift intervals (maximum 0.5 m).

It is recommended that at the Building Consent stage the pond within proposed lot 2 is drained, unsuitable materials sub-excavated and replaced with compacted GAP hard fill subject to engineering monitoring during construction.

In addition, any unsuitable and/ or deleterious materials such as organic pockets, non-engineered fill, relic foundations and/ or concrete hard standing and locally weaker spots ($<S_u$ 75 kPa) shall be cut to waste and not adopted for filling.

7 WASTEWATER ASSESSMENT

The scope of this wastewater assessment comprises a ground investigation and concept design of a suitable system to cater for 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.

7.1 Existing Wastewater Systems

No existing on-site wastewater systems were observed during our walkover survey and are not expected within the proposed lot boundaries. It is prudent to note this assessment only

includes a small strip of the balance lot adjacent to the proposed subdivision which could potentially include a wastewater system.

7.2 Concept Future Development and Wastewater Generation Volume

The concept rural residential developments within this report assume that the proposed new lot may comprise up to a five-bedroom dwelling with a peak occupancy of eight people[11]. This considers the uncertainty of potential future Building Consent design. The number of usable bedrooms within a residential dwelling must consider that proposed offices, studies, gyms, or other similar spaces may be considered a potential bedroom by the Consent Authority.

In lieu of potable water infrastructure servicing the site, roof rainwater collection within on-lot tanks has been assumed for this assessment. The design water volume for roof water tank supply is estimated at 160 litres/ person/ day[12]. This assumes standard water saving fixtures[13] being installed within the proposed future developments. This should be reviewed for each proposed lot at the Building Consent stage within a development specific wastewater design by a suitably qualified professional.

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

7.3 Treatment Standard and 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 according to final development plans. No specific treatment system design restrictions and manufacturers are currently in place. Future developers will be required to elect a treatment system and provide system specifications at Building Consent.

It is recommended that to meet suitable minimum treated effluent output quality, secondary treatment systems are accounted for within future developments. Secondary treatment has been elected to provide compliance as a permitted activity of the proposed Northland Regional Plan considering the site topography.

In Building Consent design, considering final disposal field topography and proximity to controlling site features, a higher treated effluent output standard such as UV disinfection to tertiary quality may be required.

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[11] *TP58 Table 6.1.*

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

[13] *Low water consumption dishwashers and no garbage grinders.*

7.4 Soil Loading Rate

Based on the results of the ground investigation, conservatively 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 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 enact 3 mm/ day over 2 mm/ day SLR.

7.5 Concept Land Disposal System

To provide even distribution, evapotranspiration assistance and to minimise effluent runoff it is recommended that suitably 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, covered with minimum 150 mm mulch and planted with specific evapotranspiration species to provide a minimum of 80 % species canopy cover. Alternatively, lines could be subsurface laid to topsoil with minimum 200 mm thickness and planted with lawn grass. Clean, inert site-won topsoil sourced during development from building and/ or driveways footprints may be used in the land disposal system to increase minimum thicknesses.

Specific requirements of a concept land disposal system to be confirmed during Building Consent include the following.

Table 8: Disposal Field Design Criteria

Design Criteria	Site Conditions and Compliance
Topography at the disposal areas shall not exceed 25 °. Exceedances will require a Discharge Consent.	Concept design complies, refer Drawing Nos. 101 and 102.
On shallower slopes >10 ° compliance with Northland Regional Plan (NRP) rule C.6.1.3(6) is required.	Concept design complies, proposed wastewater disposal fields are proposed on land > 10 ° and include cut-off drains.
On all terrain irrigation lines should be laid along contours.	Concept design complies, refer Drawing No. 101 and 102.
Disposal system situated no closer than 600 mm (vertically) from the winter groundwater table for secondary treated effluent.	Concept design complies, final design may require a slight raising of the disposal fields to achieve offset.
Separation from surface water features such as stormwater flow paths (including road and kerb	Concept design complies. Wastewater disposal fields can be designed to

channels), rivers, lakes, ponds, dams, and natural wetlands according to Table 9, Appendix B of the NRP.	accommodate setbacks from on-site and adjacent surface water features.

7.5.1 Concept Disposal Field Sizing

The sizing of wastewater system disposal areas is a function of the design peak flow volumes, the SLR and topographic relief. For each proposed lot a concept primary and reserve disposal field is required as follows, to be refined at the Building Consent stage. The recommendations below are presented on Drawing No. 100.

- **Concept Primary Disposal Field.** A minimum PCDI primary disposal field of 427 m^2 laid parallel to the natural contours.
- **Concept Reserve Disposal Field.** A minimum reserve disposal field equivalent to 30 % of the primary disposal field is required under NRP rule C.6.1.3(9)(b) for secondary or tertiary treatment systems. The concept design has been increased to 50 % to accommodate note 3 of TP58 Table 9.2. It is recommended each proposed lot provides a 214 m^2 reserve disposal area to be laid
- parallel to the natural contours.

Concept disposal field locations require the provision of surface water cut-off drains to meet the provisions of NRP rule C.6.1.3.

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 not been identified within the site boundaries and as such the site can provide freeboard above the 1 % AEP flood height to comply with this rule.

7.6 Summary of Concept Wastewater Design

Based on the above concept design assumptions a summary of the concept wastewater design is presented as Table 9 and presented schematically upon Drawing No. 100 within Appendix A. It is recommended that each lot is subject to Building Consent specific review and design amendment according to final development plans by a suitably qualified professional.

The concept design has been prepared with no Discharge Consent requirement. These requirements should be reviewed at the Building Consent stage and may be subject to an alternative solution.

Table 9: Concept Wastewater Design Summary

Design Element	Specification
Concept development	Five-bedroom, peak occupancy of 8 (per lot)
Concept Design generation volume	160 litres/ person/ day – 1,280 litres/ day/ lot
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 mm/ day
Concept primary disposal field size	Surface/ subsurface laid PCDI, min. 427 m^2
Concept reserve disposal field size	Surface/ subsurface laid PCDI, min. 50 %, or 214 m^2
Concept Disposal Field Level	Sited above 5 % AEP event. Raising to achieve 600 mm offset to groundwater.
Dosing Method	Pump with high water level visual and audible alarm. Minimum 24-hour emergency storage volume.
Concept Stormwater Control	Divert surface/ stormwater drains away from disposal fields. Contour drains not required. Stormwater management discharges downslope of all disposal fields.

1. Unless further water saving measures are included.

7.7 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 features are likely to be included within a designated 30 x 30 m square building site area as required by FNDC District Plan Rule 13.7.2.2.

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 application. Based on the proposed scheme plan, 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.

8 STORMWATER ASSESSMENT

Increased storm water runoff occurs as pervious surfaces such as pasture are converted to impervious features such as future roof, driveway and/ or internal Right of Ways.

8.1 Regulatory Requirements

Stormwater management for the proposed activity is controlled by the FNDC Operative District Plan[14] and NRC Proposed Regional Plan[15]. The requirement for subdivision and probable future development under these legislations is summarised below.

8.1.1 Regional Provisions

The Proposed Regional Plan states the diversion and discharge of stormwater into water or onto or into land where it may enter water from an impervious area or by way of a stormwater collection system, is a permitted activity, provided the criteria of Rule C.6.4.2(1) to (8) are met. The proposed activity is considered to meet the requirements of a Permitted Activity. Assessment of the consent status is summarised in Section 8.7.2 and in full within Appendix C.

8.1.2 District Wide Provisions

Subdivision activity and provisions for probable future development within both urban and rural environments is controlled by District Plan Rule 13.7.3.4.

8.1.3 Environmental Zone Provisions

Permitted activity status within the rural production zone is determined by Rule 8.6.5.1.3 which is presented below.

> *The maximum proportion of the gross site area covered by buildings and other impermeable surfaces shall be 15 %.*

8.2 Impervious Surfaces and Activity Status

The proposed activity has been assessed as a Permitted Activity in accordance with rules outlined by Sections 8.1.1 to 8.1.3. A summary of this is provided as Table 10 below which have been developed from our observations and AutoCAD drawings in lieu of specific survey. For the proposed lot, this has been taken as conceptual, maximum probable development of typical rural residential scenarios. Refer Section 8.3.

Table 10: Summary of Impervious Surfaces

Surface	Proposed Lot 1		Proposed Lot 2		Proposed Lot 3	
Existing Condition	**NA**				**(2,577,848 m²)**	
Roof					0 m²	0 %
Driveway					0 m²	0 %
Right of Way					0 m²	0 %
Total impervious					0 m²	0 %
Proposed Condition	**(11,300 m²)**		**(4,810 m²)**		**(2,561,738 m²)**	
Roof (Concept)	300 m²	2.65 %	300 m²	6.24 %	0 m²	0 %

[14] *https://www.fndc.govt.nz/Your-Council/District-Plan/Operative-plan*
[15] *Proposed Regional Plan for Northland July 2021 – Appeals Version*

Driveway (Concept)	200 m^2	1.77 %	200 m^2	4.16 %	0 m^2	0 %
Right of Way	0 m^2	0 %	0 m^2	0 %	0 m^2	0 %
Total	500 m^2	4.42 %	500 m^2	10.4 %	0 m^2	0 %
Activity Status	Permitted		Permitted		Permitted	

8.3 Stormwater Management Concept

Based on the assessment within Table 10, the proposed development meets the provisions of a Permitted Activity. 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 (Lots 1 and 2).** The proposed application includes subdivision formation only and not lot specific residential development at this stage. As such 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 m^2 potential roof area and up to 200 m^2 potential driveway or parking areas. No RoW areas are expected to be accounted for within the application.

  To comply with the NRC Proposed Regional Plan Rule C6.4.2(2) and FNDC Engineering Standards Table 4-1 for a site with no immediate flood control, it is recommended future impermeable surfaces are attenuated to 80 % of the pre-development peak run-off condition for the design storm event which has been designated as the 50 and 20 % Annual Exceedance Probability (AEP) scenarios. Control to the 10 % AEP event is considered less conservative than the above.

- **Subdivision Development.** No additional impervious surfaces are expected to form the subdivision outside of new vehicle crossings. Increased runoff from subdivision development is not expected and additional attenuation is not proposed to avoid an adverse environmental effect.

8.4 Design Storm Event

This assessment has been modelled to provide stormwater attenuation up to and including 80 % of the pre development condition for the 50 and 20 % AEP storm events 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 predevelopment model to comply with NRP Rule C6.4.2(2). Attenuation modelling under this scenario avoids exacerbating downstream flooding.

Correctly sized discharge devices have adopted the 1 % AEP event to reduce scour and erosion at discharge locations which may otherwise result in concentrated discharge.

Relevant design rainfall intensity and depths have been ascertained for the site location from the NIWA HIRDS meteorological model[16]. NIWA provides guidelines for modelling the effects of potential climate change effects of rainfall intensity increase by applying a potential change factor to historical data. This report has adopted potential change factors to account for a 2.1°c climate change increase scenario. NIWA HIRDS and climate change factor data is presented in full within Appendix D.

8.5 Concept Attenuation Model

As detailed above, it is recommended that future residential developments provide on-lot stormwater attenuation for all impervious surface areas to the pre-development peak runoff condition. This is achievable by installing specifically sized low-flow orifices into the roof runoff attenuation tank. A typical schematic retention/ detention tank arrangement detail is presented as Drawing No. 401 within Appendix A.

The concept design presented in this report should be subject to verification and an updated design at Building Consent stage once final development plans are available. This is typically applied as a notice to the applicable titles.

The rational method has been adopted by Geologix with run-off coefficients as published by Auckland Council TP108[17] and FNDC Working Draft Engineering Standards[18] to provide a suitable attenuation design to limit post development peak flows to pre-development conditions.

Calculations to support the concept design are presented as Appendix D to this report. A summary of the concept stormwater attenuation design is presented as Table 11.

Table 11: Probable Future Development Attenuation Concept

Design Parameter	50 % AEP	20 % AEP	10 % AEP	1 % AEP
Proposed Lots 2 & 3				
Regulatory Compliance	FNDC Engineering Standards		NRC Proposed Regional Plan	NA – Not considered for this application
Pre-development peak flow	63.09 l/s	82.46 l/s	96.68 l/s	
80 % pre-development peak flow	50.47 l/s	’65.97 l/s	NA	
Post-development peak flow	65.42 l/s	85.51 l/s	100.25 l/s	
Total Storage Volume Required	14,301 litres	18,692 litres	10,314 l/s	
Concept	Adopt attenuation to 80 % of pre-development condition for 20 % AEP storm as critical condition. Assuming 1x 25,000 litre tank, install 44 mm orifice 1.94 m below overflow.			

[16] *NIWA High Intensity Rainfall Data System, https://hirds.niwa.co.nz.*
[17] *Auckland Regional Council Technical Publication 108, Guidelines for stormwater runoff modelling in the Auckland Region, April 1999.*
[18] *FNDC Working Draft Engineering Standards 2021, Issue 0.3 – May 2021.*

8.5.1 On-Lot Discharge

The direct discharge of water tank overflow in a concentrated manner can cause scour and erosion in addition to excessive saturation of shallow soils. It is recommended that overflow from future rainwater detention tanks is conveyed in sealed pipes to a designated discharge point downslope of proposed building footprints and wastewater disposal fields. A concept design accommodating this is presented within Appendix A on Drawing No. 100.

It is recommended that conceptually sized dispersion devices are subject to specific assessment at the Building Consent stage once final development plans are available. 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 1 % AEP storm event peak flows from the attenuation tank and including minimum 100 mm dia. PVC piping.

Concept sizing of future dispersion pipe or trench is presented as Table 12. Calculations to derive this are presented within Appendix D, based on the NIWA HIRDS Depth-Duration data. Typical details of these options are presented within Appendix A as Drawing No. 402.

Table 12: Summary of Concept Dispersion Devices

Concept Impervious Area to Tank	Dispersion Pipe/ Trench Length	Concept
Proposed Lot 2 & 3		
500 m^2	4.2 m	Above ground dispersion device or in-ground dispersion trench.

8.6 Stormwater Quality

The proposed application is for a rural residential subdivision. 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 according to Auckland Council GD01) within the base of the stormwater attenuation pond and 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 point.

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.

8.7 Assessment Criteria and Consent Status

8.7.1 District Plan

The proposed activity has been assessed as a **Restricted Discretionary Activity** according to District Plan Chapter 13.11.

8.7.2 Regional Plan

The proposed activity is determined to meet the requirements of a **Permitted Activity** according to the provisions of Proposed Regional Plan Rule C.6.4.2. Assessment criteria are presented in full within Appendix C.

9 POTABLE WATER & FIRE FIGHTING

In the absence of reticulated potable water infrastructure 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 the concept design and refined during Building Consent. A second tank may be required for sufficient potable water volumes and is commonly adopted in rural residential development.

The absence of potable water infrastructure and fire hydrants requires provision of the on-lot roof water supply tanks to be used for firefighting purposes. Specific analysis and calculation 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 at the Building Consent stage.

10 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[19], Northland Regional Council (NRC) Proposed Regional Plan for Northland[20] and Regional Water and Soil Plan for Northland. Following our ground investigation, the Geologix GIR and considering the measures presented in this report, a summary of the proposed activities against defined natural hazards is presented as Table 13.

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[19] *Operative District Plan Rule 13.7.3.2.*
[20] *Proposed Regional Plan for Northland, Appeals Version, July 2021, Chapter D.6.*

Table 13: Summary of Natural Hazards

Natural Hazard	Applicability	Mitigation & Effect on Environment
Erosion	NA	No mitigation required, less than minor.
Overland flow paths, flooding, inundation	NA	No mitigation required, less than minor, proposed building envelopes are well above the flood hazard potential.
Landslip	NA	Less than minor provided measures identified by this report are adopted.
Rockfall	NA	Less than minor provided measures identified by this report are adopted, i.e. debris fence within proposed lot 2.
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.

11 LIMITATIONS

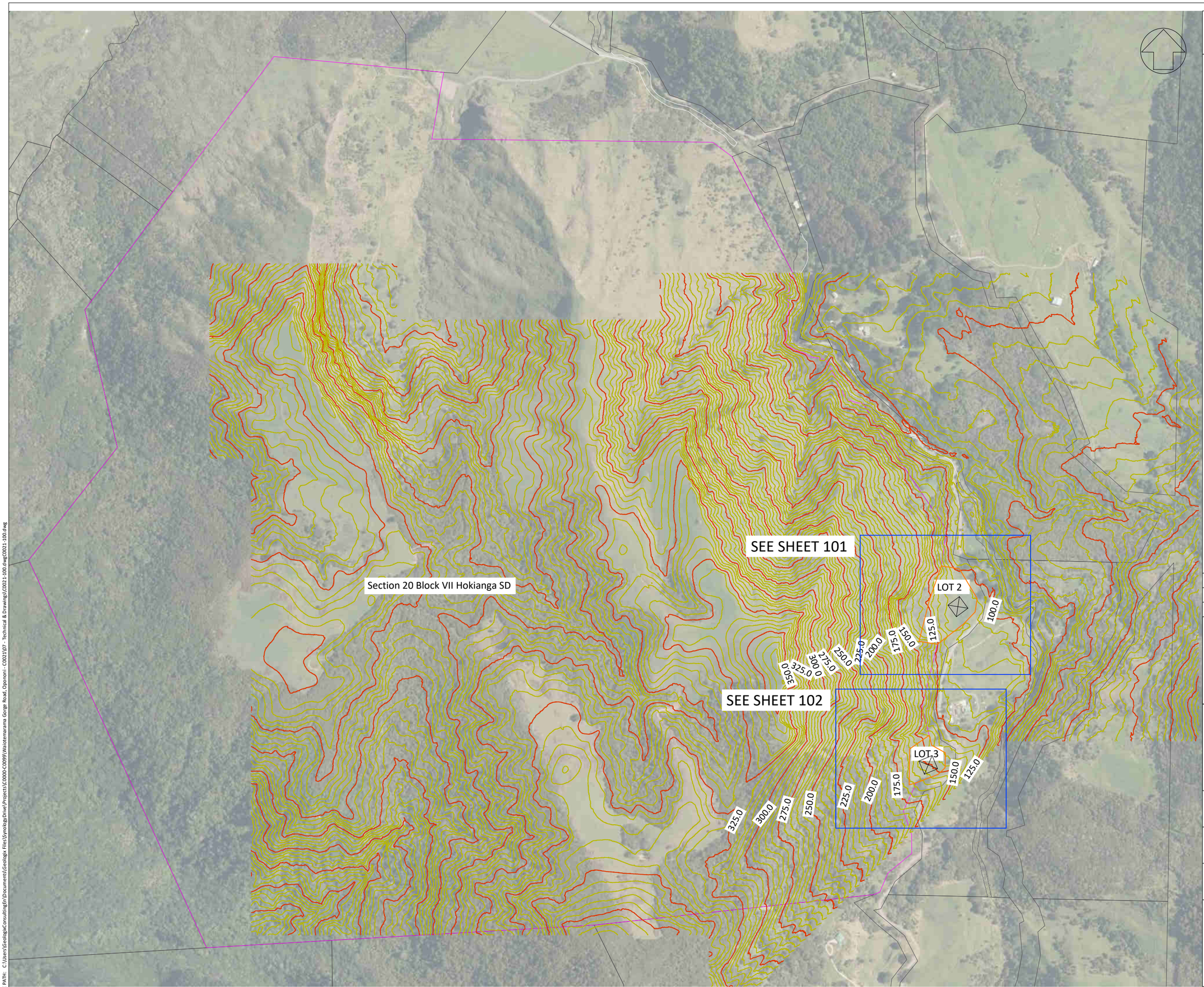
This report has been prepared for J & P Bill Family Trust as our Client. It may be relied upon by our Client and their appointed Consultants, Contractors and for the purpose of Consent as outlined by the specific objectives in this report. This report and associated recommendations, conclusions or intellectual 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 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



GENERAL NOTES

1. CONTOURS AT 5 m INTERVALS.
2. TOPOGRAPHIC SURVEY DATA PROVIDED BY NRC LIDAR.
3. FOR INDICATION ONLY, NOT FOR CONSTRUCTION.
4. FEATURES PRESENTED ARE INDICATIVE AND HAVE NOT BEEN VERIFIED.
5. DO NOT SCALE FROM THIS DRAWING.

SITE BOUNDARY

LOT BOUNDARY

70 0 Meters 70 140

1:7000

A	CONSENT	10/10/2023
Revision	Issue	Date

geologix consulting engineers

AUCKLAND | NORTHLAND

Project Name and Address

WAIOTEMARAMA GEORGE ROAD

OMAPERE, FAR NORTH

SECTION 20 BLOCK VII

Project	Drawn By
C0021	TI

Client

JASON AND PENNY BILL

Sheet Title

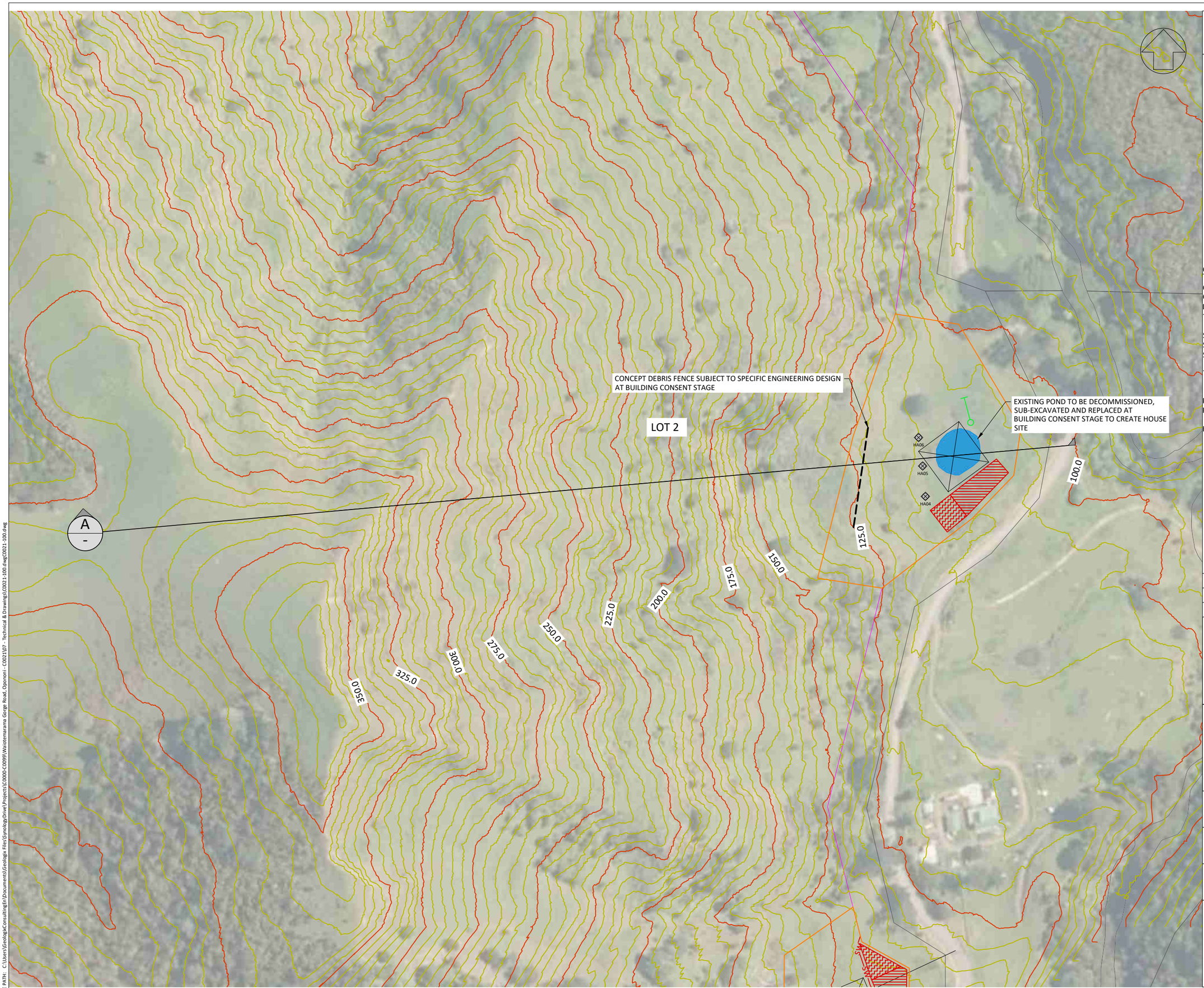
SITE LAYOUT PLAN

Sheet

100

FILE PATH: C:\Users\GeologixConsulting\En\Documents\Geologix Files\SynoKpy\Drive\Projects\C0000-C0099\Waiotemarama Gorge Road, Opononi - C0021\07 - Technical & Drawing\C0021-100.dwg

PLOTTED: 03/04/2022



GENERAL NOTES

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4. FEATURES PRESENTED ARE INDICATIVE AND HAVE NOT BEEN VERIFIED.
5. DO NOT SCALE FROM THIS DRAWING.

SITE BOUNDARY

LOT BOUNDARY

SW PROPOSED CUT OFF DRAIN

BH02 GEOLOGIX HAND AUGER BOREHOLE - JULY 2023

PRIMARY DISPOSAL FIELD

RESERVE DISPOSAL FIELD

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 mm/ DAY
TREATMENT SYSTEM	TBC AT BUILDING CONSENT
PRIMARY DISPOSAL AREA	427 m²
RESERVE DISPOSAL AREA	214 m² (50 %)
FINAL DESIGN?	NO - SUBJECT TO BUILDING CONSENT VERIFICATION

20 0 Meters 20 40

1:2000

Revision	Issue	Date
A	CONSENT	10/10/2023

geologix consulting engineers

AUCKLAND | NORTHLAND

Project Name and Address

WAIOTEMARAMA GEORGE ROAD

OMAPERE, FAR NORTH

SECTION 20 BLOCK VII

Project	Drawn By
C0021	TI

Client

JASON AND PENNY BILL

Sheet Title

GEOTECHNICAL SITE PLAN - LOT 2

Sheet

101

PLOTTED: 03/04/2022

FILE PATH: C:\Users\GeologixConsulting\En\Documents\Geologix Files\Synology\Drive\Projects\C0000-C0099\Waiotemarama Gorge Road, Opononi - C0021\07 - Technical & Drawings\C0021-100.dwg\C0021-100.dwg

CONTOURS AT 5 m INTERVALS.
2. TOPOGRAPHIC SURVEY DATA PROVIDED BY NRC LIDAR.
3. FOR INDICATION ONLY, NOT FOR CONSTRUCTION.
4. FEATURES PRESENTED ARE INDICATIVE AND HAVE NOT BEEN VERIFIED.
5. DO NOT SCALE FROM THIS DRAWING.

SITE BOUNDARY

LOT BOUNDARY

SW PROPOSED CUT OFF DRAIN

BH02 GEOLOGIX HAND AUGER BOREHOLE - JULY 2023

LOT 3

CONCEPTUAL SOLDIER PILE WALL
4.0 m EMBEDMENT, 118 kN/m STABILISING SHEAR FORCE
SUBJECT TO REFINEMENT AT BUILDING CONSENT STAGE

HA01

HA02

HA03

B
-

225.0

200.0

175.0

150.0

125.0

PLOTTED: 03

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consulting engineers

APPENDIX B

Engineering Borehole Records

INVESTIGATION LOG

HOLE NO.: HA01

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 2 and 3

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 04/07/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 04/07/2023

CONTRACTOR: Internal

RIG: Hand tools

DRILLER: TW LW

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
Grassed TOPSOIL comprising organic SILT; dark blackish brown; moist; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200		
Clayey SILT, with minor gravel; dark brown with light brown streaks. Very stiff; moist; low plasticity; gravel, fine to medium, angular; [Northland Allochthon].		0.2				170 62	
SILT, with minor gravel; light brown with orange specks. Very stiff; moist; low plasticity; gravel, angular; [Northland Allochthon].		0.4				189+ -	
Clayey SILT, with minor gravel; dark brown mottled orange . Very stiff; moist; high plasticity; gravel, angular; [Northland Allochthon].		0.6				189+ -	
		0.8				UTP -	
Silty CLAY; dark brown with orange streaks. Very stiff; moist; high plasticity; [Northland Allochthon].		1.0				189 -	
1.4m: Becoming mottled light grey and orange.		1.2				166 49	
2.0m: Becoming Wet.		1.4				189+ -	04/07/2023
		1.6				189+ -	
		1.8				189+ -	
		2.0				UTP -	
End Of Hole: 3.00m		2.2					
		2.4					
		2.6					
		2.8					
		3.0					
		3.2					
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					

PHOTO(S)

REMARKS

1. Hand auger terminated at target depth.
2. Groundwater encountered at 2.0m at the time of drilling.

WATER

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

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA02

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 2 and 3

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 04/07/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 04/07/2023

CONTRACTOR: Internal

RIG: Hand tools

DRILLER: TW LW

LOGGED BY: LW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
Grassed TOPSOIL comprising organic SILT; dark blackish brown; moist; low plasticity. gravel, fine to medium, angular.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200	UTP	04/07/2023
Sandy gravelly SILT; dark brown. Very stiff; moist to wet; gravel, fine to medium, angular; [Northland Allochthon].		0.4				-	
		0.6				UTP	
		0.8				-	
		1.0				184	
Sandy SILT, with trace gravel; brown. Very stiff; wet; gravel, fine to medium, angular; [Northland Allochthon].		1.2				35	
1.3m: With minor gravel; brown mottled orange.		1.4				184	
		1.6				31	
		1.8				198+	
Clayey SILT; brown mottled orange. Very stiff; wet; low plasticity; [Northland Allochthon].		2.0				-	
2.2m: With minor gravel. Gravel, fine to medium, angular.		2.2				177	
		2.4				35	
		2.6				198+	
		2.8				-	
		3.0				198+	
End Of Hole: 3.00m		3.2				-	
		3.4				UTP	
		3.6				-	
		3.8				UTP	
		4.0				-	
		4.2					

PHOTO(S)

REMARKS

1. Hand auger completed at target depth.
2. Groundwater encountered at 0.3m 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: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 2 and 3

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 04/07/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 04/07/2023

CONTRACTOR: Internal

RIG: Hand tools

DRILLER: TW LW

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
Grassed TOPSOIL comprising organic SILT; dark blackish brown; moist; low plasticity, gravel, fine to medium, angular.		0.0	TS			
Gravelly SILT; brown. Very stiff; wet; silt, friable; gravel, fine to medium, angular; [Northland Allochthon].		0.2	TS		UTP -	04/07/2023
		0.4			UTP -	
		0.6			UTP -	
		0.8				
Clayey gravelly SILT; brown mottled orange. Very stiff; wet; low plasticity; gravel, fine to medium, angular; [Northland Allochthon].		1.0			155 50	
1.4m: With minor gravel.		1.2			155 55	
1.7m: With some gravel.		1.4			UTP -	
End Of Hole: 2.10m		1.6			UTP -	
		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				

Scala penetrometer scale: 2 4 6 8 10 12 14 16 18

Vane shear strength scale: 50 100 150 200

Values

PHOTO(S)

REMARKS

1. Hand auger terminated at 2.1m due to dense strata.
2. Groundwater encountered at 0.4m at the end of the day.

WATER

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

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

INVESTIGATION LOG

HOLE NO.: HA04

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 2 and 3

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 04/07/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 04/07/2023

CONTRACTOR: Internal

RIG: Hand tools

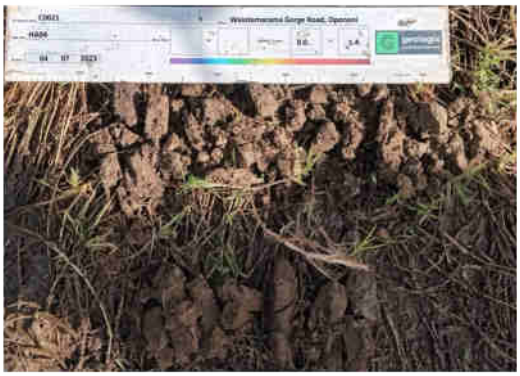
DRILLER: TW LW

LOGGED BY: LW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 100mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
Grassed TOPSOIL comprising organic SILT; dark blackish brown; moist; low plasticity.		0.0	TS				
SILT, with some gravel; brown. Very stiff; moist; silt, friable; gravel, fine to medium, angular; [Northland Allochthon].		0.2				167	
		0.4				44	
Clayey SILT, with trace gravel; brown. Very stiff; moist; low plasticity; gravel, fine to medium, angular; [Northland Allochthon].		0.6				198+	
1.0m: With trace sand; brown and orange.		0.8				-	
1.1m: With minor gravel.		1.0				198+	
		1.2				-	
End Of Hole: 4.00m		1.4		6		198+	
		1.6		4		-	
		1.8		5		UTP	
		2.0		5		-	
		2.2		5			
		2.4		5			
		2.6		5			
		2.8		5			
		3.0		4			
		3.2		5			
		3.4		8			
		3.6		7			
		3.8		7			
		4.0		6			
		4.2		7			
				7			
				6			
				6			
				7			
				9			
				13			
				11			
				13			
				11			
				12			
				20			

Groundwater Not Encountered

PHOTO(S)



REMARKS

1. Hand auger terminated at 1.4m due to dense strata.
2. Continued with DCP from 1.4m until refusal at 4.0m.
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.: HA05

CLIENT: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 2 and 3

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 04/07/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 04/07/2023

CONTRACTOR: Internal

RIG: Hand tools

DRILLER: TW LW

LOGGED BY: LW

MATERIAL DESCRIPTION (See Classification & Symbology sheet for details)	SAMPLES	DEPTH (m)	LEGEND	SCALA PENETROMETER (Blows / 0mm)	VANE SHEAR STRENGTH (kPa) Vane: 3467	Values	WATER
Grassed TOPSOIL comprising organic SILT; dark blackish brown; moist; low plasticity.		0.0	TS				
SILT, with minor gravel; brown. Very stiff; moist; gravel, fine to medium, angular; [Northland Allochthon].		0.2				UTP -	
		0.4					
		0.6				198+ -	
Clayey SILT, with trace gravel; brown mottled orange. Very stiff; moist; low plasticity; gravel, fine to medium, angular; [Northland Allochthon].		0.8				171 68	
		1.0					
		1.2				120 50	
		1.4					
		1.6				196 58	
1.7m: With trace gravel. Moist to wet; gravel, angular.		1.8				198 -	
		2.0					
		2.2				198 -	
2.2m: With trace sand; becoming brown and grey. Sand, fine.		2.4				179 44	▼ 04/07/2023
		2.6					
2.6m: With minor gravel. Gravel, fine to medium, angular.		2.8				198 -	
		3.0					
End Of Hole: 3.00m		3.2				UTP -	
		3.4					
		3.6					
		3.8					
		4.0					
		4.2					

PHOTO(S)

REMARKS

1. Hand auger completed at target depth.
2. Groundwater encountered at 2.5m 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: Jason and Penni Bill

JOB NO.: C0021

PROJECT: Six sites along Waiotemarama Gorge Road - Lot 2 and 3

SITE LOCATION: Adjacent to Waiotemarama Gorge Road

START DATE: 04/07/2023

CO-ORDINATES:

ELEVATION: Ground

END DATE: 04/07/2023

CONTRACTOR: Internal

RIG: Hand tools

DRILLER: TW LW

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
Grassed TOPSOIL comprising organic SILT; dark blackish brown; moist; low plasticity.		0.0	TS	2 4 6 8 10 12 14 16 18	50 100 150 200 Values	
Clayey SILT; dark brown mottled light grey and orange. Very stiff; moist to saturated; low plasticity; [Northland Allochthon].		0.2			UTP -	
		0.4			189+ -	
		0.6				
		0.8			189+ -	04/07/2023
		1.0				
1.2m: Becoming mottled orange.		1.2			189+ -	
1.3m: Becoming saturated.		1.4			189+ -	
		1.6				
		1.8			189+ -	
		2.0			189+ -	
		2.2				
		2.4			UTP -	
End Of Hole: 2.50m		2.6				
		2.8				
		3.0				
		3.2				
		3.4				
		3.6				
		3.8				
		4.0				
		4.2				

PHOTO(S)

REMARKS

1. Hand auger completed at target depth of 2.5m.
2. Groundwater encountered at 1.3m at the time of drilling.
3. Groundwater measured at 0.8 at the end of the day.

WATER

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

INVESTIGATION TYPE

- ☑ Hand Auger
- ☐ Test Pit

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APPENDIX C

Assessment of Environmental Effects and Assessment Criteria

Table 14: 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. Disposal field well above mapped flood hazard.
Stormwater flowpath[4]	5 m	NR	Complies.
Surface water feature[5]	15 m	15 m, increased to 30 m in certain conditions	Complies.
Coastal Marine Area	15 m	30 m	Complies.
Existing water supply bore.	20 m	NR	Complies.
Property boundary	1.5 m	1.5	Complies. Including proposed subdivision boundaries.
Winter groundwater table	0.6 m	0.6 m	Complies. Disposal fields may require raising by up to 300 mm.
Topography			Complies, >10 ° and <25 °.
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 15: Proposed Northland Regional Plan Stormwater Assessment Criteria, to rule C.6.4.2

Assessment Criteria	Comments
1) the discharge or diversion is not from: a) a public stormwater network, or b) a high-risk industrial or trade premises	Complies
2) the diversion and discharge does not cause or increase flooding of land on another property in a storm event of up to and including a 10 percent annual exceedance probability, or flooding of buildings on another property in a storm event of up to and including a one percent annual exceedance probability	Complies, attenuation to 80 % of pre development level for 20 % AEP event more conservative than pre development of the 10 % AEP event.
3) where the diversion or discharge is from a hazardous substance storage or handling area: a) the stormwater collection system is designed and operated to prevent hazardous substances stored or used on the site from entering the stormwater system, or b) there is a secondary containment system in place to intercept any spillage of hazardous substances and either discharges that spillage to a trade waste system or stores it for removal and treatment, or c) if the stormwater contains oil contaminants, the stormwater is passed through a stormwater treatment system designed in accordance with the Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand (Ministry for the Environment, 1998) prior to discharge	Complies. Site is residential.
4) where the diversion or discharge is from an industrial or trade premises: a) the stormwater collection system is designed and operated to prevent any contaminants stored or used on the site, other than those already controlled by condition 3) above, from entering stormwater unless the stormwater is discharged through a stormwater treatment system, and b) any process water or liquid waste stream on the site is bunded, or otherwise contained, within an area of sufficient capacity to provide secondary containment equivalent to 100 percent of the quantity of any process water or liquid waste that has the potential to spill into a stormwater collection system, in order to prevent trade waste entering the stormwater collection system	Complies. Site is residential.
5) the diversion or discharge is not into potentially contaminated land, or onto potentially contaminated land that is not covered by an impervious area	Complies.
6) the diversion and discharge does not cause permanent scouring or erosion of the bed of a water body at the point of discharge	Complies, specifically sized discharge devices are provided from all on-lot devices.
7) the discharge does not contain more than 15 milligrams per litre of total petroleum hydrocarbons	Complies. Site is residential.
8) the discharge does not cause any of the following effects in the receiving waters beyond the zone of reasonable mixing: a) the production of conspicuous oil or grease films, scums, or foams, of floatable or suspended materials, or b) a conspicuous change in the colour or visual clarity, or c) an emission of objectionable odour, or d) the rendering of fresh water unsuitable for consumption by farm animals, or 163 e) the rendering of fresh water taken from a mapped priority drinking water abstraction point (refer I Maps | Ngā mahere matawhenua) unsuitable for human consumption after existing treatment.	Complies.

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APPENDIX D

Stormwater Calculations

Project Ref:	C0021	**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD		
Design Case:	CONCEPT FUTURE DEVELOPMENT	**50 % AEP STORM EVENT, 80 % OF PRE DEVELOPMENT**	
Date:	10 October 2023 REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF PREDICTED 2.1 DEGREE CLIMATE CHANGE. RESIDENTIAL DEVELOPMENT AREAS ARE BASED ON EXISTING SURVEY DATA.
RUNOFF COEFFIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PREDEVELOPMENT SCENARIO				**POST DEVELOPMENT SCENARIO**			
ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s	ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s
IMPERVIOUS A	0	0	0.00	TO TANK	300	0.96	5.64
IMPERVIOUS B	0	0	0.00	OFFSET	200	0.83	3.25
IMPERVIOUS C	0	0	0.00	PERVIOUS	4310	0.67	56.53
EX. PERVIOUS	4810	0.67	63.09	EX. CONSENTED	0	0.96	0.00
TOTAL	**4810**	TYPE D	**63.09**	**TOTAL**	**4810**	TYPE D	**65.42**

PRE DEVELOPMENT RUNOFF

50 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	56.1	mm/hr
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	25.62	%
50 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	70.47	mm/hr
50 % AEP PRE DEVELOPMENT PEAK FLOW	63.09	l/s
80 % OF PRE DEVELOPMENT PEAK FLOW	**50.47**	**l/s**

* CLIMATE CHANGE FACTOR CALCULATED IN ACCORDANCE WITH NIWA HIRDS RECOMMENDATIONS. HISTORIC RAINFALL INTENSITY, 10 MINUTES IS MULTIPLIED BY POTENTIAL CLIMATE CHANGE FACTORS. NIWA RECOMMENDS THAT FOR 10 MINUTE TO 1 HOUR ADOPT THE 1 HR FACTOR.

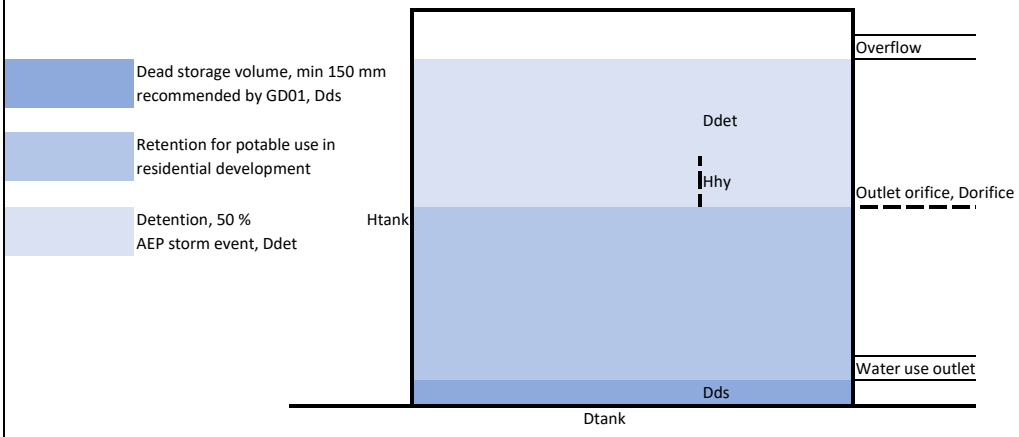
INCREASED POST DEVELOPMENT RUNOFF, 50 % AEP WITH CLIMATE CHANGE PROJECTION OF 2.1 DEGREES

TIME, min	INTENSITY, mm/hr	CC FACTOR	CC INTENSITY, mm/hr	RUNOFF, Q, l/s	Allowable flow, l/s	Difference, l/s	Required Storage, litres
10	56.10	1.2562	70.47	65.42	41.58	23.83	14301
20	39.20	1.2562	49.24	45.71	41.58	4.13	4953
30	31.70	1.2562	39.82	36.96	41.58	No Att. Req.	0
60	21.80	1.2562	27.39	25.42	41.58	No Att. Req.	0
120	14.80	1.2457	18.44	17.11	41.58	No Att. Req.	0
360	7.83	1.2058	9.44	8.76	41.58	No Att. Req.	0
720	5.13	1.1785	6.05	5.61	41.58	No Att. Req.	0
1440	3.30	1.1512	3.80	3.53	41.58	No Att. Req.	0
2880	2.08	1.1281	2.35	2.18	41.58	No Att. Req.	0
4320	1.57	1.1155	1.75	1.63	41.58	No Att. Req.	0

NOTE: ALLOWABLE FLOW PROVIDES FOR ANY OFFSET ARISING FROM FLOWS NOT DIRECTLY DISCHARGING TO TANK

ATTENUATION TANK DESIGN OUTPUT

Concept sizing assuming 25,000 litre tank



SPECIFICATION

			NOTES:
TOTAL STORAGE REQUIRED	14.301	m3	
TANK HEIGHT, Htank	2.6	m	Concept sizing assuming 25,000 litre tank
TANK DIAMTER, Dtank	3.5	m	No. of Tanks 1
TANK AREA, Atank	9.62	m2	Single tank area
TANK MAX STORAGE VOLUME, Vtank	25015	litres	
REQUIRED STORAGE HEIGHT, Ddet	1.49	m	Below overflow
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum
TOTAL WATER DEPTH REQUIRED	1.64	m	
AVERAGE DISCHARGE RATE, Qavg	0.00017	m3/s	
AVERAGE HYDRAULIC HEAD, Hhy	0.74	m	
AREA OF ORIFICE, Aorifice	1.02E-03	m2	
ORIFICE DIAMETER, Dorifice	36	mm	Minimum 10 mm diameter
VELOCITY AT ORIFICE	5.40	m/s	
ACHIEVABLE STORAGE OF SURFACES TO TANK IN 24 HOURS	51364	litres/ 24hrs	
AREA TO TANK CAN SERVICE ATTENUATION?	YES		

Project Ref:	C0021		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**20 % AEP STORM EVENT, 80 % OF PRE DEVELOPMENT**	
Date:	10 October 2023	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF PREDICTED 2.1 DEGREE CLIMATE CHANGE. RESIDENTIAL DEVELOPMENT AREAS ARE BASED ON EXISTING SURVEY DATA.
RUNOFF COEFFIENTS DETERMINED FROM FNDC ENGINEERING STANDARDS 2023 TABLE 4-3.

PREDEVELOPMENT SCENARIO				**POST DEVELOPMENT SCENARIO**			
ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s	ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s
IMPERVIOUS A	0	0	0.00	TO TANK	300	0.96	7.37
IMPERVIOUS B	0	0	0.00	OFFSET	200	0.83	4.25
IMPERVIOUS C	0	0	0.00	PERVIOUS	4310	0.67	73.89
EX. PERVIOUS	4810	0.67	82.46	EX. CONSENTED	0	0.96	0.00
TOTAL	**4810**	TYPE D	**82.46**	**TOTAL**	**4810**	TYPE D	**85.51**

PRE DEVELOPMENT RUNOFF

20 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	72.6	mm/hr
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	26.88	%
20 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	92.1	mm/hr
20 % AEP PRE DEVELOPMENT PEAK FLOW	82.46	l/s
80 % OF PRE DEVELOPMENT PEAK FLOW	**65.97**	**l/s**

* CLIMATE CHANGE FACTOR CALCULATED IN ACCORDANCE WITH NIWA HIRDS RECOMMENDATIONS. HISTORIC RAINFALL INTENSITY, 10 MINUTES IS MULTIPLIED BY POTENTIAL CLIMATE CHANGE FACTORS. NIWA RECOMMENDS THAT FOR 10 MINUTE TO 1 HOUR ADOPT THE 1 HR FACTOR.

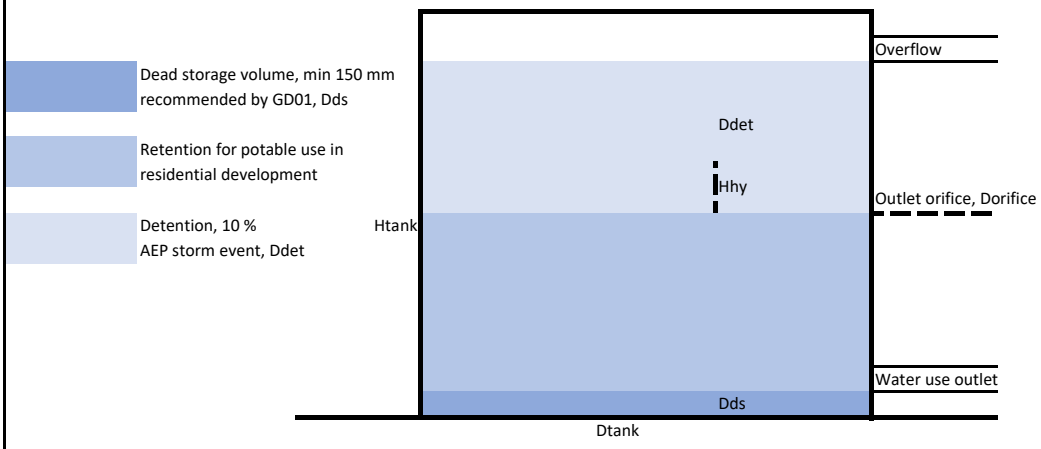
INCREASED POST DEVELOPMENT RUNOFF, 10 % AEP WITH CLIMATE CHANGE PROJECTION OF 2.1 DEGREES

TIME, min	INTENSITY, mm/hr	CC FACTOR	CC INTENSITY, mm/hr	RUNOFF, Q, l/s	Allowable flow, l/s	Difference, l/s	Required Storage, litres
10	72.60	1.2688	92.11	85.51	54.35	31.15	18692
20	50.80	1.2688	64.46	59.83	54.35	5.48	6574
30	41.10	1.2688	52.15	48.41	54.35	No Att. Req.	0
60	28.30	1.2688	35.91	33.33	54.35	No Att. Req.	0
120	19.30	1.2583	24.29	22.54	54.35	No Att. Req.	0
360	10.20	1.2205	12.45	11.56	54.35	No Att. Req.	0
720	6.71	1.1932	8.01	7.43	54.35	No Att. Req.	0
1440	4.32	1.1638	5.03	4.67	54.35	No Att. Req.	0
2880	2.73	1.1407	3.11	2.89	54.35	No Att. Req.	0
4320	2.06	1.1302	2.33	2.16	54.35	No Att. Req.	0

NOTE: ALLOWABLE FLOW PROVIDES FOR ANY OFFSET ARISING FROM FLOWS NOT DIRECTLY DISCHARGING TO TANK

ATTENUATION TANK DESIGN OUTPUT

Concept sizing assuming 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	18.692	m3		
TANK HEIGHT, Htank	2.6	m	Concept sizing assuming 25,000 litre tank	
TANK DIAMETER, Dtank	3.5	m	No. of Tanks	1
TANK AREA, Atank	9.62	m2	Single tank area	
TANK MAX STORAGE VOLUME, Vtank	25015	litres		
REQUIRED STORAGE HEIGHT, Ddet	1.94	m	Below overflow	
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum	
TOTAL WATER DEPTH REQUIRED	2.09	m		
AVERAGE DISCHARGE RATE, Qavg	0.00022	m3/s		
AVERAGE HYDRAULIC HEAD, Hhy	0.97	m		
AREA OF ORIFICE, Aorifice	1.52E-03	m2		
ORIFICE DIAMETER, Dorifice	44	mm	Note minimum 10 mm diameter	
VELOCITY AT ORIFICE	6.17	m/s		
ACHIEVABLE STORAGE OF SURFACES	67735	litres/ 24hrs		
AREA TO TANK CAN SERVICE ATTENUATION?		YES		

Project Ref:	C0021		**STORMWATER ATTENUATION TANK DESIGN**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		**10 % AEP STORM EVENT**	
Date:	10 October 2023	REV 1		

ATTENUATION DESIGN PROVIDED IN ACCORDANCE WITH NEW ZEALAND BUILDING CODE E1 FOR THE RATIONALE METHOD ACCOUNTING FOR THE EFFECTS OF PREDICTED 2.1 DEGREE CLIMATE CHANGE. RESIDENTIAL DEVELOPMENT AREAS ARE BASED ON EXISTING SURVEY DATA.

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

PREDEVELOPMENT SCENARIO				**POST DEVELOPMENT SCENARIO**			
ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s	ITEM	AREA, A, m2	COEFFICIENT, C	RUNOFF, l/s
IMPERVIOUS A	0	0	0.00	TO TANK	300	0.96	8.64
IMPERVIOUS B	0	0	0.00	OFFSET	200	0.83	4.98
IMPERVIOUS C	0	0	0.00	PERVIOUS	4310	0.67	86.63
EX. PERVIOUS	4810	0.67	96.68	EX. CONSENTED	0	0.96	0.00
TOTAL	**4810**	TYPE D	**96.68**	**TOTAL**	**4810**	TYPE D	**100.25**

PRE DEVELOPMENT RUNOFF			
10 % AEP RAINFALL INTENSITY, 10 MIN, I, mm/hr	84.7	mm/hr	* CLIMATE CHANGE FACTOR CALCULATED IN ACCORDANCE WITH NIWA
CLIMATE CHANGE FACTOR, 2.1 DEG, 10 MIN*	27.51	%	HIRDS RECOMMENDATIONS. HISTORIC RAINFALL INTENSITY, 10 MINUTES
10 % AEP RAINFALL INTENSITY, 10 MIN WITH CC	108.0	mm/hr	IS MULTIPLIED BY POTENTIAL CLIMATE CHANGE FACTORS. NIWA
10 % AEP PRE DEVELOPMENT PEAK FLOW	96.68	l/s	RECOMMENDS THAT FOR 10 MINUTE TO 1 HOUR ADOPT 1 HR FACTOR

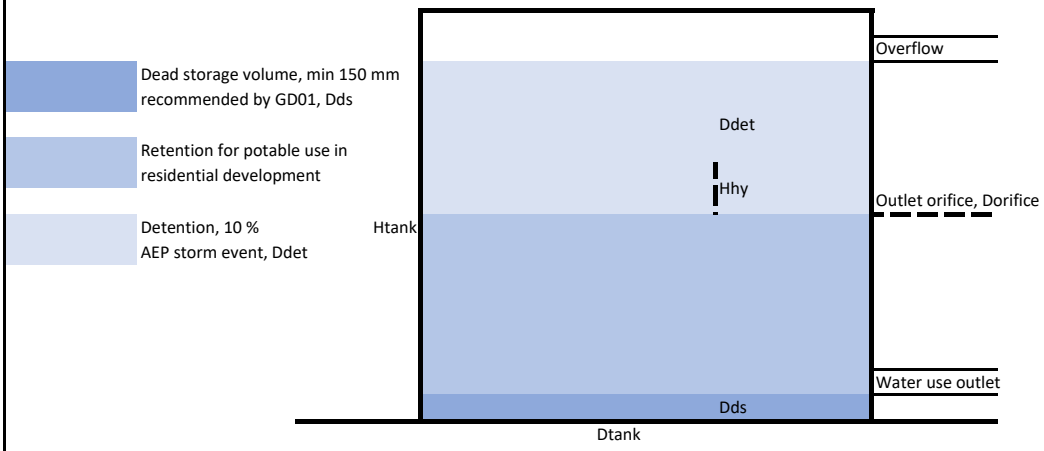
INCREASED POST DEVELOPMENT RUNOFF, 10 % AEP WITH CLIMATE CHANGE PROJECTION OF 2.1 DEGREES

TIME, min	INTENSITY, mm/hr	CC FACTOR	CC INTENSITY, mm/hr	RUNOFF, Q, l/s	Allowable flow, l/s	Difference, l/s	Required Storage, litres
10	84.70	1.2751	108.00	100.25	83.06	17.19	10314
20	59.40	1.2751	75.74	70.31	83.06	No Att. Req.	0
30	48.10	1.2751	61.33	56.93	83.06	No Att. Req.	0
60	33.20	1.2751	42.33	39.30	83.06	No Att. Req.	0
120	22.70	1.2646	28.71	26.65	83.06	No Att. Req.	0
360	12.00	1.2268	14.72	13.67	83.06	No Att. Req.	0
720	7.89	1.1995	9.46	8.79	83.06	No Att. Req.	0
1440	5.09	1.1701	5.96	5.53	83.06	No Att. Req.	0
2880	3.22	1.147	3.69	3.43	83.06	No Att. Req.	0
4320	2.44	1.1365	2.77	2.57	83.06	No Att. Req.	0

NOTE: ALLOWABLE FLOW PROVIDES FOR ANY OFFSET ARISING FROM FLOWS NOT DIRECTLY DISCHARGING TO TANK

ATTENUATION TANK DESIGN OUTPUT

Concept sizing assuming 25,000 litre tank



SPECIFICATION

TOTAL STORAGE REQUIRED	10.314	m3		
TANK HEIGHT, Htank	2.6	m	Concept sizing assuming 25,000 litre tank	
TANK DIAMETER, Dtank	3.5	m	No. of Tanks	1
TANK AREA, Atank	9.62	m2	Single tank area	
TANK MAX STORAGE VOLUME, Vtank	25015	litres		
REQUIRED STORAGE HEIGHT, Ddet	1.07	m	Below overflow	
DEAD STORAGE VOLUME, Dds	0.15	m	GD01 recommended minimum	
TOTAL WATER DEPTH REQUIRED	1.22	m		
AVERAGE DISCHARGE RATE, Qavg	0.00012	m3/s		
AVERAGE HYDRAULIC HEAD, Hhy	0.54	m		
AREA OF ORIFICE, Aorifice	6.24E-04	m2		
ORIFICE DIAMETER, Dorifice	28	mm	Note minimum 10 mm diameter	
VELOCITY AT ORIFICE	4.59	m/s		
ACHIEVABLE STORAGE OF SURFACES	80023	litres/ 24hrs		
AREA TO TANK CAN SERVICE ATTENUATION?		YES		

Project Ref:	C0021		STORMWATER DISPERSION PIPE/ TRENCH	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD			
Design Case:	CONCEPT FUTURE DEVELOPMENT		WEIGHTED RUNOFF	
Date:	10 October 2023	REV 1		

TP108 Worksheet 1 - Runoff curve number & Initial Abstraction

Soil Class	Cover description	Curve Number, CN	Area	Product of CN * Area
TYPE D	TO TANK	98	300	29400
TYPE D	OFFSET	89	200	17800
TYPE D	PERVIOUS	80	4310	344800
TYPE D	EX. CONSENTED	98	0	0
		Total	**4810**	**392000**
		Total Pervious	4310	m2
		Total Impervious	500	m2
		Weighted Runoff, CN	**81.5**	
		Weighted Initial Abstraction, Ia	**4.5**	mm

TP108, FIGURE 5.1

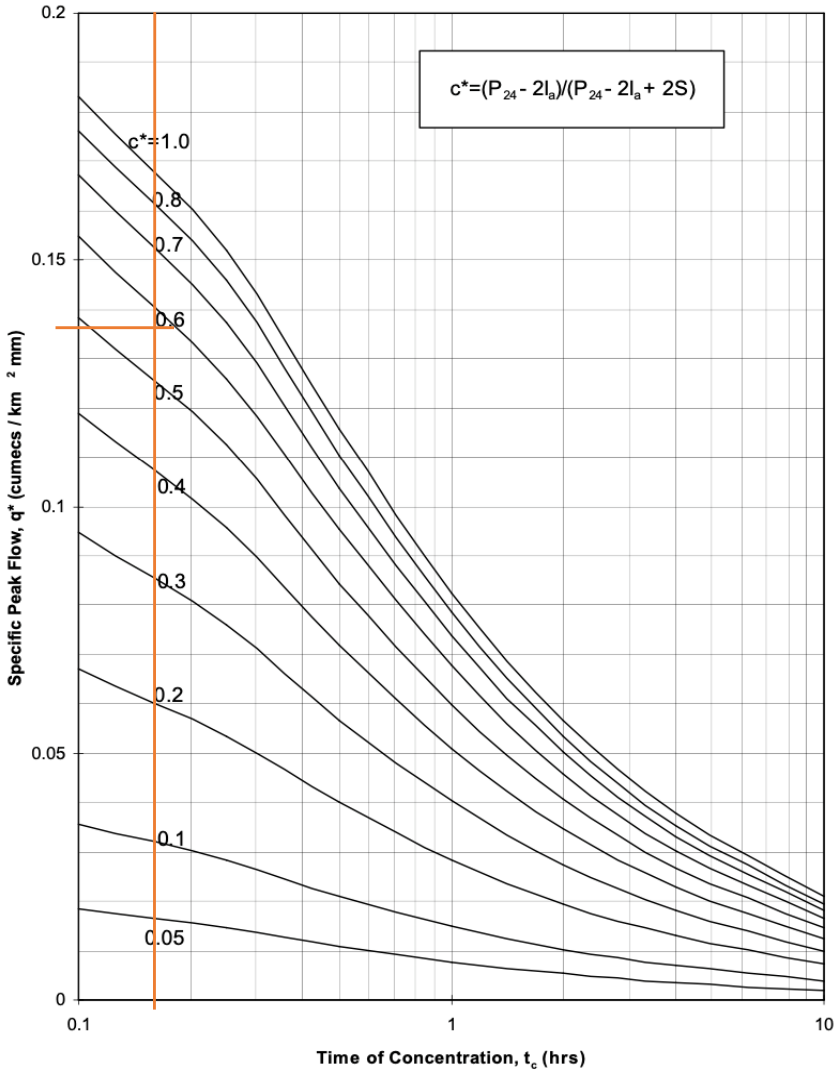


Figure 5.1 - Specific Peak Flow Rate

Project Ref:	C0021	**STORMWATER DISPERSION PIPE/ TRENCH**	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD		
Design Case:	CONCEPT FUTURE DEVELOPMENT	**DISCHARGE DEVICE - LEVEL SPREADER OR TRENCH**	
Date:	10 October 2023 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 TP108 GRAPHICAL METHOD BASED ON NIWA HIRDS DEPTH-DURATION DATA AND ACCOUNTING FOR THE PROVISION OF CLIMATE CHANGE.

DESIGN STORM EVENT **1%** AEP EVENT

ESTIMATE DESIGN RAINFALL DEPTH, P24

RAINFALL DEPTH	24 HR DURATION	1%	188	mm
CLIMATE CHANGE FACTOR	2.1 DEGREE INCREASE,24 HR	1%	8.6	%
RAINFALL DEPTH WITH CC, P24			204.2	mm

ESTIMATE DETENTION VOLUME, TP108 GRAPHICAL METHOD

PEAK FLOW RATE, qp = q* x A x P24

WHERE,
- q*= SPECIFIC PEAK FLOW RATE (l/s)
- P24= 24 HR DESIGN RAINFALL DEPTH (mm)
- A= CATCHMENT AREA TO BE MITIGATED (m2)

CURVE NUMBER, CN (WEIGHTED)	81		See summary table.
INITIAL ABSTRACTION, Ia	4.48	mm	As TP108, adopt 0 mm impervious, 5 mm pervious, value adopted is weighted
MITIGATION AREA, Am	500	m2	Impervious areas within this design
SOIL STORAGE, S	57.7	mm	
RUNOFF INDEX, C*	0.63	mm	
TIME OF CONCENTRATION, tc	0.167	hrs	
SPECIFIC PEAK FLOWRATE, q*	0.136		TP108, Figure 5.1, see next page.
PEAK FLOWRATE, qp	13.88	l/s	
RUNOFF DEPTH, Q24	154.9	mm	
RUNOFF VOLUME, V24	77471	litres	

CONSTRUCTION OF DISPERSION ABOVE GROUND PIPE OR PIPE WITHIN TRENCH

DIA. OF ORIFICE, D	10	mm
AREA OF ORIFICE, A	78.54	mm2
DESIGN VELOCITY, Dv	8.19	m/s
NUMBER OF ORIFICES	22	No.
ORIFICE INTERVALS, C/C	200	mm
DISPERSION PIPE LENGTH	4.2	m

Project Ref:	C0021	STORMWATER ATTENUATION TANK DESIGN	geologix consulting engineers
Project Address:	WAIOTEMARAMA GORGE ROAD		
Design Case:	CONCEPT FUTURE DEVELOPMENT	CLIMATE CHANGE FACTORS	
Date:	10 October 2023 REV 1		

CLIMATE CHANGE PROJECTIONS

REPRODUCED FROM NIWA HIRDS, *https://niwa.co.nz/information-services/hirds/help*

Duration/ARI	2 yr	5 yr	10 yr	20 yr	30 yr	40 yr	50 yr	60 yr	80 yr	100 yr
1 hour	12.2	12.8	13.1	13.3	13.4	13.4	13.5	13.5	13.6	13.6
2 hours	11.7	12.3	12.6	12.8	12.9	12.9	13	13	13.1	13.1
6 hours	9.8	10.5	10.8	11.1	11.2	11.3	11.3	11.4	11.4	11.5
12 hours	8.5	9.2	9.5	9.7	9.8	9.9	9.9	10	10	10.1
24 hours	7.2	7.8	8.1	8.2	8.3	8.4	8.4	8.5	8.5	8.6
48 hours	6.1	6.7	7	7.2	7.3	7.3	7.4	7.4	7.5	7.5
72 hours	5.5	6.2	6.5	6.6	6.7	6.8	6.8	6.9	6.9	6.9
96 hours	5.1	5.7	6	6.2	6.3	6.3	6.4	6.4	6.4	6.5
120 hours	4.8	5.4	5.7	5.8	5.9	6	6	6	6.1	6.1

HIRDS V4 Intensity-Duration-Frequency Results
Sitename: waiotemarama gorge road
Coordinate system: WGS84
Longitude: 173.4261
Latitude: -35.5266

DDF Model Parameters:	c	d	e	f	g	h	i
Values:	0.00247304	0.45238351	-0.01215667	-0.00090973	0.25186548	-0.01108536	2.99142465

Example:	Duration (hrs)	ARI (yrs)	x	y	Rainfall Rate (mm/hr)
	24	100	3.17805383	4.600149227	7.840310188

Rainfall intensities (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	51.3	35.8	28.9	19.9	13.5	7.14	4.67	3	1.89	1.43	1.16	0.991
2	0.5	56.1	39.2	31.7	21.8	14.8	7.83	5.13	3.3	2.08	1.57	1.28	1.09
5	0.2	72.6	50.8	41.1	28.3	19.3	10.2	6.71	4.32	2.73	2.06	1.69	1.44
10	0.1	84.7	59.4	48.1	33.2	22.7	12	7.89	5.09	3.22	2.44	1.99	1.7
20	0.05	97.1	68.2	55.2	38.2	26.1	13.9	9.12	5.89	3.73	2.82	2.31	1.97
30	0.033	105	73.4	59.4	41.1	28.1	15	9.85	6.37	4.03	3.06	2.5	2.13
40	0.025	110	77.1	62.5	43.3	29.6	15.8	10.4	6.71	4.25	3.23	2.64	2.25
50	0.02	114	80.1	64.9	44.9	30.8	16.4	10.8	6.98	4.43	3.36	2.75	2.34
60	0.017	117	82.5	66.9	46.3	31.7	16.9	11.1	7.21	4.57	3.47	2.84	2.42
80	0.013	123	86.3	70	48.5	33.2	17.7	11.7	7.56	4.8	3.64	2.98	2.54
100	0.01	127	89.2	72.4	50.2	34.4	18.4	12.1	7.84	4.98	3.78	3.09	2.64
250	0.004	144	101	82.1	57	39.2	21	13.8	8.98	5.71	4.34	3.55	3.03

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	6.6	4.1	3.1	2.2	1.5	0.92	0.69	0.26	0.17	0.13	0.11	0.09
2	0.5	7.3	4.5	3.4	2.4	1.7	1	0.75	0.29	0.19	0.15	0.12	0.1
5	0.2	10	6.5	4.8	3.4	2.3	1.4	0.99	0.4	0.26	0.2	0.16	0.14
10	0.1	13	8.6	6.3	4.3	3	1.7	1.2	0.51	0.33	0.25	0.2	0.17
20	0.05	16	11	8.3	5.6	3.8	2.1	1.5	0.63	0.41	0.31	0.25	0.22
30	0.033	19	13	9.8	6.5	4.4	2.5	1.7	0.72	0.46	0.36	0.29	0.25
40	0.025	21	15	11	7.2	4.8	2.7	1.9	0.8	0.51	0.39	0.32	0.27
50	0.02	23	16	12	7.8	5.2	2.9	2	0.86	0.55	0.42	0.34	0.29
60	0.017	24	17	13	8.3	5.5	3.1	2.1	0.91	0.58	0.44	0.36	0.31
80	0.013	27	19	14	9.2	6.1	3.5	2.4	1	0.63	0.48	0.4	0.34
100	0.01	29	21	16	10	6.6	3.7	2.5	1.1	0.68	0.52	0.43	0.37
250	0.004	40	29	22	14	8.9	5.1	3.5	1.5	0.91	0.69	0.57	0.49

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	54.9	38.4	31	21.3	14.4	7.53	4.89	3.12	1.95	1.47	1.2	1.02
2	0.5	60.2	42.1	34	23.4	15.9	8.29	5.39	3.44	2.15	1.62	1.32	1.12
5	0.2	78.1	54.7	44.2	30.5	20.7	10.9	7.07	4.52	2.84	2.14	1.74	1.48
10	0.1	91.3	64	51.8	35.7	24.3	12.8	8.34	5.33	3.35	2.53	2.06	1.75
20	0.05	105	73.5	59.5	41.2	28	14.8	9.64	6.17	3.88	2.93	2.39	2.03
30	0.033	113	79.2	64.1	44.4	30.3	16	10.4	6.68	4.21	3.18	2.59	2.21
40	0.025	118	83.2	67.4	46.7	31.9	16.8	11	7.05	4.44	3.35	2.74	2.33
50	0.02	123	86.5	70.1	48.5	33.1	17.5	11.4	7.33	4.62	3.49	2.85	2.43
60	0.017	127	89	72.2	50	34.1	18.1	11.8	7.57	4.77	3.61	2.94	2.51
80	0.013	132	93.2	75.6	52.4	35.8	18.9	12.4	7.94	5.01	3.79	3.09	2.63
100	0.01	137	96.4	78.2	54.2	37	19.6	12.8	8.24	5.2	3.93	3.21	2.73
250	0.004	155	109	88.7	61.6	42.2	22.4	14.7	9.43	5.96	4.51	3.69	3.14

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	54.9	38.4	31	21.3	14.4	7.53	4.89	3.12	1.95	1.47	1.2	1.02
2	0.5	60.2	42.1	34	23.4	15.9	8.29	5.39	3.44	2.15	1.62	1.32	1.12
5	0.2	78.1	54.7	44.2	30.5	20.7	10.9	7.07	4.52	2.84	2.14	1.74	1.48
10	0.1	91.3	64	51.8	35.7	24.3	12.8	8.34	5.33	3.35	2.53	2.06	1.75
20	0.05	105	73.5	59.5	41.2	28	14.8	9.64	6.17	3.88	2.93	2.39	2.03
30	0.033	113	79.2	64.1	44.4	30.3	16	10.4	6.68	4.21	3.18	2.59	2.21
40	0.025	118	83.2	67.4	46.7	31.9	16.8	11	7.05	4.44	3.35	2.74	2.33
50	0.02	123	86.5	70.1	48.5	33.1	17.5	11.4	7.33	4.62	3.49	2.85	2.43
60	0.017	127	89	72.2	50	34.1	18.1	11.8	7.57	4.77	3.61	2.94	2.51
80	0.013	132	93.2	75.6	52.4	35.8	18.9	12.4	7.94	5.01	3.79	3.09	2.63
100	0.01	137	96.4	78.2	54.2	37	19.6	12.8	8.24	5.2	3.93	3.21	2.73
250	0.004	155	109	88.7	61.6	42.2	22.4	14.7	9.43	5.96	4.51	3.69	3.14

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	55.9	39	31.5	21.7	14.7	7.63	4.95	3.16	1.97	1.48	1.2	1.02
2	0.5	61.2	42.8	34.5	23.8	16.1	8.4	5.45	3.47	2.17	1.63	1.33	1.13
5	0.2	79.5	55.6	45	31	21.1	11	7.17	4.57	2.86	2.16	1.76	1.49
10	0.1	92.9	65.1	52.7	36.4	24.8	13	8.45	5.4	3.38	2.55	2.08	1.77
20	0.05	107	74.9	60.6	41.9	28.5	15	9.77	6.24	3.92	2.96	2.41	2.05
30	0.033	115	80.7	65.3	45.2	30.8	16.2	10.6	6.76	4.25	3.21	2.62	2.22
40	0.025	121	84.8	68.7	47.6	32.4	17.1	11.1	7.13	4.48	3.39	2.76	2.35
50	0.02	125	88.1	71.4	49.4	33.7	17.8	11.6	7.42	4.67	3.53	2.88	2.45
60	0.017	129	90.7	73.5	50.9	34.8	18.3	12	7.66	4.82	3.64	2.97	2.53
80	0.013	135	95	77	53.4	36.4	19.2	12.6	8.04	5.06	3.83	3.12	2.66
100	0.01	140	98.2	79.6	55.2	37.7	19.9	13	8.34	5.25	3.97	3.24	2.76
250	0.004	158	111	90.4	62.8	43	22.7	14.9	9.55	6.02	4.56	3.72	3.17

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	58.7	41	33.1	22.8	15.4	7.95	5.12	3.25	2.02	1.51	1.23	1.04
2	0.5	64.4	45	36.4	25	16.9	8.76	5.66	3.58	2.23	1.67	1.36	1.15
5	0.2	83.8	58.7	47.5	32.7	22.2	11.5	7.46	4.73	2.95	2.22	1.8	1.53
10	0.1	98.2	68.8	55.7	38.4	26.1	13.6	8.8	5.59	3.49	2.63	2.13	1.81
20	0.05	113	79.1	64.1	44.3	30.1	15.7	10.2	6.47	4.05	3.05	2.48	2.11
30	0.033	121	85.3	69.1	47.8	32.5	17	11	7.01	4.39	3.3	2.69	2.28
40	0.025	128	89.7	72.6	50.3	34.2	17.9	11.6	7.4	4.63	3.49	2.84	2.41
50	0.02	133	93.2	75.5	52.3	35.6	18.6	12.1	7.69	4.82	3.63	2.96	2.51
60	0.017	136	95.9	77.8	53.9	36.7	19.2	12.5	7.95	4.98	3.76	3.06	2.6
80	0.013	143	100	81.5	56.5	38.5	20.2	13.1	8.34	5.23	3.94	3.21	2.73
100	0.01	148	104	84.3	58.4	39.8	20.9	13.6	8.66	5.43	4.09	3.33	2.83
250	0.004	167	118	95.7	66.4	45.4	23.9	15.5	9.91	6.23	4.7	3.83	3.26

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	55.5	38.7	31.3	21.5	14.6	7.59	4.92	3.14	1.96	1.48	1.2	1.02
2	0.5	60.8	42.5	34.3	23.6	16	8.36	5.42	3.46	2.16	1.63	1.32	1.13
5	0.2	78.9	55.2	44.7	30.8	20.9	11	7.13	4.55	2.85	2.15	1.75	1.49
10	0.1	92.3	64.7	52.3	36.1	24.6	12.9	8.4	5.37	3.37	2.54	2.07	1.76
20	0.05	106	74.3	60.2	41.6	28.3	14.9	9.72	6.22	3.91	2.95	2.4	2.05
30	0.033	114	80.1	64.9	44.9	30.6	16.1	10.5	6.73	4.23	3.2	2.61	2.22
40	0.025	120	84.2	68.2	47.2	32.2	17	11.1	7.1	4.47	3.37	2.75	2.34
50	0.02	124	87.4	70.9	49.1	33.5	17.7	11.5	7.38	4.65	3.51	2.87	2.44
60	0.017	128	90	73	50.6	34.5	18.2	11.9	7.62	4.8	3.63	2.96	2.52
80	0.013	134	94.3	76.4	53	36.2	19.1	12.5	8	5.04	3.81	3.11	2.65
100	0.01	139	97.5	79	54.8	37.4	19.8	12.9	8.3	5.23	3.95	3.23	2.75
250	0.004	157	111	89.7	62.3	42.6	22.6	14.8	9.5	6	4.54	3.71	3.16

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	61.3	42.8	34.5	23.8	16	8.23	5.28	3.34	2.07	1.55	1.25	1.06
2	0.5	67.3	47	38	26.1	17.7	9.08	5.84	3.68	2.28	1.71	1.39	1.18
5	0.2	87.8	61.4	49.7	34.3	23.2	12	7.72	4.87	3.03	2.27	1.84	1.56
10	0.1	103	72.1	58.3	40.3	27.3	14.1	9.12	5.76	3.59	2.69	2.18	1.85
20	0.05	118	82.9	67.1	46.4	31.5	16.4	10.6	6.67	4.16	3.13	2.54	2.15
30	0.033	127	89.4	72.4	50.1	34	17.7	11.4	7.23	4.51	3.39	2.76	2.34
40	0.025	134	94	76.2	52.7	35.8	18.7	12.1	7.63	4.76	3.58	2.91	2.47
50	0.02	139	97.7	79.2	54.8	37.3	19.4	12.5	7.94	4.96	3.73	3.03	2.57
60	0.017	143	101	81.6	56.5	38.4	20.1	13	8.21	5.12	3.86	3.13	2.66
80	0.013	150	105	85.5	59.2	40.3	21	13.6	8.61	5.38	4.05	3.29	2.79
100	0.01	155	109	88.4	61.3	41.7	21.8	14.1	8.94	5.58	4.2	3.42	2.9
250	0.004	175	124	100	69.7	47.5	24.9	16.1	10.2	6.41	4.82	3.93	3.33

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	56.5	39.5	31.9	21.9	14.8	7.71	4.99	3.18	1.98	1.49	1.21	1.03
2	0.5	62	43.3	35	24.1	16.3	8.49	5.5	3.5	2.18	1.64	1.34	1.13
5	0.2	80.5	56.4	45.6	31.4	21.3	11.1	7.24	4.61	2.88	2.17	1.77	1.5
10	0.1	94.2	66	53.4	36.9	25.1	13.1	8.53	5.44	3.41	2.57	2.09	1.78
20	0.05	108	75.9	61.4	42.5	28.9	15.2	9.87	6.3	3.95	2.98	2.43	2.06
30	0.033	116	81.8	66.2	45.8	31.2	16.4	10.7	6.82	4.28	3.23	2.63	2.24
40	0.025	122	85.9	69.6	48.2	32.9	17.3	11.3	7.19	4.52	3.41	2.78	2.36
50	0.02	127	89.3	72.3	50.1	34.2	18	11.7	7.48	4.71	3.55	2.9	2.46
60	0.017	131	91.9	74.5	51.6	35.2	18.6	12.1	7.73	4.86	3.67	2.99	2.54
80	0.013	137	96.2	78	54.1	36.9	19.4	12.7	8.11	5.1	3.85	3.14	2.67
100	0.01	141	99.5	80.7	56	38.2	20.2	13.1	8.41	5.29	4	3.26	2.77
250	0.004	160	113	91.6	63.6	43.5	23	15	9.64	6.07	4.59	3.75	3.19

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	67.1	46.8	37.8	26	17.4	8.87	5.63	3.54	2.17	1.61	1.3	1.11
2	0.5	73.8	51.6	41.7	28.7	19.3	9.81	6.25	3.91	2.4	1.79	1.45	1.23
5	0.2	96.6	67.6	54.7	37.7	25.5	13	8.3	5.19	3.2	2.39	1.93	1.64
10	0.1	113	79.5	64.3	44.4	30	15.4	9.83	6.15	3.8	2.84	2.3	1.95
20	0.05	130	91.5	74.1	51.3	34.7	17.8	11.4	7.13	4.42	3.3	2.68	2.26
30	0.033	141	98.8	80	55.4	37.5	19.3	12.3	7.73	4.79	3.58	2.9	2.46
40	0.025	148	104	84.1	58.2	39.5	20.4	13	8.17	5.06	3.79	3.07	2.6
50	0.02	154	108	87.5	60.6	41.1	21.2	13.6	8.5	5.27	3.95	3.2	2.71
60	0.017	158	111	90.1	62.4	42.4	21.9	14	8.79	5.44	4.08	3.3	2.79
80	0.013	166	117	94.5	65.5	44.4	22.9	14.7	9.22	5.73	4.29	3.47	2.94
100	0.01	171	121	97.7	67.8	46	23.8	15.3	9.58	5.94	4.45	3.61	3.05
250	0.004	194	137	111	77.1	52.4	27.2	17.5	11	6.81	5.11	4.15	3.51

HIRDS V4 Depth-Duration-Frequency Results
Sitename: waiotemarama gorge road
Coordinate system: WGS84
Longitude: 173.4261
Latitude: -35.5266
DDF Model

Parameters:	c	d	e	f	g	h	i
Values:	0.00247304	0.45238351	-0.01215667	-0.00090973		0.25186548	-0.01108536	2.991425

Example:	Duration (hrs)	ARI (yrs)	x	y	Rainfall Depth (mm)
	24	100	3.17805383	4.600149227	188.1674445

Rainfall depths (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	8.56	11.9	14.5	19.9	27.1	42.8	56	72	90.7	103	112	119
2	0.5	9.36	13.1	15.8	21.8	29.7	47	61.5	79.1	99.7	113	123	131
5	0.2	12.1	16.9	20.5	28.3	38.6	61.4	80.5	104	131	149	162	172
10	0.1	14.1	19.8	24	33.2	45.3	72.1	94.7	122	154	175	191	204
20	0.05	16.2	22.7	27.6	38.2	52.2	83.2	109	141	179	203	221	236
30	0.033	17.4	24.5	29.7	41.1	56.3	89.9	118	153	194	220	240	256
40	0.025	18.3	25.7	31.3	43.3	59.2	94.6	125	161	204	232	253	270
50	0.02	19	26.7	32.4	44.9	61.5	98.4	130	168	213	242	264	281
60	0.017	19.6	27.5	33.4	46.3	63.4	101	134	173	219	250	272	290
80	0.013	20.4	28.8	35	48.5	66.4	106	140	182	230	262	286	305
100	0.01	21.1	29.7	36.2	50.2	68.8	110	145	188	239	272	297	316
250	0.004	23.9	33.7	41.1	57	78.3	126	166	216	274	312	341	364

Depth standard error (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	1.1	1.5	1.5	2.2	3.1	5.9	8.2	6.4	8.1	8.9	9.6	10
2	0.5	1.2	1.6	1.7	2.4	3.4	6.5	9	7.1	8.9	9.9	11	12
5	0.2	1.6	2.2	2.4	3.4	4.6	8.8	12	9.8	12	14	15	16
10	0.1	2.1	2.8	3.2	4.3	5.8	11	15	12	15	17	18	20
20	0.05	2.6	3.6	4.3	5.6	7.3	13	18	15	19	22	23	26
30	0.033	3	4.1	5	6.5	8.4	15	20	17	21	25	27	29
40	0.025	3.3	4.5	5.6	7.3	9.3	16	22	19	24	27	29	32
50	0.02	3.6	4.9	6.1	7.9	10	18	24	20	25	29	32	35
60	0.017	3.8	5.2	6.5	8.5	11	19	25	22	27	31	34	37
80	0.013	4.2	5.8	7.2	9.5	12	20	28	24	30	34	37	41
100	0.01	4.5	6.3	7.9	10	13	22	30	25	32	37	40	44
250	0.004	6.2	8.7	11	15	18	29	40	34	43	49	54	59

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	9.16	12.8	15.5	21.3	28.9	45.2	58.7	75	93.8	106	115	122
2	0.5	10	14	17	23.4	31.7	49.7	64.6	82.5	103	117	127	135
5	0.2	13	18.2	22.1	30.5	41.4	65.2	84.9	109	136	154	167	178
10	0.1	15.2	21.3	25.9	35.7	48.7	76.7	100	128	161	182	198	210
20	0.05	17.5	24.5	29.8	41.2	56.1	88.6	116	148	186	211	230	244
30	0.033	18.8	26.4	32.1	44.4	60.5	95.8	125	160	202	229	249	265
40	0.025	19.7	27.7	33.7	46.7	63.7	101	132	169	213	242	263	280
50	0.02	20.5	28.8	35	48.5	66.2	105	137	176	222	251	274	291
60	0.017	21.1	29.7	36.1	50	68.3	108	142	182	229	260	283	301
80	0.013	22.1	31.1	37.8	52.4	71.6	114	149	191	241	273	297	316
100	0.01	22.8	32.1	39.1	54.2	74.1	118	154	198	249	283	308	328
250	0.004	25.8	36.4	44.4	61.6	84.4	134	176	226	286	325	354	377

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	9.16	12.8	15.5	21.3	28.9	45.2	58.7	75	93.8	106	115	122
2	0.5	10	14	17	23.4	31.7	49.7	64.6	82.5	103	117	127	135
5	0.2	13	18.2	22.1	30.5	41.4	65.2	84.9	109	136	154	167	178
10	0.1	15.2	21.3	25.9	35.7	48.7	76.7	100	128	161	182	198	210
20	0.05	17.5	24.5	29.8	41.2	56.1	88.6	116	148	186	211	230	244
30	0.033	18.8	26.4	32.1	44.4	60.5	95.8	125	160	202	229	249	265
40	0.025	19.7	27.7	33.7	46.7	63.7	101	132	169	213	242	263	280
50	0.02	20.5	28.8	35	48.5	66.2	105	137	176	222	251	274	291
60	0.017	21.1	29.7	36.1	50	68.3	108	142	182	229	260	283	301
80	0.013	22.1	31.1	37.8	52.4	71.6	114	149	191	241	273	297	316
100	0.01	22.8	32.1	39.1	54.2	74.1	118	154	198	249	283	308	328
250	0.004	25.8	36.4	44.4	61.6	84.4	134	176	226	286	325	354	377

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	9.31	13	15.7	21.7	29.3	45.8	59.4	75.7	94.6	107	116	123
2	0.5	10.2	14.3	17.3	23.8	32.2	50.4	65.4	83.3	104	118	128	135
5	0.2	13.2	18.5	22.5	31	42.2	66.2	86	110	137	155	169	179
10	0.1	15.5	21.7	26.4	36.4	49.5	77.9	101	130	162	184	200	212
20	0.05	17.8	25	30.3	41.9	57.1	90	117	150	188	213	232	246
30	0.033	19.1	26.9	32.7	45.2	61.6	97.3	127	162	204	231	251	267
40	0.025	20.1	28.3	34.4	47.6	64.9	103	134	171	215	244	265	282
50	0.02	20.9	29.4	35.7	49.4	67.4	107	139	178	224	254	276	294
60	0.017	21.5	30.2	36.8	50.9	69.5	110	144	184	231	262	285	303
80	0.013	22.5	31.7	38.5	53.4	72.9	115	151	193	243	275	299	319
100	0.01	23.3	32.7	39.8	55.2	75.4	120	156	200	252	286	311	331
250	0.004	26.3	37.1	45.2	62.8	85.9	136	179	229	289	328	357	380

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	9.79	13.7	16.5	22.8	30.7	47.7	61.5	78.1	97	109	118	125
2	0.5	10.7	15	18.2	25	33.9	52.6	67.9	86	107	121	130	138
5	0.2	14	19.6	23.7	32.7	44.4	69.2	89.5	114	142	160	173	184
10	0.1	16.4	22.9	27.8	38.4	52.2	81.5	106	134	168	189	205	218
20	0.05	18.8	26.4	32	44.3	60.2	94.4	122	155	194	219	238	253
30	0.033	20.2	28.4	34.5	47.8	65	102	132	168	211	238	258	274
40	0.025	21.3	29.9	36.3	50.3	68.5	108	140	177	222	251	272	290
50	0.02	22.1	31.1	37.7	52.3	71.2	112	145	185	232	262	284	302
60	0.017	22.7	32	38.9	53.9	73.4	115	150	191	239	270	293	311
80	0.013	23.8	33.5	40.7	56.5	77	121	157	200	251	284	308	328
100	0.01	24.6	34.6	42.1	58.4	79.7	126	163	208	261	295	320	340
250	0.004	27.9	39.3	47.8	66.4	90.7	143	186	238	299	338	368	391

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	9.25	12.9	15.6	21.5	29.1	45.6	59.1	75.4	94.2	106	115	123
2	0.5	10.1	14.2	17.2	23.6	32	50.1	65.1	83	104	117	127	135
5	0.2	13.2	18.4	22.3	30.8	41.9	65.8	85.6	109	137	155	168	179
10	0.1	15.4	21.6	26.2	36.1	49.2	77.4	101	129	162	183	199	211
20	0.05	17.7	24.8	30.1	41.6	56.7	89.5	117	149	188	212	231	245
30	0.033	19	26.7	32.4	44.9	61.2	96.7	126	161	203	230	250	266
40	0.025	20	28.1	34.1	47.2	64.4	102	133	170	214	243	264	281
50	0.02	20.7	29.1	35.4	49.1	67	106	138	177	223	253	275	293
60	0.017	21.3	30	36.5	50.6	69	109	143	183	230	261	284	302
80	0.013	22.3	31.4	38.2	53	72.4	115	150	192	242	274	298	318
100	0.01	23.1	32.5	39.5	54.8	74.9	119	155	199	251	285	310	330
250	0.004	26.1	36.9	44.9	62.3	85.3	136	178	228	288	327	356	379

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	10.2	14.3	17.3	23.8	32	49.4	63.3	80.2	99.2	111	120	128
2	0.5	11.2	15.7	19	26.1	35.3	54.5	70.1	88.4	110	123	133	141
5	0.2	14.6	20.5	24.8	34.3	46.4	71.9	92.6	117	145	164	177	187
10	0.1	17.1	24	29.2	40.3	54.6	84.8	109	138	172	194	210	222
20	0.05	19.7	27.6	33.6	46.4	63	98.2	127	160	200	225	244	258
30	0.033	21.2	29.8	36.2	50.1	68.1	106	137	173	217	244	265	280
40	0.025	22.3	31.3	38.1	52.7	71.7	112	145	183	228	258	279	296
50	0.02	23.2	32.6	39.6	54.8	74.6	117	151	191	238	269	291	309
60	0.017	23.9	33.5	40.8	56.5	76.9	120	156	197	246	278	301	319
80	0.013	25	35.1	42.7	59.2	80.6	126	163	207	258	292	316	335
100	0.01	25.8	36.3	44.2	61.3	83.5	131	169	215	268	302	328	348
250	0.004	29.2	41.2	50.2	69.7	95	149	194	246	307	347	377	400

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

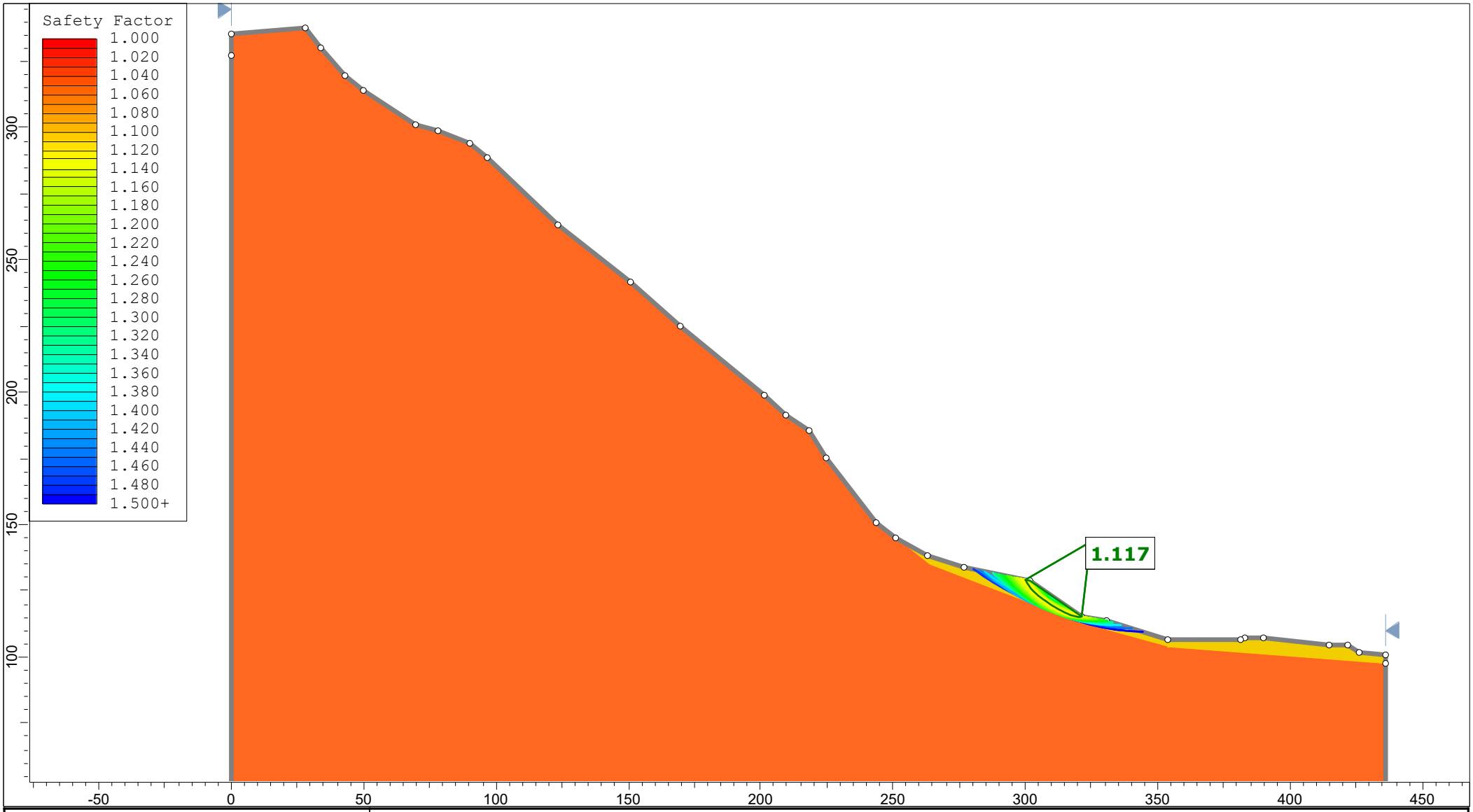
ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	9.42	13.2	15.9	21.9	29.6	46.2	59.8	76.3	95.1	107	116	123
2	0.5	10.3	14.4	17.5	24.1	32.6	50.9	66	84	105	118	128	136
5	0.2	13.4	18.8	22.8	31.4	42.7	66.9	86.8	111	138	156	170	180
10	0.1	15.7	22	26.7	36.9	50.2	78.7	102	131	164	185	201	213
20	0.05	18	25.3	30.7	42.5	57.8	91	118	151	190	215	233	248
30	0.033	19.4	27.3	33.1	45.8	62.4	98.4	128	164	206	233	253	269
40	0.025	20.4	28.6	34.8	48.2	65.7	104	135	173	217	246	267	284
50	0.02	21.2	29.8	36.2	50.1	68.3	108	141	180	226	256	278	296
60	0.017	21.8	30.6	37.3	51.6	70.4	111	145	185	233	264	287	305
80	0.013	22.8	32.1	39	54.1	73.8	117	152	195	245	277	301	321
100	0.01	23.6	33.2	40.4	56	76.4	121	158	202	254	288	313	333
250	0.004	26.7	37.6	45.8	63.6	87	138	180	231	291	330	360	383

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	11.2	15.6	18.9	26	34.9	53.2	67.6	85	104	116	125	133
2	0.5	12.3	17.2	20.8	28.7	38.6	58.9	75	93.8	115	129	139	147
5	0.2	16.1	22.5	27.3	37.7	50.9	78	99.6	125	154	172	186	196
10	0.1	18.9	26.5	32.1	44.4	60	92.2	118	148	182	205	221	234
20	0.05	21.7	30.5	37.1	51.3	69.4	107	137	171	212	238	257	271
30	0.033	23.4	32.9	40	55.4	75	116	148	186	230	258	279	295
40	0.025	24.6	34.6	42.1	58.2	78.9	122	156	196	243	273	294	312
50	0.02	25.6	36	43.7	60.6	82.2	127	163	204	253	284	307	325
60	0.017	26.4	37.1	45.1	62.4	84.7	131	168	211	261	294	317	335
80	0.013	27.6	38.8	47.2	65.5	88.9	138	176	221	275	309	333	353
100	0.01	28.5	40.2	48.9	67.8	92	143	183	230	285	320	346	366
250	0.004	32.3	45.6	55.5	77.1	105	163	209	263	327	368	398	421

APPENDIX E

Slope Stability Models



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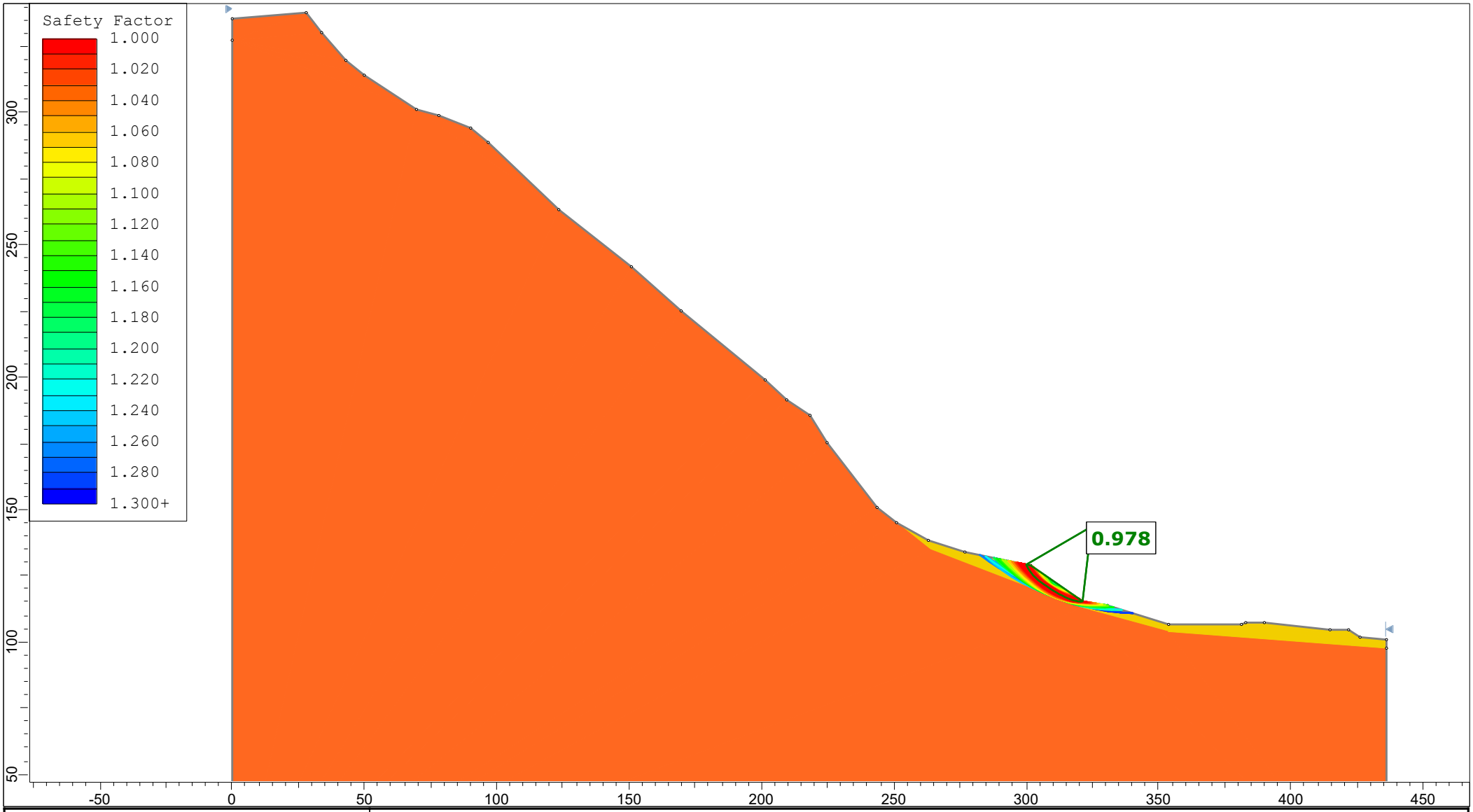
SLIDEINTERPRET 9.028

Project	C0021 - Waiotemarama Gorge Road - Lot 2		
Group	Existing Condition	*Scenario*	Static
Drawn By	EC	*Company*	Geologix Consulting Engineers Limited
Date	12/10/2023	*File Name*	Section A-1.slmd



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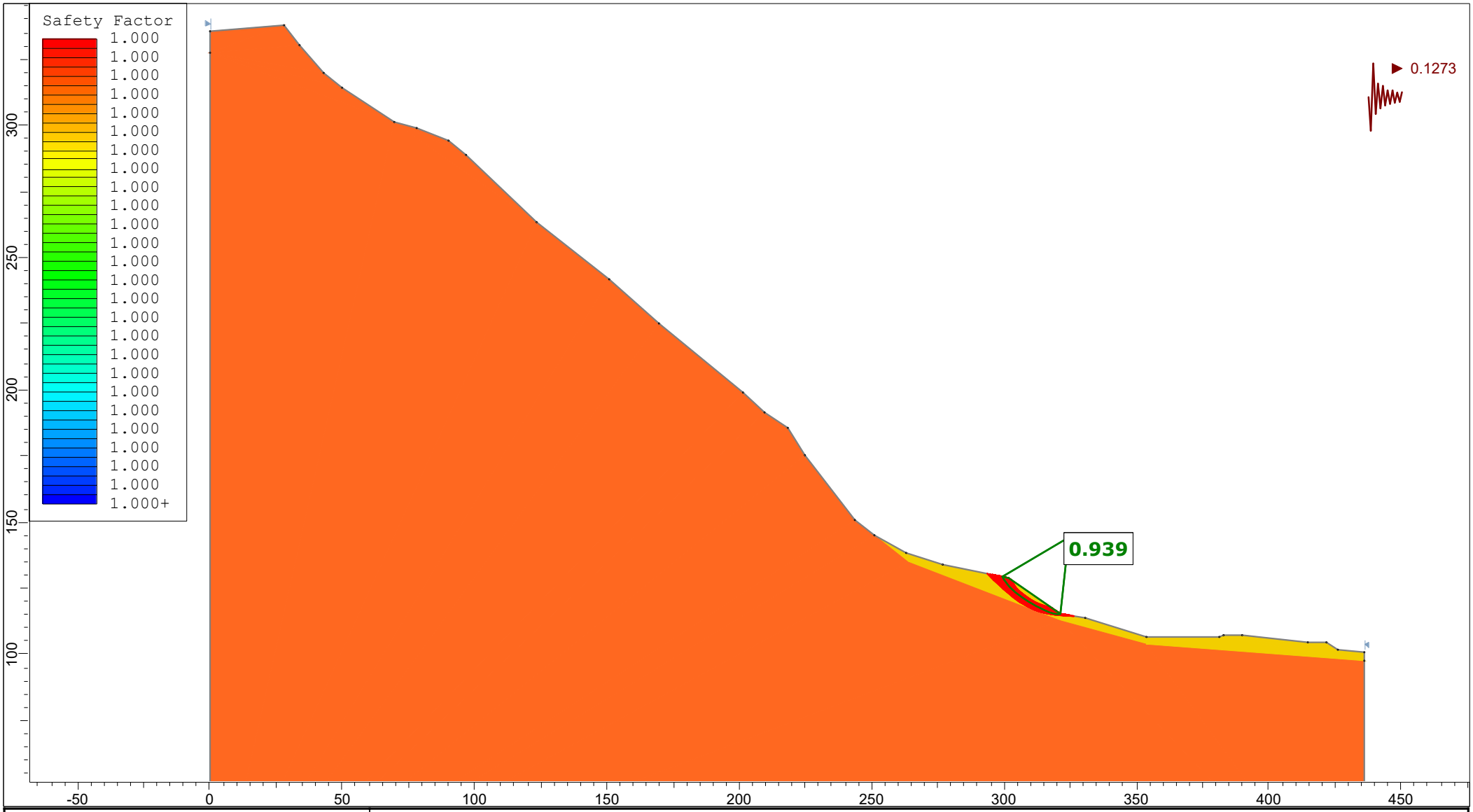
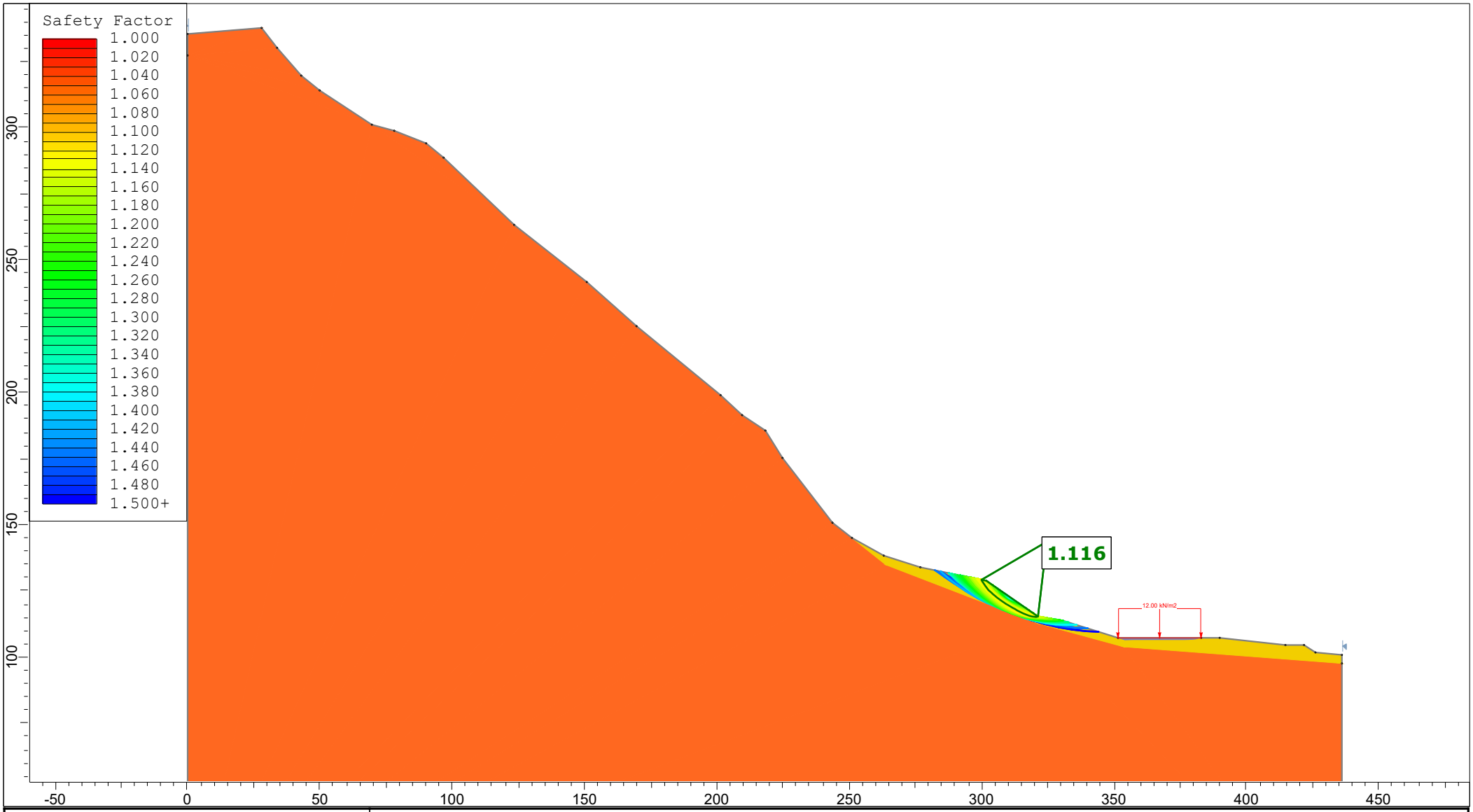
SLIDEINTERPRET 9.028

Project	C0021 - Waiotemarama Gorge Road - Lot 2		
Group	Existing Condition	*Scenario*	Elevated GW
Drawn By	EC	*Company*	Geologix Consulting Engineers Limited
Date	12/10/2023	*File Name*	Section A-1.slmd



geologix consulting engineers	*Project*	C0021 - Waiotemarama Gorge Road - Lot 2	
	Group	Existing Condition	*Scenario* Seismic
	Drawn By	EC	*Company* Geologix Consulting Engineers Limited
	Date	12/10/2023	*File Name* Section A-1.slmd

SLIDEINTERPRET 9.028



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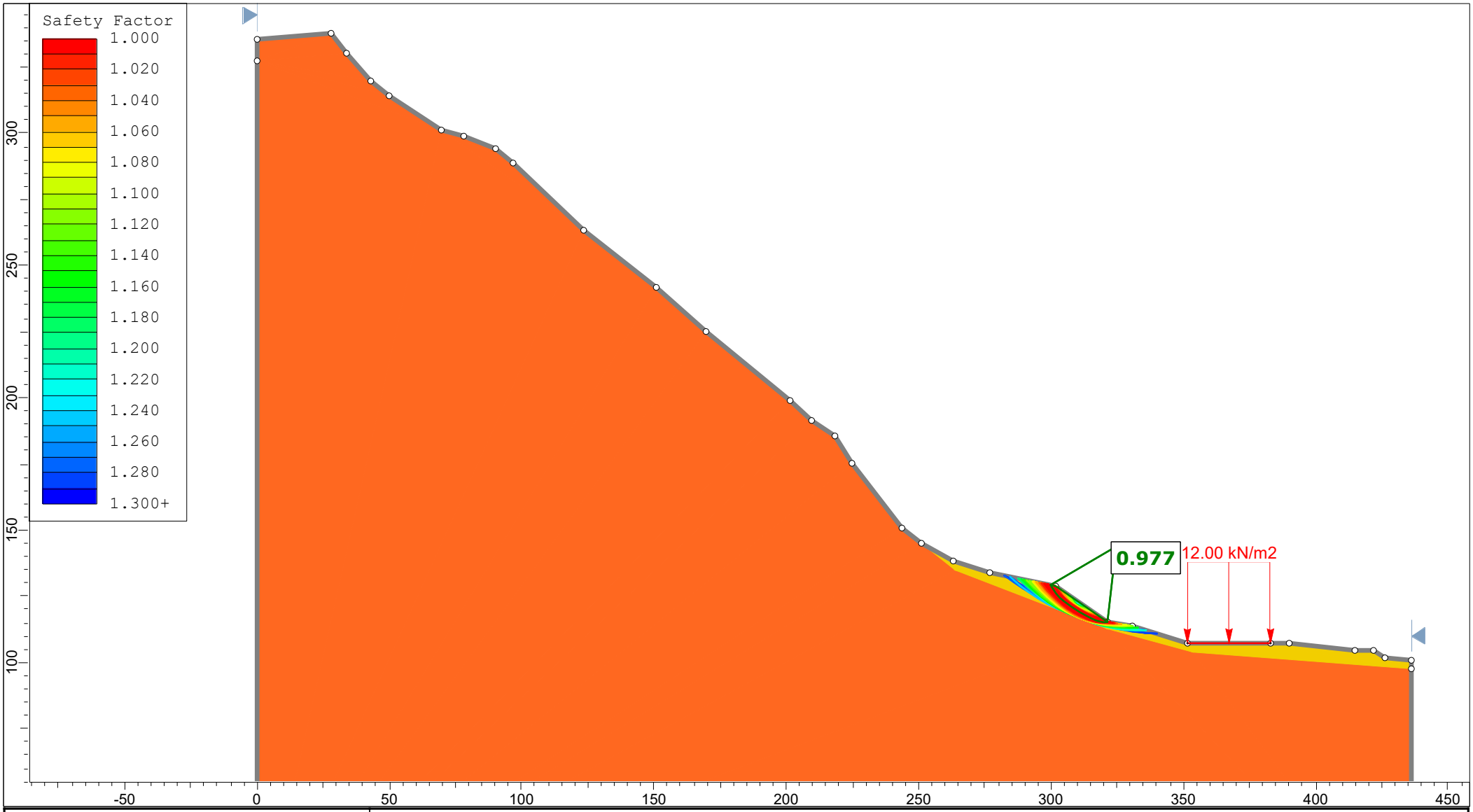
SLIDEINTERPRET 9.028

Project	C0021 - Waiotemarama Gorge Road - Lot 2		
Group	Proposed Condition	*Scenario*	Static
Drawn By	EC	*Company*	Geologix Consulting Engineers Limited
Date	12/10/2023	*File Name*	Section A-1.slmd



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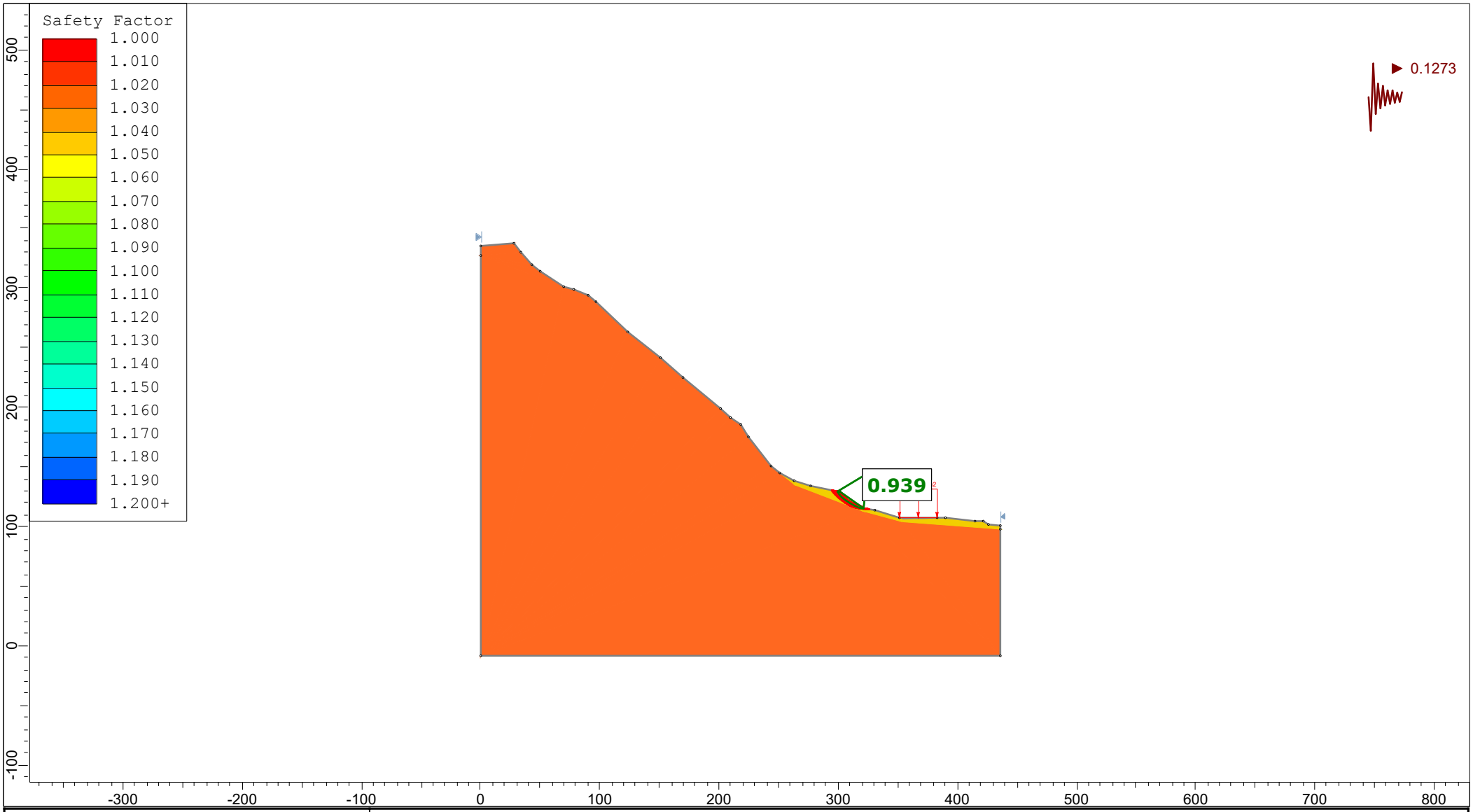
SLIDEINTERPRET 9.028

Project	C0021 - Waiotemarama Gorge Road - Lot 2		
Group	Proposed Condition	*Scenario*	Elevated GW
Drawn By	EC	*Company*	Geologix Consulting Engineers Limited
Date	12/10/2023	*File Name*	Section A-1.slmd



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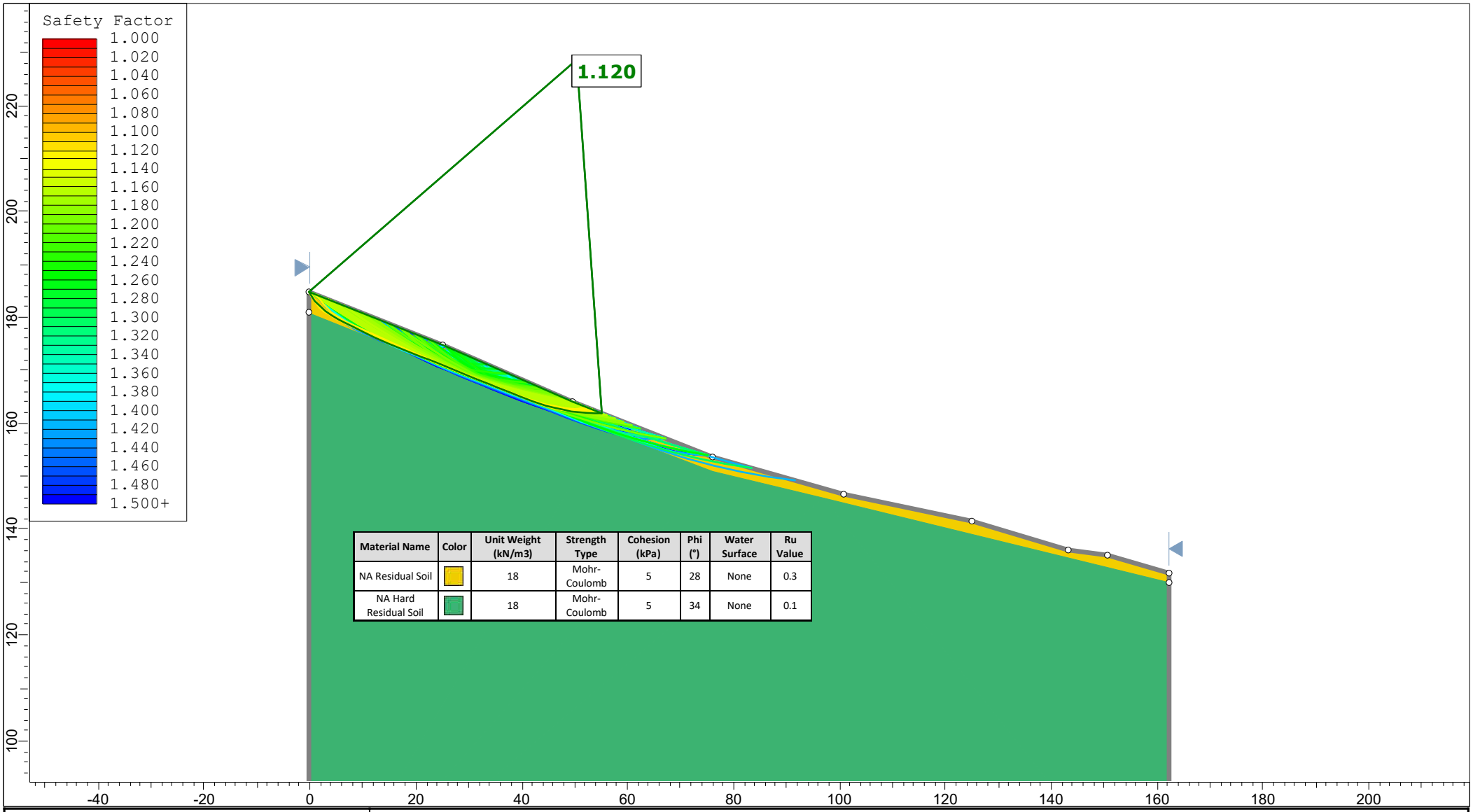
SLIDEINTERPRET 9.028

Project	C0021 - Waiotemarama Gorge Road - Lot 2		
Group	Proposed Condition	*Scenario*	Seismic
Drawn By	EC	*Company*	Geologix Consulting Engineers Limited
Date	12/10/2023	*File Name*	Section A-1.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	None	0.3
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	None	0.1

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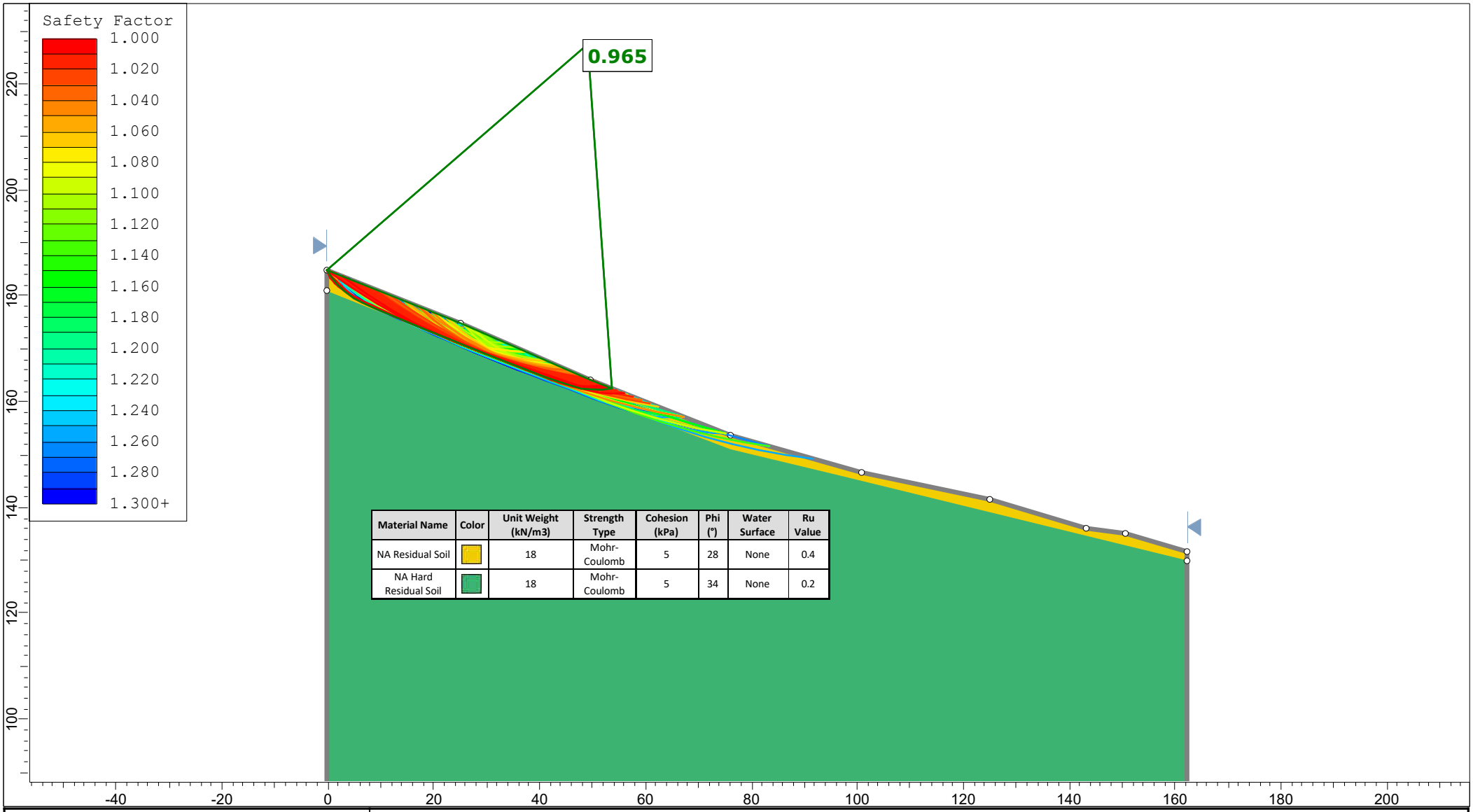
SLIDEINTERPRET 9.028

Project	Slide2 - An Interactive Slope Stability Program		
Group	Existing Condition	*Scenario*	Static
Drawn By		*Company*	
Date	12/10/2023, 7:59:04 pm	*File Name*	C0021 - Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	None	0.4
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	None	0.2

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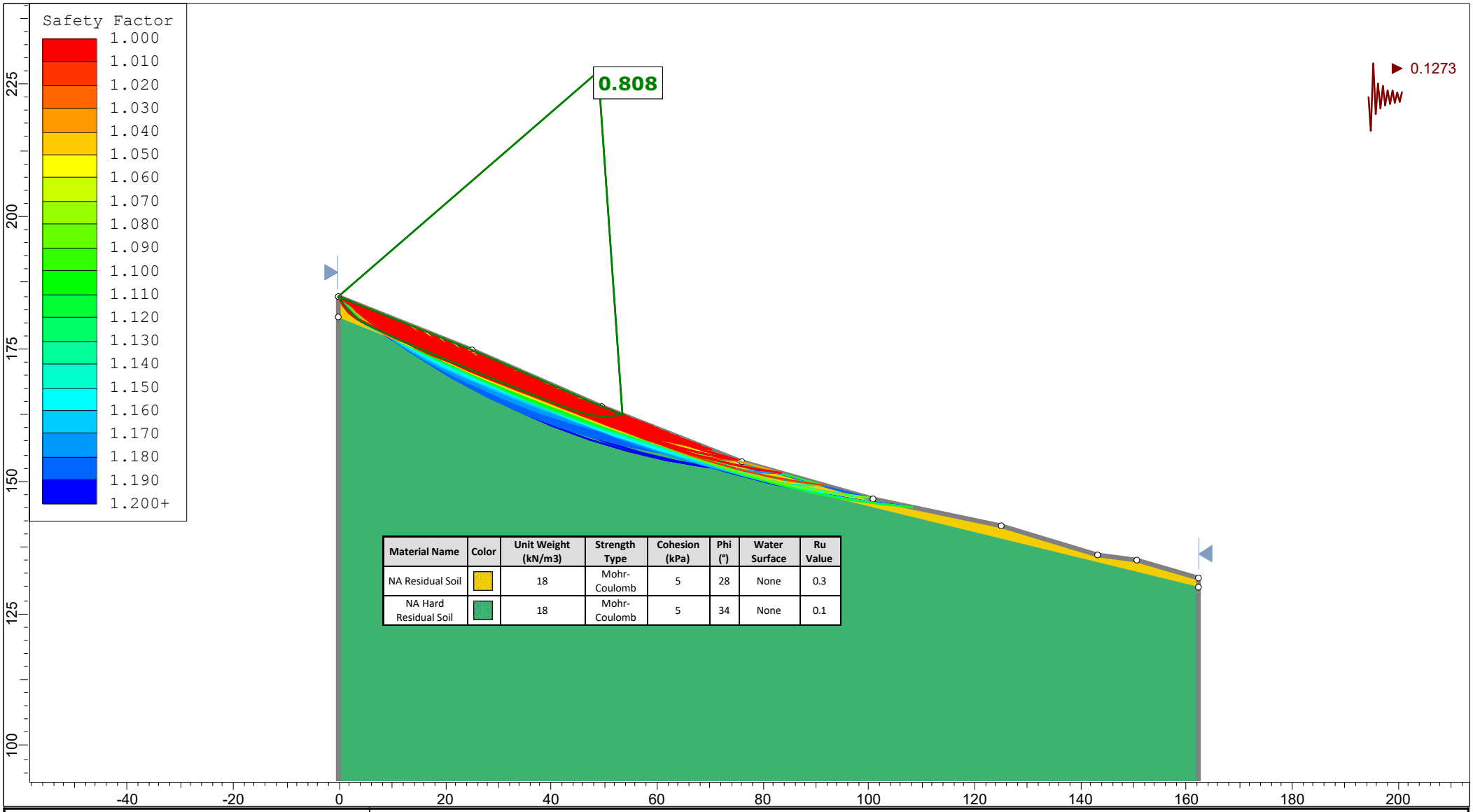
SLIDEINTERPRET 9.028

Project	Slide2 - An Interactive Slope Stability Program		
Group	Existing Condition	*Scenario*	Elevated GW
Drawn By		*Company*	
Date	12/10/2023, 7:59:04 pm	*File Name*	C0021 - Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	None	0.3
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	None	0.1

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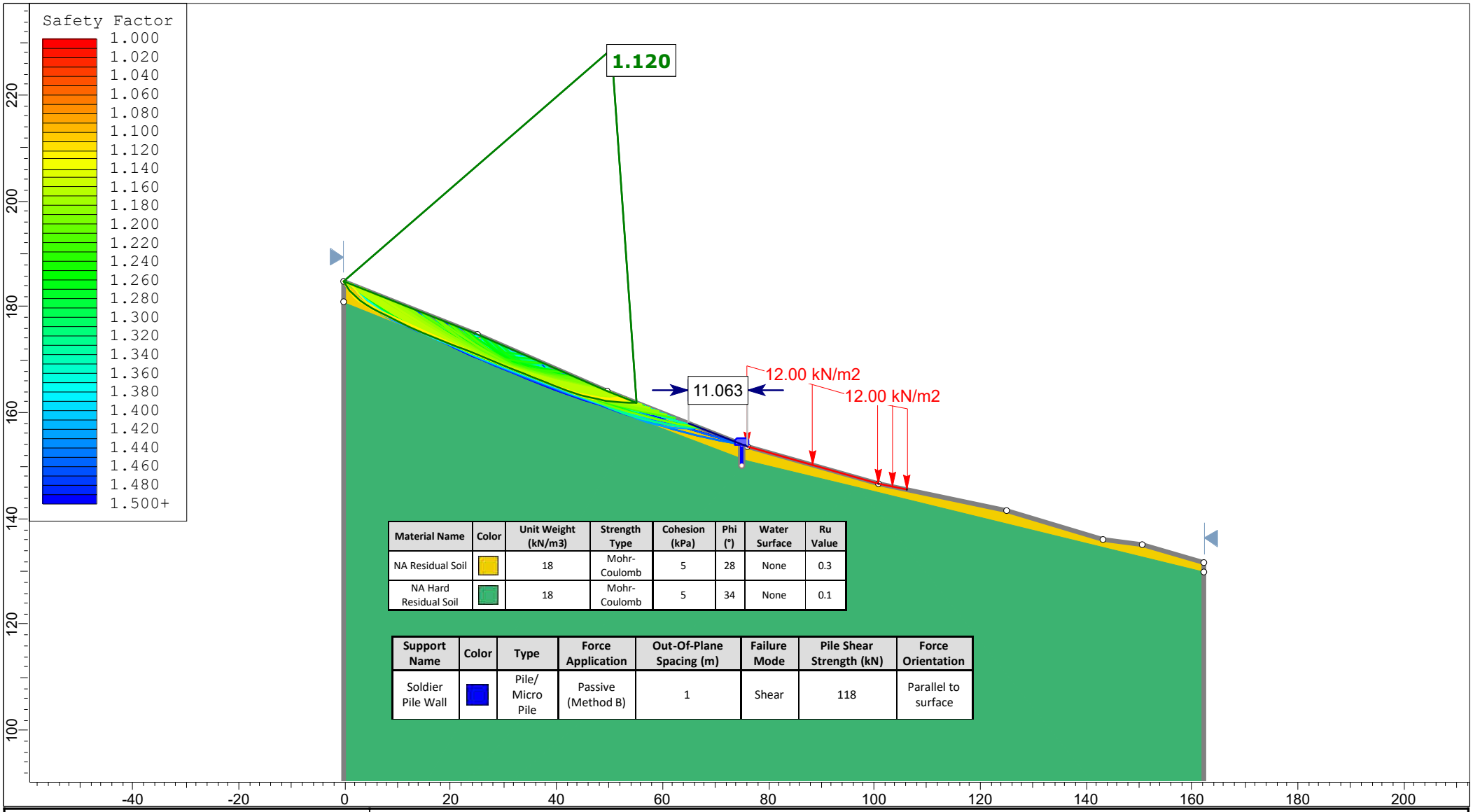
SLIDEINTERPRET 9.028

Project	Slide2 - An Interactive Slope Stability Program		
Group	Existing Condition	*Scenario*	Seismic
Drawn By		*Company*	
Date	12/10/2023, 7:59:04 pm	*File Name*	C0021 - Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	None	0.3
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	None	0.1

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Soldier Pile Wall		Pile/ Micro Pile	Passive (Method B)	1	Shear	118	Parallel to surface

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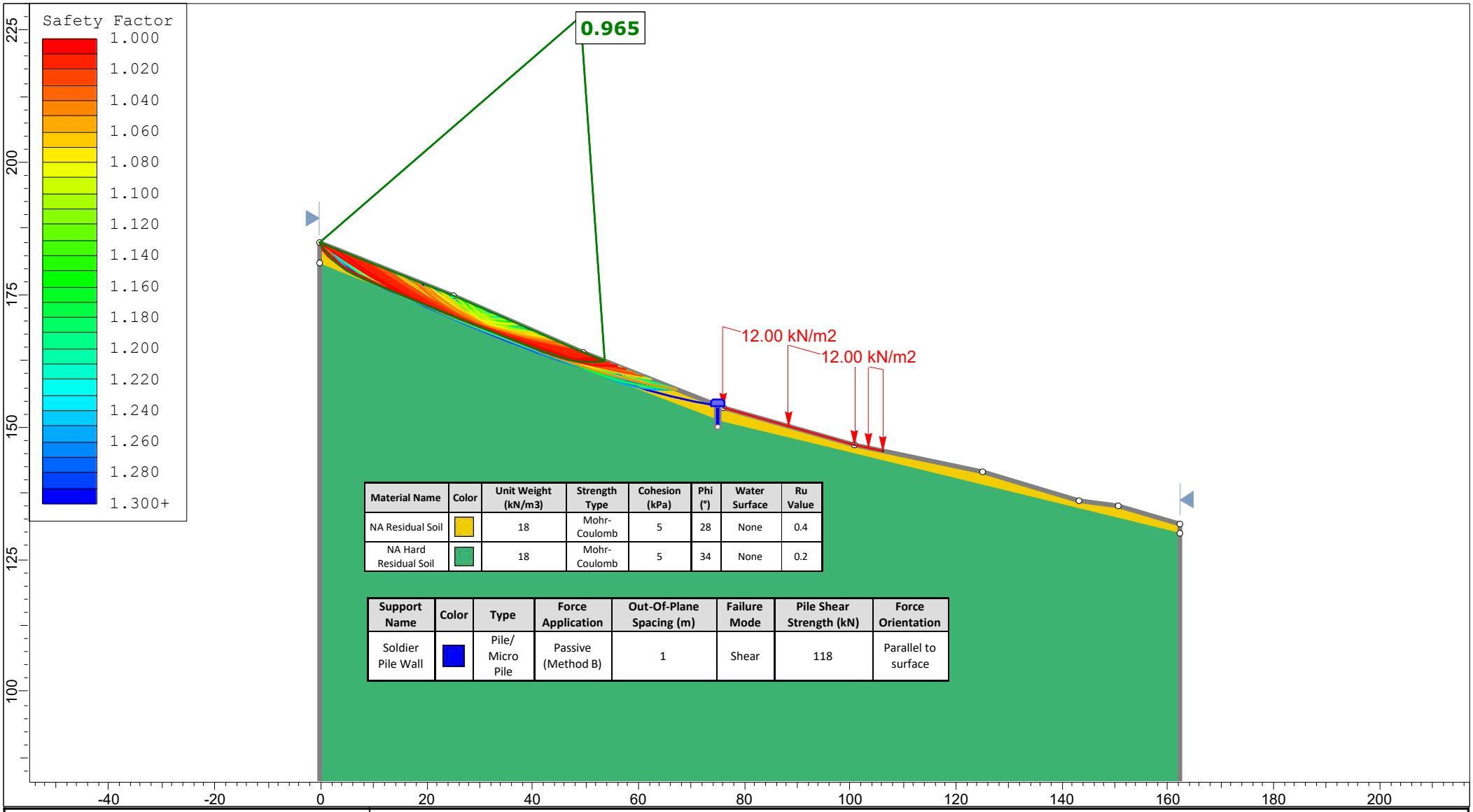
SLIDEINTERPRET 9.028

Project	Slide2 - An Interactive Slope Stability Program		
Group	Proposed Condition	*Scenario*	Static
Drawn By		*Company*	
Date	12/10/2023, 7:59:04 pm	*File Name*	C0021 - Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	None	0.4
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	None	0.2

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Soldier Pile Wall		Pile/ Micro Pile	Passive (Method B)	1	Shear	118	Parallel to surface

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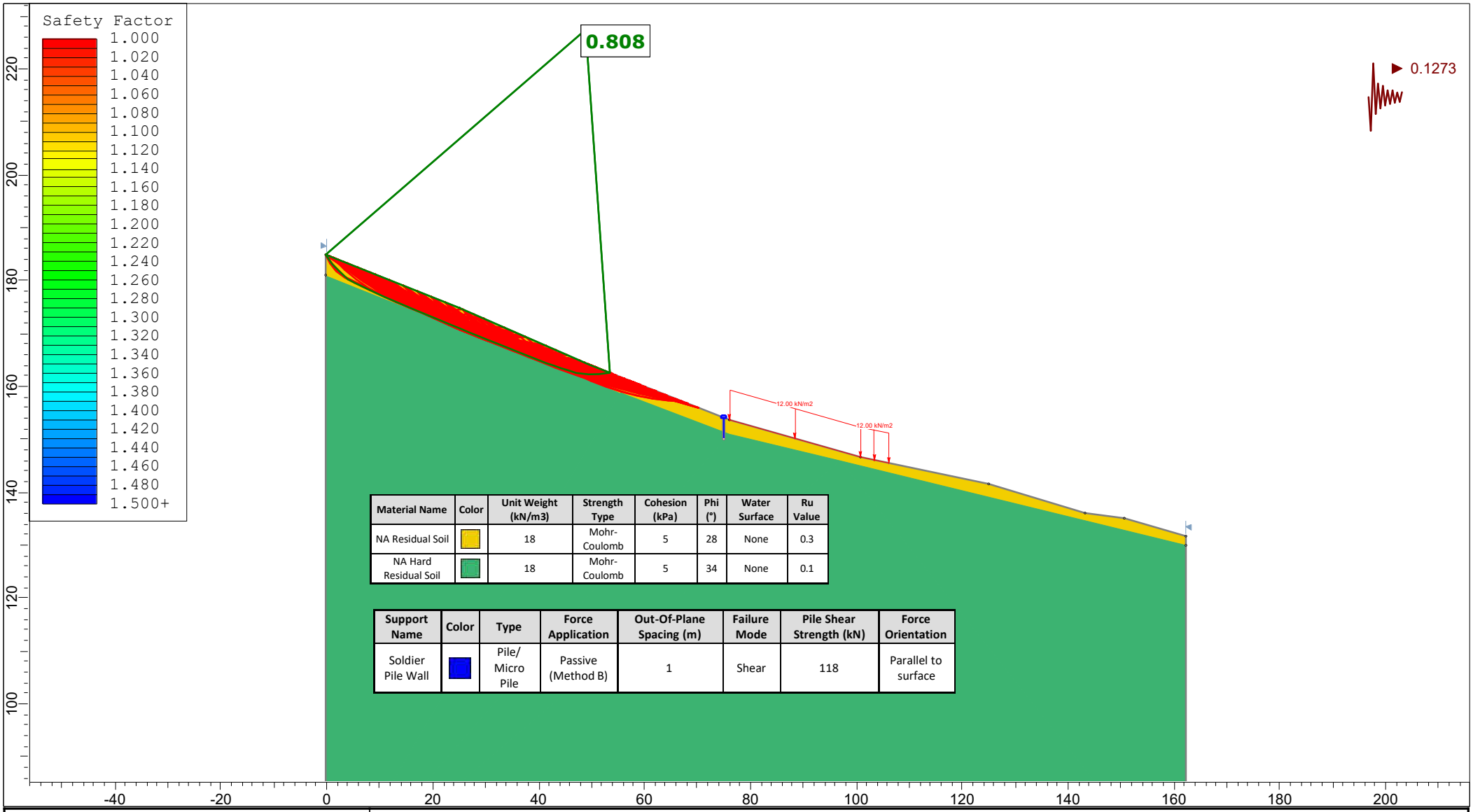
SLIDEINTERPRET 9.028

Project	Slide2 - An Interactive Slope Stability Program		
Group	Proposed Condition	*Scenario*	Elevated GW
Drawn By		*Company*	
Date	12/10/2023, 7:59:04 pm	*File Name*	C0021 - Section B.slmd



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)	Water Surface	Ru Value
NA Residual Soil		18	Mohr-Coulomb	5	28	None	0.3
NA Hard Residual Soil		18	Mohr-Coulomb	5	34	None	0.1

Support Name	Color	Type	Force Application	Out-Of-Plane Spacing (m)	Failure Mode	Pile Shear Strength (kN)	Force Orientation
Soldier Pile Wall		Pile/ Micro Pile	Passive (Method B)	1	Shear	118	Parallel to surface

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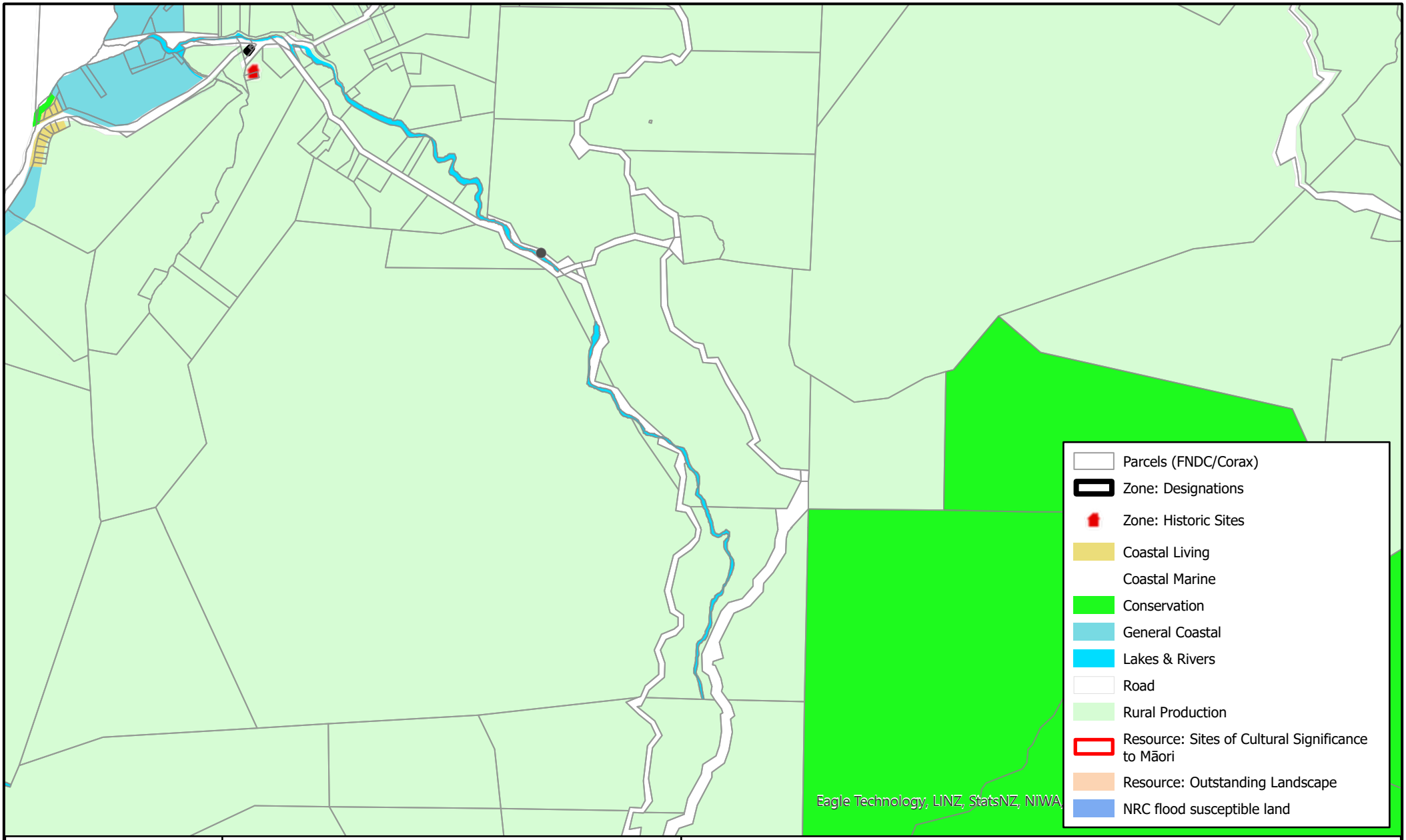
SLIDEINTERPRET 9.028

Project	Slide2 - An Interactive Slope Stability Program		
Group	Proposed Condition	*Scenario*	Seismic
Drawn By		*Company*	
Date	12/10/2023, 7:59:04 pm	*File Name*	C0021 - Section B.slmd

APPENDIX 4

PLANNING MAPS



Far North District Council
Te Kaunihera o Tai Tokerau ki te Raki

Far North Maps

0 0 1 1 km

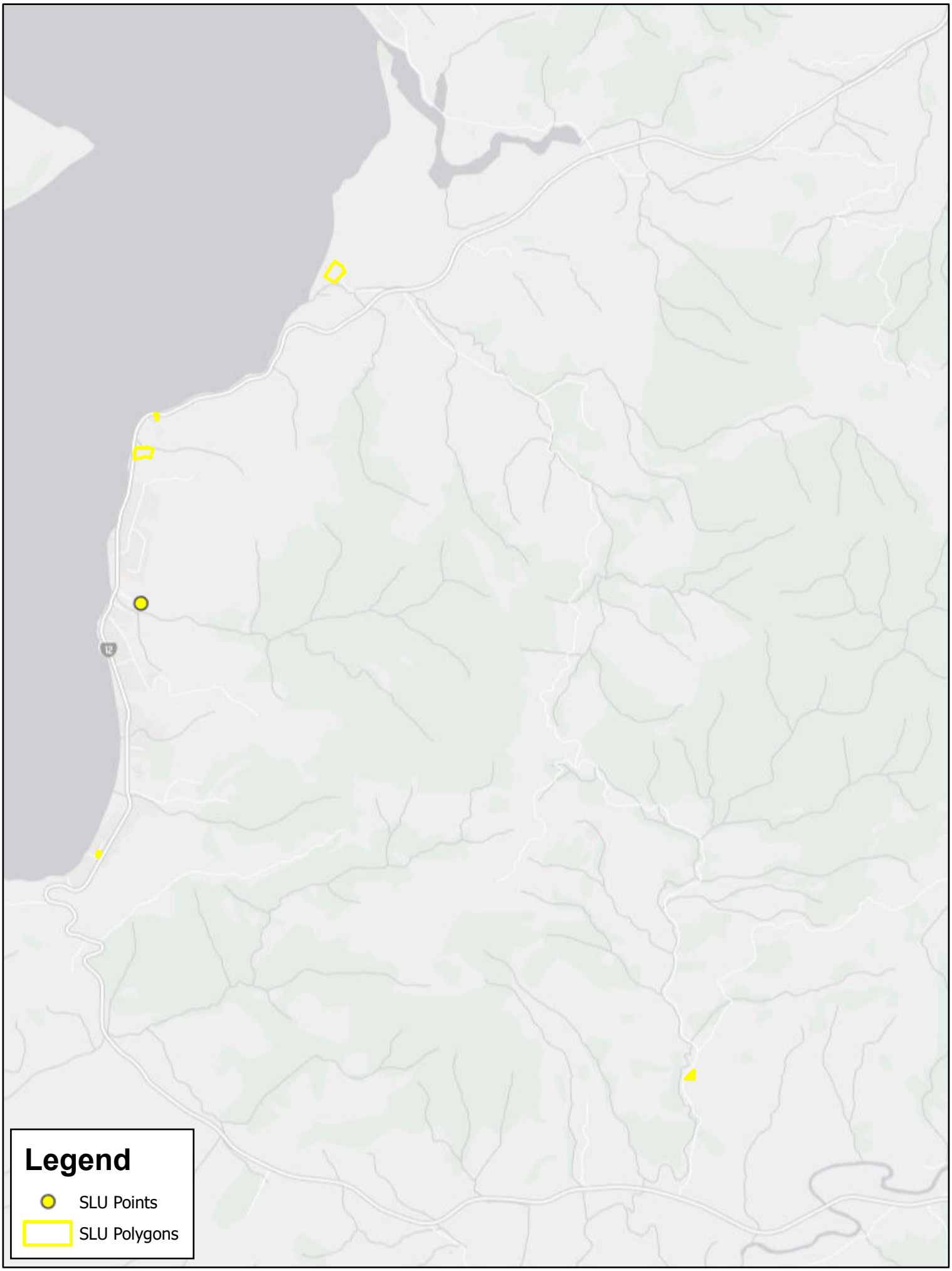
Projection NZTM2000. Datum NZGD2000. Scale:1:18,056

DISCLAIMER:
While the Far North District Council strives to keep the data in this service current, it may not be the most recent or most accurate data available. No reliance on the information contained on this map by any person is permitted. FNDC will not be liable for any omissions or errors of information contained on this map. FNDC recommends that persons seek specific advice on individual properties from FNDC and other specialist organisations which may hold more up to date or accurate information.

Created: 13/11/2023

APPENDIX 5

NRC SELECTED LAND-USE REGISTER



Northland REGIONAL COUNCIL

NRC Maps

Projection NZTM. Datum NZTM2000.
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Kilometers

November 7 2023