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

Office Use Only
Application Number:

Application for change or cancellation of resource consent condition (S.127)

(Or Associated Consent Pursuant to the Resource Management Act 1991 (RMA)) 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

If yes, who have you spoken with? ____________________

2. Type of Consent being applied for

● **Change of conditions (s.127)**

3. Consultation:

Have you consulted with Iwi/Hapū? ○ **Yes** ● **No**

If yes, which groups have you consulted with?

Who else have you consulted with?

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

4. Applicant Details:

Name/s: Ngati Kuri Trust Board Incorporated

Email:

Phone number:

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

[redacted]

Office Use Only
Application Number:

5. Address for Correspondence

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

Name/s: Steven Sanson

Email:

Phone number:

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

[redacted]

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: N/A

Property Address/ Location:

Postcode

7. Application Site Details

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

Name/s: Te Paki Stream Road, Te Paki

Site Address/ Location:

Postcode

Legal Description: Section 14 SO 469373 **Val Number:**

Certificate of title: Section 7 SO 469373

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**

7. Application Site Details (continued)

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

Please call applicant prior to site visit

8. Detailed description of the proposal:

This application relates to the following resource consent: 2230588

Specific conditions to which this application relates:

refer application

Describe the proposed changes:

refer application

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):

○ **Building Consent** Enter BC ref # here (if known)

○ **Regional Council Consent (ref # if known)** Ref # here (if known)

○ **National Environmental Standard consent** Consent here (if known)

○ **Other (please specify)** Specify 'other' here

11. 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 (including consultation from iwi/hapū).

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

12. Draft Conditions:

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

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

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 in full)** refer billing details attached

Email:

Phone number: Work Home

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

Postcode

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

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

Name: **(please write in full)**

Signature: **(signature of bill payer)** Date

MANDATORY

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

PrivacyInformation:

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 withthis application is true and complete to the best of my knowledge.

Name: (please write in full)		
Signature:		Date

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)
- ✔ Details of your consultation with Iwi and hapū
- ✔ 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 (Standard Provisions) of the Operative District Plan for details of the information that must be provided with an application. This contains more helpful hints as to what information needs to be shown on plans.

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 O 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 O 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) Ngāti Kuri Trust Board Incorporated

Email: [redacted]

Postal Address:

Phone Numbers:

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: Harry Burkhardt (please print)

Signature: [redacted] (signature of bill payer – **mandatory**) Date: 20-June 2023

Kerikeri House
Suite 3, 88 Kerikeri Road, Kerikeri

Email – office@bayplan.co.nz Website - www.bayplan.co.nz

19 February 2025

Far North District Council

Section 127 Variation – Te Paki Dunes RC 2230588

Please find attached a s127 application in relation to a proposed variation of consent conditions associated with RC 2230588.

That application approved a papakainga development of up to 36 dwellings, inclusive of 15 principle and 15 minor residential units and 6 kaumatua units with associated internal access and services, earthworks and landscaping.

The changes are associated with the occupation areas Lots 16-21 [6 x sites]. These have been altered to better reflect ground conditions and provide more suitable housing sites. Changes to roading / intersection requirements are also proposed.

In addition, wastewater has been re-designed to suit the updated arrangement as well as service the entire development. All changes are accompanied by relevant specialist input.

Changes are also proposed to specific conditions to assist with practical workability.

The conditions to be varied are sought under s127 of the Resource Management Act 1991 (**RMA**), which is a ***Discretionary Activity***.

Yours sincerely,

Steven Sanson
Consultant Planner

APPLICANT & PROPERTY DETAILS

Applicant	Ngati Kuri Trust Board
Address for Service	Bay of Islands Planning [2022] Limited Kerikeri House Suite 3 88 Kerikeri Road Kerikeri C/O – Steven Sanson steve@bayplan.co.nz 021-160-6035
Legal Description	Section 14 SO 469373 & Section 7 SO 469373
Physical Address	Te Paki Stream Road, Te Paki
Site Area	426.5ha and 2298.77ha respectively
Owner of the Site	Te Urungi o Ngati Kuri
Operative District Plan Zone / Features	Conservation
Proposed District Plan	Natural Open Space & Treaty Settlement
Archaeology	Nil known
NRC Overlays	Nil
Soils	Class 3
Protected Natural Area	Nil
HAIL	No

Schedule 1

SUMMARY OF PROPOSAL

Proposal	The changes are associated with the occupation areas Lots 16-21 [6 x sites]. These have been altered to better reflect ground conditions and provide more suitable housing sites. Changes are also proposed to roading alignments for each development area. In addition, wastewater has been re-designed to suit the updated arrangement as well as service the entire development. All changes are accompanied by relevant specialist input. Changes are also proposed to specific conditions to assist with practical workability.
Reason for Application	As above
Appendices	**Appendix A** – Parcel Details **Appendix B** – Proposed Site Layout Change, Architectural Plans, Roading Alignment Changes **Appendix C** – Existing Approval **Appendix D** – Wastewater Report **Appendix E –** Engineering Statement **Appendix F** – Landscape Architect Statement **Appendix G** – Good Ground Reports
Consultation	Not applicable
Pre Application Consultation	Not applicable

1.0 INTRODUCTION & PROPOSAL

1.1 Report Requirements

This report has been prepared for Ngati Kuri Trust Board in support of a s127 application in relation to the proposed variation of consent conditions 1 and 7 of RC 2230588.

Section 127 allows the holder of a resource consent to apply to the consent authority for a change or cancellation of a condition of the consent.

Sections 88 to 121 apply, with all necessary modifications, as if—

a) the application was an application for a resource consent for a discretionary activity; and
b) the references to a resource consent and to the activity were references only to the change or cancellation of a condition and the effects of the change or cancellation respectively.

Section 127(4) also applies including:

(4) For the purposes of determining who is adversely affected by the change or cancellation, the consent authority must consider, in particular, every person who—

(a) made a submission on the original application; and
(b) may be affected by the change or cancellation.

The conditions sought to be changed with the proposed wording is outlined below.

- Condition 1 – in relation to referring to new approved plans for a segment of the development.
- Condition 4 – Consequential amendments following the approval of updated plans in Condition 1 above.
- Condition 7 – in relation to proposed changes to enhance practical workability of the consent.

The proposed variation to read as follows (refer <u>underlined for additions</u> and ~~strikethrough for deletions~~):

General Conditions

1. That the proposed activities provided for under this consent shall be carried out in general accordance with the documentation and plans that form part of the application as follows:
   - AEE prepared by Sanson and Associates Limited dated June 2023 provided under cover of email dated 5th July 2023.
   - The plans prepared by Resilio Studio entitled 'Te Paki Dunes Papakainga Resource Consent – Revision 2 September 2023 identifying the building locations and typologies, <u>noting the changes approved to Lots 16-21 to be replaced with Lots 1-6</u>

as outlined on the plans prepared by Chester Consultants Ltd, entitled 'Civil Design – Public Drainage and Common Access Way, Drawing 700, 701 and 713, Rev 0, dated 15 August 2024, and Drawing 705, 706, 720, Rev 0, dated 30 January 2025 and 740, 741, and 742, Rev 0, dated 15 August 2024 and for those areas the Architectural Plans prepared by Panel Lock dated 9/12/2024.

- The Site Suitability Engineering Report – Revision 3 prepared by Geologix Limited dated September 2023, inclusive of the development drawings provided in Appendix A referenced as Sheets 1000, 1001, 1010 – 1014, ~~1020,~~ 1030, 1050, 1051, 1100, and 1101, noting the changes approved to Lots 16-21 being assessed and approved for good ground through the Reports prepared by FNR Consulting dated 19th November 2024 and the Memo prepared by Chester Consultants Limited dated 13 December 2024.
- The Wastewater Report prepared by Waterflow NZ Ltd, dated 25 November 2024.
- Transport Assessment Report prepared by Flow Ltd dated 13 July 2023
- Wetland Assessment Report – Revision 3 prepared by Geologix Ltd dated 6 September 2023.
- Landscape Visual Impact Assessment report prepared by Resilio Studio Limited dated 19th September 2023 including appendices, noting the noting the changes approved to Lots 16-21 through the Landscape Memorandum by Greenwood Associates, dated 18/12/2024.

4. All constructions works associated with access and servicing (but not works subject to any building consent) shall be undertaken and completed in general accordance with the Site Suitability Engineering Report – Revision 3 prepared by Geologix Limited dated September 2023, inclusive of the development drawings provided in Appendix A referenced as Sheets 1000, 1001, 1010 – ~~1014~~, 1020. 1030, 1050, 1051, 1100, and 1101, and designs and plans approved under Conditions 2(a) – (e) above, and the various reports and plans submitted through RC 2230588-RMALUC VAR/A. Where any inconsistencies arise, the plans and reports from RC 2230588-RMALUC VAR/A shall take precedence.

7. Prior to the ~~issuing of any building consent for a~~ occupation of any dwelling on the site (where 'dwelling' includes any minor unit), the consent holder shall provide suitable evidence by way of suitably qualified and experienced Chartered Professional Engineer to confirm that all services, including road access, are physically completed such that they are readily able to be utilised by the proposed dwelling at the time of lodgement of the building consent.

   ~~For avoidance of doubt, this condition will not be deemed to be met where any/all services including road access are yet to be constructed and certified as completed in order to service any dwelling at the time of lodgement of any building consent.~~

Advice note: While the application does not record any intention to stage construction of the services and access for the development, the above condition provides for dwellings to be constructed during the construction phase, and before overall construction is completed, where adequate servicing and access is available to any proposed dwelling.

The rationale behind the changes are self-explanatory to a certain extent but revolve around the following:

- Condition 1: The proposal has gone through design changes which require FNDC approval / consideration.
- Condition 4: Linked to the above, there is a consequential amendment to ensure that the plans / reports in Condition 1 are adhered to.
- Condition 7: As currently drafted, the condition frustrates progress on the site as a building consent cannot be lodged for a dwelling. The proposal seeks to carry out building consents via off-site manufacturing. Therefore, the site consents for foundations and wastewater for example cannot be executed without this condition frustrating progress.

Should there be any other changes (consequential or otherwise) that arise during process, we retain the right to make further alternations and also provide FNDC staff with discretion to make changes that assist in workability and better implementation of consent conditions.

2.0 SECTION 127 OF THE RMA

The RMA establishes that a request under s127 is deemed to be discretionary activity and Section 88 to 121 apply with the necessary modifications. Additionally, in considering the request to change the condition Council is limited to only considering what is being sought within the condition change and the effects there from.

The original resource consent application was not the subject of a publicly notified process with the approval being issued under delegated authority.

The decision was not the subject of an appeal. In terms of the effects created by this variation these factors are addressed as follows.

2.1 Application Comparison

The original application sought the following layout for development where conditions are sought to be altered [area dashed in blue in Figure 1.

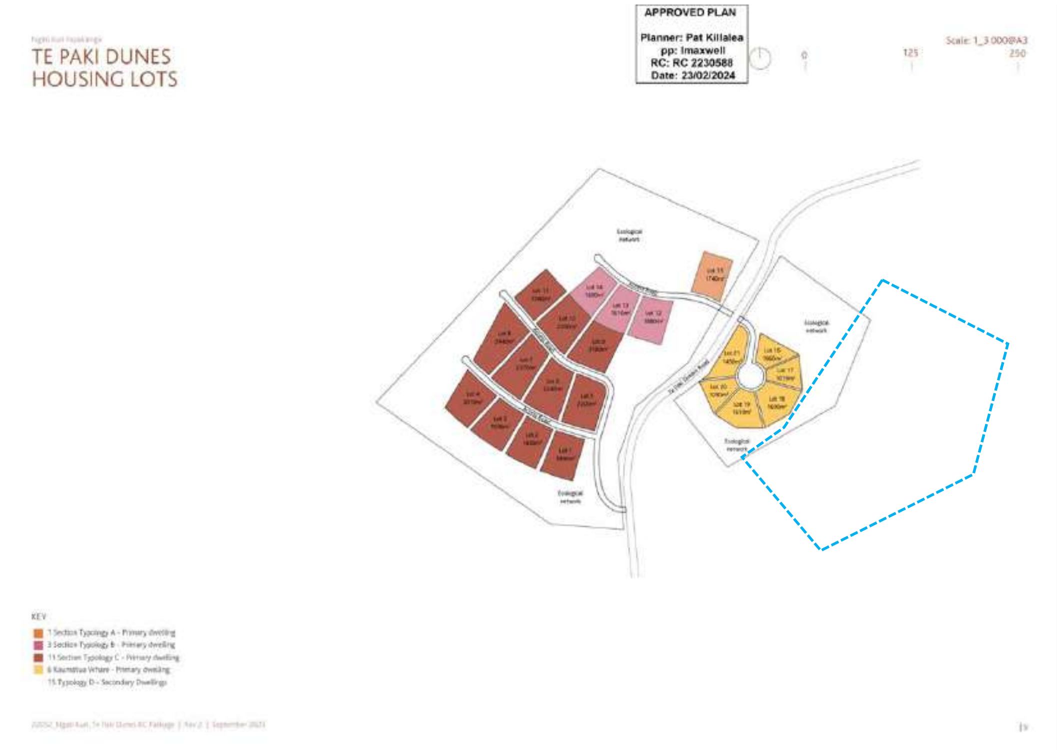


Figure 1 – Approved Development Plan

Figure 2 shows the proposed changes, and these are shown more formally in **Appendix B**.

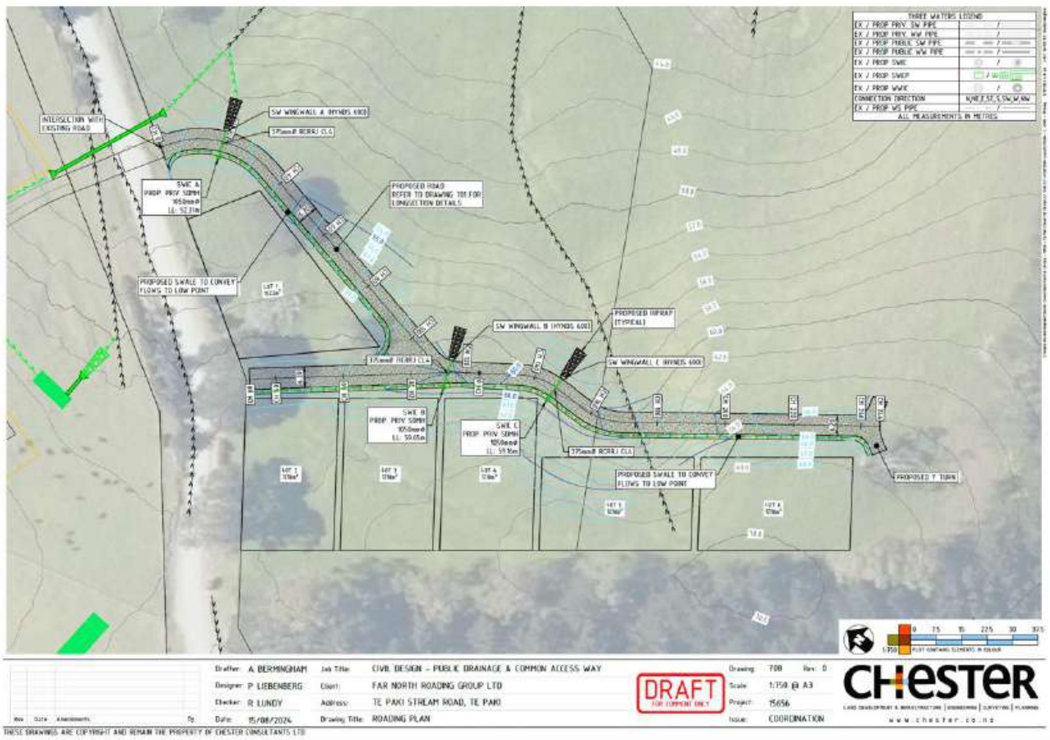


Figure 2 – Proposed Development Plan

In terms of roading alignment and requirements, the proposal required entrances to NZTA Diagram E and proposed roading areas that did not ultimately suit contours and ground conditions. The original proposal is provided in Figures 3 and 4 below as well as in appendices.

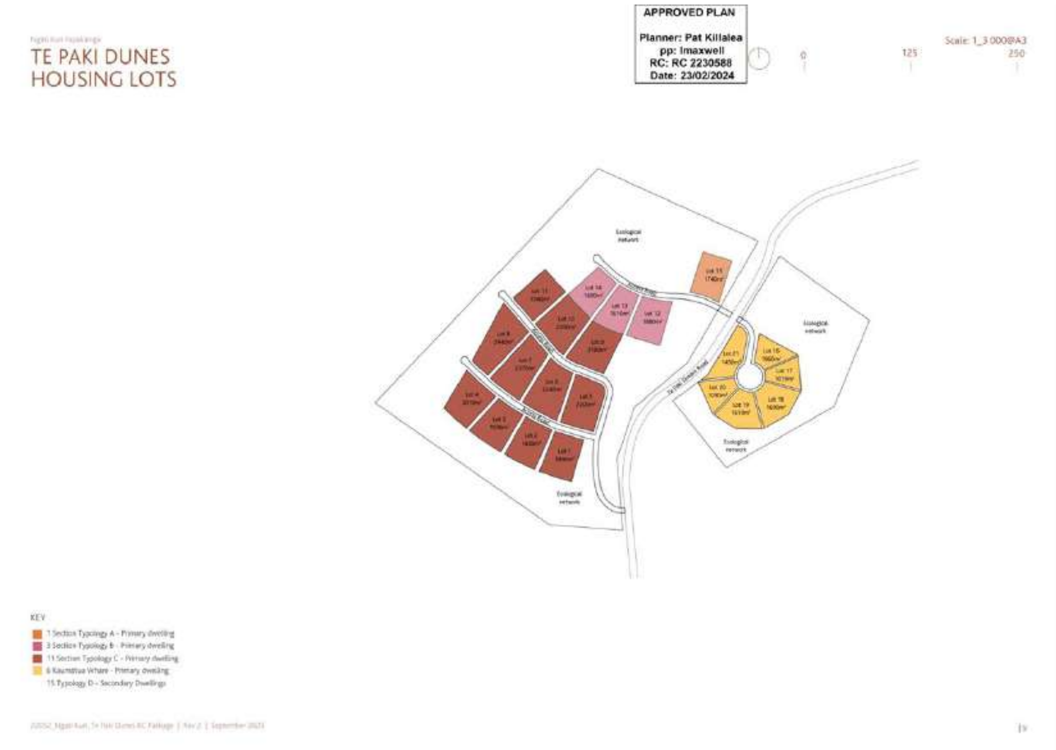


Figure 3 – Proposed Roading Layout

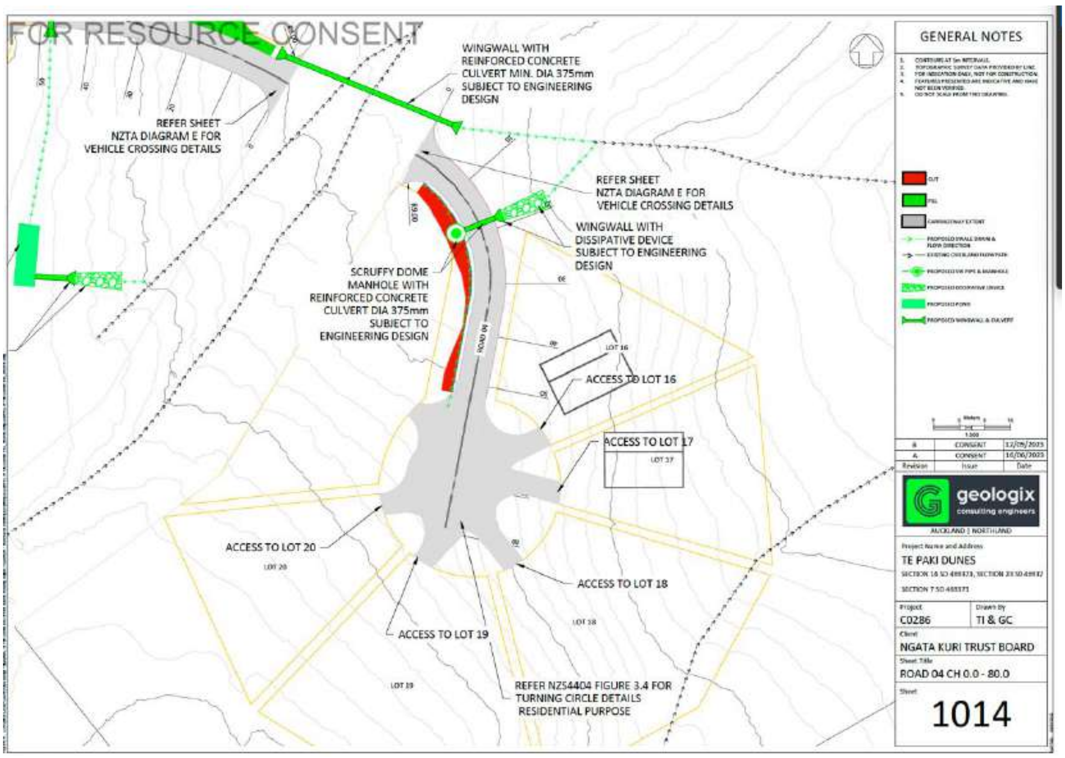


Figure 4 – Proposed Roading Layout [Specifics]

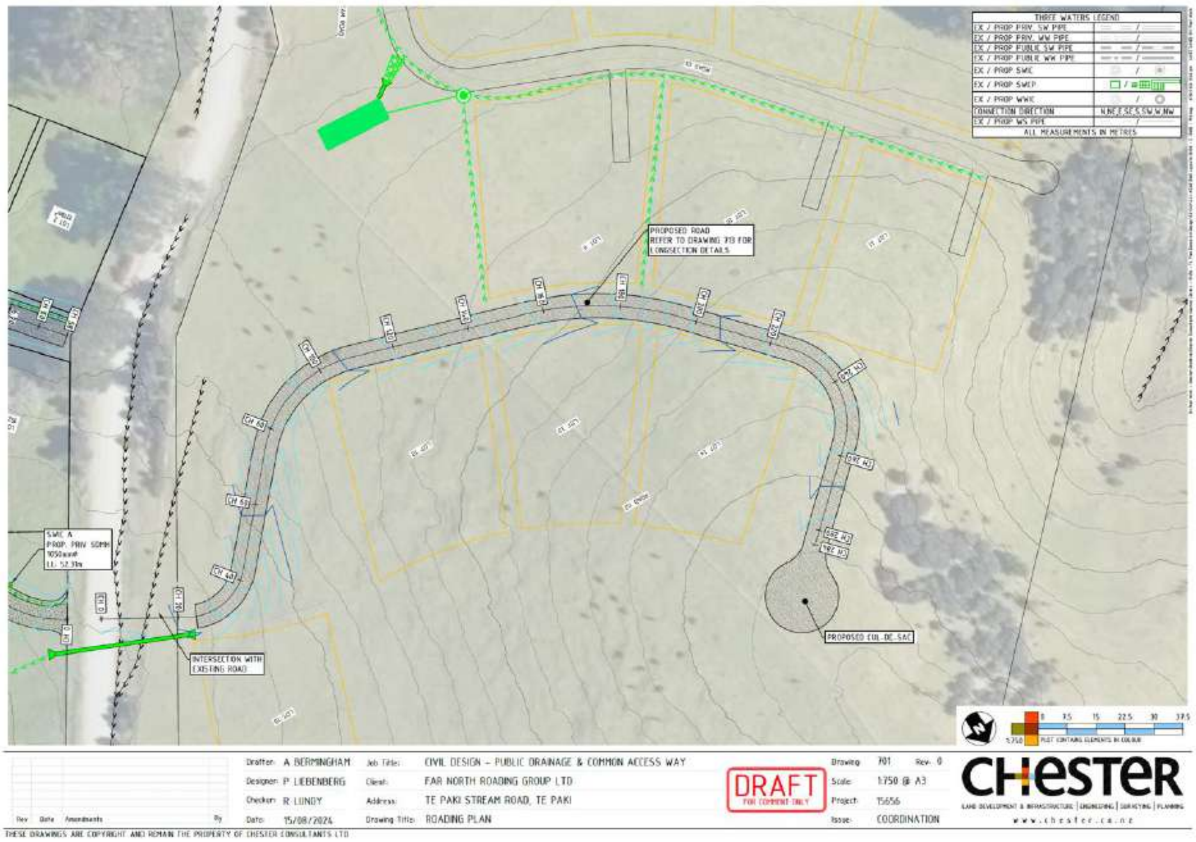


Figure 5 – Change of Access [Lots 9-15]

As can be seen in Figure 5, the access takes a wider sweep to meet contours and serve Lots 9-15. This remains in general accordance with plans, but is shown here to make certain that this is proposed and will be carried out.

As can be seen in Figure 6, are the details of the proposed intersection design to enter the Papakainga housing. The proposal is not to provide intersections into the sites via NZTA Diagram E as required by Plan 1014 as shown in Figure 4. It proposes a lesser standard but one which is in accordance with Council Engineering Standards and Guidelines with appropriate markings.

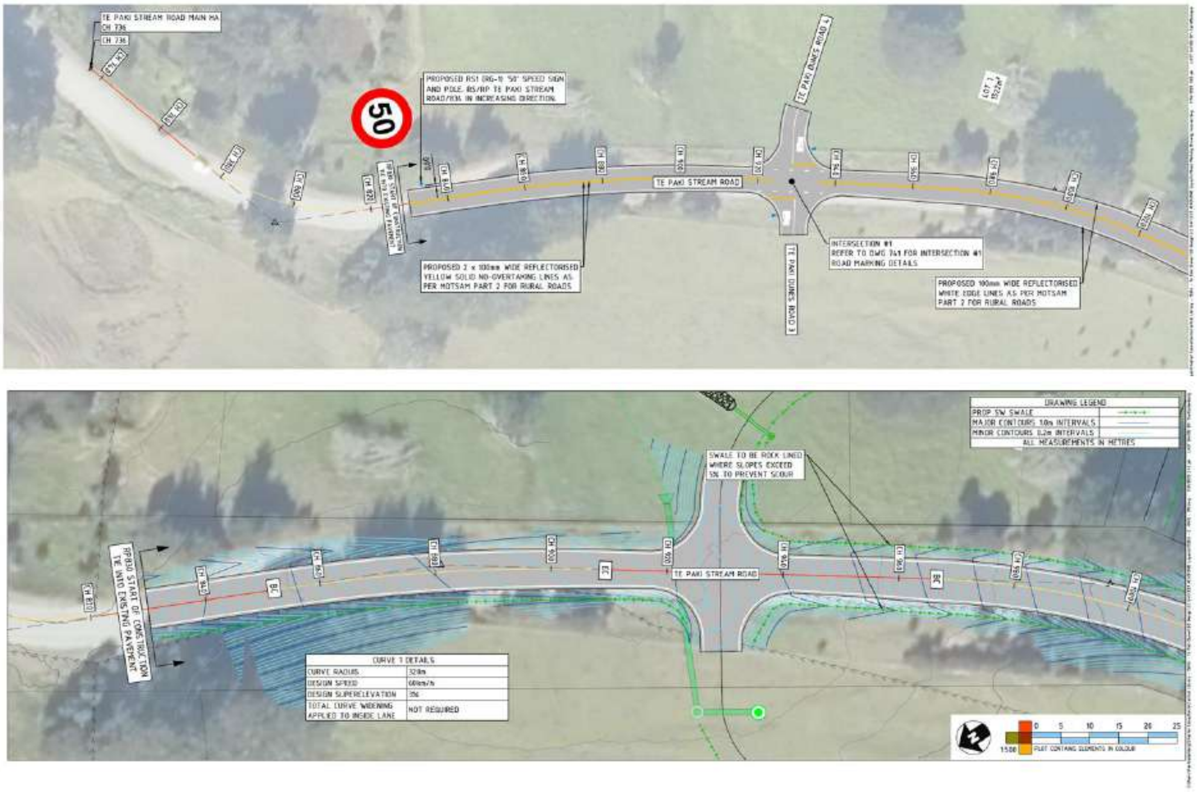


Figure 6 – Change of Intersection Details

The original application sought the following disposal areas as shown below in red by Figure 7. Subject to detailed design the amended areas for wastewater are now shown in Figure 8.

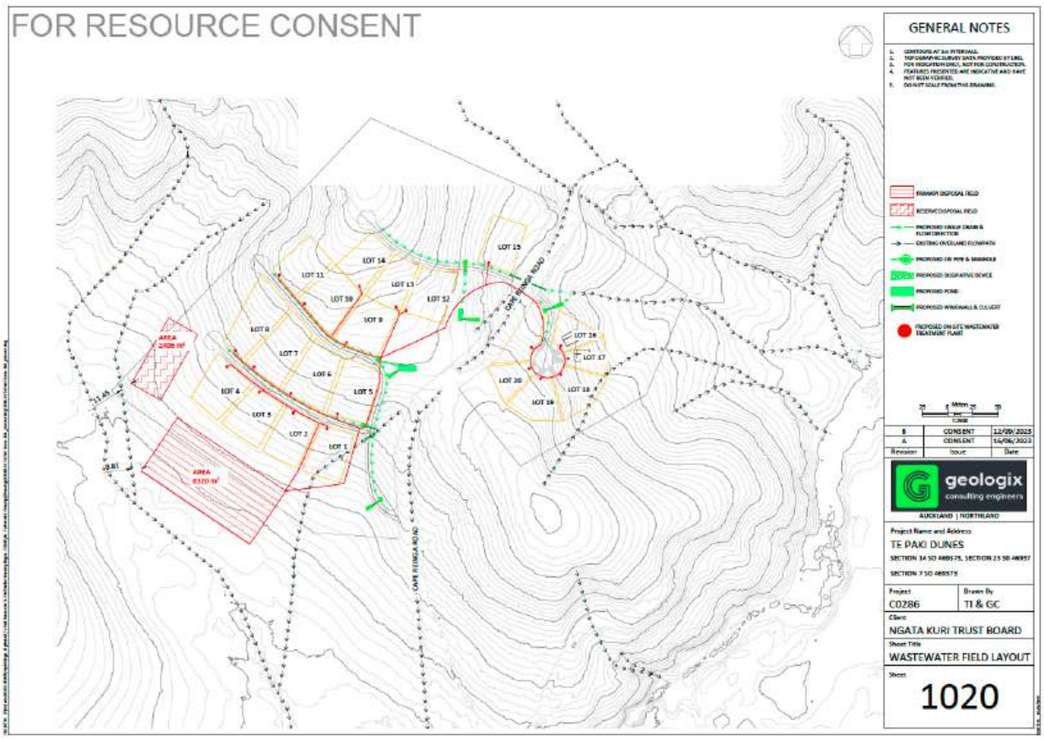


Figure 7 – Approved Wastewater Plan

This proposal seeks to amend these areas as follows.

Figure 8 – Proposed Wastewater Plan

There are slight changes to the approved plans as the Panel Lock house designs are now preferred over those originally accepted by FNDC. Therefore, these new house designs require approval although there is no change in typology, rather just design.

Condition 4 ensures consistency across the decision.

Condition 7 does not necessitate any formal changes other than wording changes to the condition.

2.2 Application Process

The Council retains the discretion to determining whether a discretionary activity should be notified. In determining this factor, it is the change in the effects of the consent conditions which are assessed against any possible adverse effects upon any person.

The RMA also requires Council to consider the effect of the change on those persons who lodged a submission to the original application. As above, the original consent was processed non-notified. Therefore, there are no submissions to consider or no persons to be considered as potentially adversely affected.

The change of conditions would not in our opinion create any adverse effects that are more than minor. The changes are associated with minor layout changes, minor house design changes, and associated reports that confirm that the changes are appropriate to better reflect local topography and to better execute the overall consent.

Overall, it is considered that the application to change the condition can be processed without notification.

2.3 Potential Effects

For this application, the potential adverse effects to be assessed are those arising from aspects of the proposal that have been identified as differing from the consented proposal.

Architectural Plans

Whilst the original consent provided some architectural designs for each house, due to budget, locations and timeframes, the Panel Lock housing concepts have been considered as more appropriate and cost effective for the site. Hence, the change in plans provided in this application. The houses are of a similar character and appearance when considered against the original and do not extend the total number of houses approved across the entire development.

Engineering Matters

From an engineering perspective, Chester Consultants have designed the new layout.

Wastewater has been addressed through the Waterflow Report provided in **Appendix D**. The report finds that each site can be appropriately serviced.

Chester Consultants are comfortable with the arrangements made in terms of wastewater, stormwater, roading, and earthworks. They are of the opinion that the changes are in general accordance with the assessment originally undertaken by Geologix. Refer to **Appendix E.**

Foundations / good ground has been re-assessed for the updated areas through **Appendix G.** The areas are considered appropriate for development and augment the assessment undertaken by Chesters. The sites can be appropriately serviced, and accordingly, there are no additional adverse effects arising from the proposal from an engineering perspective.

Visual Matters

The new layout of the allotments has been considered against the original layout and design by Resilio. Greenwood Associates has provided a brief assessment of the changes, and this is concurred with. This is provided in **Appendix F.** Accordingly, there are no additional adverse effects arising from the changes proposed.

Building Consent Alignment

The proposed change to Condition 7 means that building consents for foundation and site works can be applied for which will eventually serve a future dwelling brought in / delivered to each housing allotment. The current consent condition frustrates progress towards achieving the intent which is to provide site servicing for dwellings.

Change to Condition 4

This is a simple change to ensure that the new information is now being considered alongside the Geologix Reports / Plans originally lodged.

Conclusion

Based on the above assessment, it considered that the actual and potential adverse effects of the proposal that would be no more than minor. Additionally, there are no effects to surrounding persons.

3.0 STATUTORY CONTEXT

3.1 Policy Statements, Environmental Standards, Regional Policy Statements

All of these relevant matters were assessed and provided in the original application. The proposal is of such a small scale that reconsideration is not considered warranted.

3.2 Objectives, Policies and Rules

Section 104B requires the consideration of any relevant objectives and policies in addition to the effects of the activity. It is considered these factors have been addressed within the original land use application [both the ODP and PDP]. Reconsideration of these factors are not undertaken due to the minor nature and scale of changes proposed.

4.0 PART 2 ASSESSMENT

4.1 Section 5 – Purpose of The RMA

Section 5 in Part 2 of the RMA identifies the purpose as being the sustainable management of natural and physical resources. This means managing the use of natural and physical resources in a way that enables people and communities to provide for their social, cultural and economic well-being which sustain those resources for future generations, protecting the life supporting capacity of ecosystems, and avoiding remedying or mitigating adverse effects on the environment.

It is considered that proposal represents a sustainable use of existing resources that allow people and the community to provide for its social and economic wellbeing in a manner that mitigates adverse effects on the environment.

4.2 Section 6 – Matters of National Importance

In achieving the purpose of the RMA, a range of matters are required to be recognised and provided for. This includes:

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

In context, the relevant items to the proposal have been recognised and provided for in the design of the development.

4.3 Section 7 – Other Matters

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

These matters have been given particular regard through the design of the proposal.

4.4 Section 8 – Treaty of Waitangi

The Far North District Council is required to take into account the principles of the Treaty of Waitangi when processing this consent. This consent application may be sent to local iwi and hapū who may have an interest in this application.

4.5 Part 2 Conclusion

Given the above, it is considered that the proposal meets the purpose of the RMA.

5.0 CONCLUSION

This application seeks a consent notice variation under s127 to amend existing consent conditions in relation to layout for 6 Papakainga allotments, overall wastewater, overall roading and consent workability on the eastern side of Te Paki Stream Road.

The original proposal was considered to be consistent with the purpose of relevant national policy statements and national environmental standards. This proposal is considered to align with those same documents for the same reasons.

Objectives and policies of relevant plans were also considered as part of the original. For the same reasons, the proposal is considered to align with their aims and intent.

An assessment of Part II of the RMA has been completed with the proposal generally able to satisfy this higher order document also.

We look forward to receiving acknowledgment of the application and please advise if any additional information is required.

Yours sincerely,

Steve Sanson
Consultant Planner


Pandora
10 km
2 km
prover
PROVE IT
Data sourced from LINZ is licensed for reuse under CC by 4.0.

Addresses

523 Cape Reinga Road

581 Cape Reinga Road

523 State Highway 1

581 State Highway 1

22A Te Paki Stream Road

22B Te Paki Stream Road

Parcel Details

Parcel Id	Legal Description	Parcel Intent	Non-survey Definition	Parcel Area	Total Area
7542413	Section 7 SO 469373	Legalisation (LEGL)		2,298.7700 ha	

Statute

Statutory Action	Other Legality	Purpose	Name	Comments	Recorded Date
Statutory Vesting					13 October 2015

Addresses

341 Cape Reinga Road

433 Cape Reinga Road

341 State Highway 1

433 State Highway 1

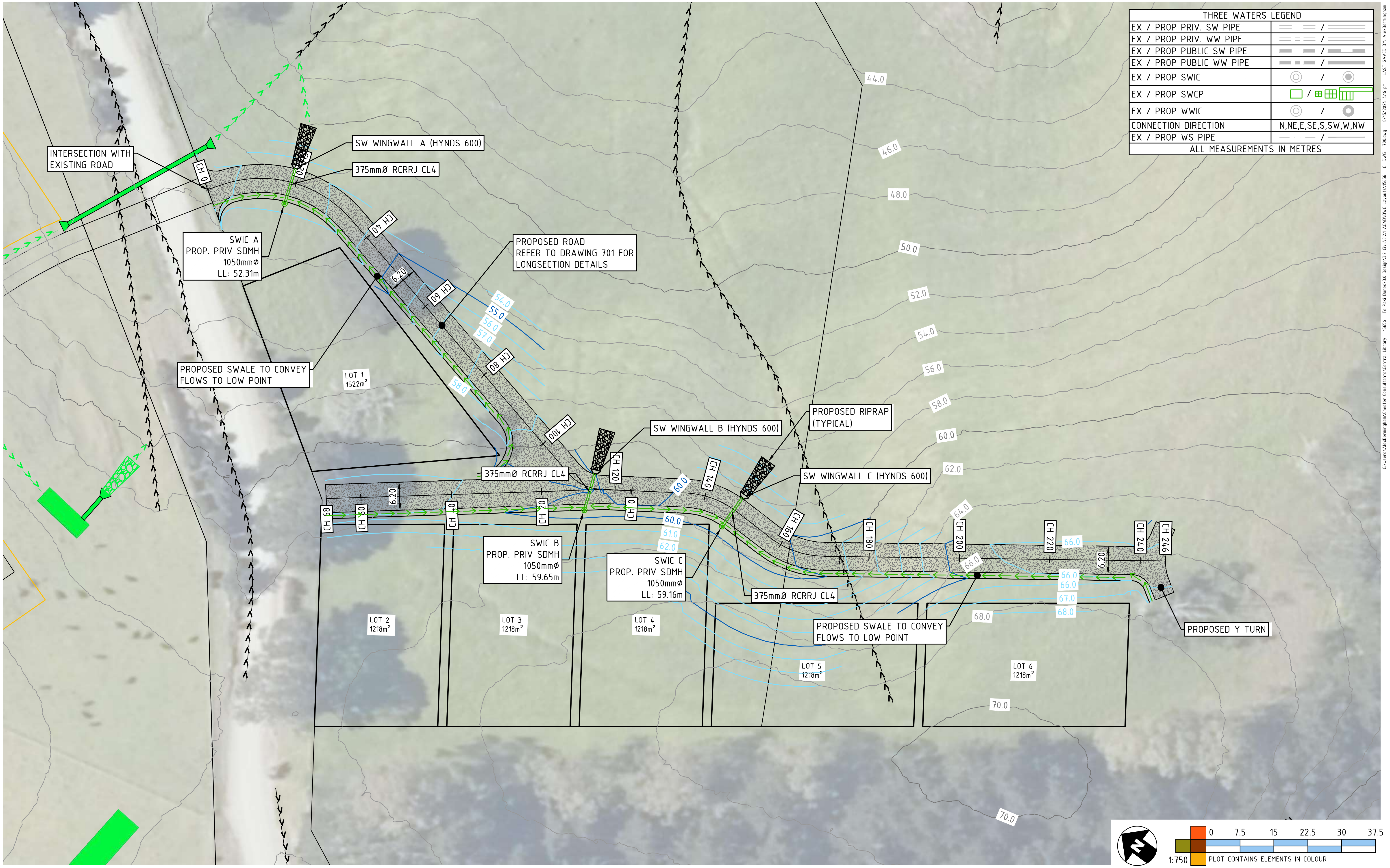
47 Te Paki Stream Road

Parcel Details

Parcel Id	Legal Description	Parcel Intent	Non-survey Definition	Parcel Area	Total Area
7542415	Section 14 SO 469373	Legalisation (LEGL)		426.5000 ha	

Statute

Statutory Action	Other Legality	Purpose	Name	Comments	Recorded Date
Statutory Vesting					13 October 2015



Rev	Date	Amendments	By

Drafter: A BERMINGHAM
Designer: P LIEBENBERG
Checker: R LUNDY
Date: 15/08/2024

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: ROADING PLAN

DRAFT
FOR COMMENT ONLY

Drawing: 700 Rev: 0
Scale: 1:750 @ A3
Project: 15656
Issue: COORDINATION

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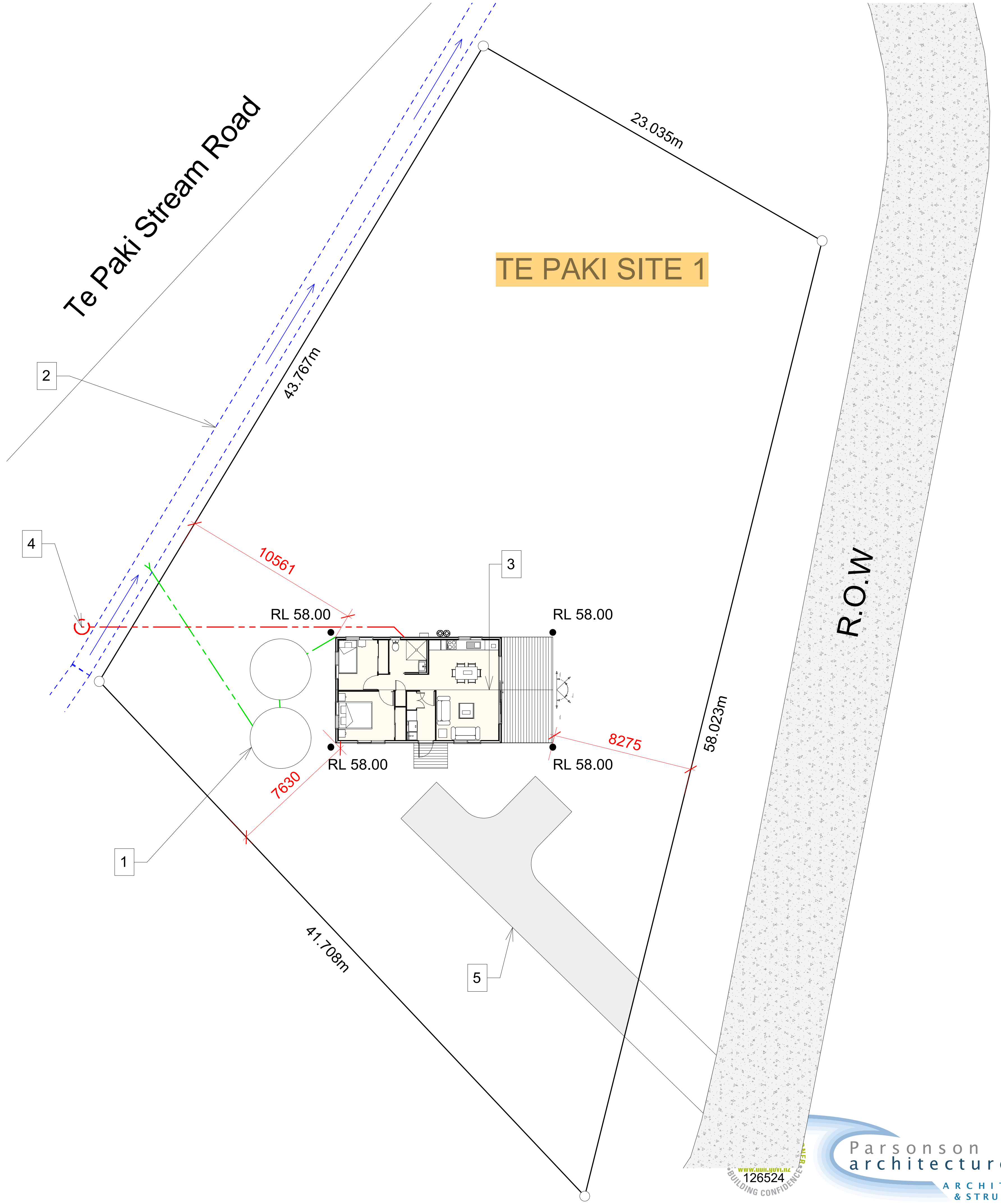
www.chester.co.nz



Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain
3. Proposed New Dwelling FFL 58.710
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1522m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	66m2
Impermeable Surfaces	=	148m2
Total Site Coverage	=	10%

126524

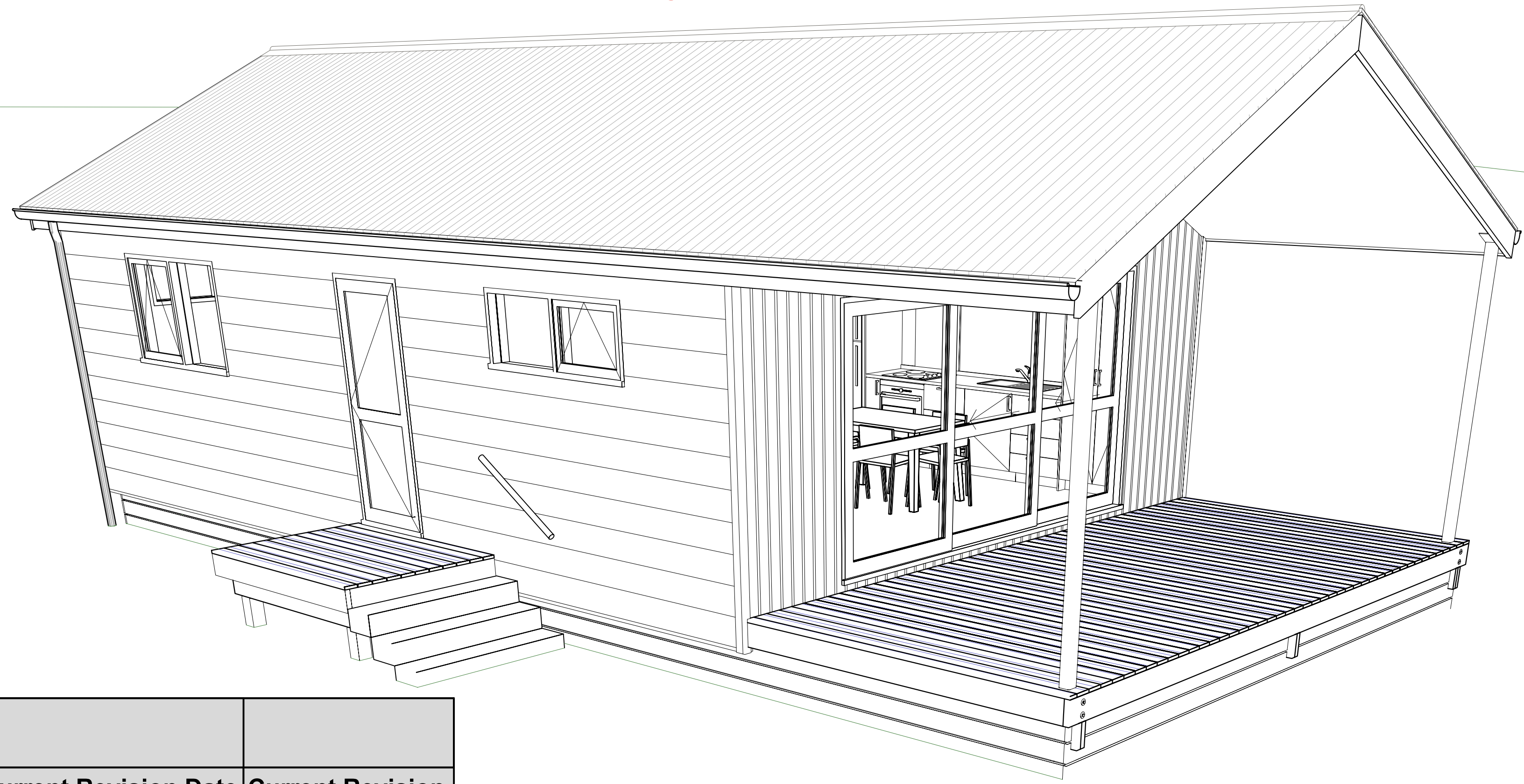
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION
PROJECT	Proposed New Papakainga Development	PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE #
		SCALE @ A3 1:250
DWG	Te Paki Dunes Site 1 Plan	DWG # A02
		DRAWN JP
		CHKD
		REVISION
STATUS	CONSENT ISSUE 15-11-2024	

These drawings shall be read in conjunction with the Triboard Construction Manual 2011

Please refer to building consent no.: EBC-2025-253/0



Drawing List

No.	Sheet Title	Current Revision Date	Current Revision
1	COVER PAGE	9/12/24	A
2	PROPERTY MAP	9/12/24	A
3	SITE-PLAN	9/12/24	A
4	ELEVATION-1	9/12/24	A
4.1	ELEVATION-2	9/12/24	A
4.2	ELEVATION-3	9/12/24	A
4.3	ELEVATION-4	9/12/24	A
5	FLOOR LAYOUT	9/12/24	A
5.1	FLOOR PLAN	9/12/24	A
5.2	FLOOR PLAN BRACING AND LINTEL	9/12/24	A
5.3	FLOOR PLAN ELECTRIC	9/12/24	A
5.4	FLOOR PLAN PLUMBING	9/12/24	A
6	PLUMBING DETAIL HOT WATER CALIFONT	9/12/24	A
6.1	PLUMBING WET AREA DETAIL	9/12/24	A
6.2	PLUMBING TABLE	9/12/24	A
6.3	BATHROOM LAYOUT	9/12/24	A
7	FOUNDATION AND SUBFLOOR	9/12/24	A
7.1	FOUNDATION DETAIL	9/12/24	A
7.2	FOUNDATION DETAIL	9/12/24	A
7.3	FLOOR JOIST	9/12/24	A
8	CROSS SECTION A-A	9/12/24	A
8.1	CROSS SECTION B-B	9/12/24	A
9	ROOF PLAN	9/12/24	A
9.1	ROOF TRUSS LAYOUT	9/12/24	A
9.2	ROOF DETAILS-1	9/12/24	A
9.3	ROOF DETAILS-2 EAVE	9/12/24	A
9.4	ROOF DETAILS-3	9/12/24	A
9.5	ROOF DETAILS-4	9/12/24	A
9.6	ROOF PORTAL	9/12/24	A
9.7	POST TO PILE FIXING	9/12/24	A
9.8	PORTAL ENGINEER DESIGN	9/12/24	A
10	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.1	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.2	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.3	CLADDING DETAILS- JH-PIPE PENETRAION	9/12/24	A
10.4	CLADDING DETAILS- JH-JOINTER	9/12/24	A
10.5	CLADDING DETAILS-JH-CORNER	9/12/24	A
10.6	CLADDING DETAILS- JH-CAVITY LAYOUT	9/12/24	A
10.7	CLADDING DETAILS- JSC-DOOR	9/12/24	A
10.8	CLADDING DETAILS- JSC-GENERAL	9/12/24	A
10.9	CLADDING DETAILS- JSC CAVITY LAYOUT	9/12/24	A
11	DETAIL-TRIBOARD CEILING FIXING	9/12/24	A
11.1	DETAIL-TRIBOARD BRACING	9/12/24	A
11.2	DETAIL-TRIBOARD BRACING	9/12/24	A
11.3	DETAIL-TRIBOARD BATTEN FIXING	9/12/24	A
11.3	DETAIL-TRIBOARD BATTEN FIXING	9/12/24	A
11.4	DETAIL-TRIBOARD LINTEL FIXING	9/12/24	A
11.4	DETAIL-TRIBOARD LINTEL FIXING	9/12/24	A
12	WINDOW SCHEDULE	9/12/24	A

PROPOSED
60m² TRANSPORTABLE
DWELLING
MIRRORED

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A1
SHEET TITLE COVER PAGE	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

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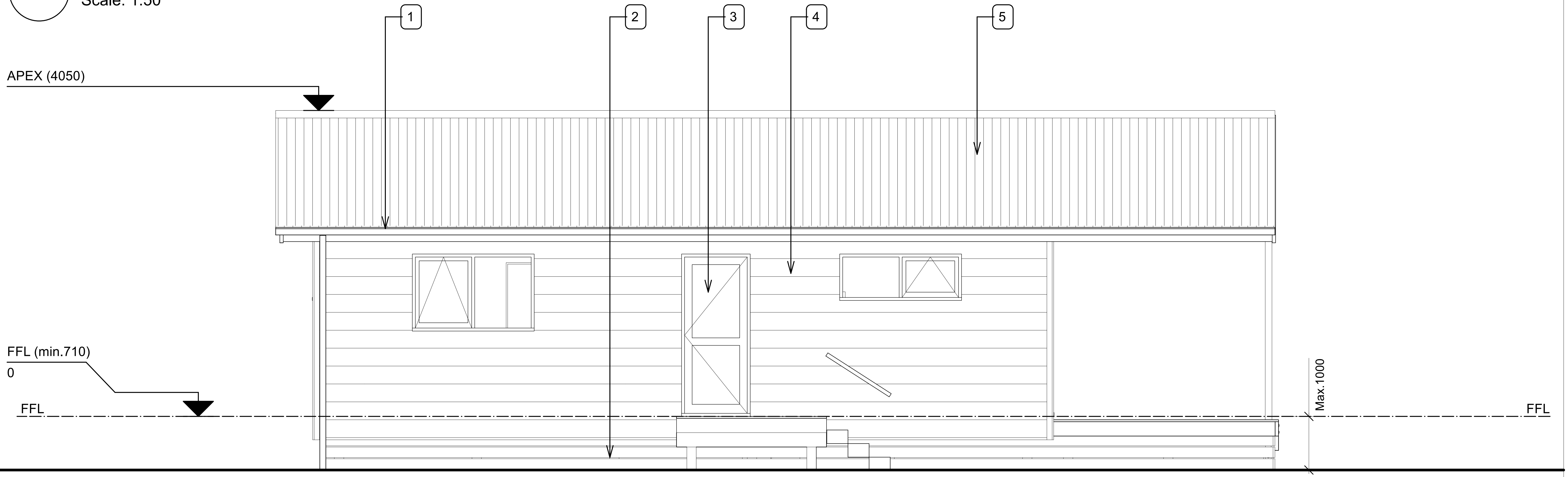
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

1 ELEVATION 1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.

Wall location 1 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

BP133067

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4 TOTAL SHEETS 49
SHEET TITLE ELEVATION-1	DRAWN Jens Marr	REVISION A 9/12/24

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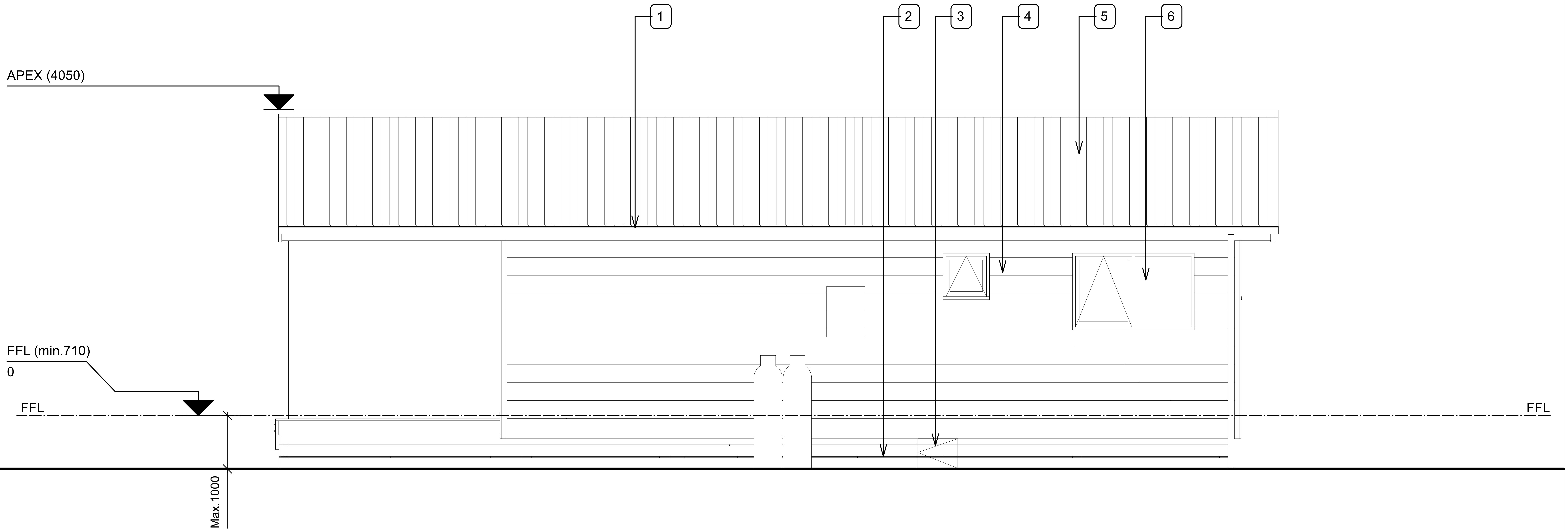
1 ELEVATION-2

Scale: 1:50



Notes

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5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
6. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 2 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.1 TOTAL SHEETS 49
SHEET TITLE ELEVATION-2	DRAWN Jens Marr	REVISION A 9/12/24

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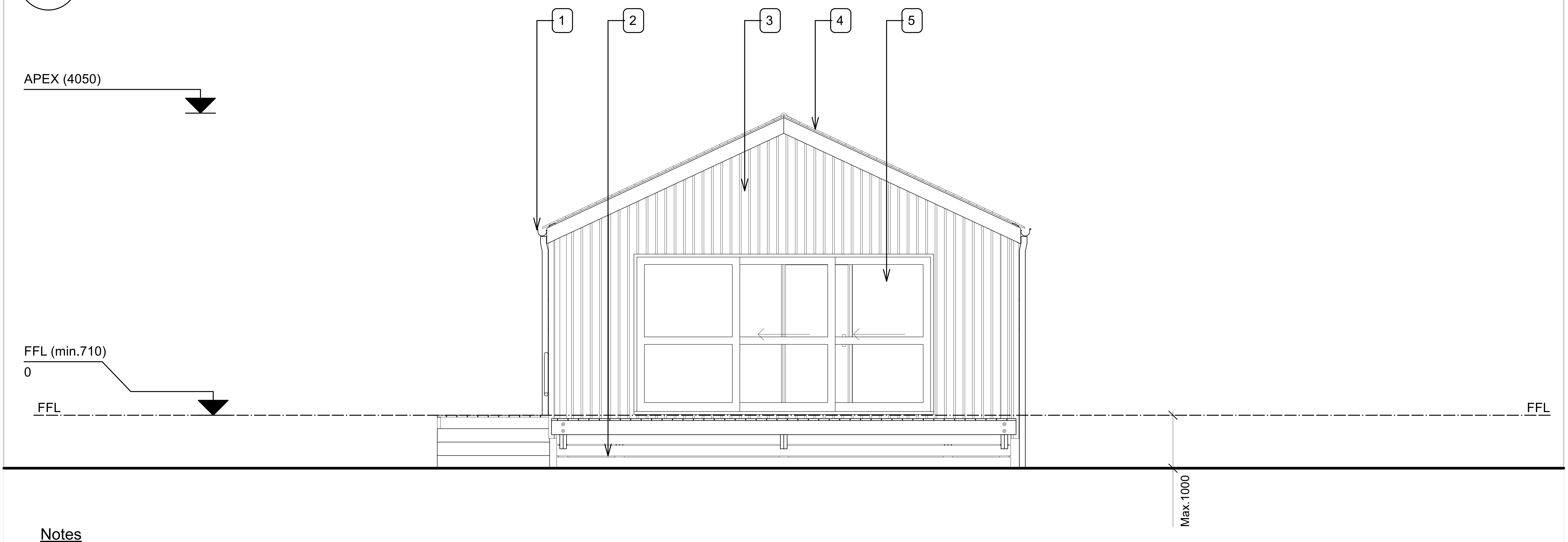
1 ELAVATION-3

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
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4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 3 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.2
SHEET TITLE ELEVATION-3	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

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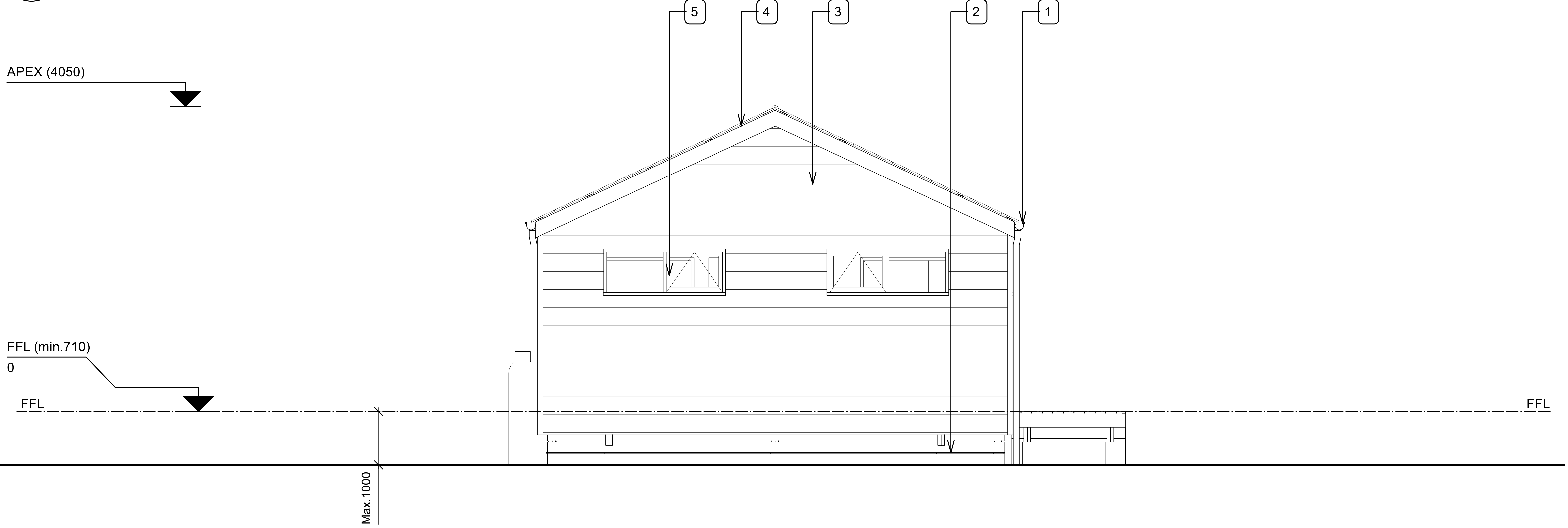
1 ELEVATION-4
Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
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4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 4 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.3 TOTAL SHEETS 49
SHEET TITLE ELEVATION-4	DRAWN Jens Marr	REVISION A 9/12/24

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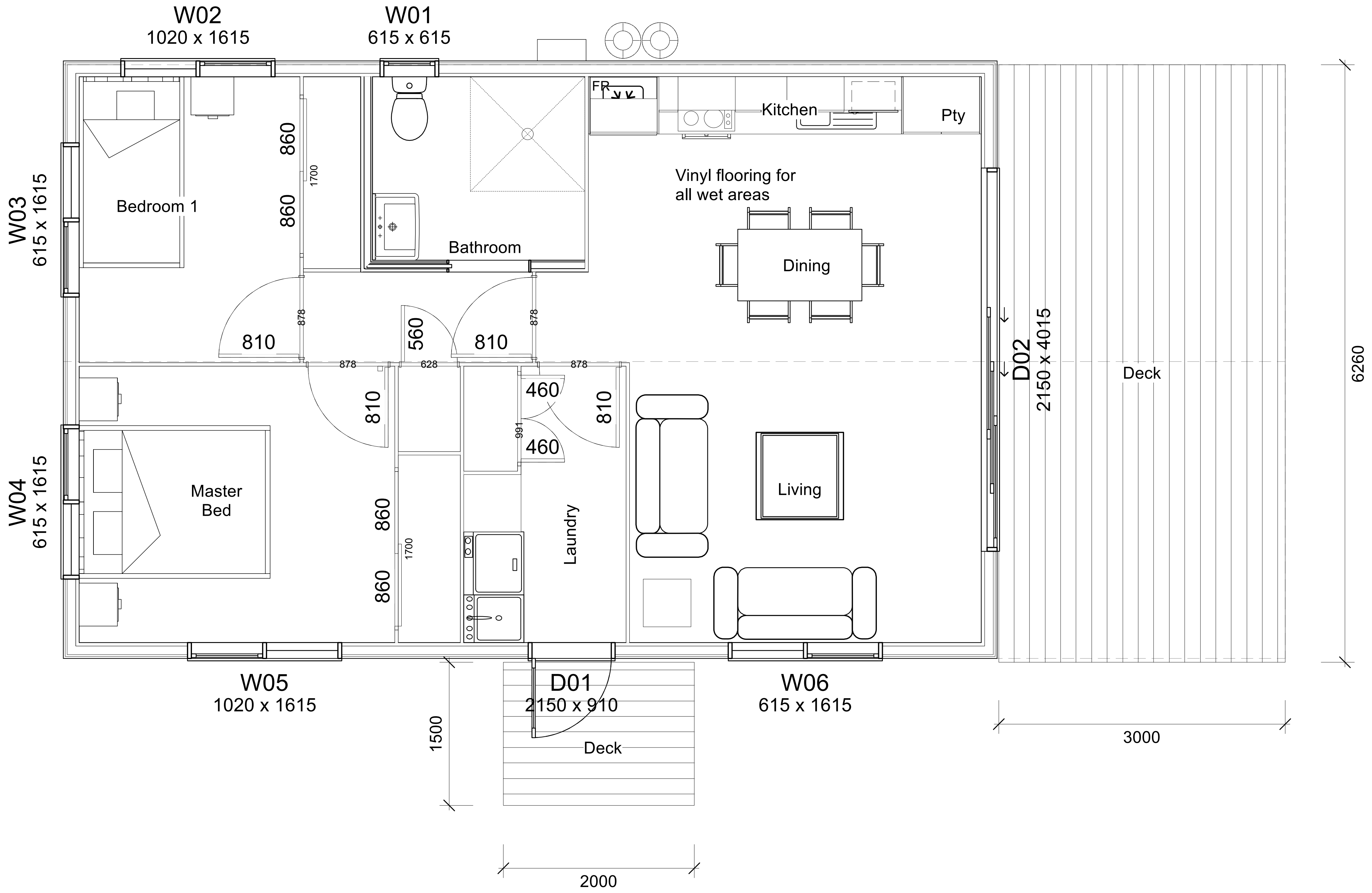
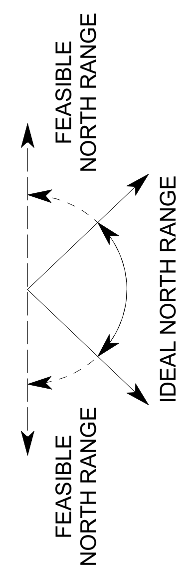
1

FLOOR PLAN

Scale: 1:50

Total Floor Area: 60m²





WALL LEGEND

Int. Wall — 36 mm Triboard

Ext. Wall — 36 mm Triboard, 90 mm Wall Batten, 20mm Cavity Batten, Traditional Weatherboard by Palliside

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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Superior Panel Construction

PROJECT		PROJECT ID
2 Bed Kiwi 60m2 mirrored		NgK-
CLIENT: Ngati Kuri	PROJECT DATE: 09/12/2024	SHEET NO: A5
SHEET TITLE: FLOOR LAYOUT	DRAWN: Jens Marr	TOTAL SHEETS: 49; REVISION: A 9/12/24

PanelLock 142 North Road SH1, Kaitaia W: www.panellock.co.nz
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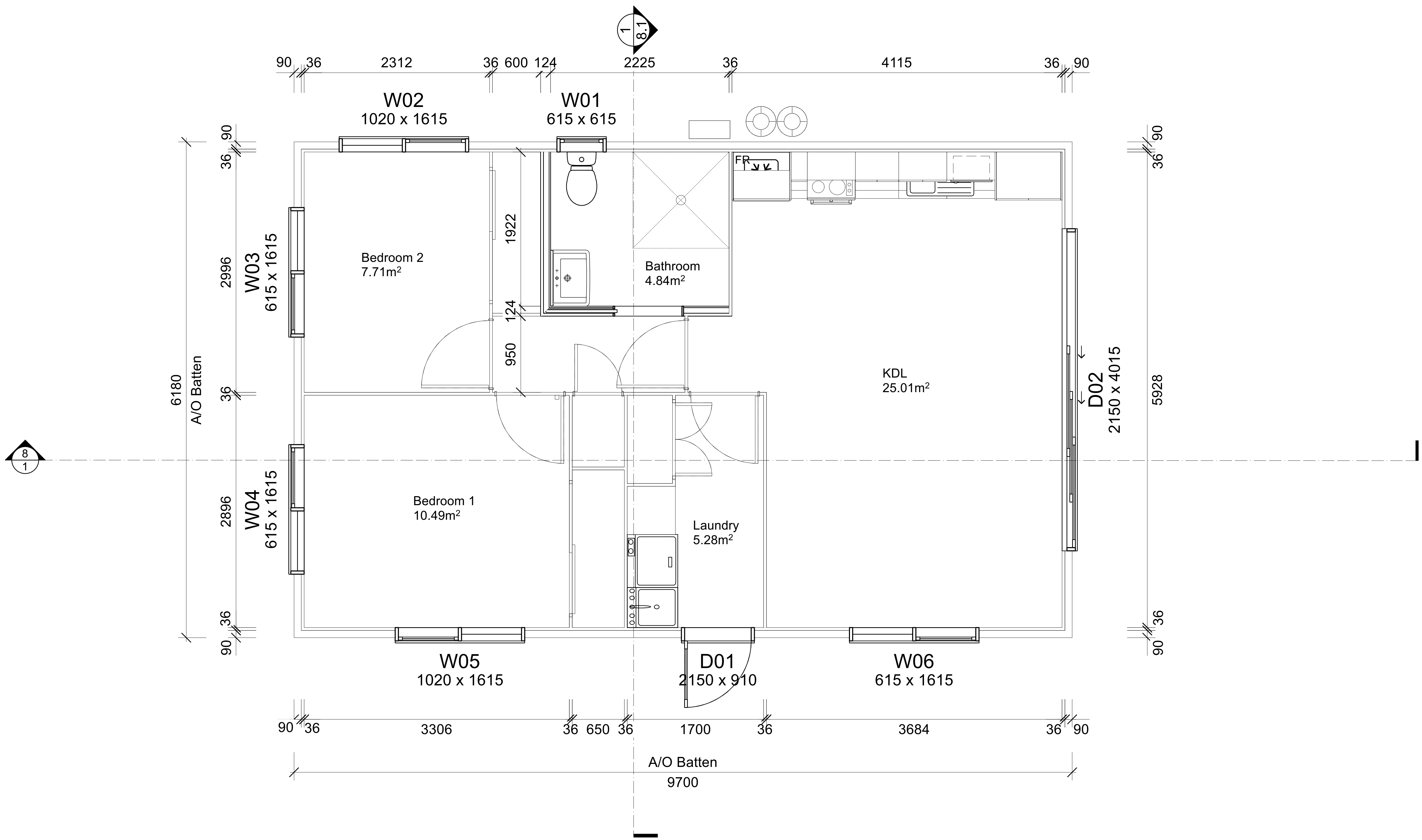
1 FLOOR PLAN

Scale: 1:50

Total Floor Area: 60m²



PROJECT: 2 Bed Kiwi 60m2 mirrored			PROJECT ID: NgK-
CLIENT: Ngati Kuri		PROJECT DATE: 09/12/2024	SHEET NO: A5.1
SHEET TITLE: FLOOR PLAN		DRAWN: Jens Marr	TOTAL SHEETS: 49; REVISION: A 9/12/24

LICENSED BUILDING PRACTITIONER · BUILDING CONFIDENCE · BP133067

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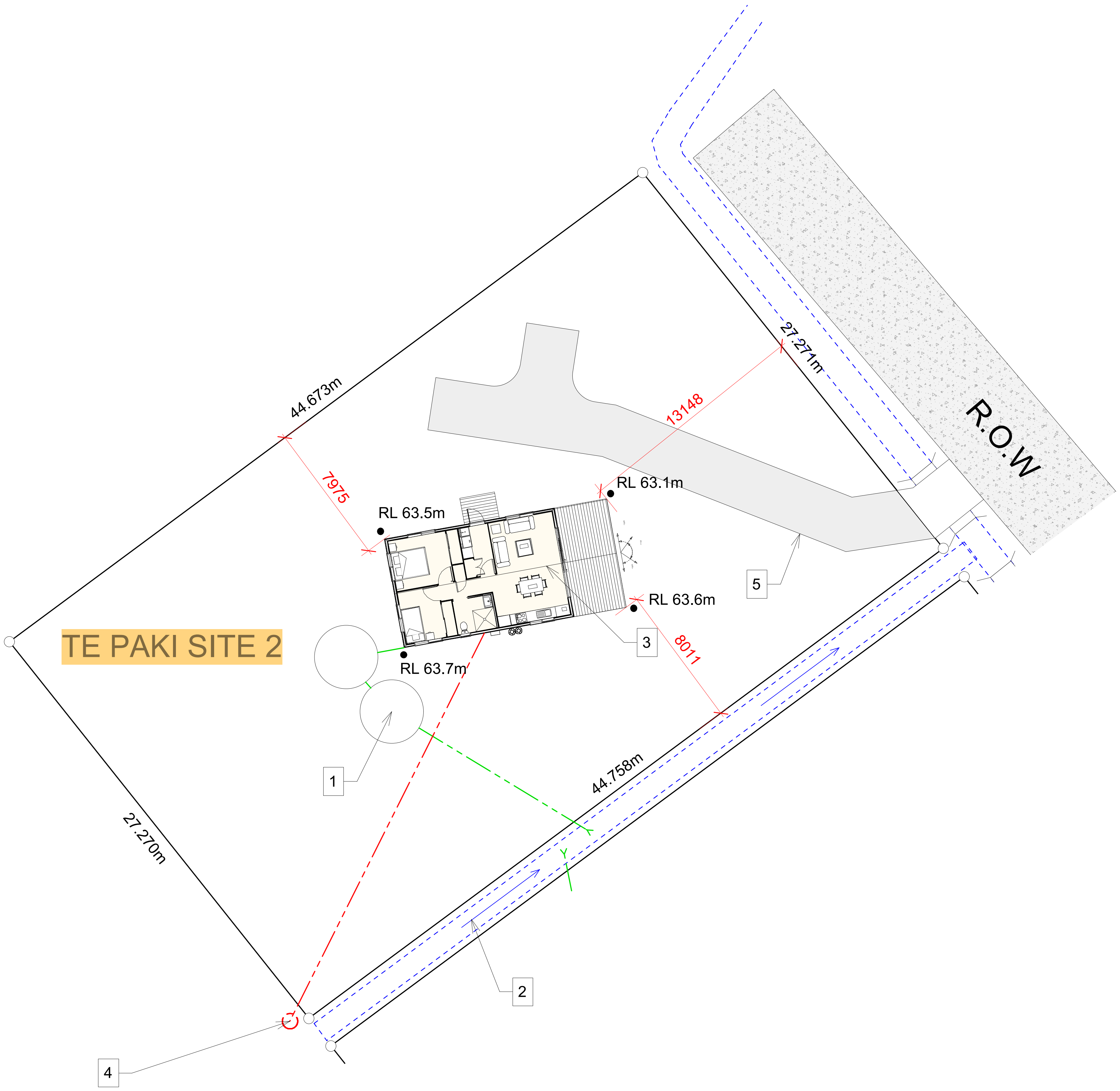


N

Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 64.410
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	98m2
Impermeable Surfaces	=	180m2
Total Site Coverage	=	15%

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

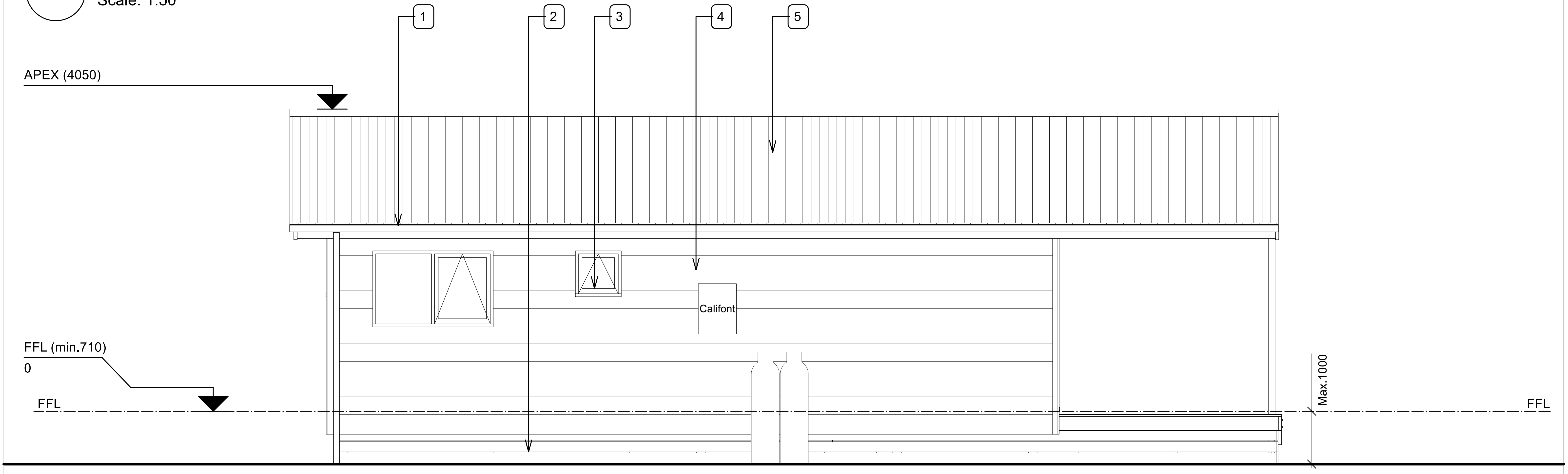
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

PROJECT	Proposed New Papakainga Development
PROJECT #	NK-1024
CLIENT	Ngati Kuri
SCALE @ A3	1:250
DWG #	A03
DRAWN	JP
DWG	Te Paki Dunes Site 2 Plan
STATUS	CONSENT ISSUE 15-11-2024

ELEVATION 1

1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
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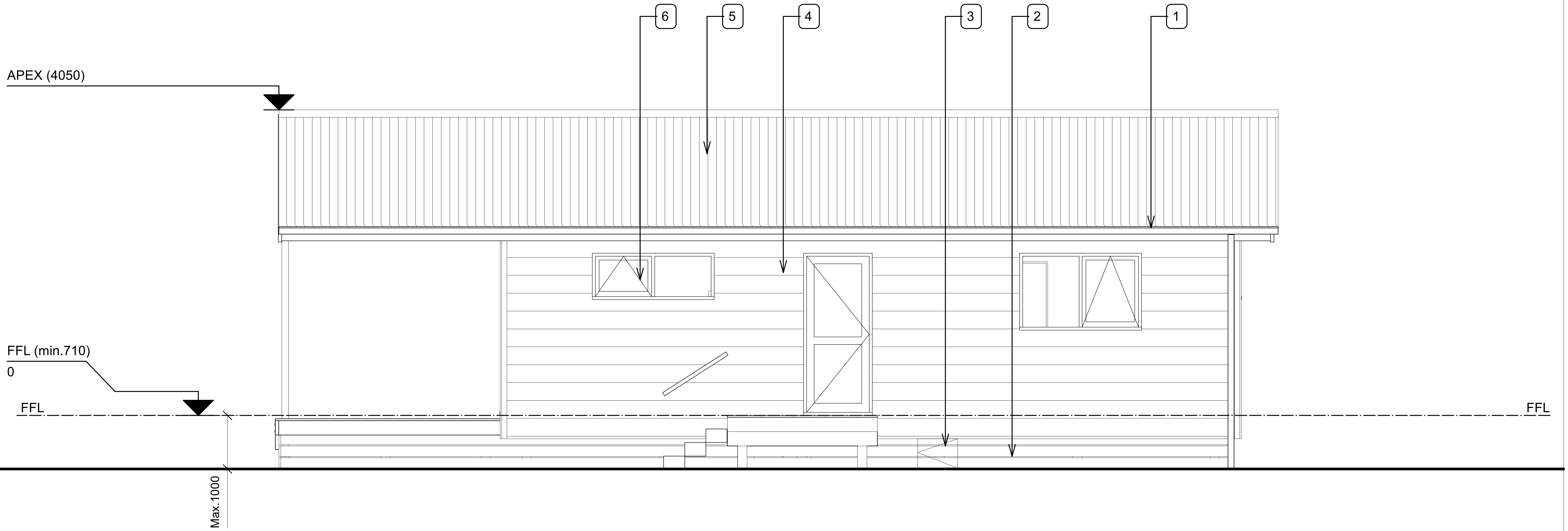
Wall location 1 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4 TOTAL SHEETS 49
SHEET TITLE ELEVATION-1	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W**: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

1 ELEVATION-2
Scale: 1:50



Notes

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Wall location 2 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.1 TOTAL SHEETS 49
SHEET TITLE ELEVATION-2	DRAWN Jens Marr	REVISION A 9/12/24

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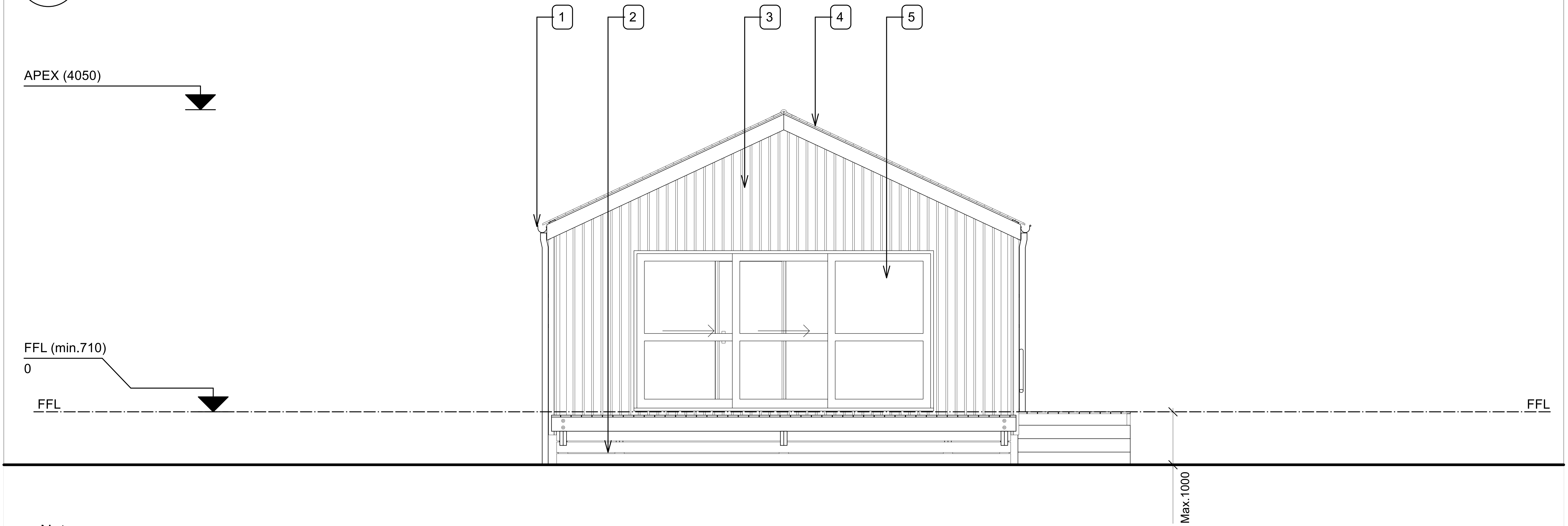
1 ELEVATION-3
Scale: 1:50



Notes

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Wall location 3 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz
Superior Panel Construction

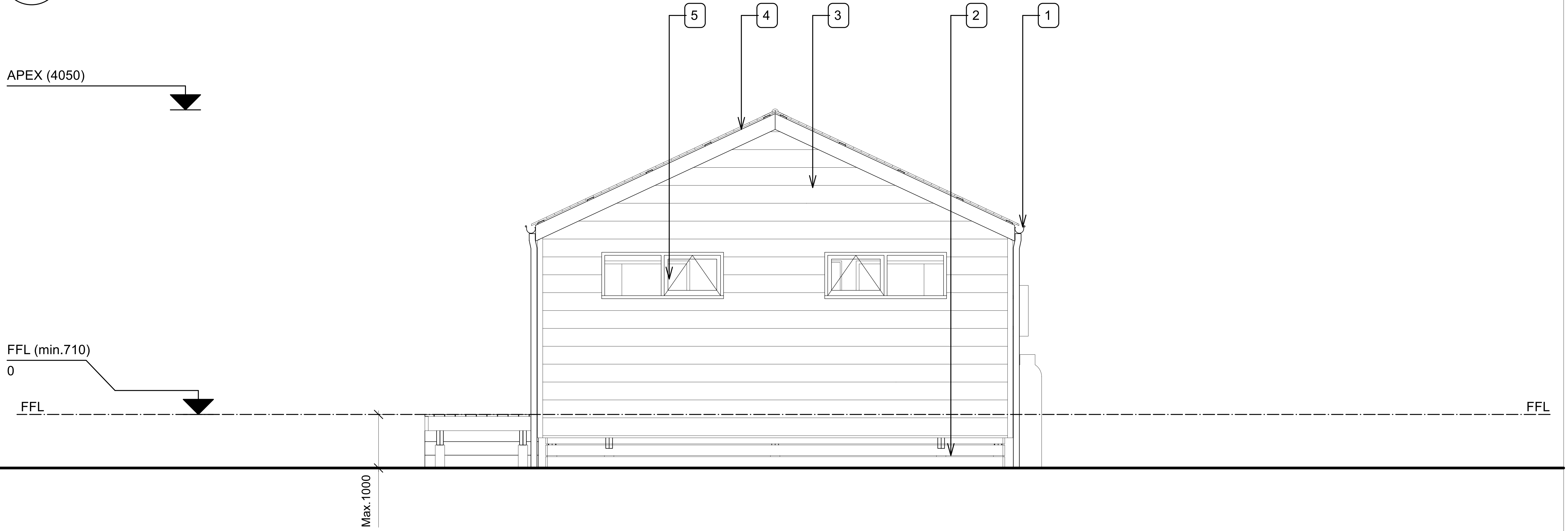
PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.2
SHEET TITLE ELEVATION-3	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W**: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

ELEVATION-4

1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 4 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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Superior Panel Construction

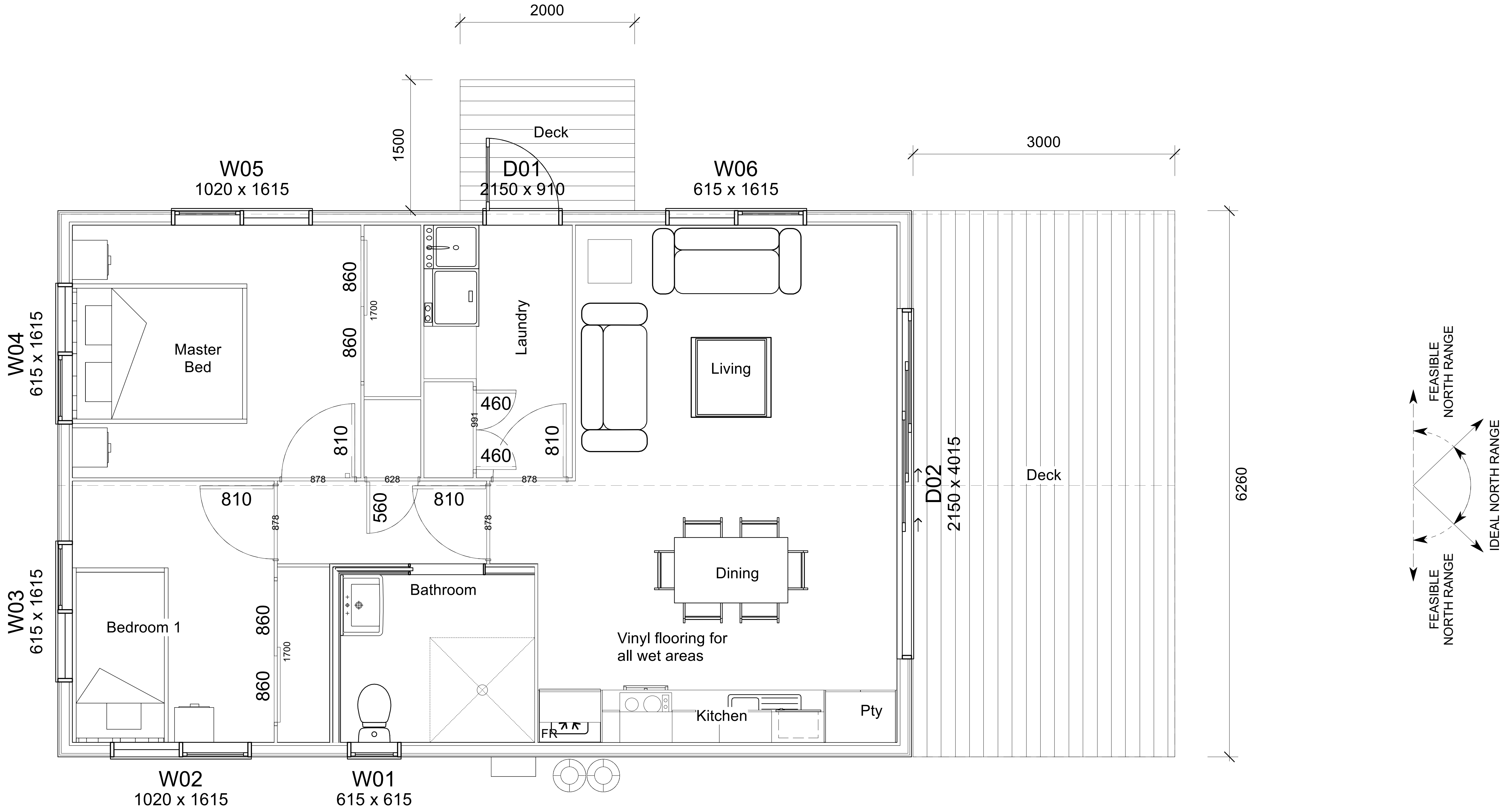
PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.3 TOTAL SHEETS 49
SHEET TITLE ELEVATION-4	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W**: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

1 FLOOR PLAN

Scale: 1:50

Total Floor Area: 60m²



WALL LEGEND

Int. Wall — 36 mm Triboard

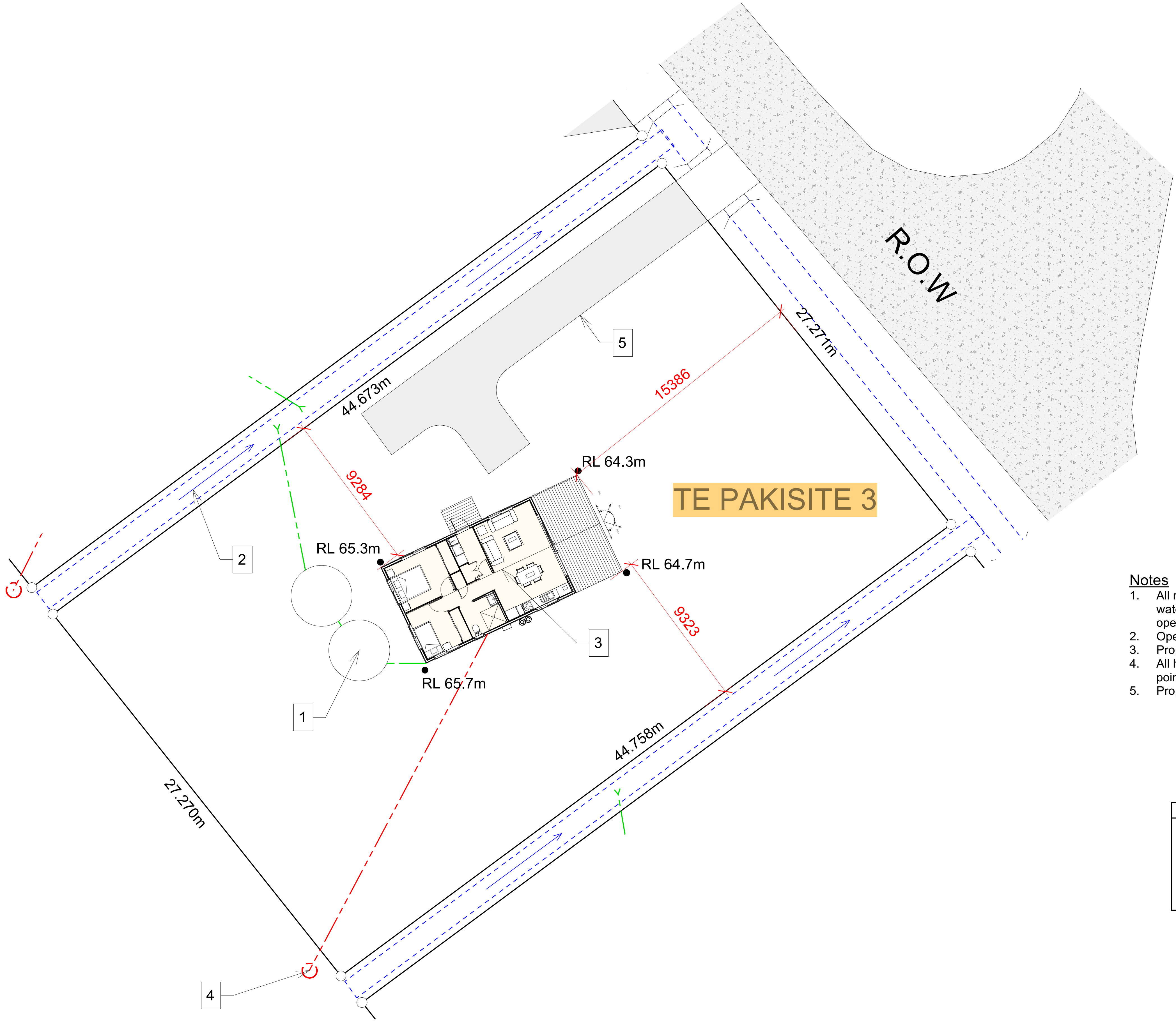
Ext. Wall — 36 mm Triboard; 90 mm Wall Batten; 20mm Cavity Batten; Traditional Weatherboard by Palliside

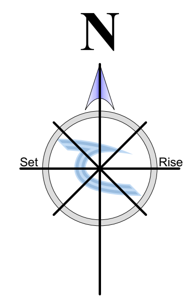
LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz Superior Panel Construction

PROJECT: 2 Bed Kiwi 60m2		PROJECT ID: NgK-
CLIENT: Ngati Kuri	PROJECT DATE: 09/12/2024	SHEET NO: A5; TOTAL SHEETS: 49
SHEET TITLE: FLOOR LAYOUT	DRAWN: Jens Marr	REVISION: A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz





Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 66.410
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	83m2
Impermeable Surfaces	=	165m2
Total Site Coverage	=	14%

LICENSED BUILDING PRACTITIONER www.dbh.govt.nz 126524 BUILDING CONFIDENCE

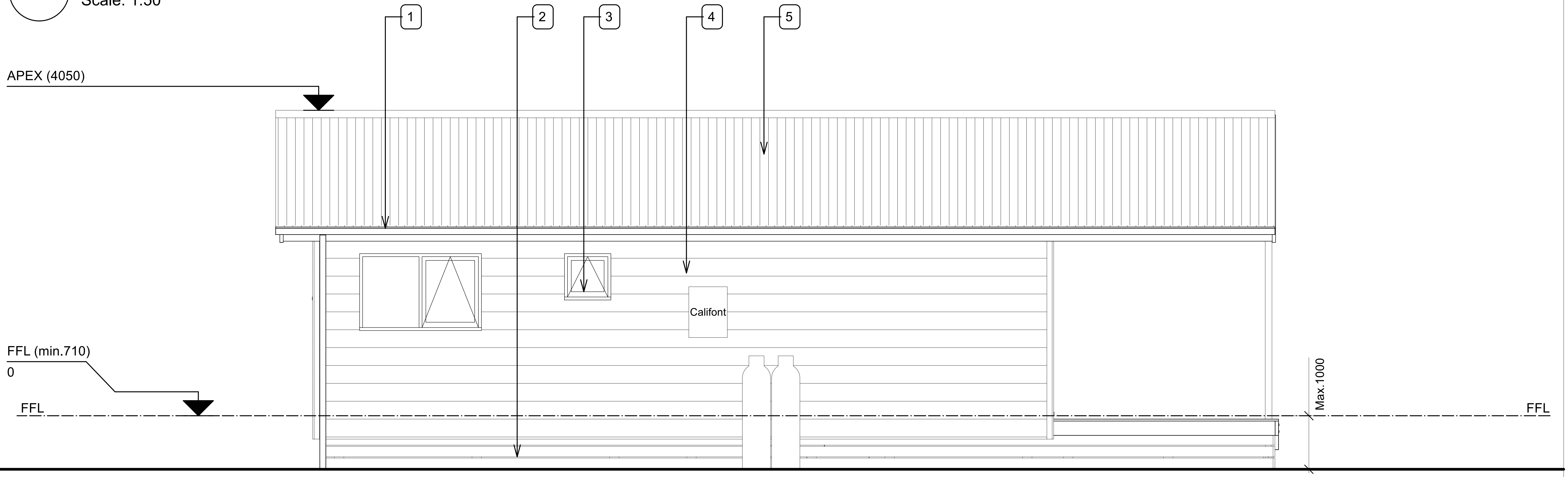
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE #	DWG # A04
DWG	Te Paki Dunes Site 3 Plan	SCALE @ A3 1:250 / DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 15-11-2024		

1 ELEVATION 1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.

Wall location 1 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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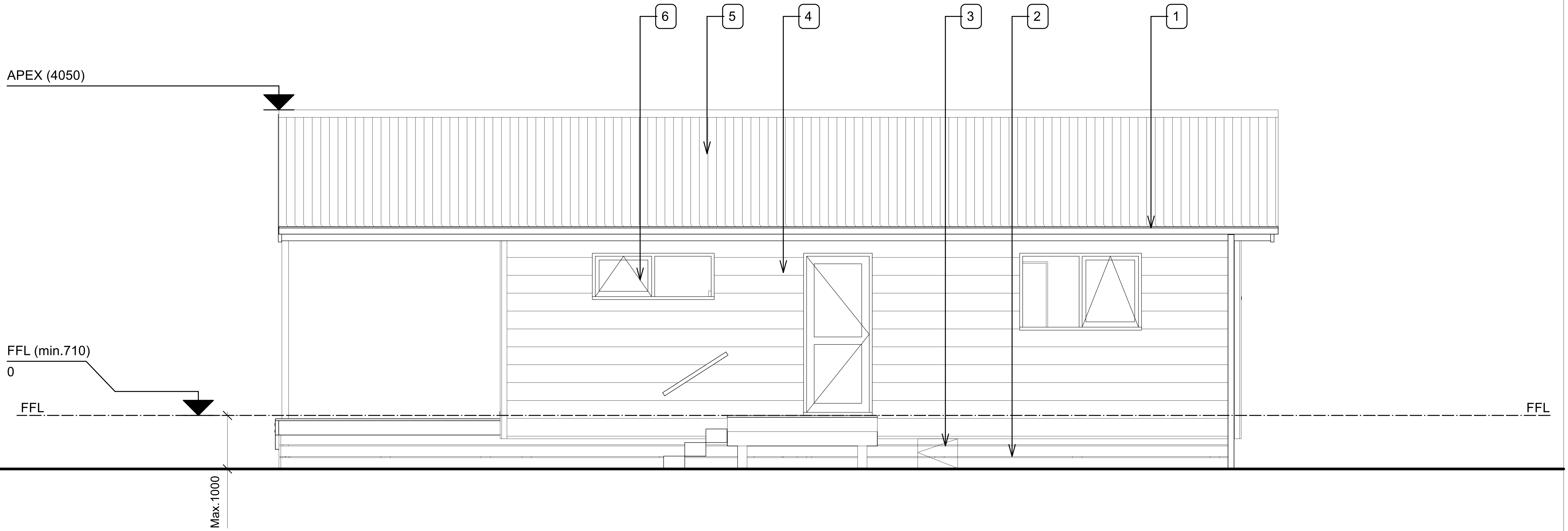
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4 TOTAL SHEETS 49
SHEET TITLE ELEVATION-1	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz

1 ELEVATION-2
Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Access Hatch/Door
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
6. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 2 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

BP133067

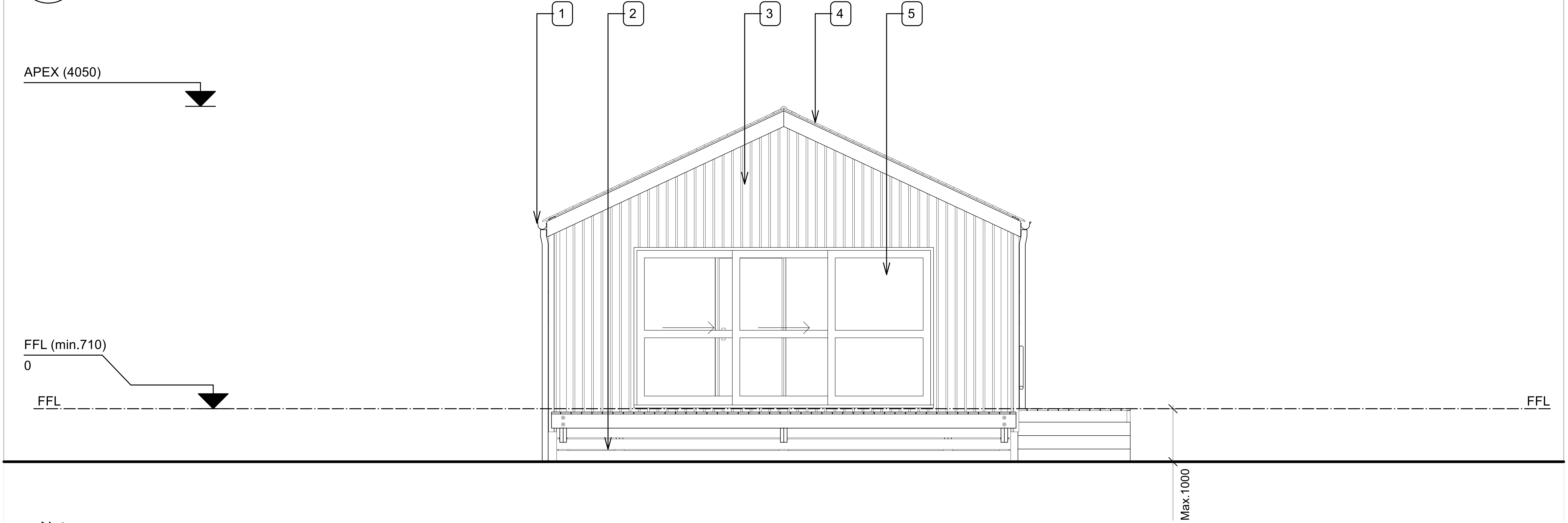
PROJECT: 2 Bed Kiwi 60m2		PROJECT ID: NgK-
CLIENT: Ngati Kuri	PROJECT DATE: 09/12/2024	SHEET NO: A4.1
SHEET TITLE: ELEVATION-2	DRAWN: Jens Marr	TOTAL SHEETS: 49; REVISION: A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz

ELEVATION-3

1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: JSC Vertical Shiplap Cladding with MicroPro® Treated Radiata Pine, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 3 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

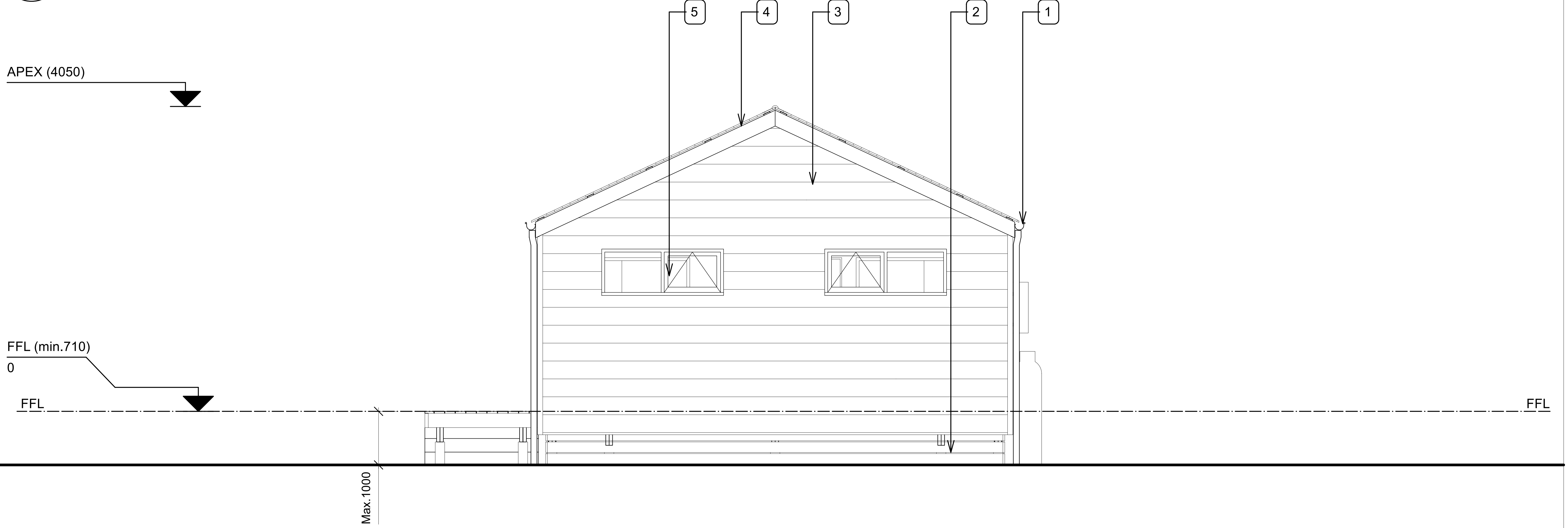
LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.2
SHEET TITLE ELEVATION-3	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia W: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand T: (09) 408 7921 M: 027 3585 363 E: luke@panellock.co.nz

1 ELEVATION-4
Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 4 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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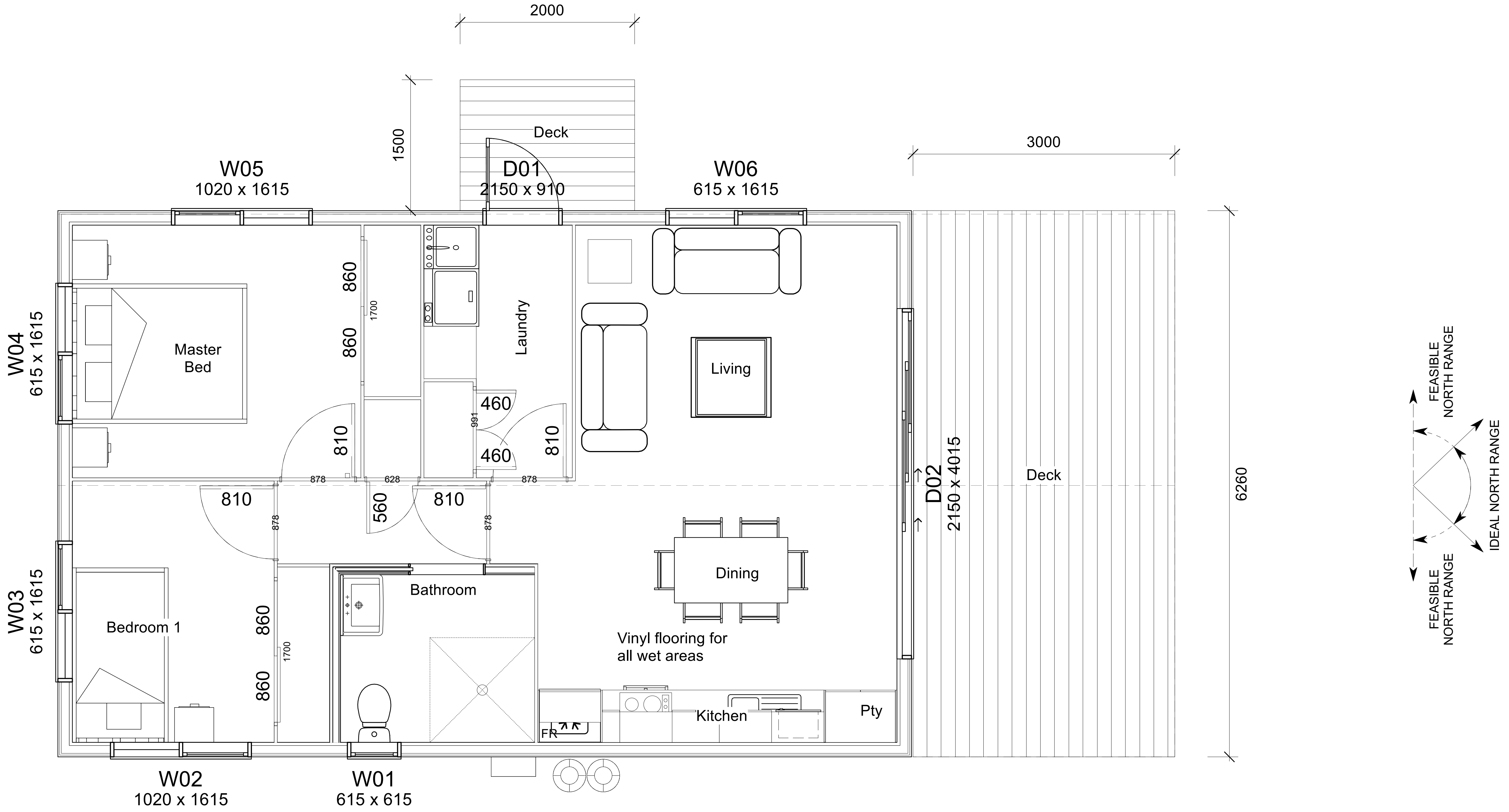
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.3 TOTAL SHEETS 49
SHEET TITLE ELEVATION-4	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia W: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand T: (09) 408 7921 M: 027 3585 363 E: luke@panellock.co.nz

1 FLOOR PLAN
Scale: 1:50

Total Floor Area: 60m²



WALL LEGEND

Int. Wall — 36 mm Triboard

Ext. Wall — 36 mm Triboard; 90 mm Wall Batten; 20mm Cavity Batten; Traditional Weatherboard by Palliside

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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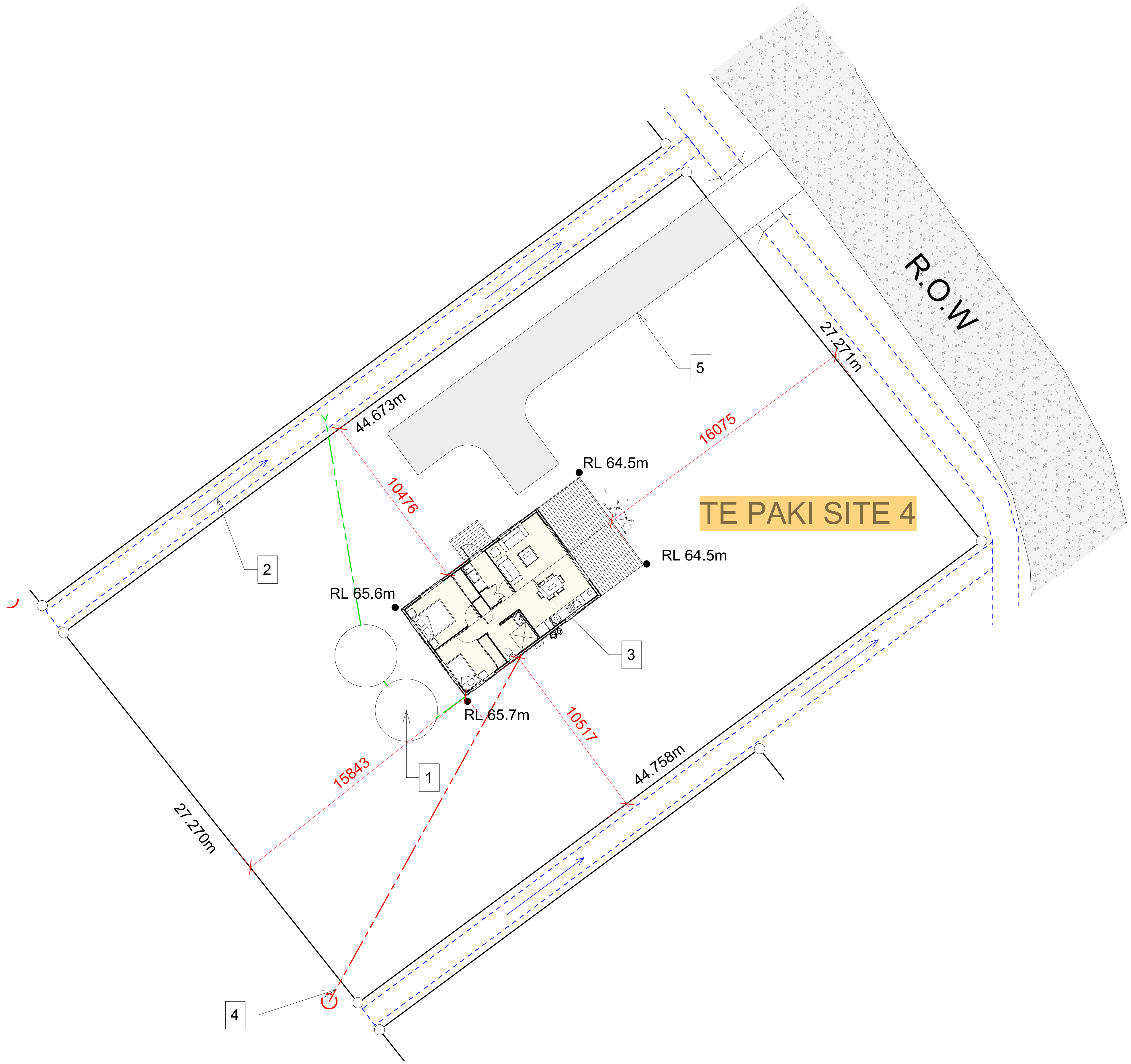
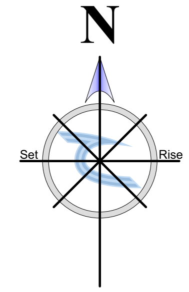
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A5
SHEET TITLE FLOOR LAYOUT	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz





Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 66.410
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	83m2
Impermeable Surfaces	=	165m2
Total Site Coverage	=	14%

LICENSED BUILDING PRACTITIONER
www.dbh.govt.nz
126524
BUILDING CONFIDENCE

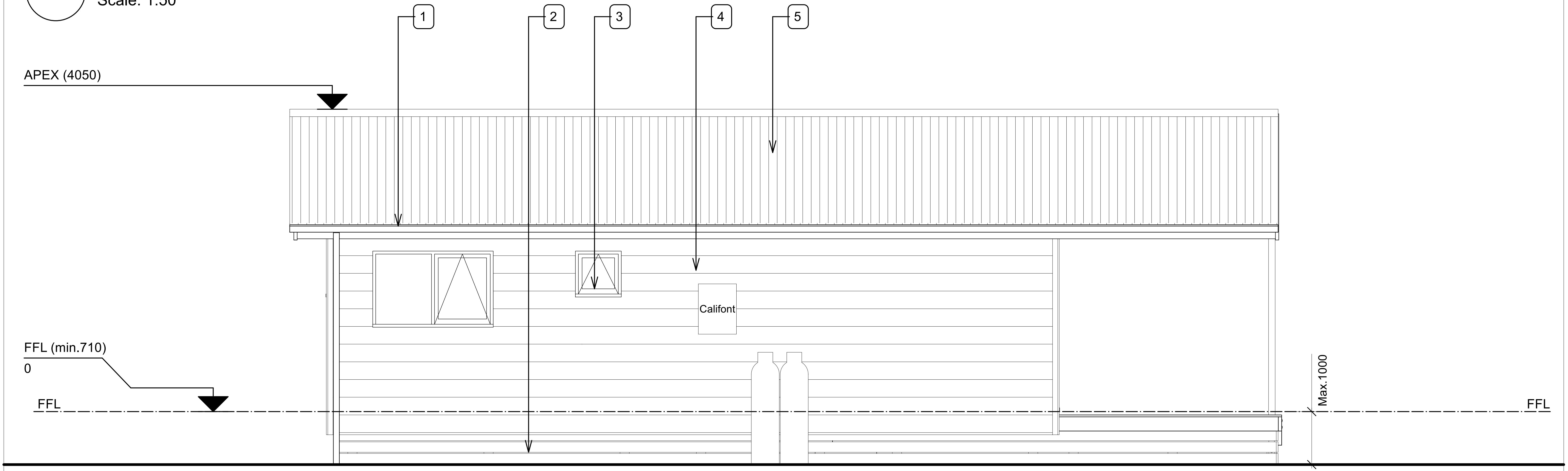
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:250	DWG # A05
DWG	Te Paki Dunes Site 4 Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 15-11-2024		

1 ELEVATION 1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.

Wall location 1 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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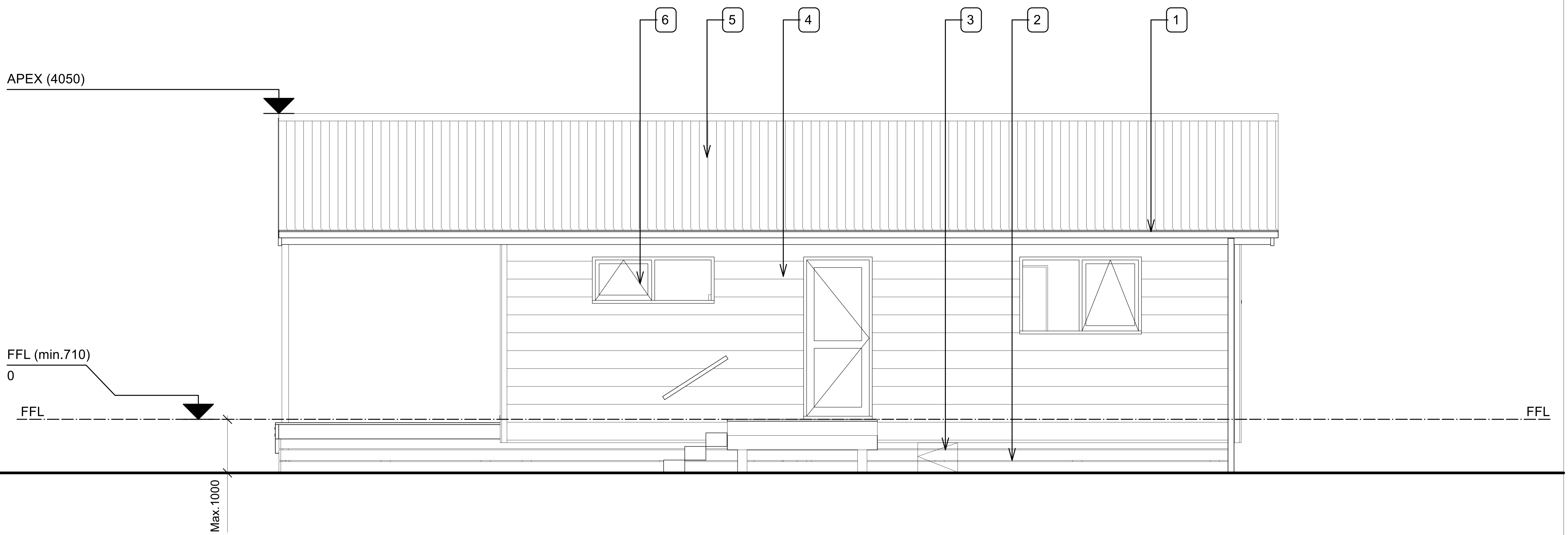
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4 TOTAL SHEETS 49
SHEET TITLE ELEVATION-1	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz

1 ELEVATION-2

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Access Hatch/Door
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
6. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 2 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

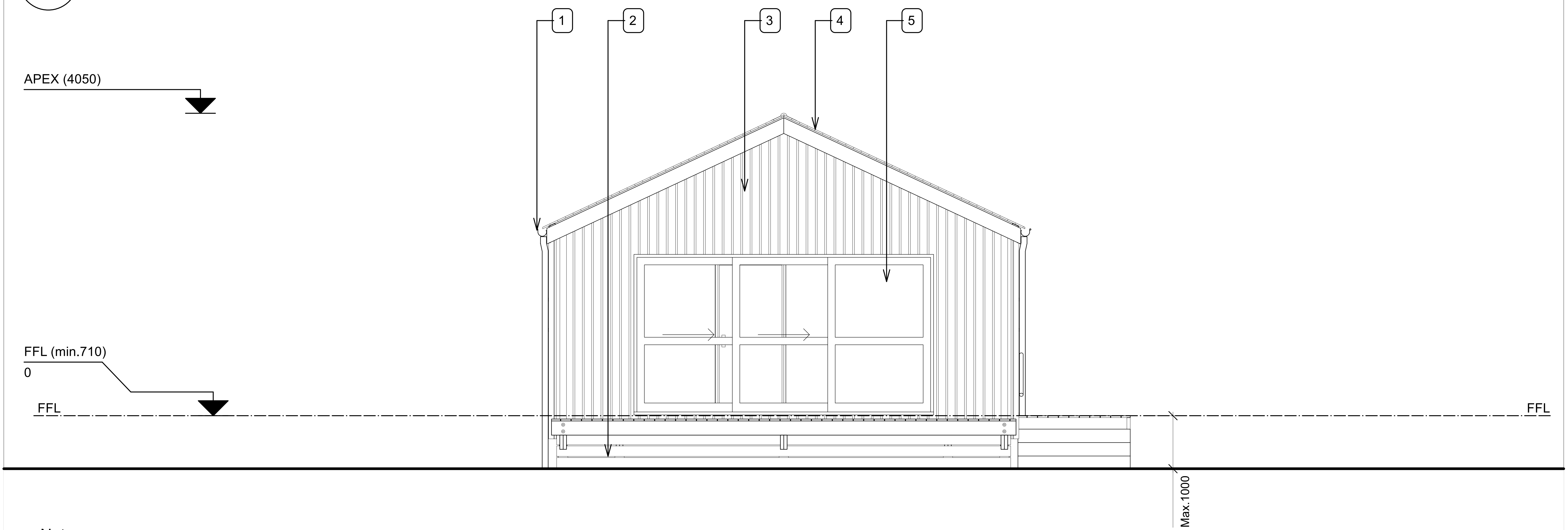
LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz Superior Panel Construction

PROJECT		PROJECT ID
2 Bed Kiwi 60m2		NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.1
SHEET TITLE ELEVATION-2	DRAWN Jens Marr	TOTAL SHEETS 49 / REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W**: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

1 ELEVATION-3
Scale: 1:50



Notes

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2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
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5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 3 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz
Superior Panel Construction

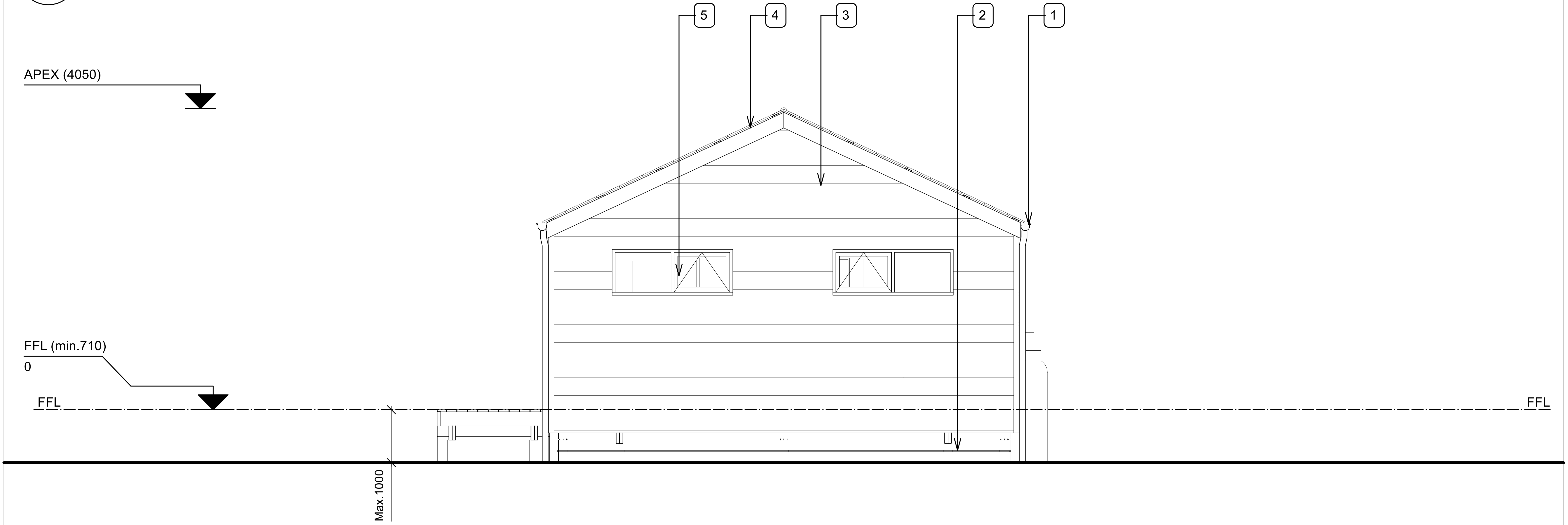
PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.2
SHEET TITLE ELEVATION-3	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia W: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand T: (09) 408 7921 M: 027 3585 363 E: luke@panellock.co.nz

1

ELEVATION-4

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
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5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 4 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz

Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.3 TOTAL SHEETS 49
SHEET TITLE ELEVATION-4	DRAWN Jens Marr	REVISION A 9/12/24

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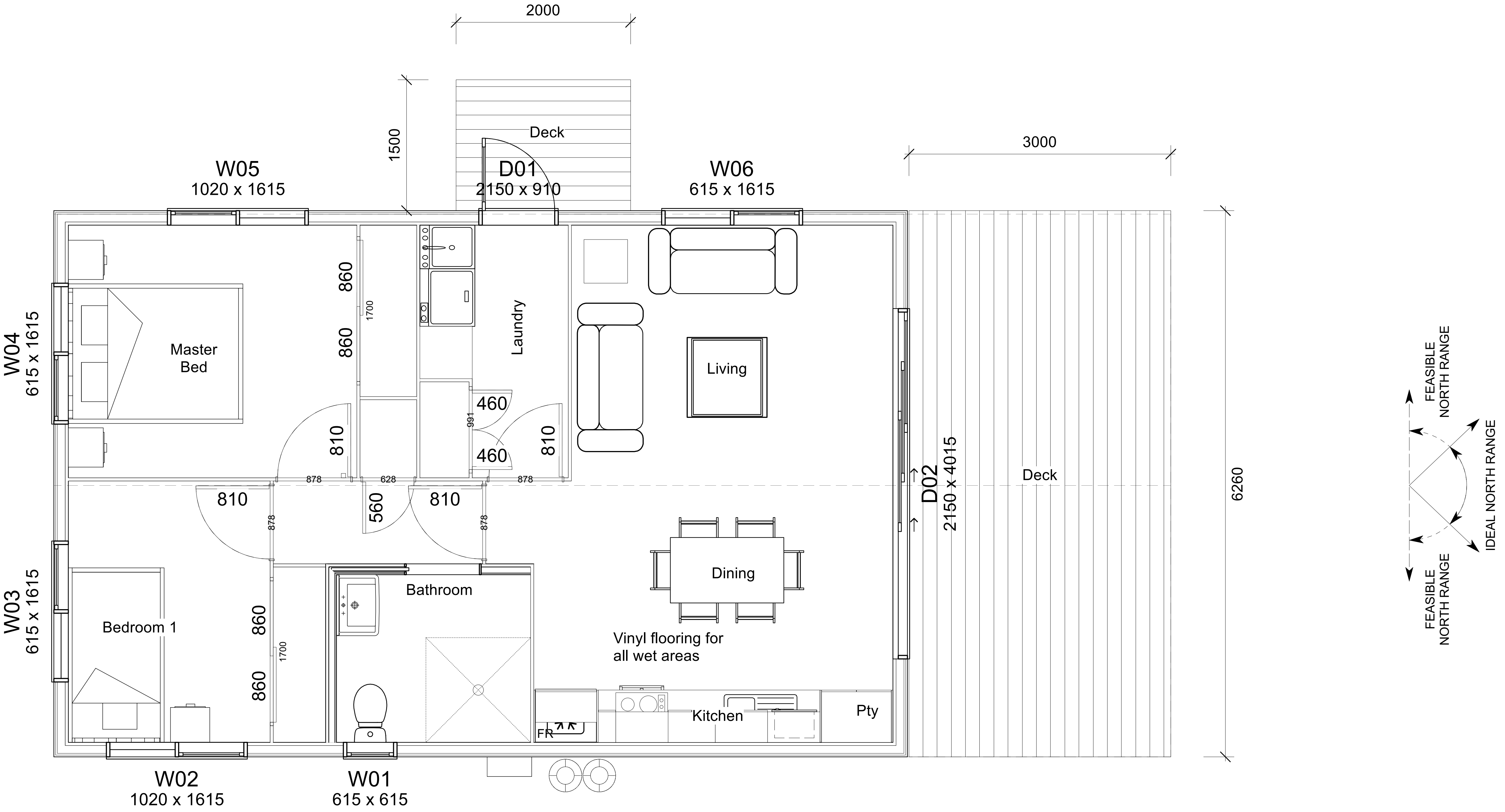
1

FLOOR PLAN

Scale: 1:50

Total Floor Area: 60m²



WALL LEGEND

Int. Wall — 36 mm Triboard

Ext. Wall — 36 mm Triboard; 90 mm Wall Batten; 20mm Cavity Batten; Traditional Weatherboard by Palliside

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz Superior Panel Construction

PROJECT: 2 Bed Kiwi 60m2		PROJECT ID: NgK-
CLIENT: Ngati Kuri	PROJECT DATE: 09/12/2024	SHEET NO: A5
SHEET TITLE: FLOOR LAYOUT	DRAWN: Jens Marr	TOTAL SHEETS: 49; REVISION: A 9/12/24

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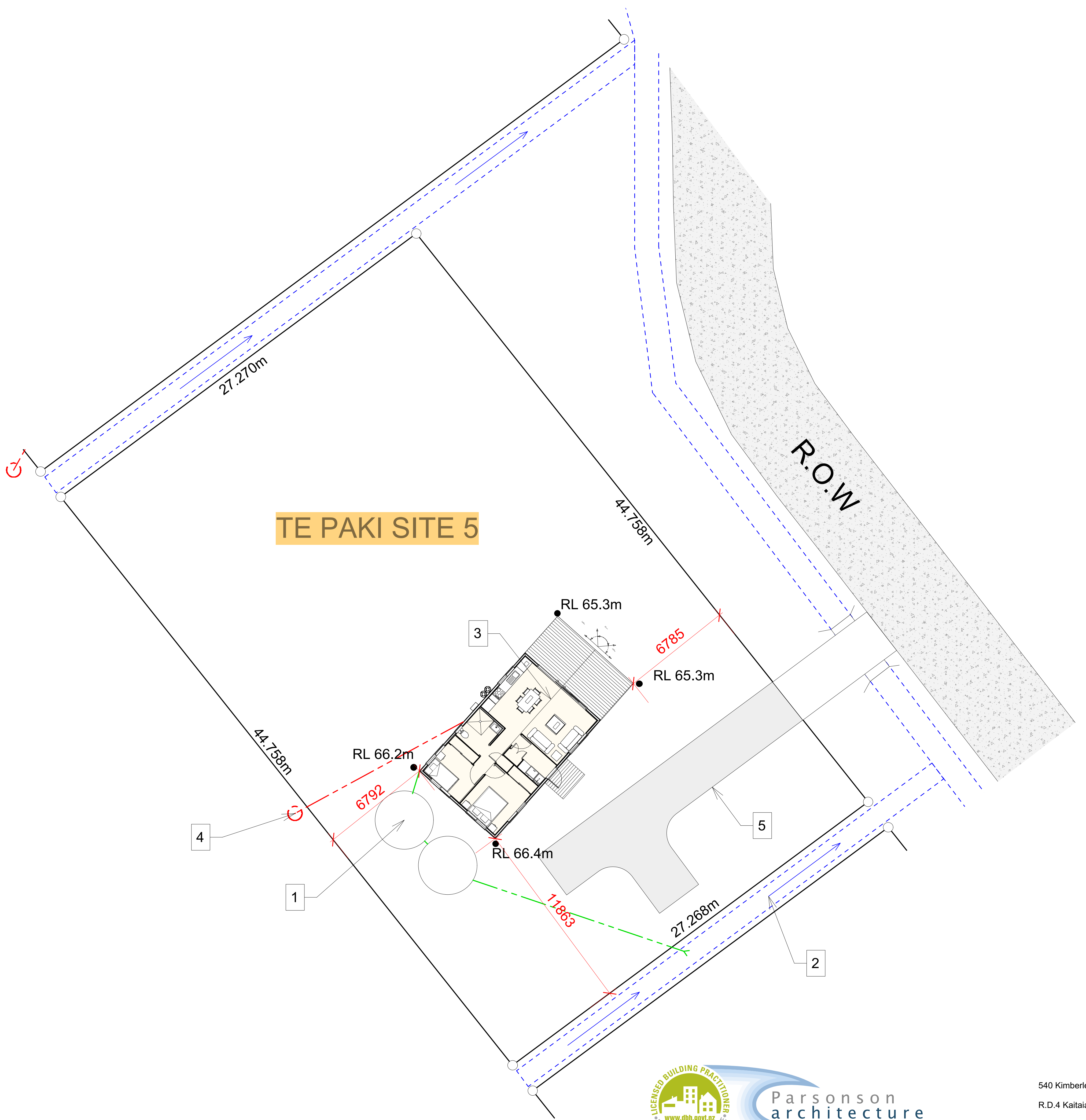
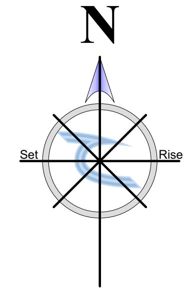




Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 67.110
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	68m2
Impermeable Surfaces	=	150m2
Total Site Coverage	=	12%

Licensed Building Practitioner www.dbh.govt.nz 126524 Building Confidence

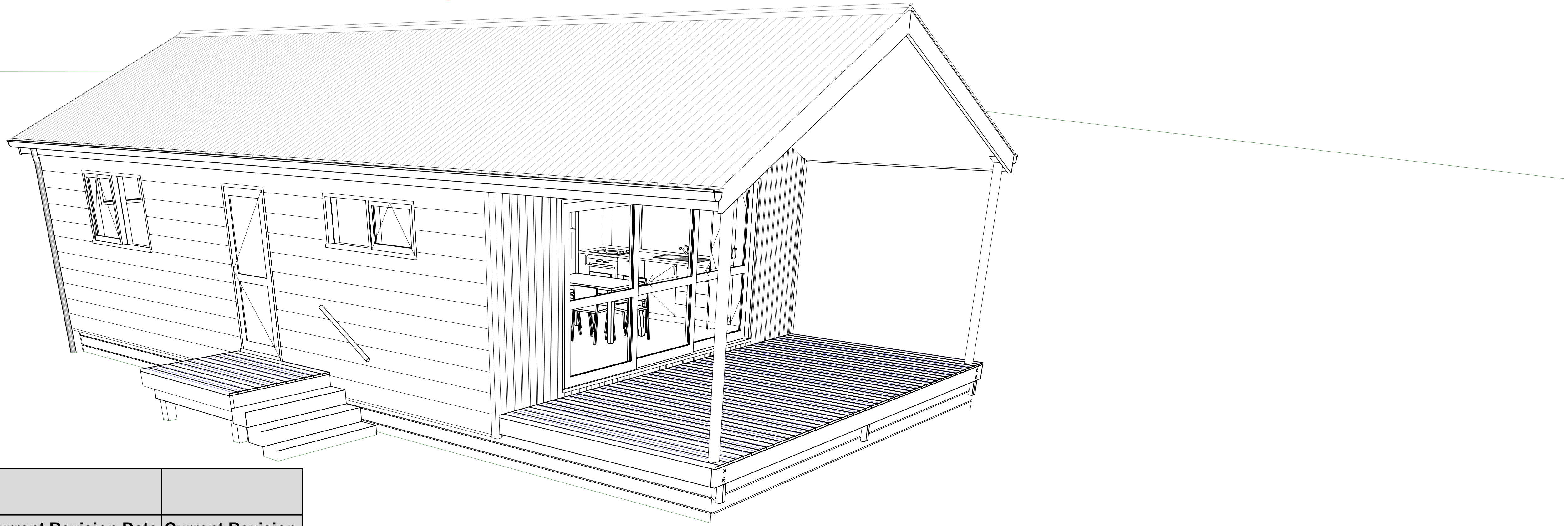
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:250	DWG # A06
DWG	Te Paki Dunes Site 5 Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 15-11-2024		

These drawings shall be read in conjunction with the Triboard Construction Manual 2011

Please refer to building consent no.: EBC-2025-253/0



Drawing List			
No.	**Sheet Title**	**Current Revision Date**	**Current Revision**
1	COVER PAGE	9/12/24	A
2	PROPERTY MAP	9/12/24	A
3	SITE-PLAN	9/12/24	A
4	ELEVATION-1	9/12/24	A
4.1	ELEVATION-2	9/12/24	A
4.2	ELEVATION-3	9/12/24	A
4.3	ELEVATION-4	9/12/24	A
5	FLOOR LAYOUT	9/12/24	A
5.1	FLOOR PLAN	9/12/24	A
5.2	FLOOR PLAN BRACING AND LINTEL	9/12/24	A
5.3	FLOOR PLAN ELECTRIC	9/12/24	A
5.4	FLOOR PLAN PLUMBING	9/12/24	A
6	PLUMBING DETAIL HOT WATER CALIFONT	9/12/24	A
6.1	PLUMBING WET AREA DETAIL	9/12/24	A
6.2	PLUMBING TABLE	9/12/24	A
6.3	BATHROOM LAYOUT	9/12/24	A
7	FOUNDATION AND SUBFLOOR	9/12/24	A
7.1	FOUNDATION DETAIL	9/12/24	A
7.2	FOUNDATION DETAIL	9/12/24	A
7.3	FLOOR JOIST	9/12/24	A
8	CROSS SECTION A-A	9/12/24	A
8.1	CROSS SECTION B-B	9/12/24	A
9	ROOF PLAN	9/12/24	A
9.1	ROOF TRUSS LAYOUT	9/12/24	A
9.2	ROOF DETAILS-1	9/12/24	A
9.3	ROOF DETAILS-2 EAVE	9/12/24	A
9.4	ROOF DETAILS-3	9/12/24	A
9.5	ROOF DETAILS-4	9/12/24	A
9.6	ROOF PORTAL	9/12/24	A
9.7	POST TO PILE FIXING	9/12/24	A
9.8	PORTAL ENGINEER DESIGN	9/12/24	A
10	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.1	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.2	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.3	CLADDING DETAILS- JH-PIPE PENETRAION	9/12/24	A
10.4	CLADDING DETAILS- JH-JOINTER	9/12/24	A
10.5	CLADDING DETAILS-JH-CORNER	9/12/24	A
10.6	CLADDING DETAILS- JH-CAVITY LAYOUT	9/12/24	A
10.7	CLADDING DETAILS- JSC-DOOR	9/12/24	A
10.8	CLADDING DETAILS- JSC-GENERAL	9/12/24	A
10.9	CLADDING DETAILS- JSC CAVITY LAYOUT	9/12/24	A
11	DETAIL-TRIBOARD CEILING FIXING	9/12/24	A
11.1	DETAIL-TRIBOARD BRACING	9/12/24	A
11.2	DETAIL-TRIBOARD BRACING	9/12/24	A
11.3	DETAIL-TRIBOARD BATTEN FIXING	9/12/24	A
11.3	DETAIL-TRIBOARD BATTEN FIXING	9/12/24	A
11.4	DETAIL-TRIBOARD LINTEL FIXING	9/12/24	A
11.4	DETAIL-TRIBOARD LINTEL FIXING	9/12/24	A
12	WINDOW SCHEDULE	9/12/24	A

PROPOSED
60m^2 TRANSPORTABLE DWELLING
MIRRORED

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A1 TOTAL SHEETS 49
SHEET TITLE COVER PAGE	DRAWN Jens Marr	REVISION A 9/12/24

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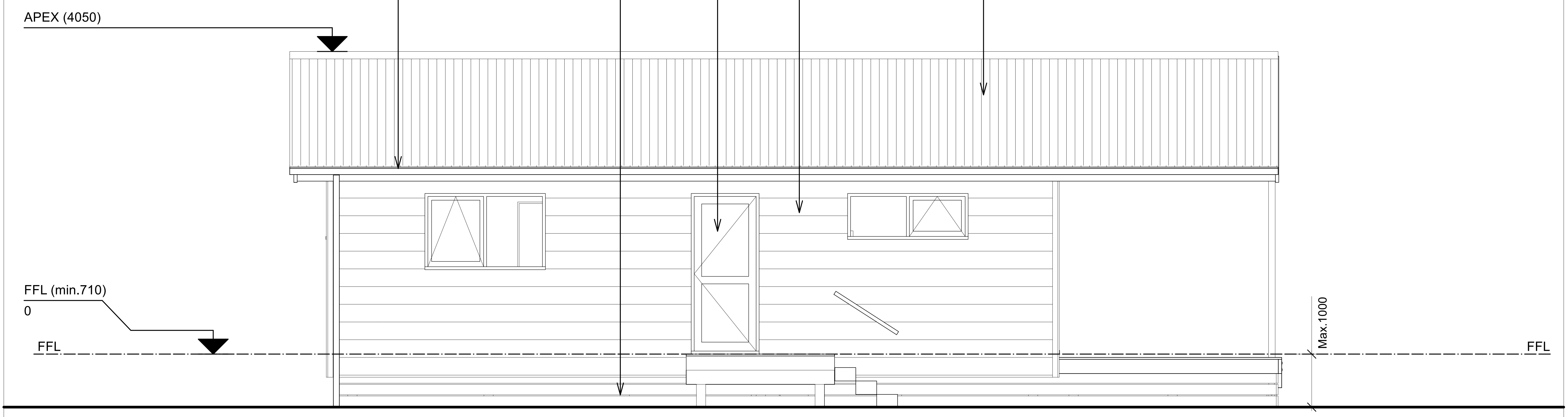
ELEVATION 1

1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.

Wall location 1 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

BP133067

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4 TOTAL SHEETS 49
SHEET TITLE ELEVATION-1	DRAWN Jens Marr	REVISION A 9/12/24

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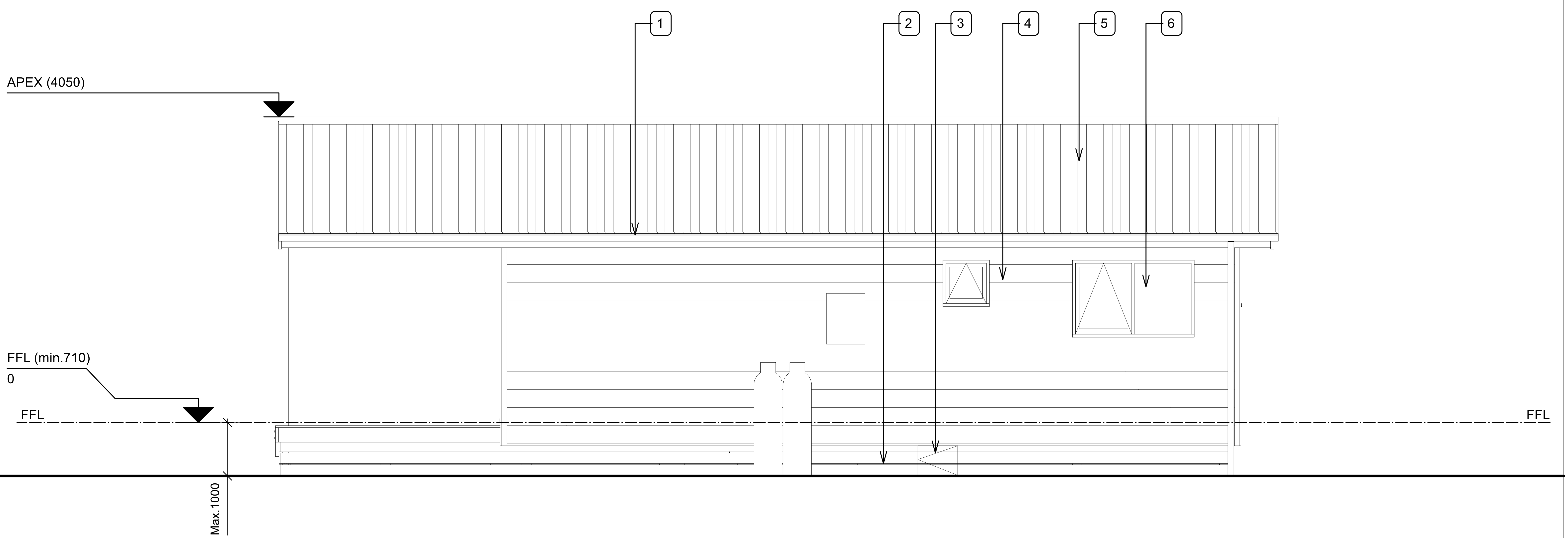
1

ELEVATION-2

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Access Hatch/Door
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
6. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 2 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.1 TOTAL SHEETS 49
SHEET TITLE ELEVATION-2	DRAWN Jens Marr	REVISION A 9/12/24

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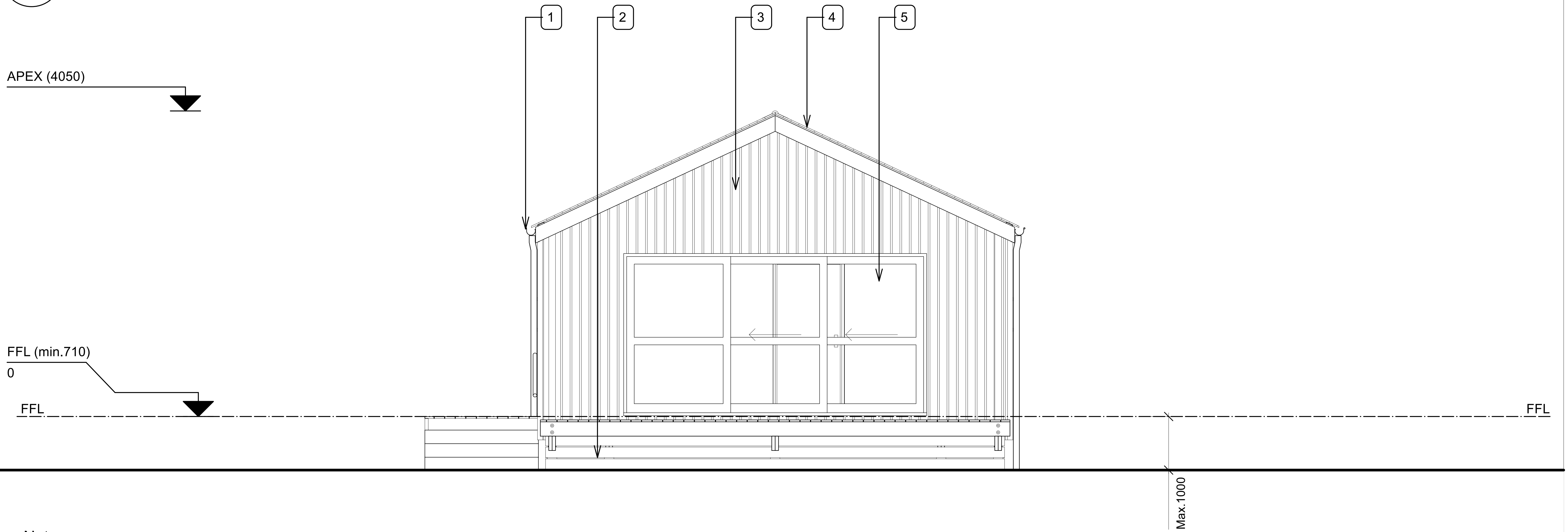
1

ELAVATION-3

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: JSC Vertical Shiplap Cladding with MicroPro® Treated Radiata Pine, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 3 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.2
SHEET TITLE ELEVATION-3	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

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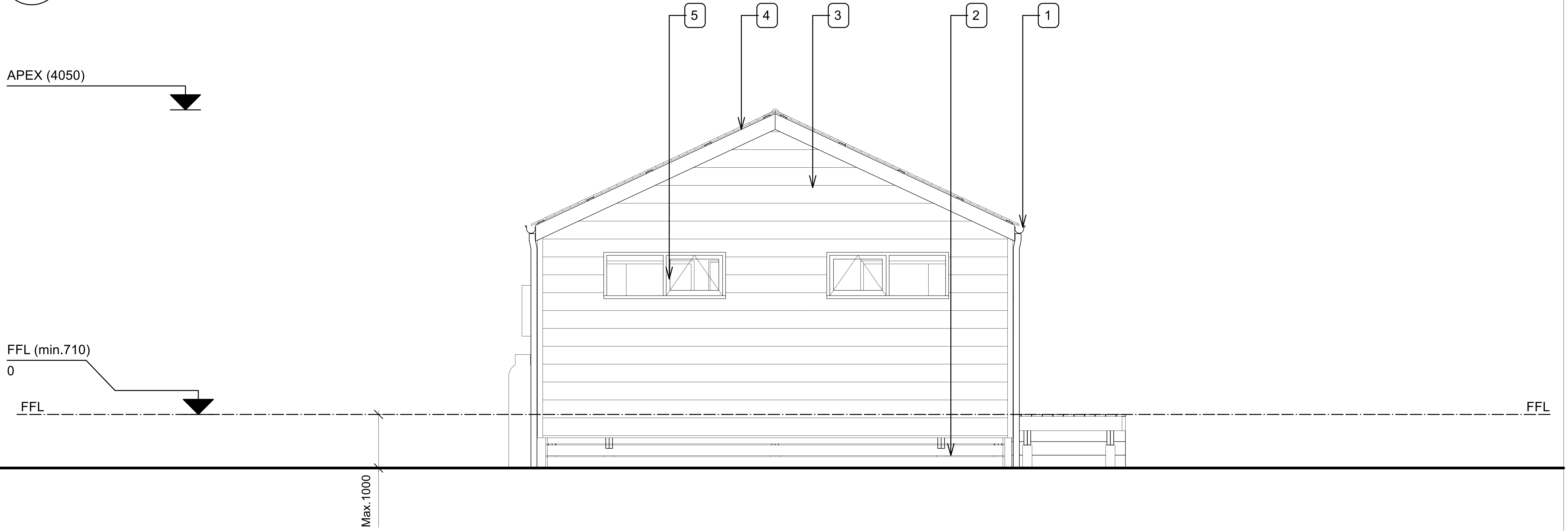
1 ELEVATION-4
Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 4 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.3 TOTAL SHEETS 49
SHEET TITLE ELEVATION-4	DRAWN Jens Marr	REVISION A 9/12/24

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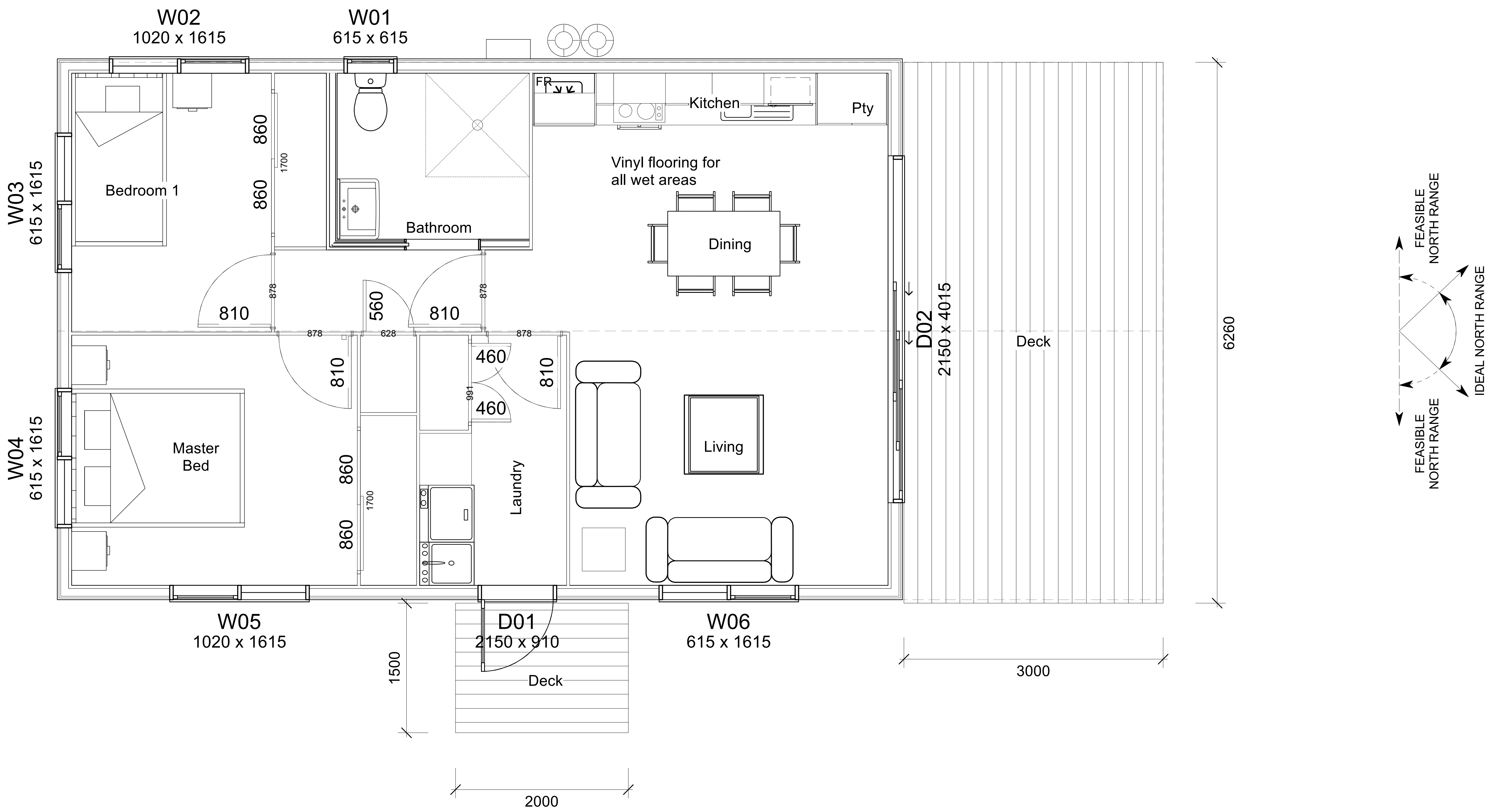
1

FLOOR PLAN

Scale: 1:50

Total Floor Area: 60m²



WALL LEGEND

Int. Wall	36 mm Triboard
Ext. Wall	36 mm Triboard 90 mm Wall Batten 20mm Cavity Batten Traditional Weatherboard by Palliside

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A5
SHEET TITLE FLOOR LAYOUT	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

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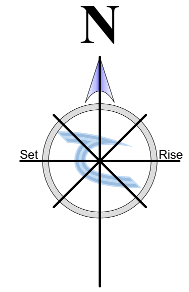
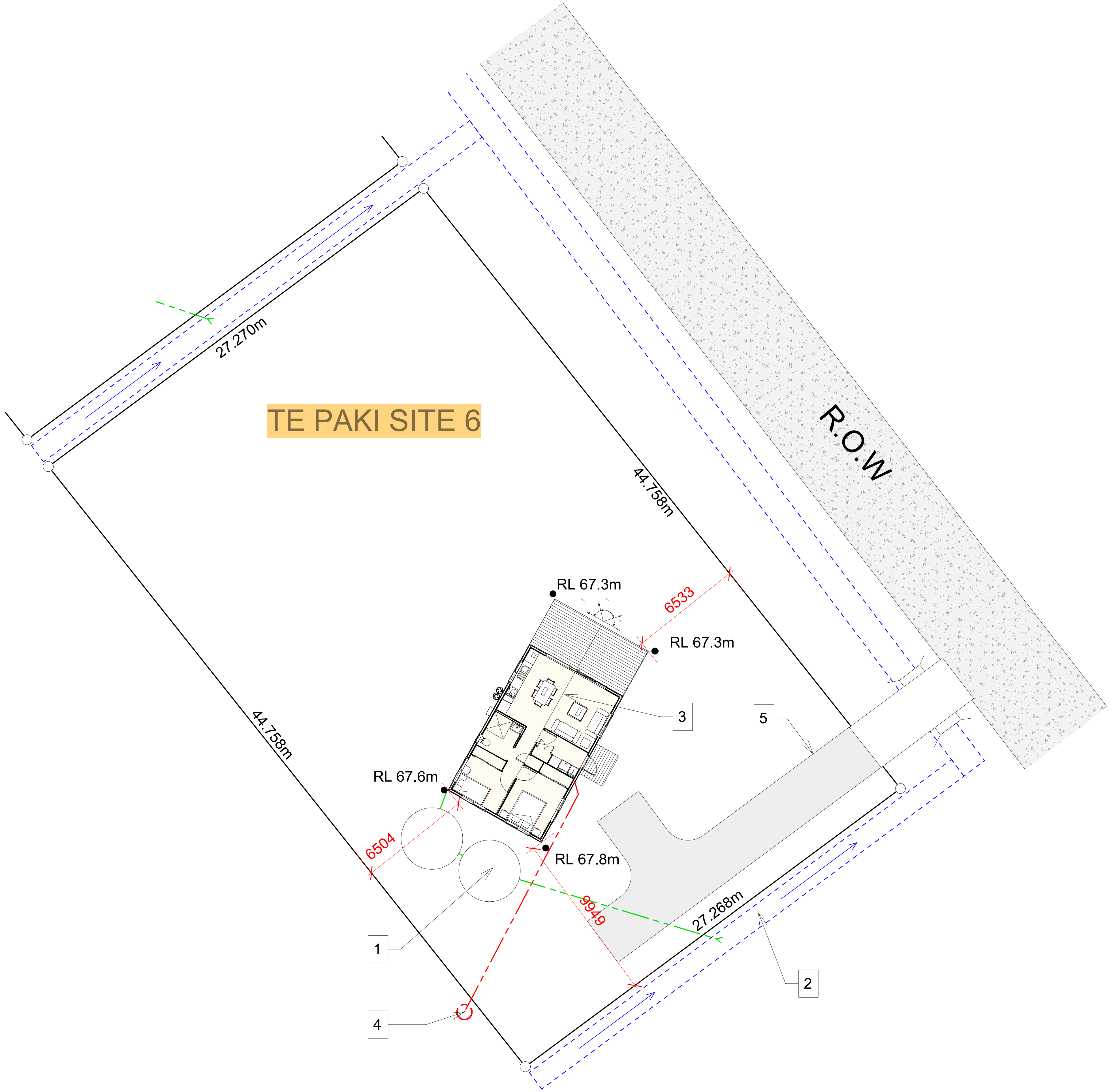




Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 68.510
4. All household waste to sewer connection point
5. Proposed Driveway

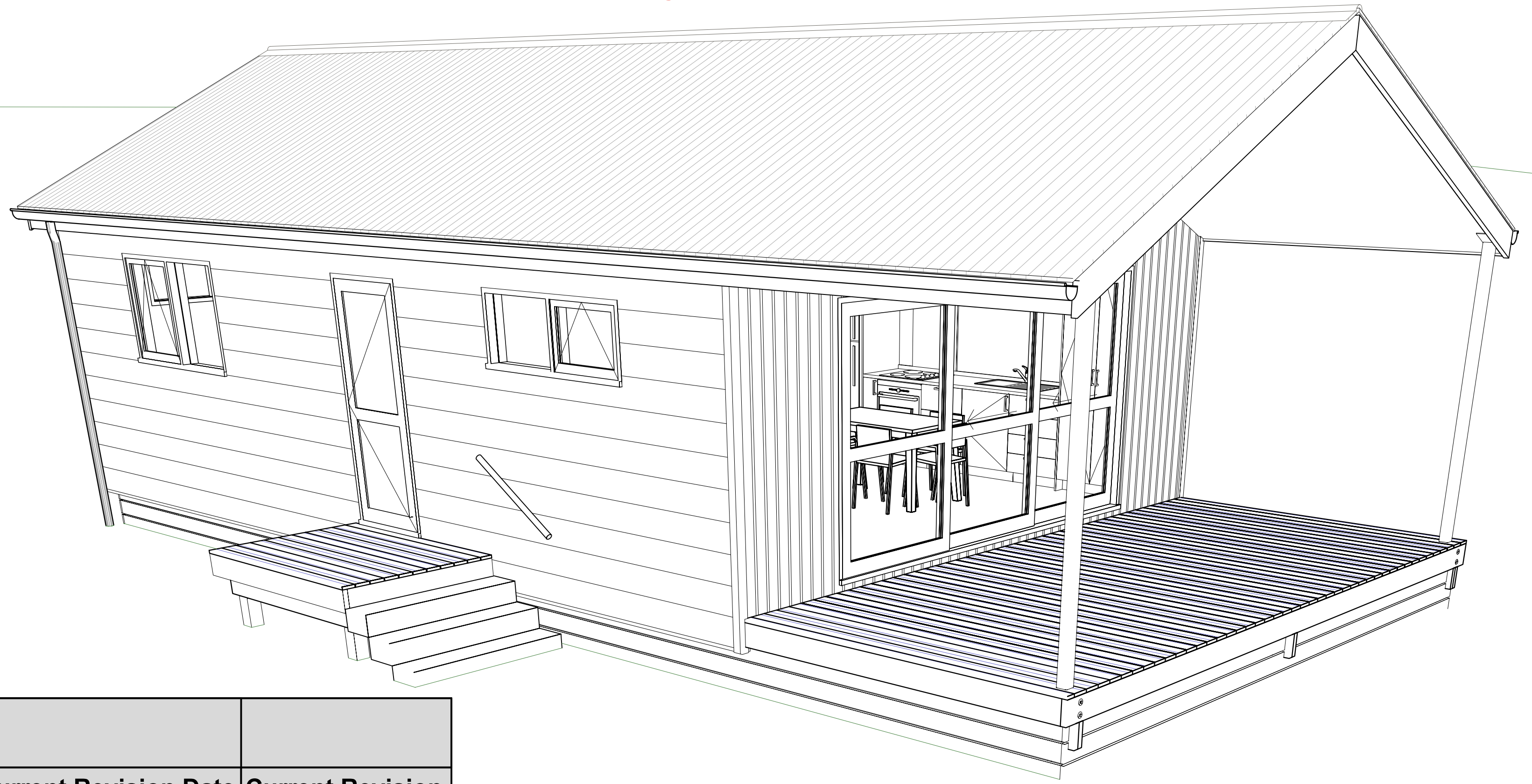
Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	71m2
Impermeable Surfaces	=	153m2
Total Site Coverage	=	12%

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN
Licensed Building Practitioner www.dbh.govt.nz 126524 Building Confidence
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:250	DWG # A07
DWG	Te Paki Dunes Site 6 Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 15-11-2024		

These drawings shall be read in conjunction with the Triboard Construction Manual 2011

Please refer to building consent no.: EBC-2025-253/0



Drawing List

No.	Sheet Title	Current Revision Date	Current Revision
1	COVER PAGE	9/12/24	A
2	PROPERTY MAP	9/12/24	A
3	SITE-PLAN	9/12/24	A
4	ELEVATION-1	9/12/24	A
4.1	ELEVATION-2	9/12/24	A
4.2	ELEVATION-3	9/12/24	A
4.3	ELEVATION-4	9/12/24	A
5	FLOOR LAYOUT	9/12/24	A
5.1	FLOOR PLAN	9/12/24	A
5.2	FLOOR PLAN BRACING AND LINTEL	9/12/24	A
5.3	FLOOR PLAN ELECTRIC	9/12/24	A
5.4	FLOOR PLAN PLUMBING	9/12/24	A
6	PLUMBING DETAIL HOT WATER CALIFONT	9/12/24	A
6.1	PLUMBING WET AREA DETAIL	9/12/24	A
6.2	PLUMBING TABLE	9/12/24	A
6.3	BATHROOM LAYOUT	9/12/24	A
7	FOUNDATION AND SUBFLOOR	9/12/24	A
7.1	FOUNDATION DETAIL	9/12/24	A
7.2	FOUNDATION DETAIL	9/12/24	A
7.3	FLOOR JOIST	9/12/24	A
8	CROSS SECTION A-A	9/12/24	A
8.1	CROSS SECTION B-B	9/12/24	A
9	ROOF PLAN	9/12/24	A
9.1	ROOF TRUSS LAYOUT	9/12/24	A
9.2	ROOF DETAILS-1	9/12/24	A
9.3	ROOF DETAILS-2 EAVE	9/12/24	A
9.4	ROOF DETAILS-3	9/12/24	A
9.5	ROOF DETAILS-4	9/12/24	A
9.6	ROOF PORTAL	9/12/24	A
9.7	POST TO PILE FIXING	9/12/24	A
9.8	PORTAL ENGINEER DESIGN	9/12/24	A
10	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.1	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.2	CLADDING DETAILS- JH-WINDOW	9/12/24	A
10.3	CLADDING DETAILS- JH-PIPE PENETRAION	9/12/24	A
10.4	CLADDING DETAILS- JH-JOINTER	9/12/24	A
10.5	CLADDING DETAILS-JH-CORNER	9/12/24	A
10.6	CLADDING DETAILS- JH-CAVITY LAYOUT	9/12/24	A
10.7	CLADDING DETAILS- JSC-DOOR	9/12/24	A
10.8	CLADDING DETAILS- JSC-GENERAL	9/12/24	A
10.9	CLADDING DETAILS- JSC CAVITY LAYOUT	9/12/24	A
11	DETAIL-TRIBOARD CEILING FIXING	9/12/24	A
11.1	DETAIL-TRIBOARD BRACING	9/12/24	A
11.2	DETAIL-TRIBOARD BRACING	9/12/24	A
11.3	DETAIL-TRIBOARD BATTEN FIXING	9/12/24	A
11.3	DETAIL-TRIBOARD BATTEN FIXING	9/12/24	A
11.4	DETAIL-TRIBOARD LINTEL FIXING	9/12/24	A
11.4	DETAIL-TRIBOARD LINTEL FIXING	9/12/24	A
12	WINDOW SCHEDULE	9/12/24	A

PROPOSED 60m² TRANSPORTABLE DWELLING **MIRRORED**

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A1 TOTAL SHEETS 49
SHEET TITLE COVER PAGE	DRAWN Jens Marr	REVISION A 9/12/24

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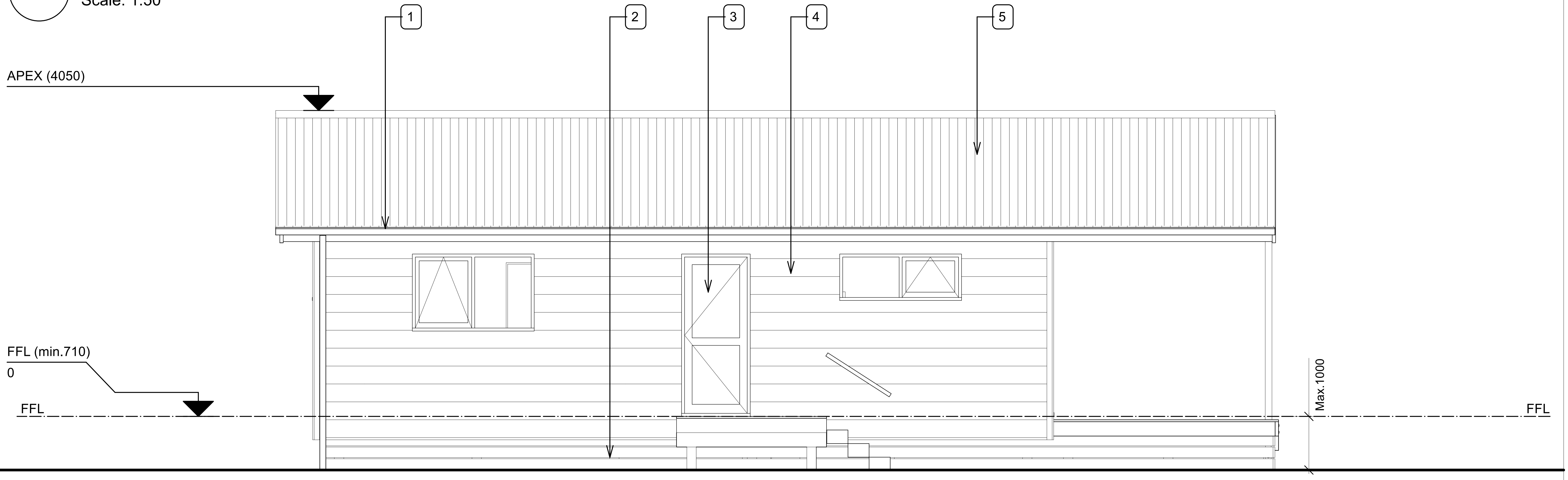
1 ELEVATION 1

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.

Wall location 1 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

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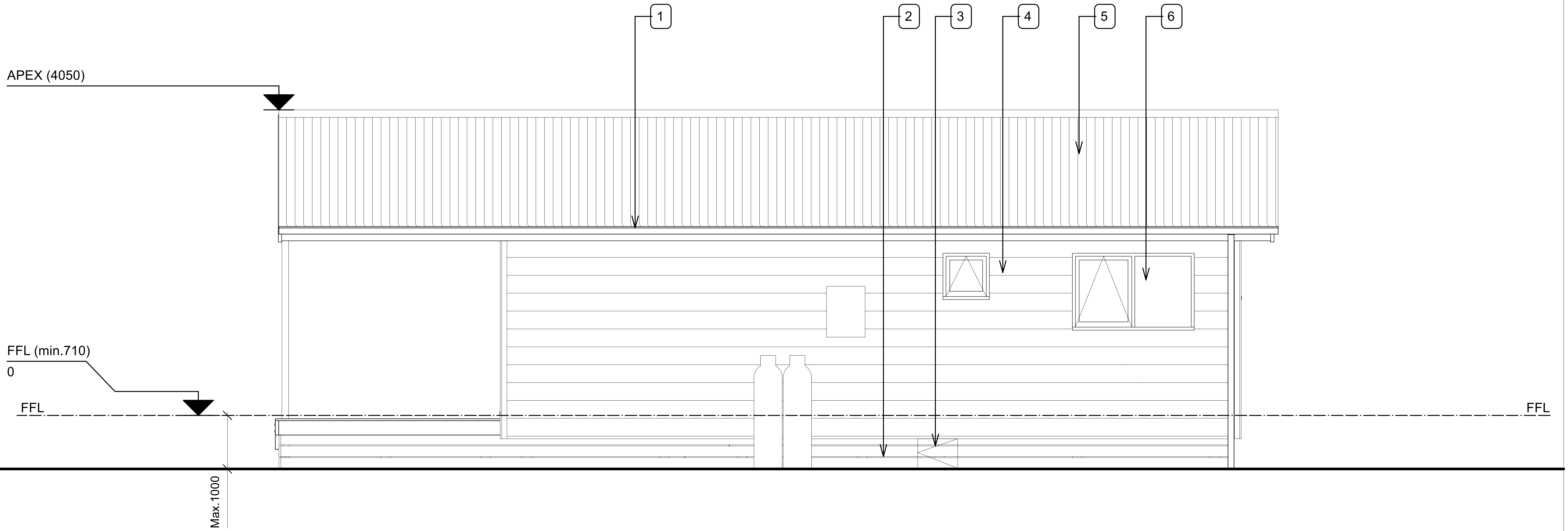
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4
SHEET TITLE ELEVATION-1	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz

1 ELEVATION-2

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Access Hatch/Door
4. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
5. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
6. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 2 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	1
Eave width	0	1	2	5	2
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	5

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

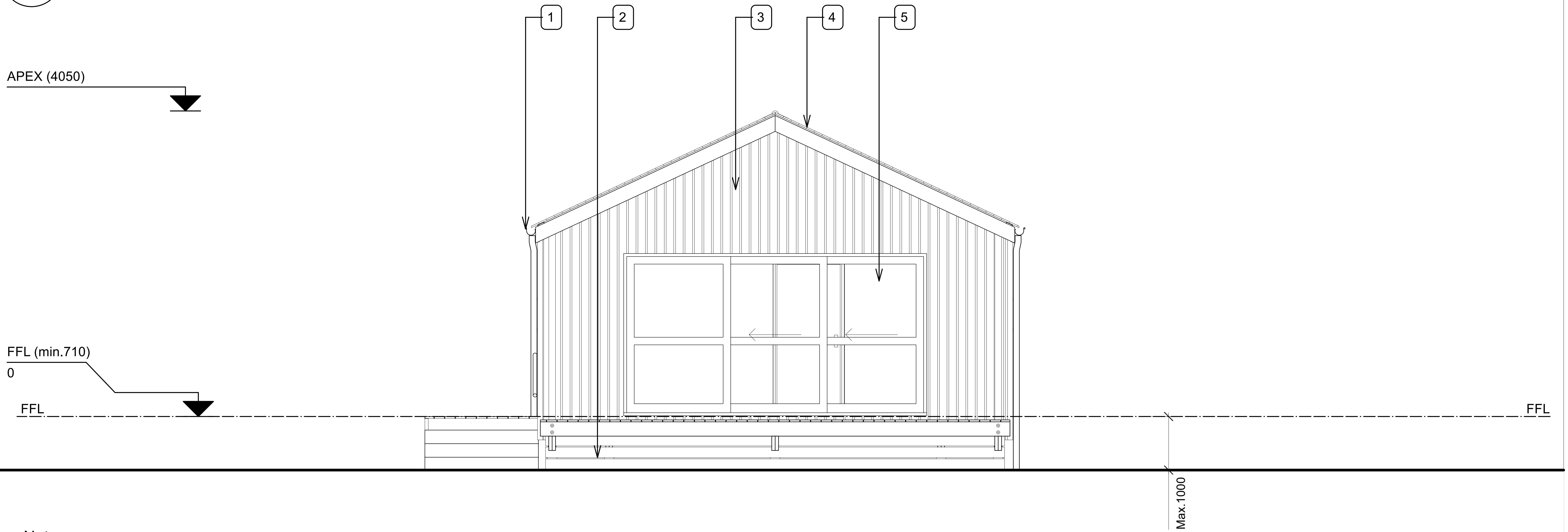
PanelLock.co.nz Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.1 TOTAL SHEETS 49
SHEET TITLE ELEVATION-2	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W**: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

1 ELEVATION-3

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: JSC Vertical Shiplap Cladding with MicroPro® Treated Radiata Pine, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 3 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

BP133067

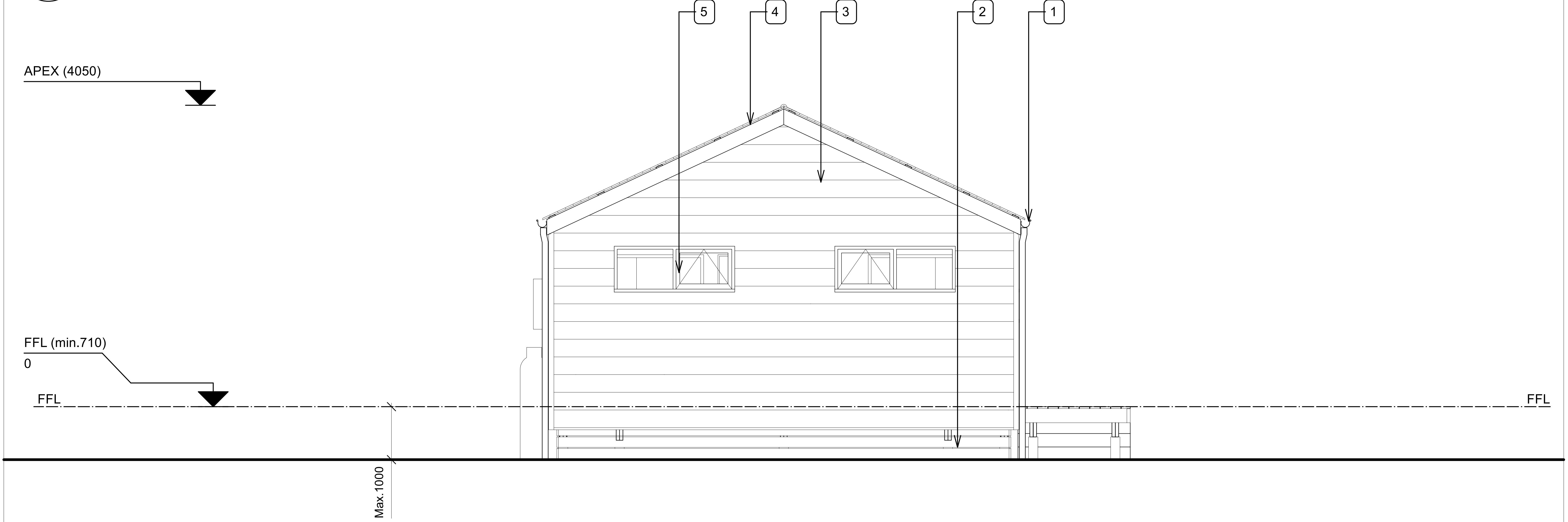
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.2
SHEET TITLE ELEVATION-3	DRAWN Jens Marr	TOTAL SHEETS 49 REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia W: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand T: (09) 408 7921 M: 027 3585 363 E: luke@panellock.co.nz

1 ELEVATION-4

Scale: 1:50



Notes

1. Marley TYPHOON® spouting with external brackets to be installed as specified by the manufacturer and to comply with E1/AS1 Paragraph 4.2.1, 5.1.2 and 5.1.3.
2. 140 x 20 H3.2 Pine Base Bds with 20mm ventilation gaps
3. Wall Cladding: Hardie Plank Weatherboard's, on 20mm cavity batten, over Thermakraft Watergate Plus 295 Wall underlay, on 90x45 battens and R2.0 polyester insulation to meet the performance requirements of Building Code clause H1, over 36mm Triboard wall panel.
4. Roof Cladding: Metalcraft T-Rib roofing in COLORSTEEL® MAXAM®, over Thermakraft Covertek 401 Self-supporting synthetic roof underlay to comply with E2/AS1 and to be installed as specified by the manufacturer. Ceiling insulation to meet the performance requirements of Building Code clause H1.
5. Aluminium joinery with double glazing to meet the performance requirements of Building Code clause H1.

Wall location 4 Risk Factor	Risk Severity				Sub totals for each risk factor
	Low	Medium	High	Very High	
Wind zone (per NZS 3604)	0	0	1	2	2
Number of storeys	0	1	2	4	0
Roof / wall junctions	0	1	3	5	0
Eave width	0	1	2	5	0
Envelope Complexity	0	1	3	6	0
Decks	0	2	4	6	0
				Total risk score:	2

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz Superior Panel Construction

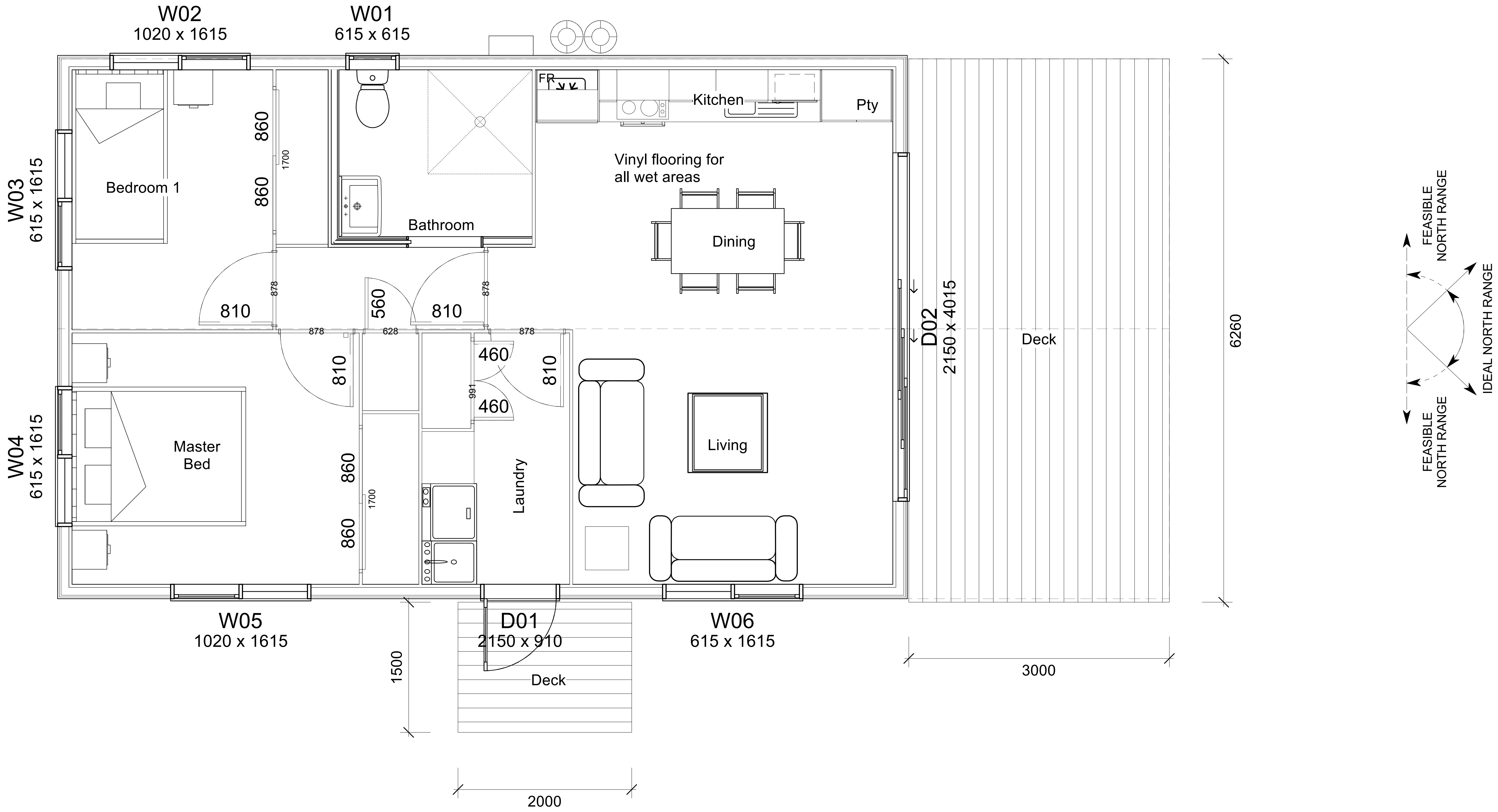
PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A4.3 TOTAL SHEETS 49
SHEET TITLE ELEVATION-4	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W**: www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T**: (09) 408 7921 **M**: 027 3585 363 **E**: luke@panellock.co.nz

1

FLOOR PLAN
Scale: 1:50

Total Floor Area: 60m²



WALL LEGEND

Int. Wall
36 mm Triboard

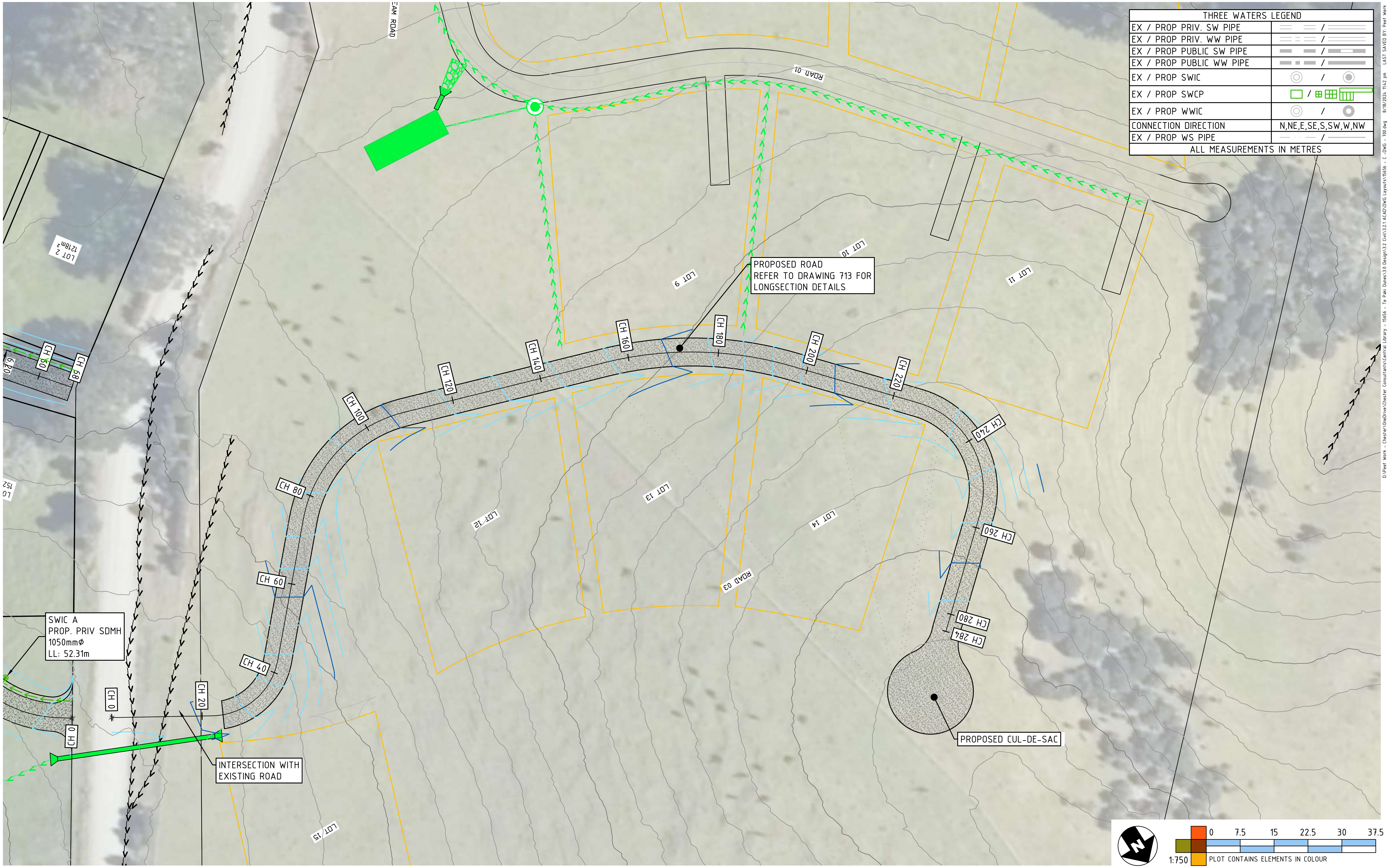
Ext. Wall
36 mm Triboard
90 mm Wall Batten
20mm Cavity Batten
Traditional Weatherboard by Palliside

LICENSED BUILDING PRACTITIONER BP133067 BUILDING CONFIDENCE

PanelLock.co.nz
Superior Panel Construction

PROJECT 2 Bed Kiwi 60m2 mirrored		PROJECT ID NgK-
CLIENT Ngati Kuri	PROJECT DATE 09/12/2024	SHEET NO A5 TOTAL SHEETS 49
SHEET TITLE FLOOR LAYOUT	DRAWN Jens Marr	REVISION A 9/12/24

PanelLock 142 North Road SH1, Kaitaia **W:** www.panellock.co.nz
PO Box 96 Kaitaia New Zealand **T:** (09) 408 7921 **M:** 027 3585 363 **E:** luke@panellock.co.nz



Rev	Date	Amendments	By

Drafter: A BERMINGHAM
Designer: P LIEBENBERG
Checker: R LUNDY
Date: 15/08/2024

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: ROADING PLAN

DRAFT
FOR COMMENT ONLY

Drawing: 701 Rev: 0
Scale: 1:750 @ A3
Project: 15656
Issue: COORDINATION

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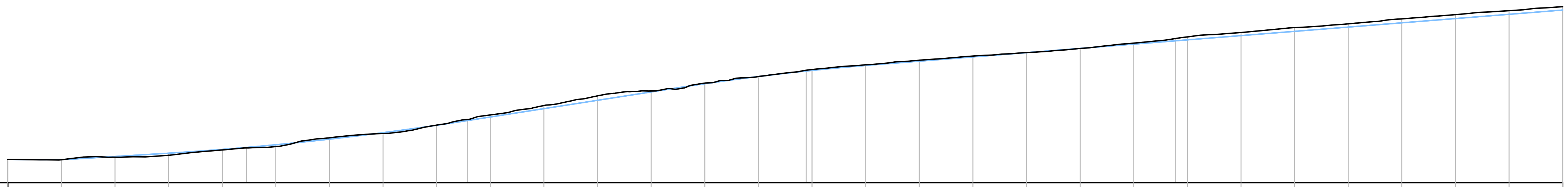
Road 3
DATUM: 52.00
VERT. EXAGGERATION 1:1

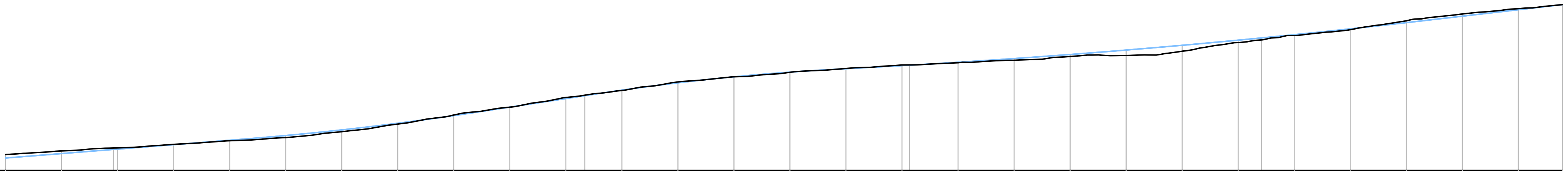


CHAINAGE	CUT/FILL DEPTHS	DESIGN LEVELS	EXISTING LEVELS
0	0.00	54.17	54.17
5	0.02	54.15	54.13
10	0.07	54.44	54.37
15	0.20	54.74	54.55
20	0.05	55.10	55.05
25	0.17	55.53	55.36
30	-0.13	56.05	56.18
35	0.08	56.66	56.58
40	-0.01	57.35	57.37
45	-0.19	58.12	58.31
50	-0.29	58.90	59.19
55	-0.42	59.68	60.10
60	-0.09	60.46	60.55
65	-0.06	61.23	61.29
70	0.00	61.91	61.91
75	-0.08	62.47	62.56
80	-0.06	62.94	63.00
85	-0.09	63.34	63.42
90	-0.08	63.73	63.81
95	-0.01	64.13	64.14
100	0.01	64.53	64.52
105	-0.09	64.93	65.02
110	-0.28	65.33	65.60
115	-0.29	65.72	66.01
120	-0.35	66.12	66.47
125	-0.30	66.52	66.82
130	-0.37	66.92	67.29
135	-0.36	67.32	67.68
140	-0.34	67.71	68.05
145	-0.31	68.11	68.42

VERTICAL GEOMETRY
2.33m -1.2%
VC 3.76, A.D. 7.4% IP CH 4.71/RL 54.11
8.93m 6.2%
VC 27.72, A.D. 9.4% IP CH 28.85/RL 55.60
19.91m 15.6%
VC 18.09, A.D. -7.7% IP CH 71.55/RL 62.27
86.13m 8.0%

HORIZONTAL GEOMETRY
22.25m 299°36'33"
R 15.00 A 20.60
31.60m 220°54'46"
R 30.00 A 34.45
45.72m 286°42'29"

Road 3
DATUM: 67.00
VERT. EXAGGERATION 1:1



CHAINAGE	CUT/FILL DEPTHS	DESIGN LEVELS	EXISTING LEVELS
145	-0.31	68.11	68.42
150	-0.23	68.51	68.74
155	-0.11	68.91	69.01
160	-0.03	69.30	69.33
165	0.05	69.70	69.65
170	0.18	70.12	69.94
175	0.16	70.62	70.46
180	0.07	71.22	71.15
185	-0.05	71.90	71.95
190	0.01	72.66	72.65
195	-0.10	73.42	73.52
200	0.03	74.18	74.15
205	-0.07	74.83	74.91
210	0.00	75.37	75.37
215	0.02	75.78	75.77
220	-0.02	76.09	76.11
225	-0.06	76.36	76.42
230	0.04	76.67	76.62
235	0.15	77.00	76.85
240	0.18	77.36	77.18
245	0.48	77.76	77.27
250	0.53	78.18	77.65
255	0.21	78.64	78.43
260	0.08	79.13	79.05
265	0.08	79.65	79.57
270	-0.16	80.20	80.37
275	-0.20	80.78	80.98
280	-0.10	81.36	81.46
284	0.00	81.81	81.81

VERTICAL GEOMETRY
86.13m 8.0%
VC 19.93, A.D. 7.3% IP CH 176.77/RL 70.64
11.32m 15.3%
VC 20.54, A.D. -9.8% IP CH 208.24/RL 75.44
4.80m 5.5%
VC 48.01, A.D. 6.1% IP CH 247.42/RL 77.59
12.57m 11.6%

HORIZONTAL GEOMETRY
45.72m 286°42'29"
R 80.00 A 42.06
28.97m 316°50'03"
R 20.00 A 31.42
26.86m 46°50'03"

LONGSECTION LEGEND	
EXISTING GROUND	
PROPOSED GROUND	
ALL MEASUREMENTS IN METRES	

1:500 0 5 10 15 20 25
PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By

Drafter: A BERMINGHAM
Designer: P LIEBENBERG
Checker: R LUNDY
Date: 15/08/2024

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: ROADING LONGSECTION 03

DRAFT
FOR COMMENT ONLY

Drawing: 713 Rev: 0
Scale: 1:500 @ A3
Project: 15656
Issue: COORDINATION

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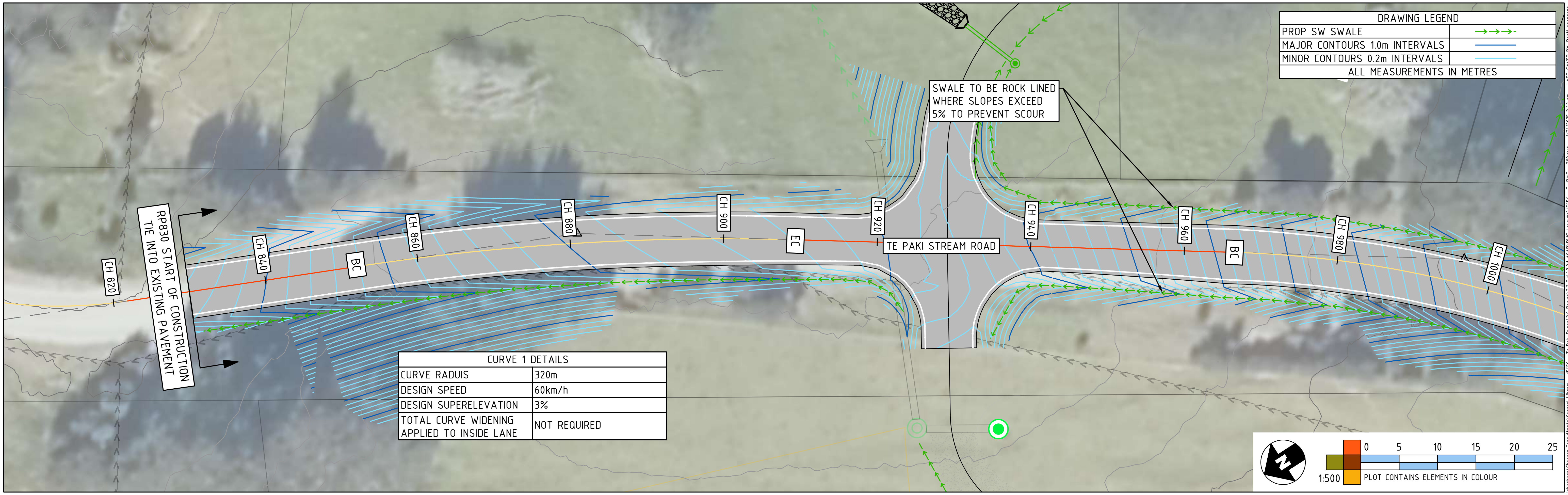
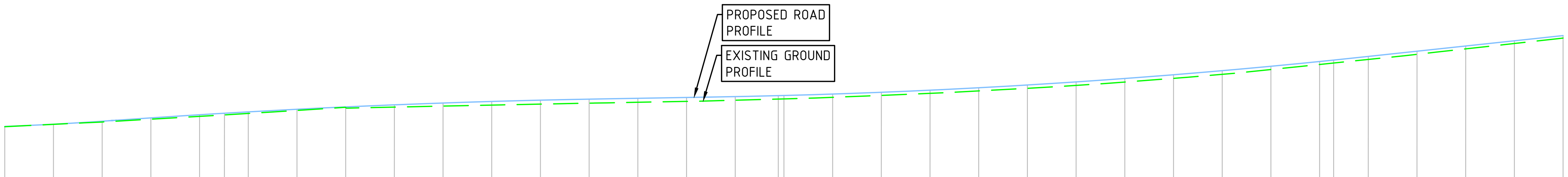


Te Paki Stream Road Main HA
DATUM: 45.00
VERT. EXAGGERATION 1:1



CHAINAGE	830	835	840	845	850	855	860	865	870	875	880	885	890	895	900	905
CUT/FILL DEPTHS	0.02	0.01	0.08	0.13	0.17	0.16	0.12	0.07	0.23	0.31	0.37	0.40	0.41	0.41	0.40	0.37
DESIGN LEVELS	50.46	50.69	50.99	51.34	51.66	51.95	52.22	52.46	52.67	52.86	53.02	53.15	53.26	53.34	53.43	53.51
EXISTING LEVELS	50.43	50.68	50.91	51.20	51.49	51.79	52.10	52.39	52.44	52.54	52.65	52.75	52.84	52.93	53.03	53.15

CHAINAGE	910	915	920	925	930	935	940	945	950	955	960	965	970	975	980	985	990
CUT/FILL DEPTHS	0.35	0.33	0.32	0.32	0.32	0.34	0.36	0.36	0.37	0.37	0.33	0.30	0.31	0.32	0.29	0.28	0.26
DESIGN LEVELS	53.63	53.77	53.96	54.17	54.42	54.70	55.02	55.37	55.75	56.17	56.62	57.11	57.63	58.16	58.69	59.23	59.76
EXISTING LEVELS	53.28	53.44	53.64	53.85	54.10	54.37	54.66	55.01	55.38	55.80	56.29	56.80	57.32	57.84	58.40	58.95	59.50

VERTICAL GEOMETRY: VC 29.81, A.D. 8.3% IP CH 826.57/RL 50.03 | -0.76m 7.1% | VC 50.94, A.D. -5.5% IP CH 866.14/RL 52.86 | 11.29m 1.7% | VC 66.69, A.D. 9.0% IP CH 936.37/RL 54.03 | 26.11m 10.7%

HORIZONTAL GEOMETRY: 30.75m 202°05'36" | R 320.00 A 56.87 | 57.02m 212°16'30" | R 140.00 A 59.19

SUPERELEVATION

Drafter:	P LIEBENBERG	Job Title:	CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY	Drawing:	704 Rev: 0
Designer:	P LIEBENBERG	Client:	FAR NORTH ROADING GROUP LTD	Scale:	1:500 @ A3
Checker:	N JULL	Address:	TE PAKI STREAM ROAD, TE PAKI	Project:	15656
Date:	30/01/2025	Drawing Title:	TE PAKI STREAM ROAD PLAN LAYOUT AND LONG SECTION SHEET 1	Issue:	FOR APPROVAL

Rev	Date	Amendments	By
0	30/01/25	FOR APPROVAL	PL

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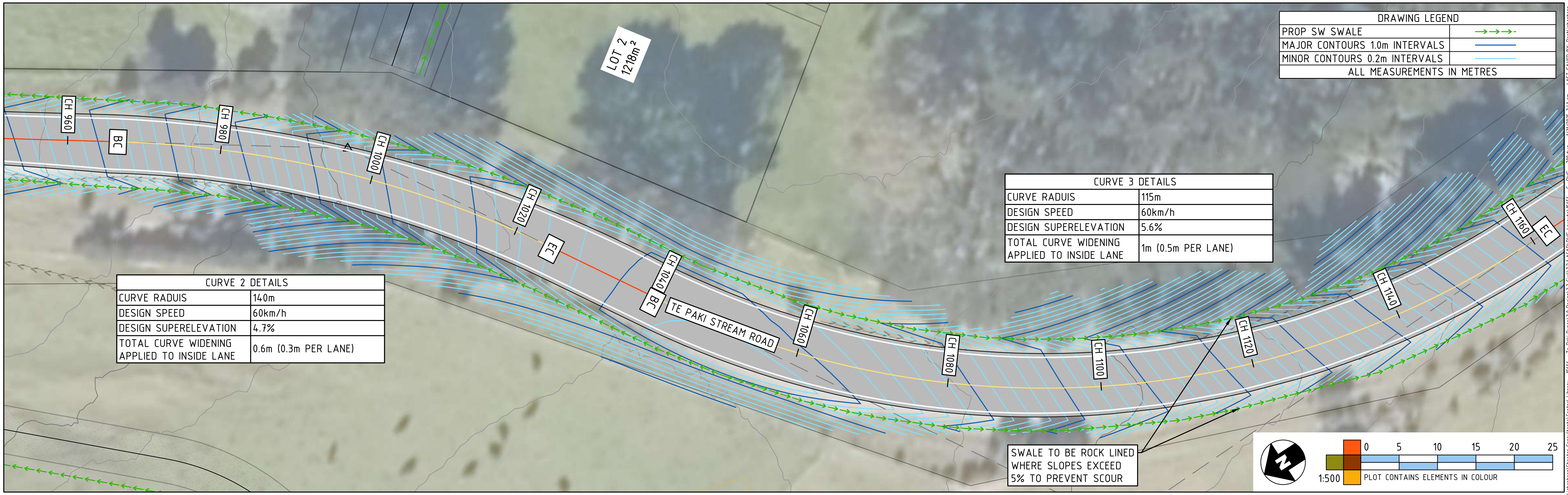
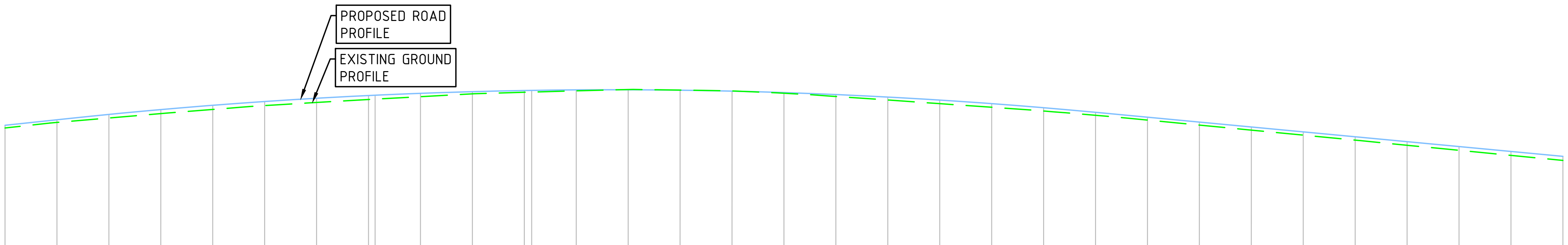


DRAWING LEGEND	
PROP SW SWALE	
MAJOR CONTOURS 1.0m INTERVALS	
MINOR CONTOURS 0.2m INTERVALS	
ALL MEASUREMENTS IN METRES	

CURVE 2 DETAILS	
CURVE RADUIS	140m
DESIGN SPEED	60km/h
DESIGN SUPERELEVATION	4.7%
TOTAL CURVE WIDENING APPLIED TO INSIDE LANE	0.6m (0.3m PER LANE)

CURVE 3 DETAILS	
CURVE RADUIS	115m
DESIGN SPEED	60km/h
DESIGN SUPERELEVATION	5.6%
TOTAL CURVE WIDENING APPLIED TO INSIDE LANE	1m (0.5m PER LANE)

Te Paki Stream Road Main HA
DATUM: 48.00
VERT. EXAGGERATION 1:1



CHAINAGE	990	995	1000	1005	1010	1015	1020	1025	1030	1035	1040	1045	1050	1055	1060
CUT/FILL DEPTHS	0.26	0.26	0.35	0.39	0.40	0.39	0.41	0.38	0.32	0.21	0.17	0.09	-0.02	-0.01	-0.01
DESIGN LEVELS	59.76	60.29	60.81	61.27	61.69	62.05	62.36	62.63	62.84	63.00	63.11	63.17	63.18	63.14	63.06
EXISTING LEVELS	59.50	60.04	60.46	60.89	61.29	61.66	61.96	62.24	62.52	62.79	62.94	63.08	63.21	63.15	63.07

CHAINAGE	1065	1070	1075	1080	1085	1090	1095	1100	1105	1110	1115	1120	1125	1130	1135	1140
CUT/FILL DEPTHS	0.06	0.19	0.28	0.34	0.35	0.32	0.29	0.27	0.29	0.30	0.31	0.32	0.35	0.36	0.38	0.39
DESIGN LEVELS	62.92	62.73	62.48	62.19	61.85	61.46	61.02	60.55	60.08	59.61	59.14	58.66	58.19	57.72	57.25	56.78
EXISTING LEVELS	62.85	62.54	62.20	61.85	61.50	61.14	60.73	60.27	59.79	59.31	58.82	58.34	57.85	57.36	56.88	56.39

VERTICAL GEOMETRY: 26.11m 10.7% | VC 99.50, A.D. -20.1% IP CH 1045.45/RL 65.68 | 76.76m -9.4%

HORIZONTAL GEOMETRY: R 140.00 A 59.19 | 15.08m 236°30'00" | R 115.00 A 120.86

SUPERELEVATION

Rev	Date	Amendments	By
0	30/01/25	FOR APPROVAL	PL

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 30/01/2025

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: TE PAKI STREAM ROAD PLAN LAYOUT AND LONG SECTION SHEET 2

Drawing: 705 Rev: 0
Scale: 1:500 @ A3
Project: 15656
Issue: FOR APPROVAL

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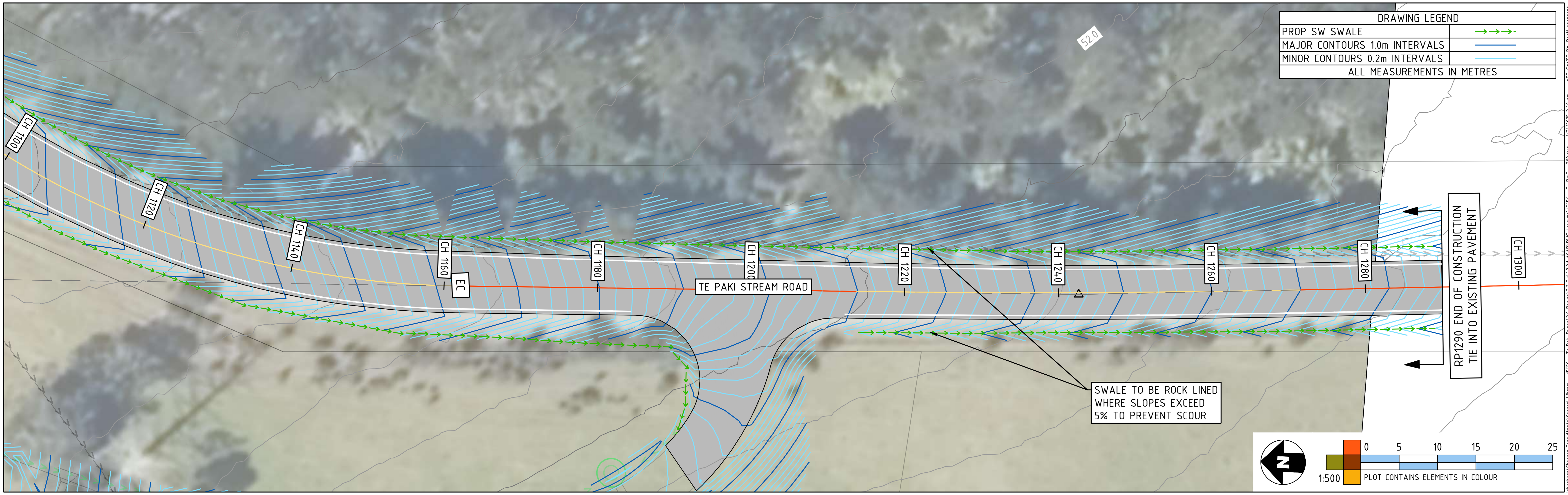

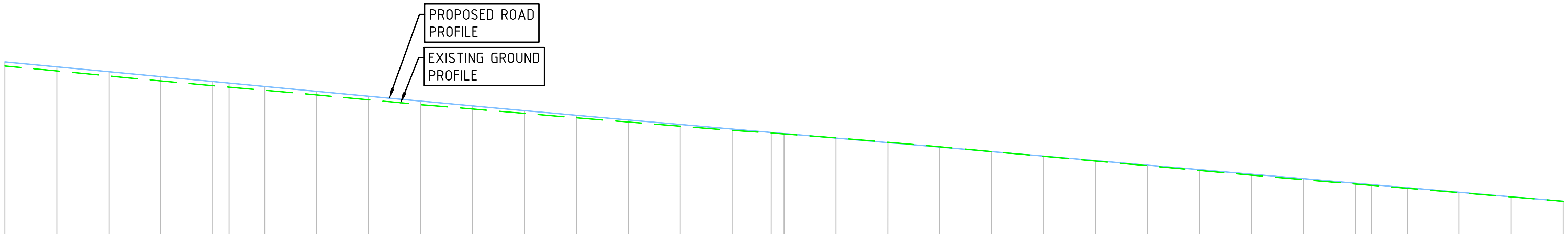

Te Paki Stream Road Main HA
DATUM: 40.00
VERT. EXAGGERATION 1:1

CHAINAGE	1140	1145	1150	1155	1160	1165	1170	1175	1180	1185	1190	1195	1200	1205	1210	1215
CUT/FILL DEPTHS	0.39	0.40	0.41	0.41	0.40	0.37	0.34	0.34	0.35	0.30	0.27	0.24	0.20	0.16	0.13	0.04
DESIGN LEVELS	56.78	56.31	55.84	55.37	54.90	54.43	53.96	53.49	53.02	52.56	52.11	51.66	51.21	50.77	50.34	49.90
EXISTING LEVELS	56.39	55.91	55.44	54.96	54.50	54.06	53.62	53.15	52.68	52.27	51.84	51.42	51.01	50.61	50.21	49.87

CHAINAGE	1220	1225	1230	1235	1240	1245	1250	1255	1260	1265	1270	1275	1280	1285	1290
CUT/FILL DEPTHS	-0.02	-0.03	-0.02	0.00	0.02	0.04	0.06	0.07	0.09	0.10	0.08	0.05	0.04	0.02	0.00
DESIGN LEVELS	49.47	49.04	48.60	48.17	47.74	47.30	46.87	46.44	46.00	45.57	45.14	44.70	44.27	43.84	43.40
EXISTING LEVELS	49.49	49.07	48.63	48.17	47.72	47.27	46.82	46.36	45.91	45.47	45.06	44.65	44.23	43.82	43.41

VERTICAL GEOMETRY: 76.76m −9.4% | VC 37.52, A.D. 0.7% IP CH 1190.74/RL 52.01 | 80.50m −8.7%

HORIZONTAL GEOMETRY: R 115.00 A 120.86 | 52.19m 176°17′02″ | R 1700.06 A 57.81 | 268.24m 174°20′08″

SUPERELEVATION

Rev	Date	Amendments	By
0	30/01/25	FOR APPROVAL	PL

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 30/01/2025

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: TE PAKI STREAM ROAD PLAN LAYOUT AND LONG SECTION SHEET 3

Drawing: 706 Rev: 0
Scale: 1:500 @ A3
Project: 15656
Issue: FOR APPROVAL

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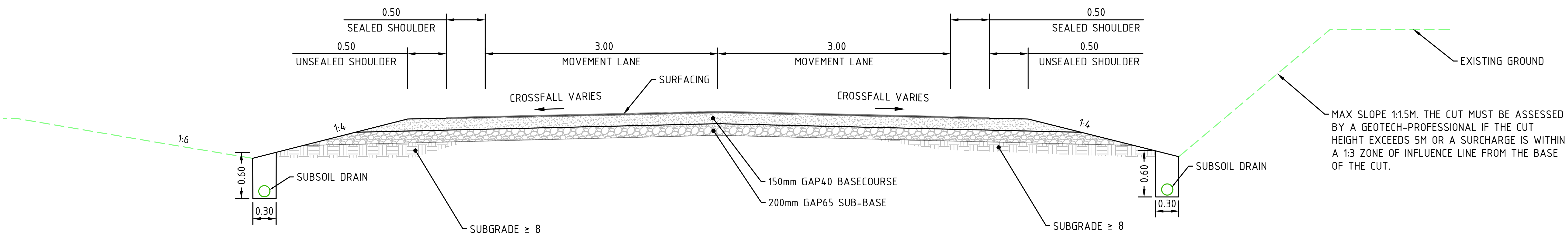
DRAWING NOTE

DRAWING SET IS INTENDED TO BE DISTRIBUTED AND READ IN ITS ENTIRETY. REFER TO DRAWING 001 FOR DRAWING SCHEDULE. REFER TO DRAWING 002 FOR APPLICABLE NOTES AND ABBREVIATIONS UNLESS OTHERWISE NOTED.



1 TE PAKI STREAM ROAD TYPICAL PAVEMENT CROSS SECTION

Scale: 1:50

NOTE:
SUBBASE AGGREGATE MUST BE WELL GRADED CRUSHED ROCK. COMPACTION MUST BE IN LIFTS OF NO MORE THAN 200mm TO 98% MDD. SITE ENGINEER TO CONFIRM CHARACTERISTIC SUBGRADE STRENGTH BEFORE STARTING CONSTRUCTION.

0 0.5 1 1.5 2 2.5
1:50 PLOT CONTAINS ELEMENTS IN COLOUR

Rev	Date	Amendments	By
0	30/01/25	FOR APPROVAL	PL

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 30/01/2025

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: ROAD PAVEMENT CROSS SECTION

Drawing: 720 Rev: 0
Scale: 1:50 @ A3
Project: 15656
Issue: FOR APPROVAL

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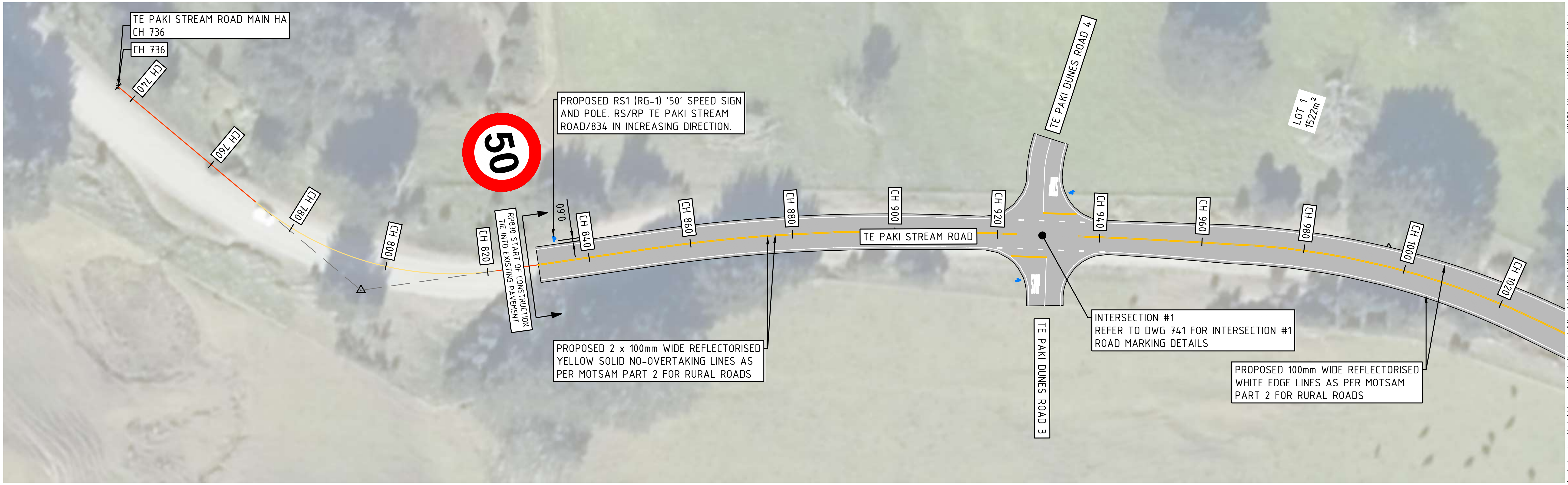

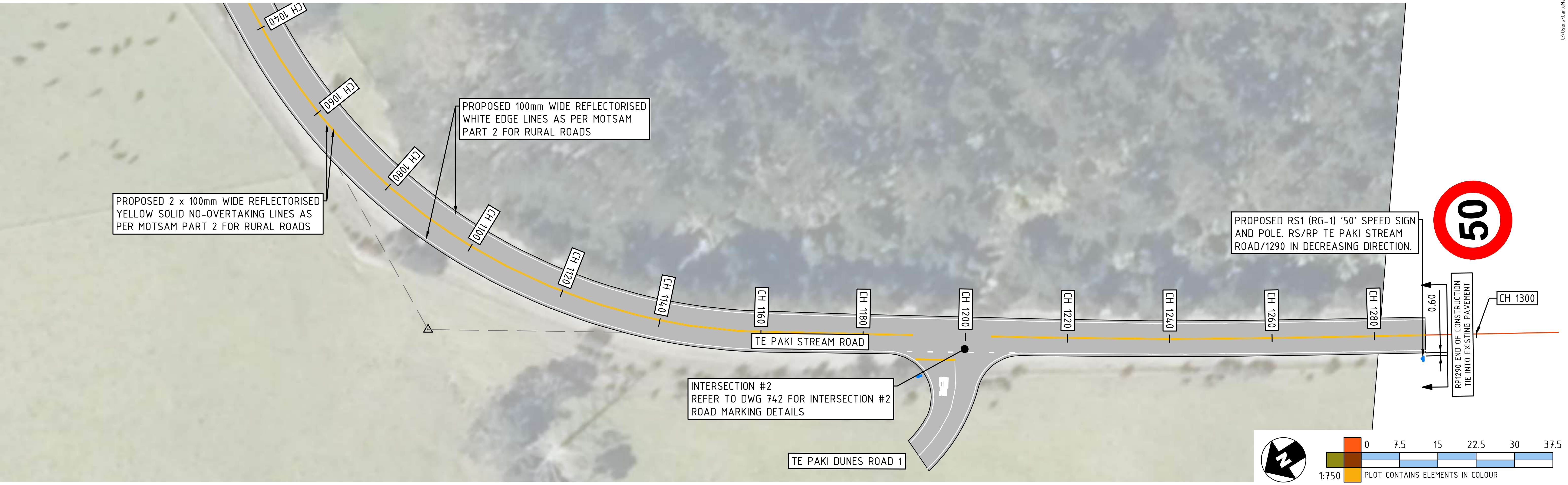

Rev	Date	Amendments	By
0	11/02/25	FOR APPROVAL	CM

Drafter:	P LIEBENBERG	Job Title:	CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY	Drawing:	740 Rev: 0
Designer:	P LIEBENBERG	Client:	FAR NORTH ROADING GROUP LTD	Scale:	1:750 @ A3
Checker:	N JULL	Address:	TE PAKI STREAM ROAD, TE PAKI	Project:	15656
Date:	15/08/2024	Drawing Title:	PROPOSED ROAD MARKING PLAN	Issue:	FOR APPROVAL

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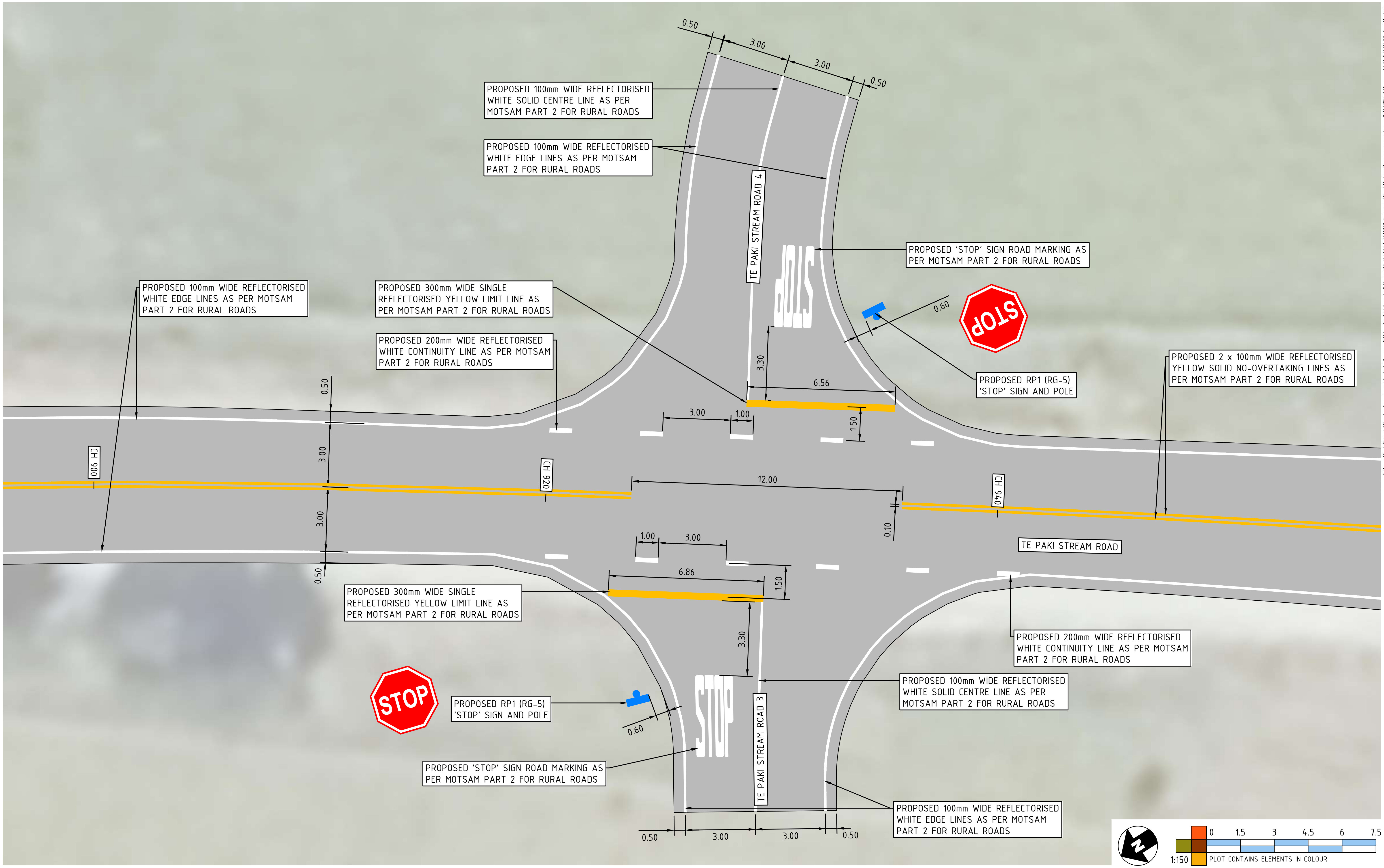

Rev	Date	Amendments	By
0	11/02/25	FOR APPROVAL	CM

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 15/08/2024

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: PROPOSED ROAD MARKING PLAN - INTERSECTION #1

Drawing: 741 Rev: 0
Scale: 1:150 @ A3
Project: 15656
Issue: FOR APPROVAL

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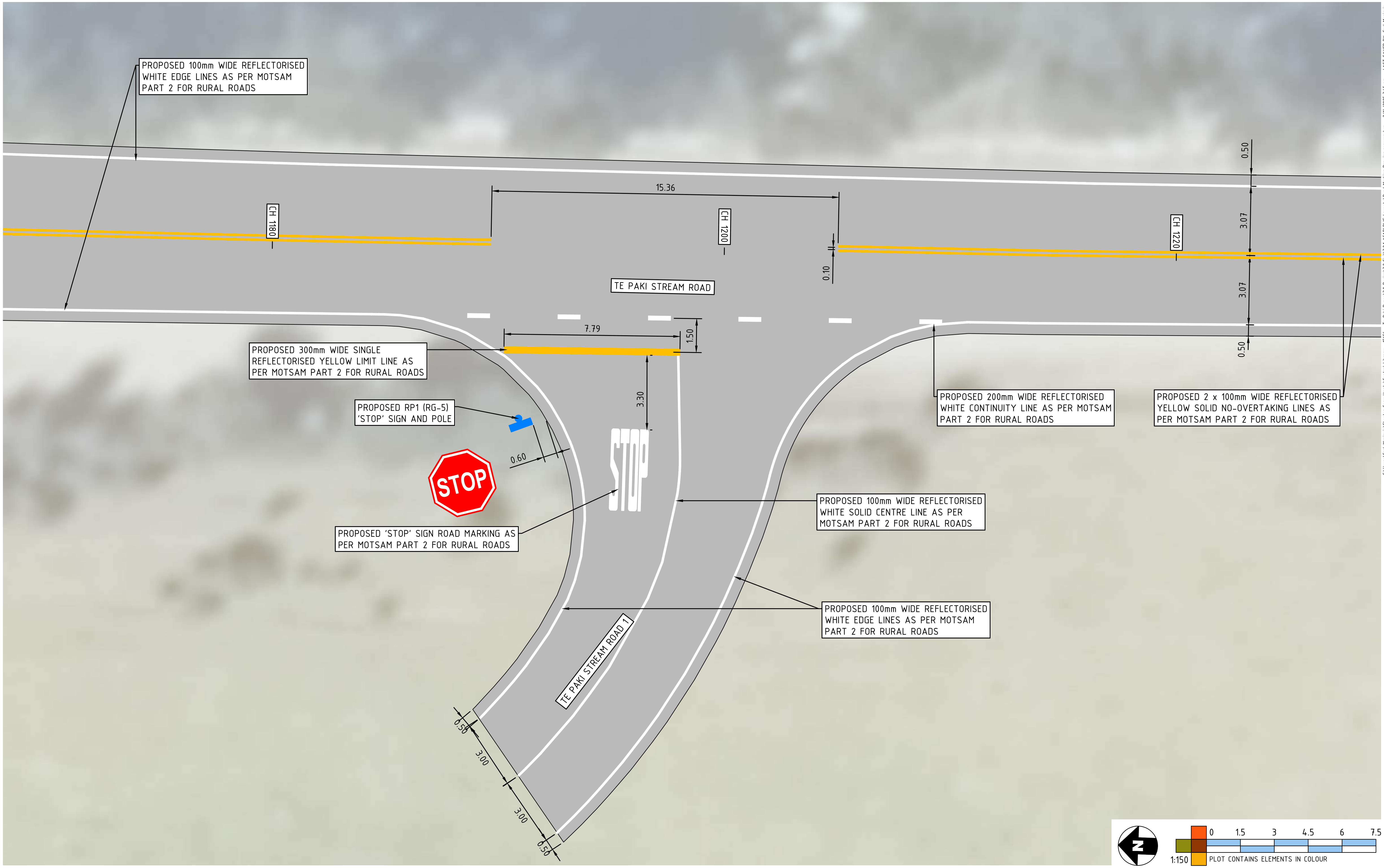

Rev	Date	Amendments	By
0	11/02/25	FOR APPROVAL	CM

Drafter: P LIEBENBERG
Designer: P LIEBENBERG
Checker: N JULL
Date: 15/08/2024

Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY
Client: FAR NORTH ROADING GROUP LTD
Address: TE PAKI STREAM ROAD, TE PAKI
Drawing Title: PROPOSED ROAD MARKING PLAN - INTERSECTION #2

Drawing: 742 Rev: 0
Scale: 1:150 @ A3
Project: 15656
Issue: FOR APPROVAL

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Far North District Council

FAR NORTH DISTRICT COUNCIL

FAR NORTH OPERATIVE AND PROPOSED DISTRICT PLANS
DECISION ON RESOURCE CONSENT APPLICATION

Resource Consent Number: 2230588-RMALUC

Pursuant to Sections 104, 104D, and 108 of the Resource Management Act 1991 (the Act), the Far North District Council hereby grants resource consent to Ngati Kuri Trust Board to undertake the following activities:

Establish a papakainga development, which provides for a maximum of 36 residential dwellings, inclusive of 15 principle and 15 minor residential dwellings and 6 kaumatua units with associated internal access and services, earthworks and landscaping.

Subject Site Details

Address:	Te Paki Stream Road, Te Paki
Legal Description:	Section 14 SO 469373 & Section 7 SO 469373

Pursuant to Section 108 of the Act, this consent is subject to the following conditions:

General Conditions

1. That the proposed activities provided for under this consent shall be carried out in general accordance with the documentation and plans that form part of the application as follows:
   - AEE prepared by Sanson and Associates Limited dated June 2023 provided under cover of email dated 5th July 2023.
   - The plans prepared by Resilio Studio entitled 'Te Paki Dunes Papakainga Resource Consent – Revision 2 September 2023 identifying the building locations and typologies.
   - The Site Suitability Engineering Report – Revision 3 prepared by Geologix Limited dated September 2023, inclusive of the development drawings provided in Appendix A referenced as Sheets 1000, 1001, 1010 – 1014, 1020. 1030, 1050, 1051, 1100, and 1101.
   - Transport Assessment Report prepared by Flow Ltd dated 13 July 2023
   - Wetland Assessment Report – Revision 3 prepared by Geologix Ltd dated 6 September 2023.
   - Landscape Visual Impact Assessment report prepared by Resilio Studio Limited dated 19th September 2023 including appendices

2. Prior to commencement of any construction works, including earthworks, the consent holder shall:

   a) Provide to the Councils Development Engineer a Construction Management Plan prepared by the Developer's Representative in accordance with Section 1.6.2 of the FNDC Engineering Standards May 2023.

   b) Provide to the Councils Development Engineer design details and drawings illustrating the sealing of a portion of Te Paki Stream Road between 760m - 1200m RP from SH1 intersection, inclusive of any earthworks, drainage, and flag lighting, with the proposed access intersections designed as 'Give-way' intersections with the appropriate signage and markings. All work is to be designed in accordance with Chapter 3 of the Councils Engineering Standards 2023 and undertaken by a Suitability Qualified and Experienced (CPEng) Engineer.

c) Provide to the Council's Development Engineer details of internal lighting design suitable to meet subcategories PR5 of PR6 of AS/NZS 1158.3.1:2020 Lighting for Roads and Public Spaces. This lighting is to remain in private ownership.

d) Provide to the Councils Development Engineer a stormwater management plan or the development prepared in accordance with Section 6 of the Site Suitability Engineering Report prepared by Geologix Limited dated September 2023. That plan shall specifically include details regarding on-site attenuation for each building, attenuation pond design, stormwater associated with roading infrastructure, and discharge requirements of any Northland Regional Council consent. The Plan shall address any requirements where staged construction is to be undertaken, including timing of construction of the attenuation pond and other components of the system.

e) Provide to the Councils resource consents monitoring team (RCmonitoring@fndc.govt.nz) a copy of any resource consent issued by the Northland Regional Council for all works associated with the development approved under this consent.

f) Provide to the Councils resource consents monitoring team (RCmonitoring@fndc.govt.nz) for approval a Planting Plan that is in general accordance with the Te Paki Dunes Papakainga Resource Consent Package Rev 2, prepared by Resilio Studios (dated September 2023). The drawing package must include landscape design drawings, specifications and maintenance requirements including:

    i. An annotated planting plan(s) which communicates the proposed location, timing / staging, and extent of all areas of planting, including any revegetation, reinstatement planting, mitigation planting and natural revegetation (if relevant). With specific regard to timing of planting, that shall specify any/all planting that should be completed prior to any building works commencing (such 'perimeter planting' in Appendix 7 of the LVIA) so that planting is established to mitigate visual amenity effects – See Condition 6 below.
    ii. Annotated cross-sections and/or design details with key dimensions to illustrate that adequate widths and depths are provided for planter boxes / garden beds
    iii. A plant schedule based on the submitted planting plan(s) which details specific plant species, plant sourcing, the number of plants, height and/or grade (litre) / Pb size at time of planting, and estimated height / canopy spread at maturity
    iv. Details of draft specification documentation for any specific drainage, soil preparation, tree pits, staking, irrigation and mulching requirements
    v. An annotated pavement plan and related specifications, detailing proposed site levels and the materiality and colour of all proposed hard surfacing
    vi. An annotated street furniture plan and related specifications which confirm the location and type of all fences, walls and other structural landscape design elements
    vii. A landscape maintenance plan (report) and related drawings and specifications for all aspects of the finalised landscape design, including in relation to the following requirements:
        a. Irrigation

b. Weed and pest control
c. Plant replacement
d. Inspection time frames
e. Contractor responsibilities

The finalised landscape design must be consistent with the landscape design intent / objectives identified in the conceptual plans and information referenced above and confirm responsibilities for ongoing maintenance requirements.

Advice Note: *It is recommended that the consent holder consider a minimum three-year management / maintenance programme for plant establishment and provide, in particular, details of maintenance methodology and frequency, allowance for fertilising, weed removal / spraying, replacement of plants, including specimen trees in case plants are severely damaged / die over the first five years of the planting being established and watering to maintain soil moisture.*

g) Provide to the Council's resource consents monitoring team (RCmonitoring@fndc.govt.nz) road names in accordance with the Councils Naming Policy dated 22 September 2023, where each of the three identified private access roads servicing the development require road names.

3. During construction works, the consent holder shall comply at all times with the Construction Management Plan provided to the Council and certified under Condition 2 a) above.

4. All constructions works associated with access and servicing (but not works subject to any building consent) shall be undertaken and completed in general accordance with the Site Suitability Engineering Report – Revision 3 prepared by Geologix Limited dated September 2023, inclusive of the development drawings provided in Appendix A referenced as Sheets 1000, 1001, 1010 – 1014, 1020. 1030, 1050, 1051, 1100, and 1101, and designs and plans approved under Conditions 2(a) – (e) above.

5. On completion of construction works specified under Condition 4. above, the consent holder shall provide to the Councils Development Engineer documentation required under Section 3.4 of the FNDC Engineering Standards 2023 as it relates to any works undertaken on Council's road reserve and/or any assets identified to vest to the Council, inclusive of erection of approved private road name signs (see Condition 2 g)). All internal works to be completed that are not intended to vest in the Council shall be certified as completed by a suitably qualified and experienced Chartered Professional Engineer as being constructed and completed in accordance with the plans and design details that form part of this consent and conditions.

For avoidance of doubt, the sealing and associated works on Te Paki Stream Road, including construction of intersections into the site as required under Condition 2(b) above, are to be completed in accordance with this condition 5 prior to occupation of the first dwelling on the site.

6. Prior to the issuing of any building consent for any dwelling on the site, the consent holder shall provide suitable certification in writing from a landscape architect to confirm that any planting or works identified under Condition 2(f) to be established prior to commencement of any building works for that dwelling (or dwellings) to mitigate visual amenity effects, has been undertaken and completed.

7. Prior to the issuing of any building consent for a dwelling on the site (where 'dwelling' includes any minor unit), the consent holder shall provide suitable evidence by way of

written confirmation from a suitably qualified and experienced Chartered Professional Engineer to confirm that all services, including road access, are physically completed such that they are readily able to be utilised by the proposed dwelling at the time of lodgement of the building consent.

For avoidance of doubt, this condition will not be deemed to be met where any/all services including road access are yet to be constructed and certified as completed in order to service any dwelling at the time of lodgement of any building consent.

Advice note: While the application does not record any intention to stage construction of the services and access for the development, the above condition provides for dwellings to be constructed during the construction phase, and before overall construction is completed, where adequate servicing and access is available to any proposed dwelling.

8. At the time of lodgement of any building consent for a dwelling on the site (where ‘dwelling’ includes any minor unit), the consent holder shall provide evidence that the building exterior colours and finishes comply with Appendix 19 Development Colours contained in the Landscape Visual Impact Assessment report prepared by Resilio Studio Limited dated 19th September 2023. For avoidance of doubt, any exterior colours and finishes shall not exceed 30% Light Reflectance Value.

9. All works identified on the Planting Plan provided and approved under Condition 2 f) are to be completed prior to the occupation of the last dwelling to be constructed on the site (where ‘dwelling’ includes any minor unit) or in accordance with planting / staging as outlined in Condition 2(f). The consent holder shall provide suitable certification in writing from a landscape architect to the Councils resource consents monitoring team (RCmonitoring@fndc.govt.nz) to confirm that all works have been undertaken and completed.

10. The consent holder shall retain and maintain all the planting implemented under condition 8 of this consent in a weed and pest free condition in perpetuity, with any plant failures to be replaced with the same species, to the satisfaction of Council. All maintenance and ongoing management shall be in accordance with the approved landscape design drawings and specifications.

11. The consent holder shall ensure that all internal communal private infrastructure (inclusive of access, lighting, stormwater, water, and wastewater services) are maintained in accordance with all specifications and requirements, including any consents issued by the Northland Regional Council. As all services are private infrastructure, the Far North District Council shall not be responsible for any maintenance or repairs to infrastructure servicing the development unless it determines of its own volition to do so.

12. The consent holder shall be responsible for ensuring that any dust nuisance associated with traffic utilising Te Paki Stream Road affecting residents within the development is managed appropriately. As a minimum, the consent holder shall ensure that any/all residents of the development are made aware by way of written advice included as part of any lease for any building on the site of the potential for dust nuisance arising from Te Paki Stream Road, and that the Far North District Council will not be responsible for mitigating any such dust nuisance unless it determines of its own volition to do so.

13. Each of the principle dwellings shall have available to it a potable water supply consisting of a minimum of 50,000 litres water storage. This is to ensure that adequate

on-site potable water is available for each dwelling, particularly during dry / drought conditions.

14. The ultimate built development on the site shall not exceed the following:
    - Fifteen (15) principal dwellings identified as ‘Section Typology Option C’ and corresponding floor plans in Appendix 3 of the plans prepared by Resilio Studio entitled ‘Te Paki Dunes Papakainga Resource Consent – Revision 2’ dated September 2023
    - Fifteen (15) minor dwellings identified as ‘Section Typology Option D’ and referred to as ‘Whare Pai’ or ‘Whare Kahui’ and corresponding floor plans in Appendix 3 of the plans prepared by Resilio Studio entitled ‘Te Paki Dunes Papakainga Resource Consent – Revision 2’ dated September 2023
    - Six (6) principal dwellings identified as ‘Kaumatua Whare Minor Dwelling’ and corresponding floor plans in Appendix 3 of the plans prepared by Resilio Studio entitled ‘Te Paki Dunes Papakainga Resource Consent – Revision 2’ dated September 2023

Advice Notes

1. Archaeological sites are protected pursuant to the Heritage New Zealand Pouhere Taonga Act 2014. It is an offence, pursuant to the Act, to modify, damage or destroy an archaeological site without an archaeological authority issued pursuant to that Act. Should any site be inadvertently uncovered, the procedure is that work should cease, with the Trust and local iwi consulted immediately. The New Zealand Police should also be consulted if the discovery includes koiwi (human remains). A copy of Heritage New Zealand’s Archaeological Discovery Protocol (ADP) is attached for your information. This should be made available to all person(s) working on site.

2. The consent holder is responsible for ensuring that any and all conditions of any consent issued by the Northland Regional Council for the development are adhered to.

3. The consent holder should consult with Fire and Emergency New Zealand regarding the provision of suitable fire-fighting water supply, access, and fixtures as part of the papakainga development.

4. The consent holder is responsible for ensuring that any / all land covenant and easement requirements that relate to the site are adhered to.

5. The conditions of consent addressing landscape planting have been approved on the basis that staging of landscaping may be implemented. This has been accepted but where staging is proposed, the staging of the plans must ensure that landscape and visual effects are minimised as any built development progresses. The Council reserves the right to review any plans illustrating staged landscaping if it has concerned that it may not be effective in mitigating or avoiding such effects.

6. The provision of electricity and telecommunication services required for the development are the sole responsibility of the consent holder. This includes any electricity service required for internal street and amenity lighting and operation of the wastewater treatment system/s.

Reasons for the Decision

1. The Council has determined (by way of an earlier report and resolution) that the application is precluded from public and limited notification under Sections 95A and 95B.

2. For the purposes of Section 104(1)(a), the assessment of actual and potential effects provided in the Notification Report is relevant. That assessment constitutes a detailed analysis of the adverse effects, an applicable permitted baseline, and consideration of conditions offered as avoidance and mitigation measures as part of the application.

3. In terms of Section 104(2), the permitted baseline and existing environment assessment provided in the Notification Report sets out those activities that are permitted in the District Plan. The assessment is adopted for the purpose of Section 104(2). It is recorded that there is no readily applicable and credible permitted baseline for the extent of built development proposed.

4. As recorded in the Notification Report, the majority of potential adverse effects can be managed such that they will not extend beyond the subject site. Earthworks, stormwater and wastewater discharge activities will be subject to any consent granted by the Northland Regional Council. The on-site servicing and traffic effects have been addressed by provision of engineering information that has been reviewed and accepted by the relevant Council engineers and NTA.

5. Written approval has been provided by Waka Kotahi NZTA such that Section 104(3)(a)(ii) applies. No regard is given to any adverse effects on Waka Kotahi NZTA.

6. Careful consideration has been given to the extent of potential adverse effects on landscape and visual amenity. The extent and nature of the proposed development is not anticipated in the Conservation Zone, noting that the proposal is a non-complying activity and infringes both building coverage and stormwater management rules. Despite this, the nature and scale of the site is such that the development can be accommodated while minimising adverse effects. Extensive landscape planting is required to avoid and mitigate the built form associated with the development and conditions of consent can be imposed to achieve this such that the adverse effects will be minor and acceptable.

7. A number of conditions are required to avoid and mitigate potential adverse effects. Many of these have been offered as part of the application, while other matters such as compliance with the plans provided and provision of adequate servicing are necessary. A condition requiring a Construction Management Plan to be provided prior to any works (including earthworks) commencing on the site will assist in defining the hours of operation, compliance with construction noise standards, traffic management, and potential impacts on road integrity.

8. It is noted that NTA have requested additional lighting at the intersection of the development with Te Paki Stream Road and internal street lighting which can be required as a condition of consent. Agreement has been reached regarding sealing of a portion of Te Paki Stream Road where it fronts the development site and this is required as a condition of consent.

9. The effects assessment provided in the application details the positive effects arising from the proposal. These are relevant when considering effects under Section 104(1)(a). Those identified positive effects are significant and weigh heavily in favour of the effects of the proposal being considered acceptable overall.

10. Overall, the extent of potential positive and adverse effects on the environment associated with granting the activity are considered to be acceptable in the receiving environment.

11. Section 9 of the application provides an assessment of the national, regional, and district level documents that are relevant to the proposal. The assessment provided of the Regional Policy Statement for Northland, and Operative and proposed Far North

District Plan is accepted and adopted for the purpose of this report. It is recorded that there are strong directives in planning documents at the regional and district level regarding the recognition and provision for the relationship of tangata whenua and their culture and traditions with their ancestral land. Chapter 2 - Tangata Whenua contained in the Operative District Plan includes objectives 2.7.1 and 2.7.2 and supporting policies which reflect Te Tiriti principles and development and management of land in a manner which is consistent with sustainable management. Similarly, the proposed District Plan includes a Tangata Whenua Chapter that includes Objective TW-05 which states *'The economic, social and cultural well-being of tangata whenua is enhanced through the development of Māori land administered under Te Ture Whenua Māori Act 1993 and land returned in the Treaty settlement process.'*

12. It is noted that there are no National Policy Statements that are relevant to the proposal that require detailed consideration. The application lodged with the Northland Regional Council will require detailed consideration under the National Policy Statement for Freshwater, National Environmental Standard for Freshwater, Regional Policy Statement and Proposed Regional Plan for Northland. On that basis, no further assessment of those provisions is provided in this report.

13. An important component of the proposal is the use of land that was obtained following the Treaty Settlement between the Crown and Ngati Kuri. The land is considered to be Maori ancestral land. The application details the current status of the land, whereby it is identified as commercial redress property forming part of the wider Te Paki Station land holding. The proposed papakainga development *'….provides a financial tool for those who whakakpapa (have ancestry) to Ngāti Kuri to promote a lifetime interest in housing on the Papakāinga. Where these leasehold areas are surrendered, it can only be back to the Ngāti Kuri Trust Board. This aspect ensures land remains within Ngāti Kuri control.'*

14. The approach of developing Maori ancestral land for such purposes aligns with a number of objectives and policies contained in the Regional Policy Statement for Northland and Operative and proposed District Plans.

15. It is considered that the proposal is consistent with the relevant planning provisions.

16. Section 104(1)(c) requires consideration of Other Matters. In this case, there are considered to be several Other Matters that are relevant and reasonably necessary to determine the application. these matters are as follows:
    - The subject site is zoned Conservation under the Operative Far North District Plan. The zone description refers to the zone being applied to *'….esplanade reserves, public land administered by the Department of Conservation and other existing reserves which exist primarily for a conservation function. It is also applied in some circumstances to land adjacent to the coastal marine area and rivers where the Council has given a high priority to the protection of the land from inappropriate use and development.'* While the zoning may have been appropriate when the Operative District Plan was first implemented in 2009, it is considered that the zone, and provisions contained therein, does not reflect the current ownership or anticipated development rights that would be available were the subject site zoned more appropriately.
    - The subject site is zoned Natural Open Space under the proposed Far North District Plan, with an overlay identifying it as Treaty Settlement land. The Natural Open Space Zone *'….generally applies to public land that is administered by government agencies and includes a variety of parks and historic reserves. In most cases these areas have a high degree of biodiversity requiring active management.'* While there is a Treaty Settlement Overlay shown on the proposed Plan maps, the zoning does

not recognise the change of ownership out of Crown hands. In a similar manner to the Operative Plan zone, the proposed Plan does not reflect the current ownership or anticipated development rights that would be available were the subject site zoned more appropriately.

- As a non-complying activity, precedent effects and effects on District Plan integrity require consideration. In this case, it is considered that there are sufficient distinguishing and unique factors associated with the application that set aside any concerns regarding potential precedent effects or effects on District Plan integrity. Those factors include the current ownership and relevance of the current Operative and proposed District Pan provisions as identified above, and the nature of the proposal as a papakainga development on Maori ancestral land.

17. As defined under current case law, an assessment of Part 2 matters is not required unless there are issues of invalidity, incomplete coverage or uncertainty in the planning provisions. The Operative District Plan contains provisions that are relevant to the proposal, and there is no evidence to suggest the relevant provisions are invalid, incomplete or present uncertainty in making any decision. No assessment of the application against Part 2 provisions is therefore required.

18. Section 104D states that *'…. a consent authority may grant a resource consent for a non-complying activity only if it is satisfied that either—*
    (a) the adverse effects of the activity on the environment (other than any effect to which section 104(3)(a)(ii) applies) will be minor; or
    (b) the application is for an activity that will not be contrary to the objectives and policies of—
    ….(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.'

19. As assessed in this report, it is considered that the proposal will result in minor or less than minor adverse effects subject to conditions either offered in the application or as can be imposed under Section 108. The relevant provisions of the Operative and proposed District Plan have been assessed as part of the application. The proposal is not considered to be contrary to the objectives and policies of either Plan.

20. It is considered that the activity is consistent with the sustainable management purpose of the Resource Management Act. Consent can therefore be granted subject to conditions.

Approval

This resource consent has been prepared by A Hartstone, Consultant Planner, and is granted under delegated authority (pursuant to Section 34A of the Resource Management Act 1991) from the Far North District Council by:

R.J. Killalea

Independent Commissioner

Date: 22nd February 2024

Right of Objection
If you are dissatisfied with the decision or any part of it, you have the right (pursuant to section 357A of the Resource Management Act 1991) to object to the decision. The objection must be in writing, stating reasons for the objection and must be received by Council within 15 working days of the receipt of this decision.

Lapsing Of Consent
Pursuant to section 125 of the Resource Management Act 1991, the subdivision consent will lapse 5 years after the date of commencement of consent, and the land use consent will lapse 10 years after the date of commencement of consent unless, before the consent lapses;

a) The consent is given effect to; or

b) An application is made to the Council to extend the period of consent, and the council decides to grant an extension after taking into account the statutory considerations, set out in section 125(1)(b) of the Resource Management Act 1991.

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

TE PAKI DUNES PAPAKĀINGA RESOURCE CONSENT

Revision 2 | September 2023

Prepared by

RESILIOSTUDIO

design tribe

Prepared for

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

Ngāti Kuri Trust Board | Ngāti Kuri Papakāinga

Document Quality Statement

Report Number:	Revision 2
Prepared for	Ngāti Kuri Trust Board
Document Author	Resilio Studio
Reviewed by	Gary Marshall Director Resilio Studio
Authorised for Issue	Gary Marshall Director Resilio Studio

Document Control

The following person(s) shall receive a copy of this document upon each subsequent release:

Name	Title/Group	Organisation
Tammy Tauroa	Director	Ngāti Kuri Trust Board
Gary Marshall	Director	Resilio Studio

REVISION HISTORY

Version	Publication date
Revision 2	September 2023

LIMITATIONS

This report has been prepared exclusively Ngāti Kuri Trust Board on the basis of the brief received by Resilio Studio. Information, opinions and recommendations contained within it cannot be used by any other entity without the review and written consent of Resilio Studio. Resilio Studio accepts no liability or responsibility whatsoever for the use or reliance upon this report by any unauthorised third party.

Prepared by

RESILIOSTUDIO

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info@resilio.nz

CONTENTS

SITE CONTEXT

Ngāti Kuri Papakāinga

ROHE AND SITE LOCATIONS

TE PAKI DUNES

- 21 Sections
- 36 Dwellings
- 14 Hectares

KEY

- Site location
- State Highway 1
- Marae
- Significant maunga

Scale: 1_250 000@A3

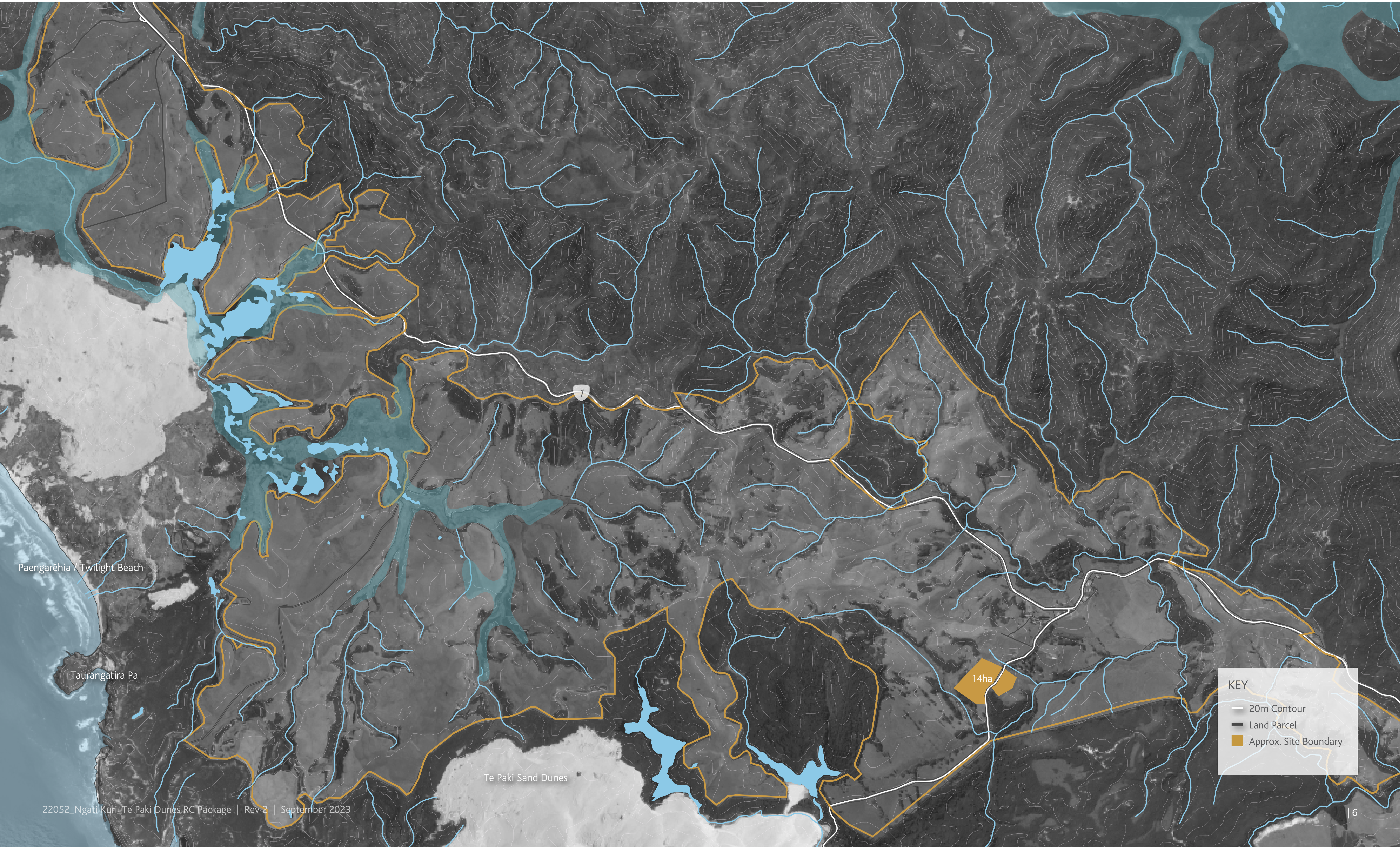
0 5 15KM

TE PAKI DUNES CONTEXT

APPROVED PLAN

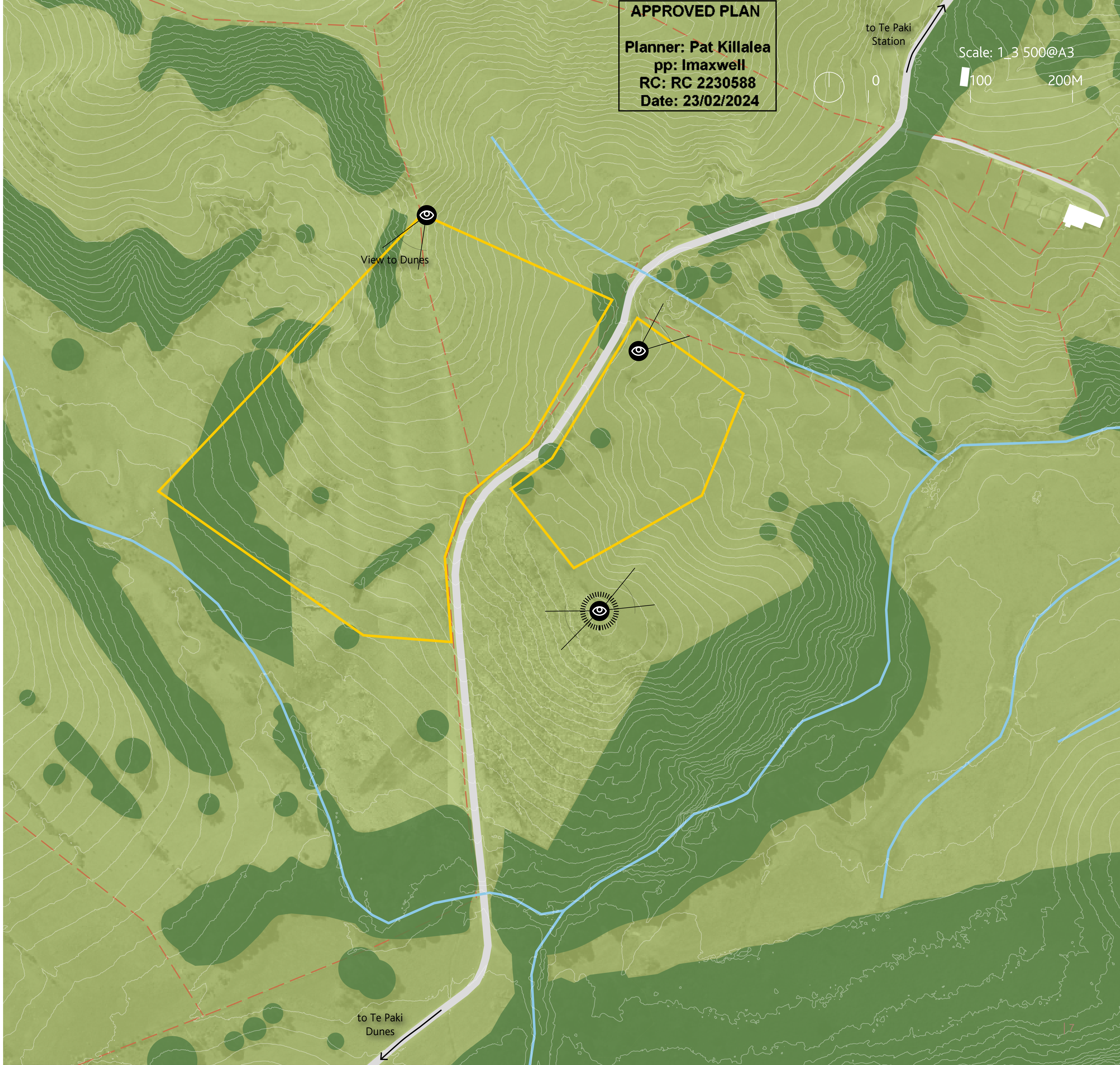
Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

Scale: 1_30 000@A3



Ngāti Kuri Papakāinga

TE PAKI DUNES SITE ANALYSIS

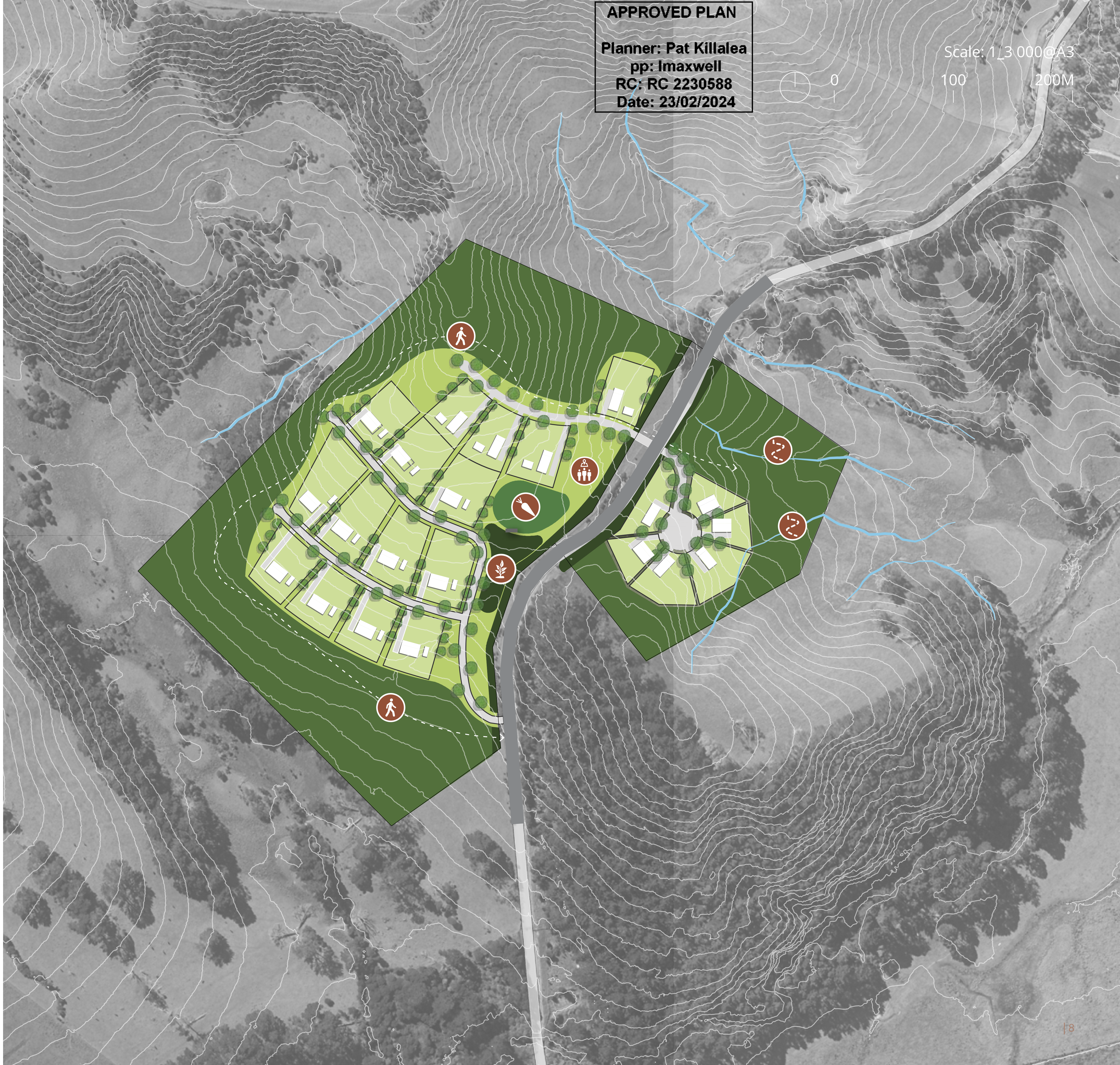


KEY

- Site
- Vehicle route
- Overland flow path/waterways
- Fence
- Building footprints
- Existing vegetation
- Open space
- Knoll
- Views

Ngāti Kuri Papakāinga

TE PAKI DUNES MASTERPLAN



KEY

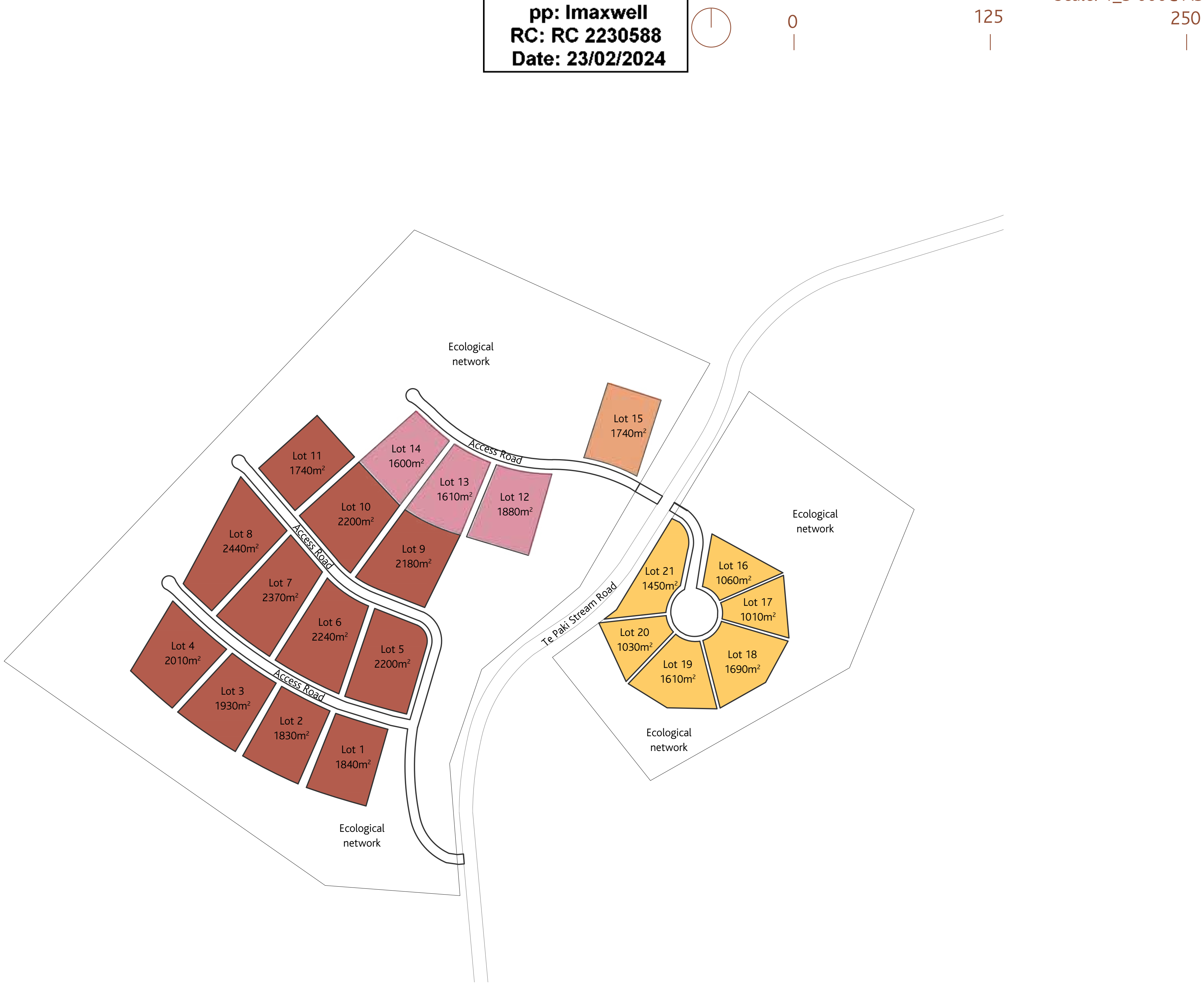
- Proposed Route
- Sealed Road/Traffic calming
- Overland flow path/waterways
- Building footprints
- Proposed Ecological Network / Revegetation
- Open space
- Stream Restoration
- Māra Kai
- Shared Facilities
- Taonga Species
- Walking track

TE PAKI DUNES HOUSING LOTS

APPROVED PLAN

Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

Scale: 1_3 000@A3



KEY

- 1 Section Typology A - Primary dwelling
- 3 Section Typology B - Primary dwelling
- 11 Section Typology C - Primary dwelling
- 6 Kaumātua Whare - Primary dwelling
- 15 Typology D - Secondary Dwellings

PAPAKĀINGA ELEMENTS

1. Overview of Papakāinga development
2. Lot typologies and Streetscapes
3. Taiao and natural environment
4. Whenua
5. Whare

OVERVIEW OF PAPAKĀINGA DEVELOPMENT

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

The papakāinga layout is in response to the taiao and Ngāti Kuri whānau residential and recreational needs.
This diagram provides an overview of the typical papakāinga layout.
Each dwelling has provisions for māra kai, outlier kai preparations, recreation and respite as well as passive observation.

KEY

- (A) Housing Section Typology A - Primary Dwelling
- (B) Housing Section Typology B - Primary Dwelling
- (D) Housing Section Typology D - Secondary Dwelling

SECTION TYPOLOGY OPTION A

APPROVED PLAN

Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

The housing lots will consist of either 3, 4 or 5 bedroom homes with many of the lots being large enough to accommodate a minor dwelling in the future.

The houses are proposed to be built from a mixture of feature timber, concrete block and profiled metal claddings with natural recessive colours inspired by the whenua including natural timber, concrete block and powder coated metal claddings.

KEY

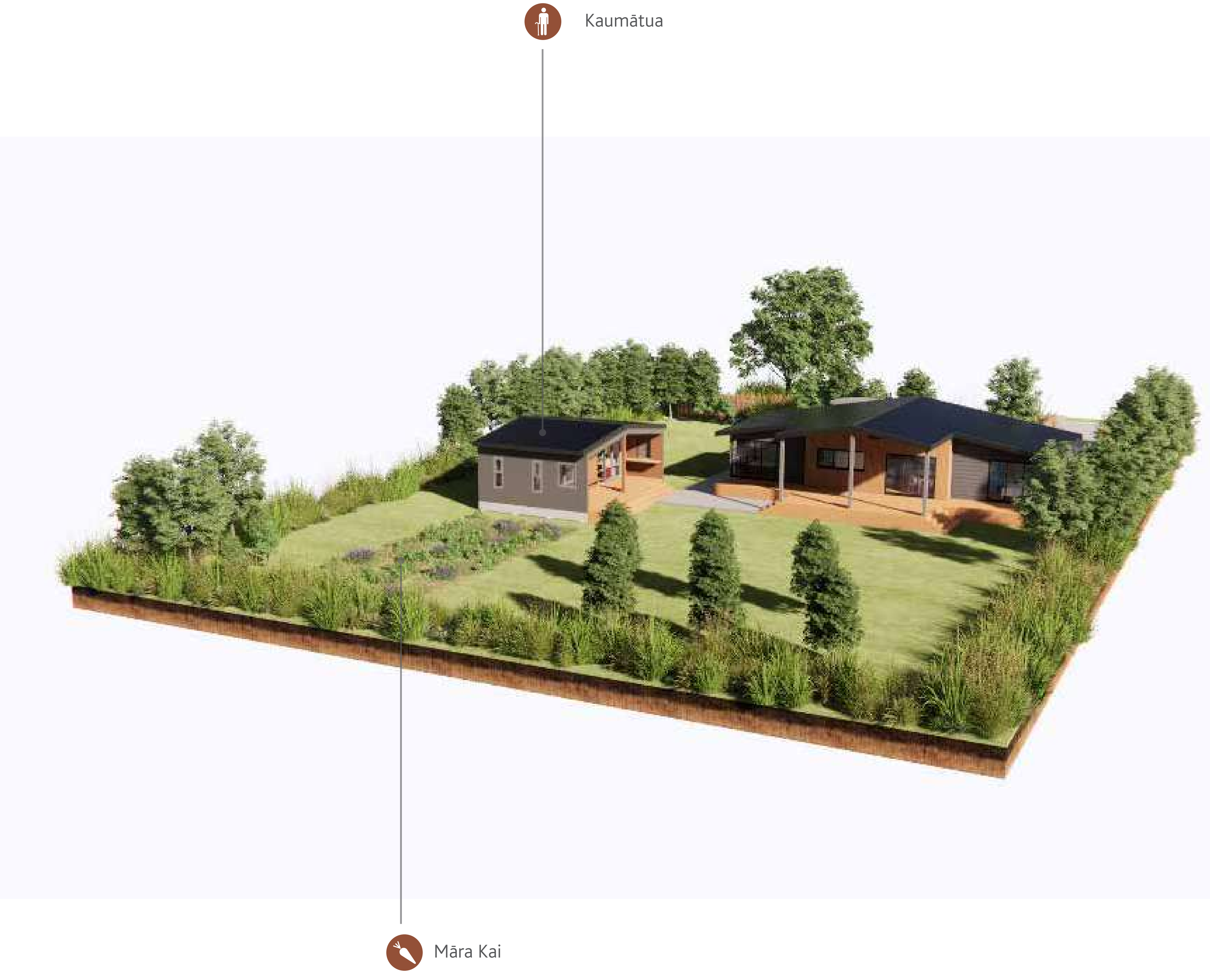
1. Low - Medium Amenity Planting / Passive Surveillance
2. Mara Kai
3. Orchard Planting
4. Screening of Water Tanks
5. Shelter Belt
6. Rain Garden
7. Vegetated screening between homes
8. Speciemen Trees

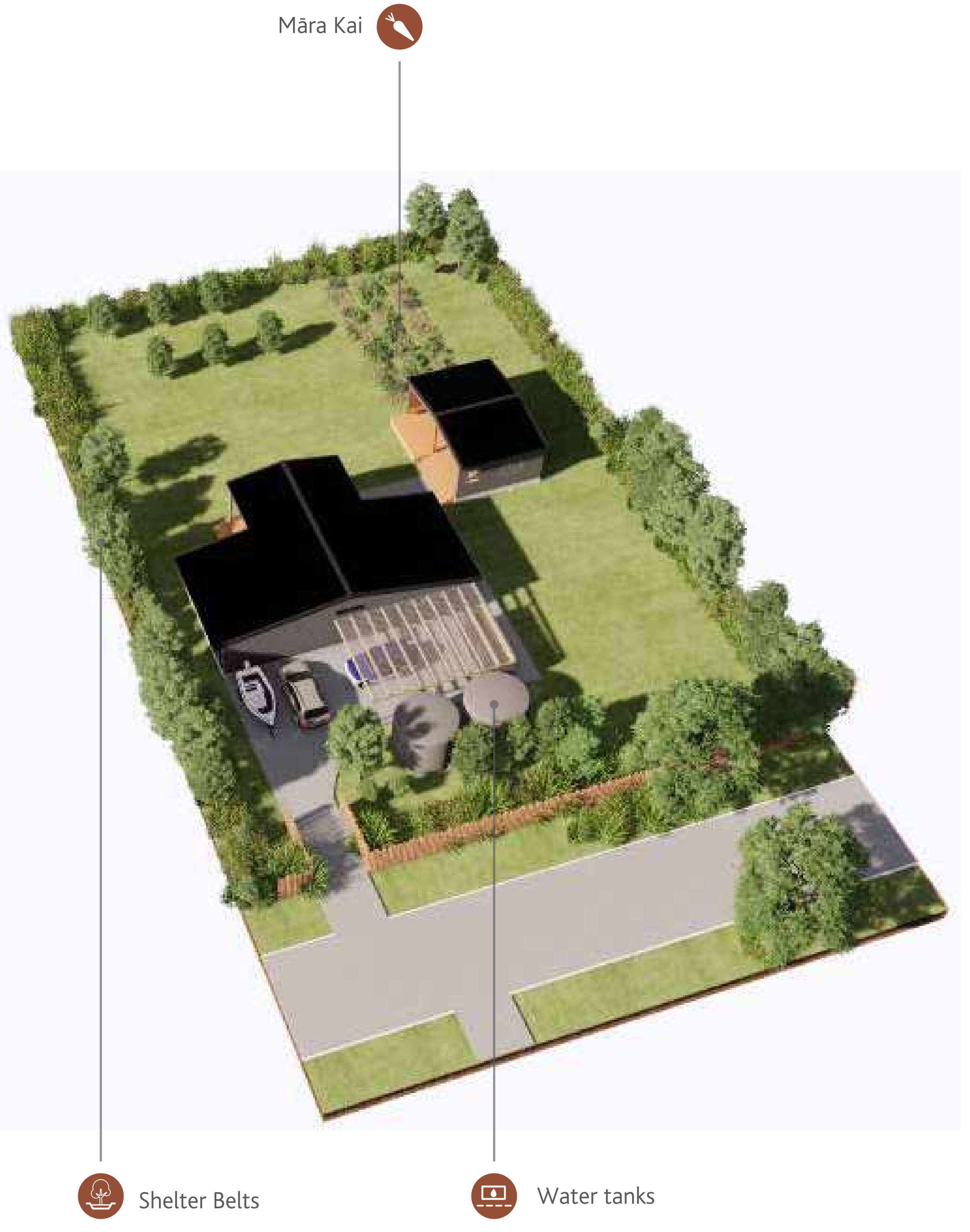
Scale: 1_250@A3

0 10 20

SECTION TYPOLOGY OPTION A

APPROVED PLAN
Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024





SECTION TYPOLOGY OPTION B

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

The housing lots will consist of either 3, 4 or 5 bedroom homes with many of the lots being large enough to accommodate a minor dwelling in the future.
The houses are proposed to be built from a mixture of feature timber, Axon panel and profiled metal claddings with natural recessive colours inspired by the whenua, ngahere and repo.

KEY

1. Vegetated Screening
2. Māra Kai
3. Orchard Planting
4. Screening of Water Tanks
5. Shelter Belt / Grey Water Dispersal Areas
6. Rain Garden
7. Low - Medium Amenity Planting / Passive Surveillance
8. Speciemen Trees
9. Taonga Species

Scale: 1_250@A3

0 10 20

SECTION TYPOLOGY OPTION B

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

SECTION TYPOLOGY OPTION C

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

The housing lots will consist of either 3, 4 or 5 bedroom homes with many of the lots being large enough to accommodate a minor dwelling in the future.

The houses are proposed to be built from a mixture of feature timber, concrete block and profiled metal claddings with natural recessive colours inspired by the whenua including natural timber, concrete block and powder coated metal claddings.

KEY

1. Vegetated Screening
2. Mara Kai
3. Orchard Planting
4. Shelter Belt / Grey Water Dispersal Areas
5. Swale
6. Low - Medium Amenity Planting / Passive Surveillance
7. Speciemen Trees
8. Planted slopes (max 1:3 slope)

Scale: 1_250@A3

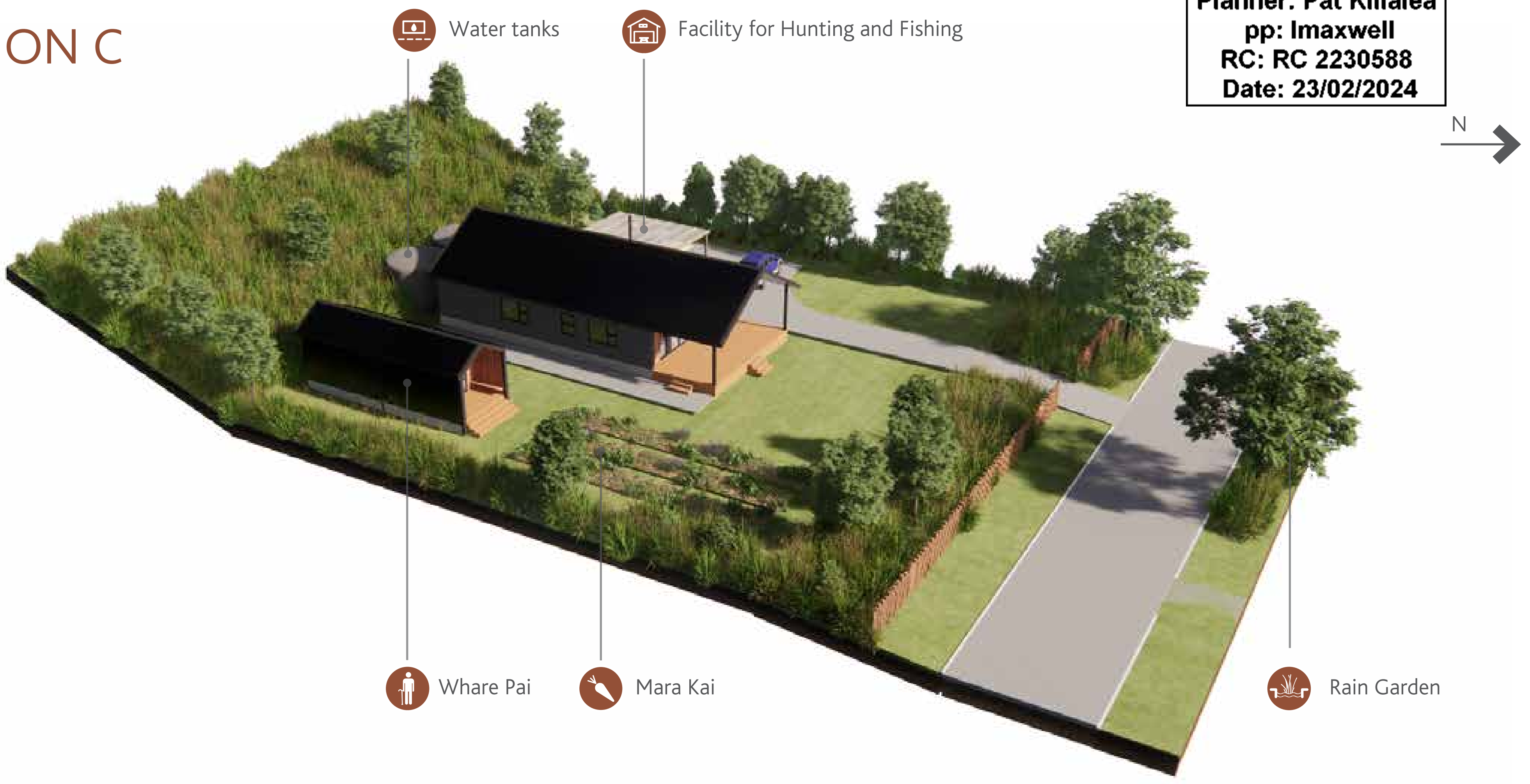
0 10 20

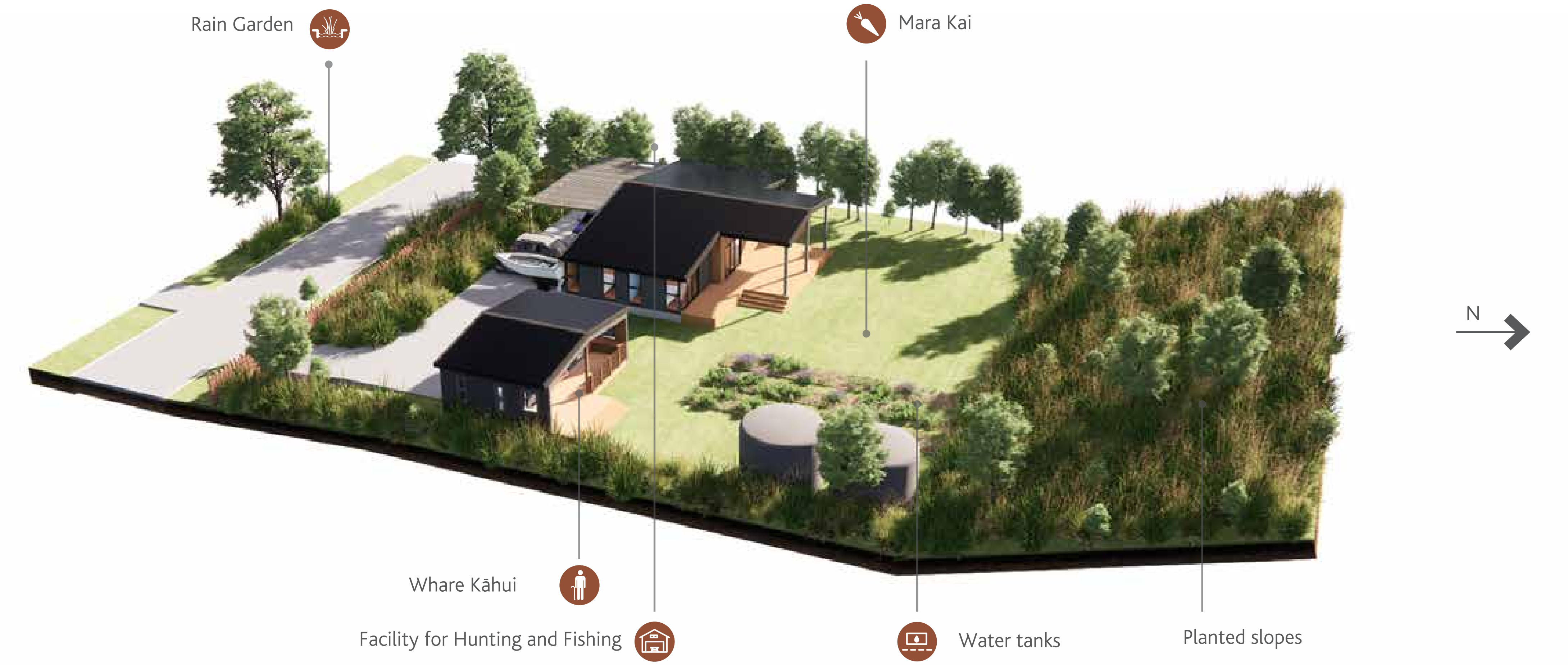
SECTION TYPOLOGY OPTION C

APPROVED PLAN
Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

The housing lots will consist of either 3, 4 or 5 bedroom homes with many of the lots being large enough to accommodate a minor dwelling in the future.

The houses are proposed to be built from a mixture of feature timber, concrete block and profiled metal claddings with natural recessive colours inspired by the whenua including natural timber, concrete block and powder coated metal claddings.





SECTION TYPOLOGY OPTION D

Whare Pai

1 bedroom self contained kaupapa Māori tiny house with a mix of feature timber and profiled metal claddings with natural recessive colours inspired by the whenua, ngāhere and repo.

- Familiar vernacular 'whare' design with modern twist
- Mahau / porch as core living space
- Compact living, dining kitchen
- Bed alcove
- Wheel chair accessible Ensuite

Whare Kāhui

1 bedroom self contained kaupapa Māori tiny house with a mix of feature timber and profiled metal claddings with natural recessive colours inspired by the whenua, ngāhere and repo.

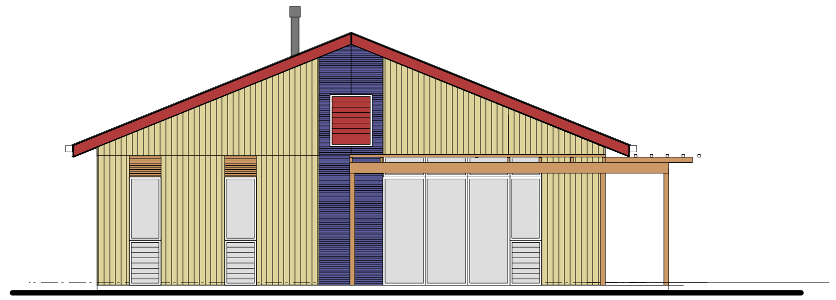
- Familiar vernacular 'whare' design
- Mahau / porch as core living space
- Compact living, dining and kitchen
- Separate bedroom

KAUMĀTUA WHARE

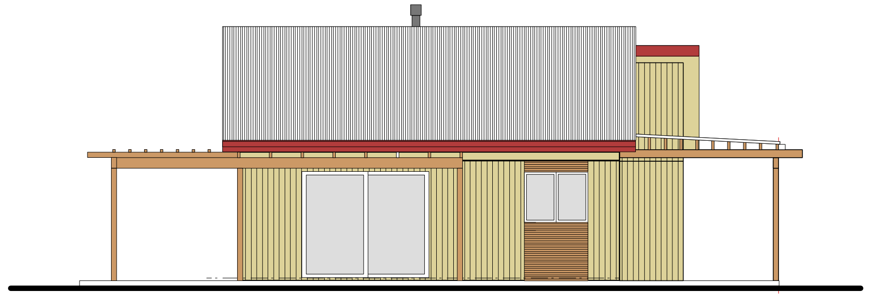
APPROVED PLAN

Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

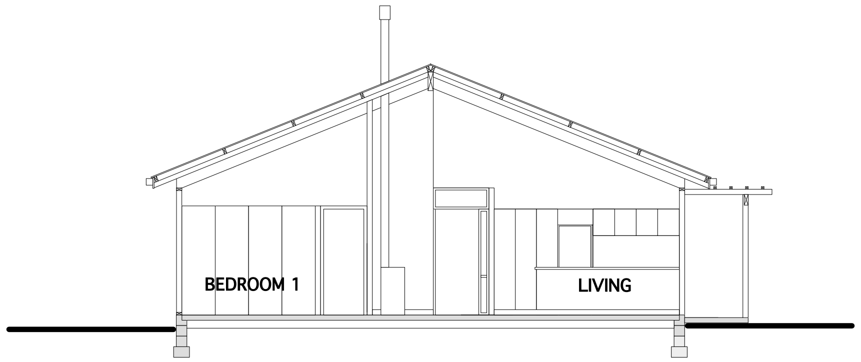
The Kaumātua housing will consist of 2 bedroom homes built from a mixture of feature timber, Axon panel and profiled metal claddings with natural recessive colours inspired by the whenua, ngahere and repo.



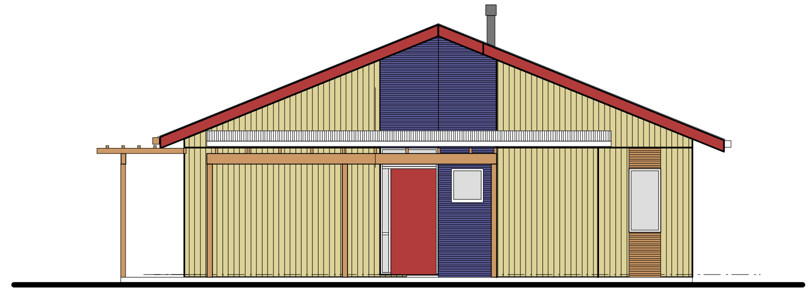
NORTH ELEVATION



WEST ELEVATION

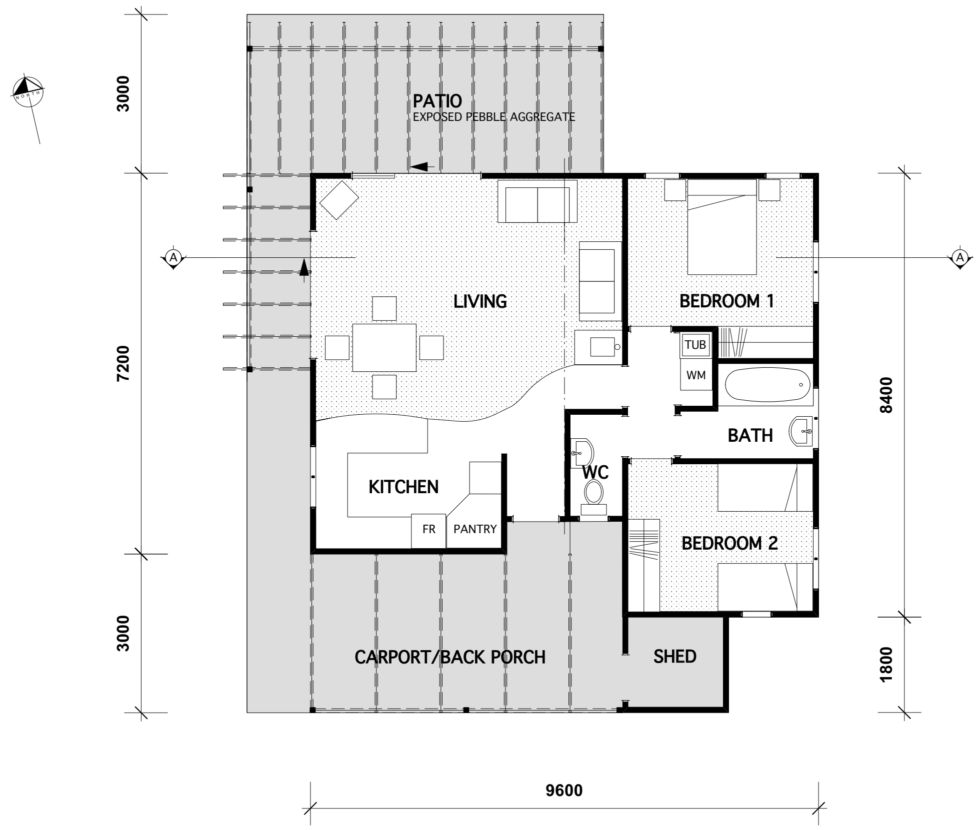


SECTION A-A



SOUTH ELEVATION

EAST ELEVATION



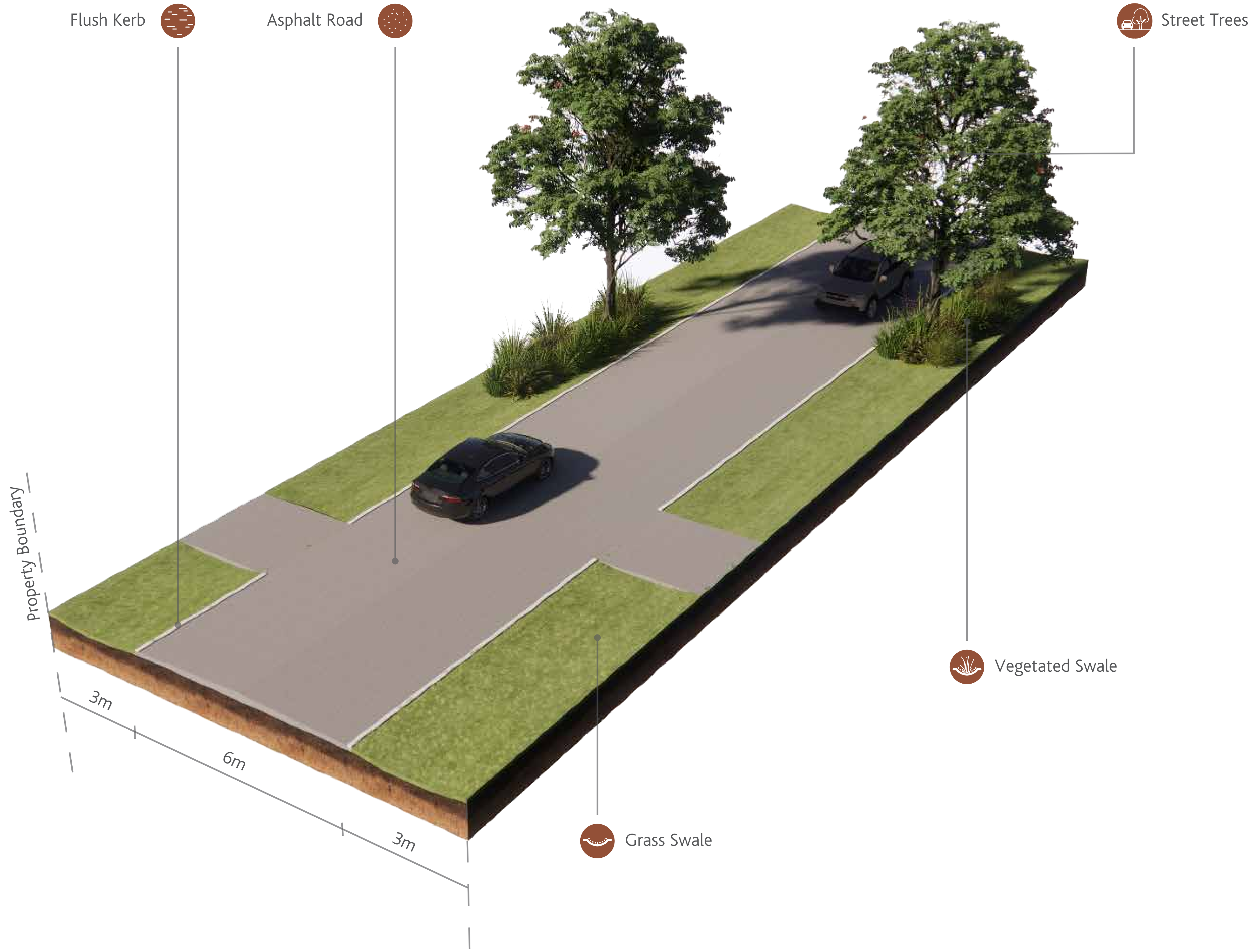
FLOOR PLAN

TYPICAL STREETSCAPE

The streets are designed to maintain a 'low key', slow speed rural environment.

The flush kerbs, grass swale, rain gardens and street trees all contribute towards achieving this outcome.

The sealed surface is important for reducing negative health effects of dust during dry conditions.



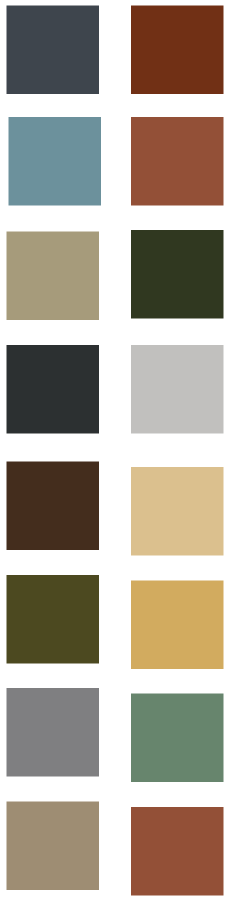
APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

COLOURS OF NGĀTI KURI WHENUA AND ROHE

Natural recessive colours inspired by the whenua will be for all used for building materials, including house façades, roofs, tanks and communal buildings with associated facilities will adhere to this colour scheme.

Natural building materials such as timber from local sources are given preference where available.

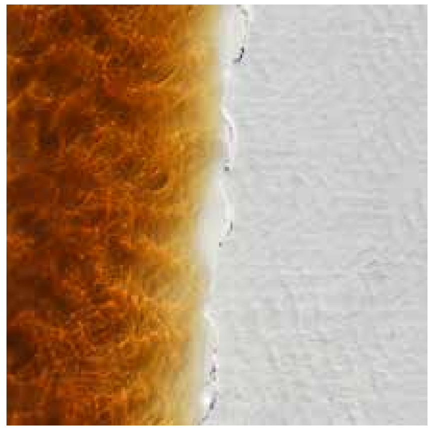
















TAONGA SPECIES - NGAHERE

Taonga species will be planted within dedicated areas of the papakāinga to be protected and nutured. These taonga include the rare Manawatāwhi Kaikōmako and Ratā moehau.

MANAWATĀWHI KAIKŌMAKO

RĀTĀ MOEHAU

TŌTARA

KAHIKA

KOHEKOHE

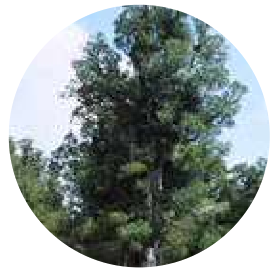
KARAKA

TAWAPOU

KAURI

KAWAKA

MATAI



INTRODUCTION TO PRODUCTIVE LANDSCAPES

PRODUCTIVE LANDSCAPE ZONES

Productive Landscape Zones (PLZ) is a permaculture concept that organizes a site such as a garden, a farm or papakāinga into areas requiring similar types and amounts of management and maintenance. On a practical level, a PLZ is determined by how often the area and the elements in it need to be used and maintained. Organising different types of food systems using PLZs helps to understand the indicative size and scale of land area, resources, labour and investment required to establish and maintain the food system. The PLZ should also reflect the underlying environmental patterns and natural processes of a site including climate, landform, soils, water and vegetation. The PLZs are numbered 1 to 5. Zones 1 and 2 are intensive systems requiring frequent access, management and maintenance. Zones 3 and 4 are extensive systems while zone 5 are lightly managed areas for wild harvest.

ZONE 1 - MĀRA KAI

This is the most intensively managed area of the garden that requires daily interaction. Social spaces can be intergrated such as decks, courtyards and lawns and play areas. Seasonal produces might include annual vegetables, salad mixes, herbs and flowers for cutting. An additional layer oto this zone eneficial insects; small fruit plants, dwarf and espalier fruit trees; some small livestock such as worms; bees; and poultry.

ZONE 2 - URU HUARĀKAU

Areas of intensive seasonal food production which includes annual and perennial vegetables and staple crops with long growing seasons; flowers for cutting and beneficial insects; larger shrubs and fruit bushes; orchards and forest gardens;

ZONE 3 - AHUWHENUA MĀORI

Extensive productive areas for large sites, typically in rural and rural residential areas. Land uses include terracing, contour planting, forest gardens and orchards of larger fruit eg avocados and nut trees; large scale berry crops, some commercial market and field crops; fire retardant and shelter planting; as well as animal shelters, workshops and larger composting systems.

ZONE 4 - RONGOĀ RĀKAU

Extensive productive areas for large rural sites which typically involves a combination of grazing and forestry. Land uses include pasture for larger grazing animals such as horses, sheep, and cows and a wide range of forestry systems including agroforestry, native and analogue forestry for timber and firewood, large nut trees; shelter planting; dams lakes, wetlands and natural waterways; and vehicle and foot access.

ZONE 5 - MAHINGA KAI + NGAHERE

Areas providing for core and broad scale ecosystem functions that provide sovereignty and education in alignment with tikanga and includes small but not insignificant yields of food, fibre and fuel. Zone 5 includes patches of remnant vegetation and native ecosystems, riparian corridors, wetlands and natural waterways as well as vacant sites, fragmented, disturbed, neglected or unused areas of land that are under a process of succession and are likely to be reverting back to a temperate forest.

MĀRA KAI

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

MĀRA KAI

Daily managed gardens for annual and perennial vegetables, salad mixes, herbs and materials as well as staple crops with long growing seasons and flowers for cuttings, beneficial insects and pollination for small fruit-bearing plants and shrubs.

Diversification of structure, layout and contents of garden areas such as horizontal and vertical gardens will help to save on space.

Introducing wide range of produce will provide a sustainable year round food source while improving biodiversity within the papakāinga.

URU HUARĀKĀU

A wide selection of fruit and nut species that provide seasonal yields and are easily accessible on site and appropriate for the climatic conditions of Te Tai Tokerau.

Species that would be included;
Orchard and perennial cropping; some market crops; larger composting areas; mushroom cultivation; animals such as bees, poultry, pigs, goats; and fire retardant and shelter planting.

TAEWA / RIWAI

KŪMARA

UWHIUWHI

PIKO PIKO

RAU RĒTIHI

KANGA

KŌKIHI

PUANANĪ / POROKARI

PAUKENA

KAMOKAMO

MANARINI

RĒMANA

KOTAKOTA

PARAMU

WHĪTOA

NGAHERE AND MAHINGA KAI STRATEGY

Ngahere and Mahinga Kai species will be planted throughout the papakāinga so that there is easy access and an abundance of resource for all to utilise. These species will reproduce in large numbers as to keep the populations of these species thriving.


COASTAL KARAMU


KĀNUKA


MĀNUKA


POROKAIWHIRI


NGAIO


TARATARA


HAEKARO


HANGEHANGE


HOUPARA


MAHOE


KARO


MAPOU


AKEAKE


WHAUWHAUPAKU


TOETOE

SHARED FACILITIES

A variety of shared facilitites will be provided on the sites for the specific activities required. Facilities will be light on the land and in keeping with the aesthetic of the rural / bush context.

EDUCATIONAL HUTS / SHELTER

WATER TANKS AND REFUSE STORAGE

WALKING TRACKS

GARDEN UTILITY SHEDS

SEEDLING NURSERIES

COMPOSTING STATIONS

APPENDIX 1 - PLANTING PLAN & SCHEDULE

TE PAKI DUNES PLANTING PLAN

KEY

- Overland flow path / waterways
- Ngahere revegetation area
- Open space
- Taonga species
- Māra kai
- Vegetated roadside screening

TE PAKI DUNES PLANTING SCHEDULE

APPROVED PLAN

Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

Coastal Forest Revegetation - Area 6.6 ha

Code	Māori name	Botanical Name	Percentage Mix %	Grade (L)	Centers (m)	Quantity
Co_mac	Coastal Karamū	Coprosma macrocarpa subsp. minor	10%	3L	1.0	7674
Ku_eri	Kānuka	Kunzea ericoides	15%	3L	1.0	11511
Le_sco	Mānuka	Leptospermum scoparium	10%	3L	1.0	7674
Me_ram	Mahoe	Melicytus ramiflorus	15%	3L	1.0	11511
He_arb	Pigeonwood, porokaiwhiri	Hedycarya arborea	10%	3L	1.0	3837
My_lae	Ngaio	Myoporum laetum	10%	3L	1.0	3837
Pi_eug	Taratara	Pittosporum eugenoides	10%	3L	1.0	7674
My_aus	Red mapou, Red matipo	Myrsine australis	10%	3L	1.0	7674
Pi_cra	Karo	Pittosporum crassifolium	10%	3L	1.0	7674
Do_vis	Akeake	Dodonea viscosa	10%	3L	1.0	7674
					Total	76740

Taonga Species Grove - Area 1670m²

Code	Māori name	Botanical Name	Percentage Mix %	Grade (L)	Centers (m)	Quantity
Pe_bay	Manawatāwhi Kaikōmako	Pennantia baylisiana	20%	8L	2.0	96
Me_bar	Rātā moehau, Bartlett's rātā,	Metrosideros bartlettii	20%	5L	2.0	96
El_joh	Elingamita	Elingamita Johnsonii	20%	5L	2.0	96
Ge_lig	Pāhange	Geniostoma ligustrifolium var. crassum	20%	3L	2.0	96
Ve_ada	Puāwai Rua / Unuwhao	Veronica adamsii	20%	3L	2.0	96
					Total	482

Vegetated Screening - Area 2815m²

Code	Māori name	Botanical Name	Percentage Mix %	Grade (L)	Centers	Quantity
Co_mac	Coprosma macrocarpa subsp. minor	Coastal Karamū	11%	3L	1.5	393
Ps_les	Pseudopanax lessonii	Houpara	12%	3L	1.5	429
Ku_eri	Kunzea ericoides	Kānuka	12%	3L	1.5	429
Pi_cra	Pittosporum crassifolium	Karo	20%	3L	1.5	715
Pi_eug	Pittosporum eugenoides	Taratara	15%	3L	1.5	536
My_aus	Myrsine australis	Red mapou, red matipo	15%	3L	1.5	536
Le_sco	Leptospermum scoparium	Mānuka	15%	3L	1.5	536
					Total	**3575**

Specimen Trees within Coastal Forest Revegetation - Area 6.6 ha

Code	Māori name	Botanical Name	Percentage Mix %	Grade (L)	Centers (m)	Quantity
Ag_aus	Kauri	Agathis australis	6%	5L	5.0	288
Be_tar	Taraire	Beilschmiedia tarairi	5%	5L	5.0	153
Be_taw	Tawa	Beilschmiedia tawa	5%	5L	5.0	153
Co_lae	Karaka	Corynocarpus laevigatus	5%	5L	5.0	153
Da_cup	Rimu	Dacrydium cupressinum	5%	5L	5.0	153
Da_dac	Kahikatea	Dacrycarpus dacrydioides	6%	5L	5.0	184
Dy_spe	Kohekohe	Dysloxlum spectabile	6%	5L	5.0	184
El_den	Hinau	Elaeocarpus dentatus	5%	5L	5.0	153
El_hoo	Pōkākā	Elaeocarpus hookerianus	5%	5L	5.0	153
Kn_exc	Rewarewa	Knightia excelsa	5%	5L	5.0	153
Li_plu	Kawaka	Libocedrus plumosa	5%	5L	5.0	153
Me_exc	Pōhutukawa	Metrosideros excelsa	6%	5L	5.0	184
Ne_ape	Coastal maire	Nestigis apetala	5%	5L	5.0	153
Pl_con	Tawāpou	Planchonella constata	5%	5L	5.0	153
Po_tot	Tōtara	Podocarpus totara	5%	5L	5.0	153
Pr_fer	Miro	Prumnopitys ferruginea	5%	5L	5.0	153
Pr_tax	Mataī	Prumnopitys taxifolia	5%	5L	5.0	153
Vi_luc	Pūriri	Vitex lucens	6%	5L	5.0	184
We_sil	Towai	Weinmannia silvicola	5%	5L	5.0	153
					Total	3173

Open Space - Area 0.35 ha

Code	Māori name	Botanical Name	Percentage Mix %	Grade (L)	Area
		Mixed turf species appropriate for Northland	100		0.35ha

Māra Kai - Area 2008m²

Code	Māori name	Botanical Name	Percentage Mix %	Grade (L)	Area
		Various Species	100		2008m²

APPENDIX 2 - SUSTAINABILITY STRATEGY

PASSIVE DESIGN

Passive design describes design strategies that allow a building to respond to local climate and site conditions to maximise building users' comfort and health while minimising energy use.

For more informhttps://www.nzgbc.org.nz/GreenStar

http://www.level.org.nz/passive-design

https://living-future.org/lbc/

https://www.smarterhomes.org.nz/

Source: James Lunday TBC

BUILDING ORIENTATION
Buildings should be oriented north and/or designed in a way that captures light and warmth from the sun. Consideration should be made to seasonal variations of the sun's path, as well as prevailing winds, for shelter and natural ventilation.

GLAZING
Glazing is required to allow light and heat into a building. Glazing and glazing units (frames) should be designed to admit light while controlling heat gain and heat loss. The Window Energy Efficiency Rating System (WEERS) is a useful 6-star rating programme that compares the thermal performance of windows in buildings.

In order to balance solar gain with insulation, on average, no more than 40% of a building should be glazed.

THERMAL MASS
Thermal mass works by absorbing heat and re-radiating it as temperatures drop. By utilising the thermal mass of a heavyweight material, temperature fluctuations can be reduced, resulting in a more constant indoor temperature.

The ideal material is:

- Dense and heavy, so it can absorb and store significant amounts of heat.
- A reasonably good heat conductor (heat has to be able to flow in and out).
- Has a dark surface, a textured surface or both (helping it absorb and re-radiate heat).

INSULATION
Inadequate insulation and air leakage are the main causes of heat loss in homes. Insulating the ceiling, under the floor, walls and windows creates a secure thermal envelope and forms the barrier between heated and unheated spaces.

Check for brands that have the Environmental Choice N.Z licence.

Environmental Choice New Zealand (ECNZ) is an environmental labelling programme which has been created to help businesses and consumers find products and services that ease the burden on the environment.

NATURAL VENTILATION
Effective ventilation is necessary for temperature control and air quality. Creating an indoor environment where there is no damp or mould requires an effective combination of ventilation and heating.

Natural ventilation is driven by pressure differences between one part of a building and another, or pressure differences between the inside and outside.
Natural ventilation is generally achieved through:

- Wind-driven (or wind-induced) cross ventilation

or

- Buoyancy-driven stack ventilation

https://www.designingbuildings.co.uk/wiki/Natural_ventilation_of_buildings

ENERGY

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

Consider energy in a holistic manner_ use less energy and reduce consumption.

There are many different ways to reduce your household and neighbourhood energy use, ranging from simple behavioural adjustments to extensive home improvements. The two major motives for conserving energy are to save on utility bills and protect the environment.

CONSERVATION
Energy conservation is important and beneficial for many reasons. It can save money, increase property value, and protect the environment, all through simple energy-saving measures.

Following sustainable building practice with scrupulous attention to the siting of buildings, choices of building materials, insulation/thermal mass and renewable energy sources for electricity production, will all assist in the long-term reduction of energy use.

- Install energy-efficient windows
- Weatherise buildings by sealing air leaks
- Insulation of attics, ceilings, floors and walls
- Low energy appliances
- Replace light bulbs - LED Lights use 25% - 80% less electricity and last longer than traditional bulbs

PRODUCTION
Remote area power systems can be used to meet the electricity needs of an individual property or group of properties, by generating electricity close to where it will be used and using sustainable energy sources such as sun, water, wind and biowaste. The low density rural and coastal nature of the Far North District offers a number of renewable energy opportunities. For example:

- Solar Panels
  The three main types of solar panels are; monocrystalline, polycrystalline and thin film. Choice of panel depends on the size of roof available. Panels with higher efficiency produce more power per m2.

- Micro-Hydro
  Hydroelectricity systems use the force of running water to turn turbine blades, which spin a shaft connected to a generator. If there is access to a stream or waterway, micro-hydro can be a reliable and economic way to generate off-grid electricity.

- Micro Digestor
  Micro digesters produce biogas using own biomass resources (waste) from farms, where livestock manure is the main substrate. The gas can be used to run machinery directly to replace mineral diesel or can be used to generate heat and electricity.

MATERIALS

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

Building materials have an environmental impact at every step of the building process.

Appropriate selection of materials can ensure efficient use, low environmental impact and minimising of waste generated. This will result in improvements to the cost-effectiveness, energy efficiency and, ultimately, the comfort of a building.

EMBODIED ENERGY
Embodied energy is the total energy required for the extraction, processing, manufacture and delivery of building materials to the building site.

Buildings should be designed, and materials selected, to balance embodied energy with factors such as climate, availability of materials and transport costs.

THE DURABILITY OF BUILDING MATERIALS
Durability and maintenance requirements of building materials should be considered together across the expected service life of a building.

Materials that require more maintenance may turn out to be preferable if their original manufacturing produces very few greenhouse gases, such as timber.

Examples - recycled steel, bamboo, precast concrete, reclaimed or recycled wood and earth.

USE OF LOCALLY SOURCED MATERIALS
The source of materials needs to be considered to keep transport costs and resultant CO2 emissions to a minimum. In particular, heavy and bulky materials should be sourced locally where possible.

Choosing local materials not only reduces the building's energy footprint, it can lead to a more vernacular architectural design style that reflects the uniqueness of the Kaipara District.

USE OF RECYCLED / UPCYCLED MATERIALS
Sourcing recycled materials can influence the design of the building, creating unique qualities they may not have been achieved through standard purchasing behaviour. It is also a good way to avoid the Materials Petal Red List, which contains the worst materials prevalent in the building industry.

TOXICITY
The Living Building Challenge 'Materials Petal Red List' of materials and chemicals provides a comprehensive list of products that should be avoided. https://living-future.org/declare/declare-about/red-list/

AVOIDING WASTE
Reducing or eliminating the production of waste during design, construction, operation, and end of life is vital to conserve natural resources and minimise waste sent to landfills.

Explore ways to integrate waste back into either an industrial loop or a natural nutrient loop, such as donating clean materials to organisations like 'Habitat for Humanity' or using excavated soils on site.

APPENDIX 3 - WHARE FLOOR PLANS

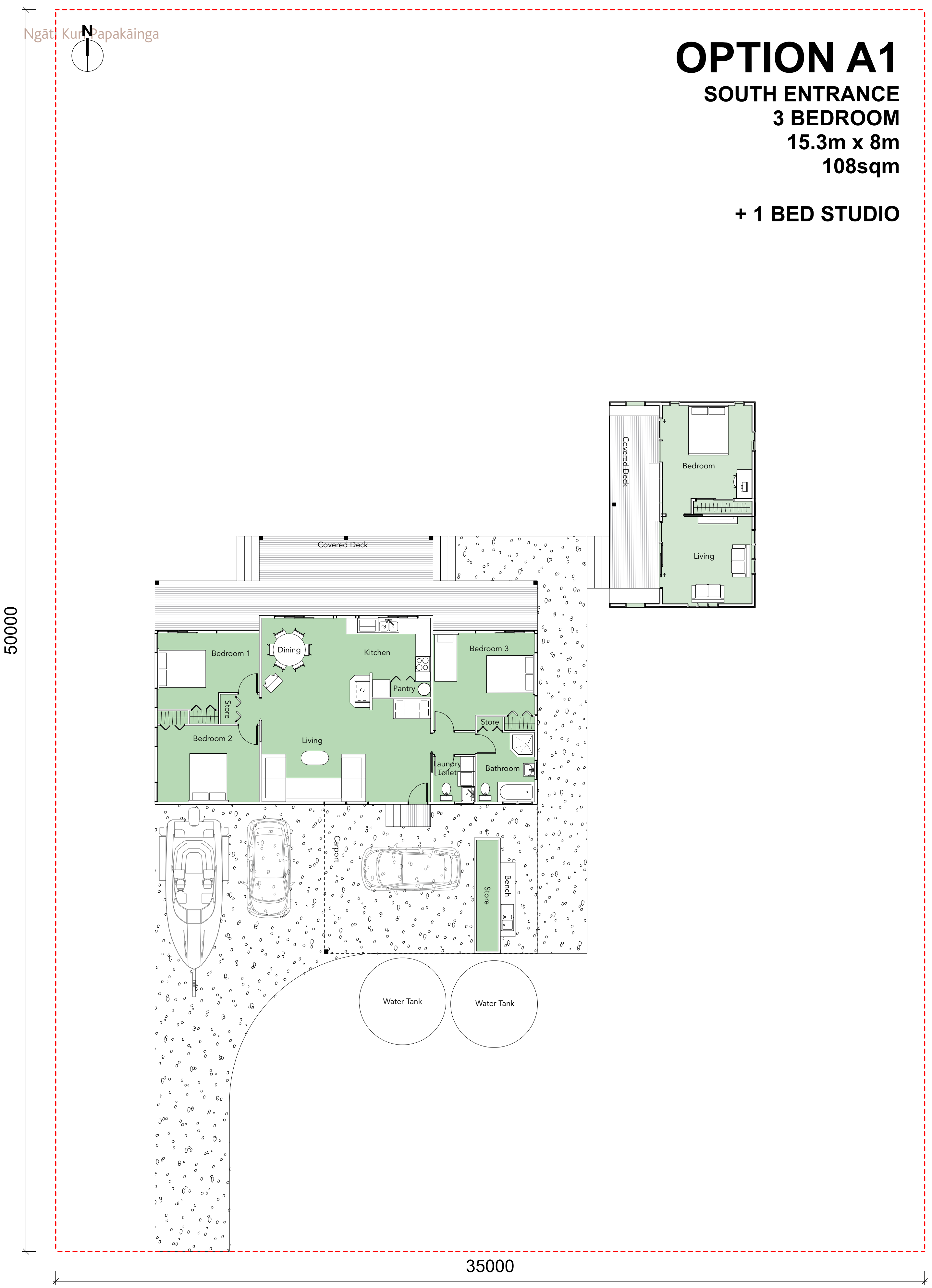
APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

OPTION A1

SOUTH ENTRANCE
3 BEDROOM
15.3m x 8m
108sqm

+ 1 BED STUDIO



1 Option A1 - Site Plan
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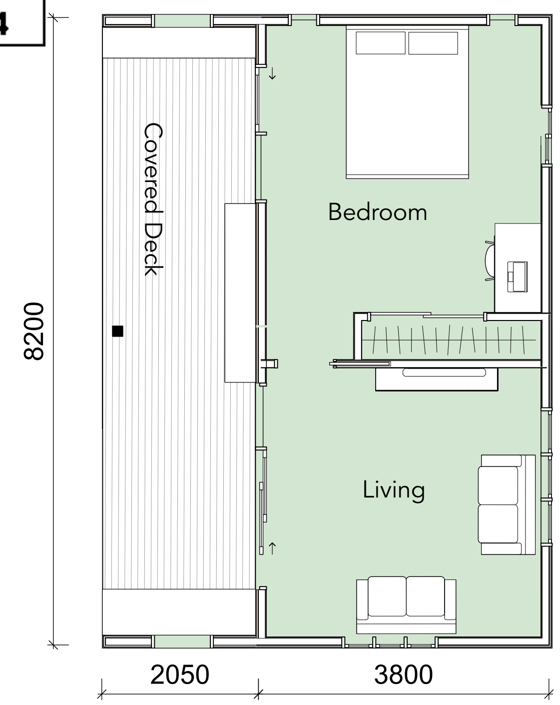
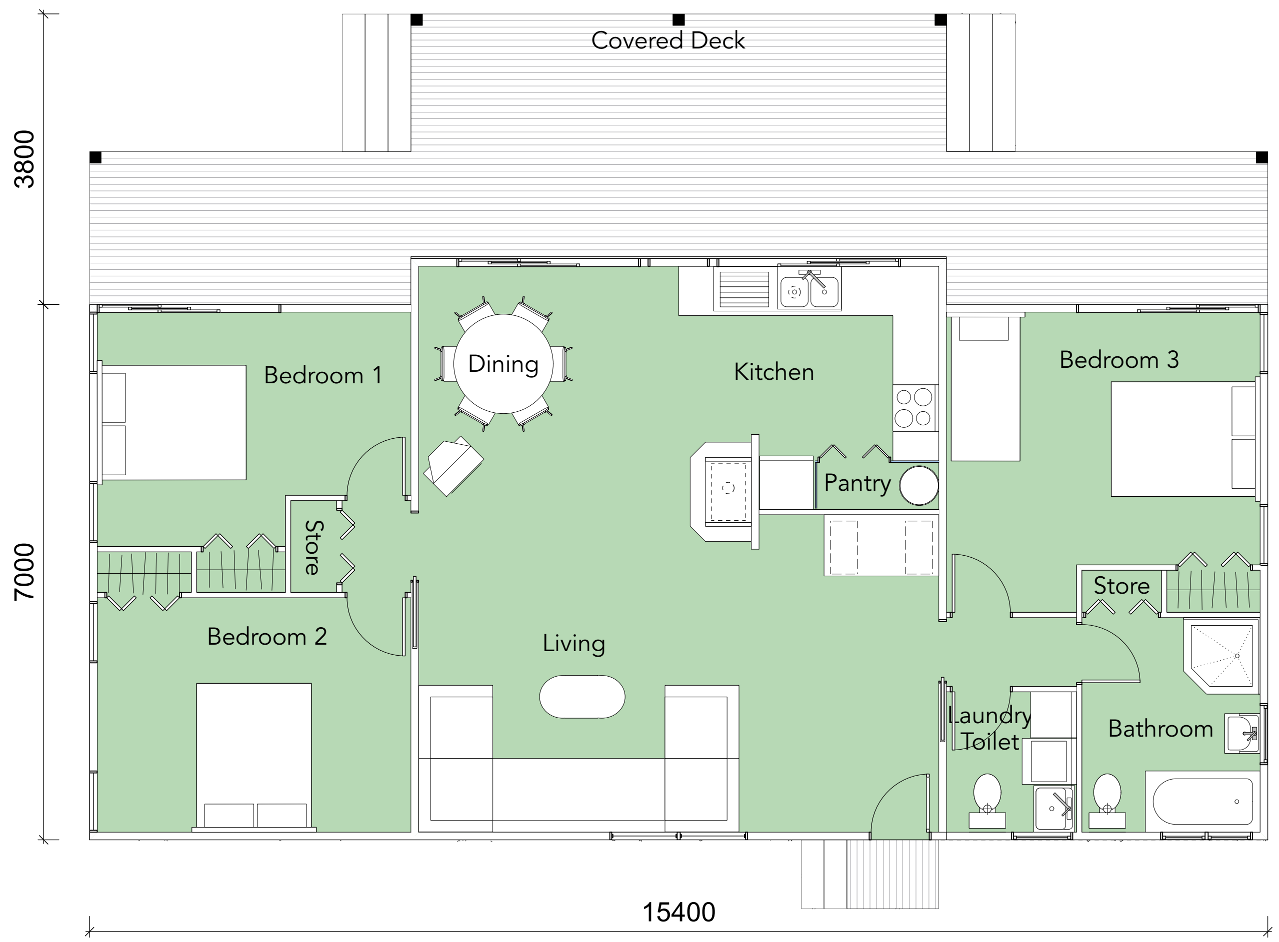


3 Secondary Dwelling
Scale: 1:50



2 Primary Dwelling
Scale: 1:50

REVISION DATE NOTES

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED. CHECK ALL DIMENSIONS AND LEVELS ON SITE PRIOR TO WORK COMMENCING. DO NOT SCALE OFF DRAWINGS. USE FIGURED DIMENSIONS ONLY.

design tribe
ARCHITECTS

Design Tribe Limited
553 Richmond Rd, Grey Lynn, Auckland 1021
PO Box 47-311, Ponsonby, Auckland 1144
PH 09 376 6975 designtribe.co.nz

CLIENT
Ngāti Kuri

PROJECT

ADDRESS

SHEET
Option A1 - South Entrance

ISSUE		ISSUE No.
Master Planning		4
DATE	SCALE	Half scale
7/6/22	1:100 @A1	1:200 @A3
DRAWN DT	CHECKED DT	
PROJECT No. 22006	DRAWING No. A1	REV / DRAWING Status

RESILIOSTUDIO

OPTION A2

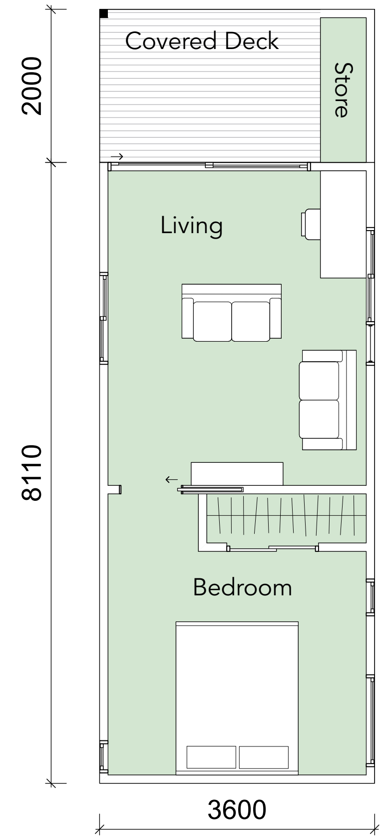
SOUTH ENTRANCE
3 BEDROOM
15.3m x 8m
108sqm

+ 1 BED STUDIO

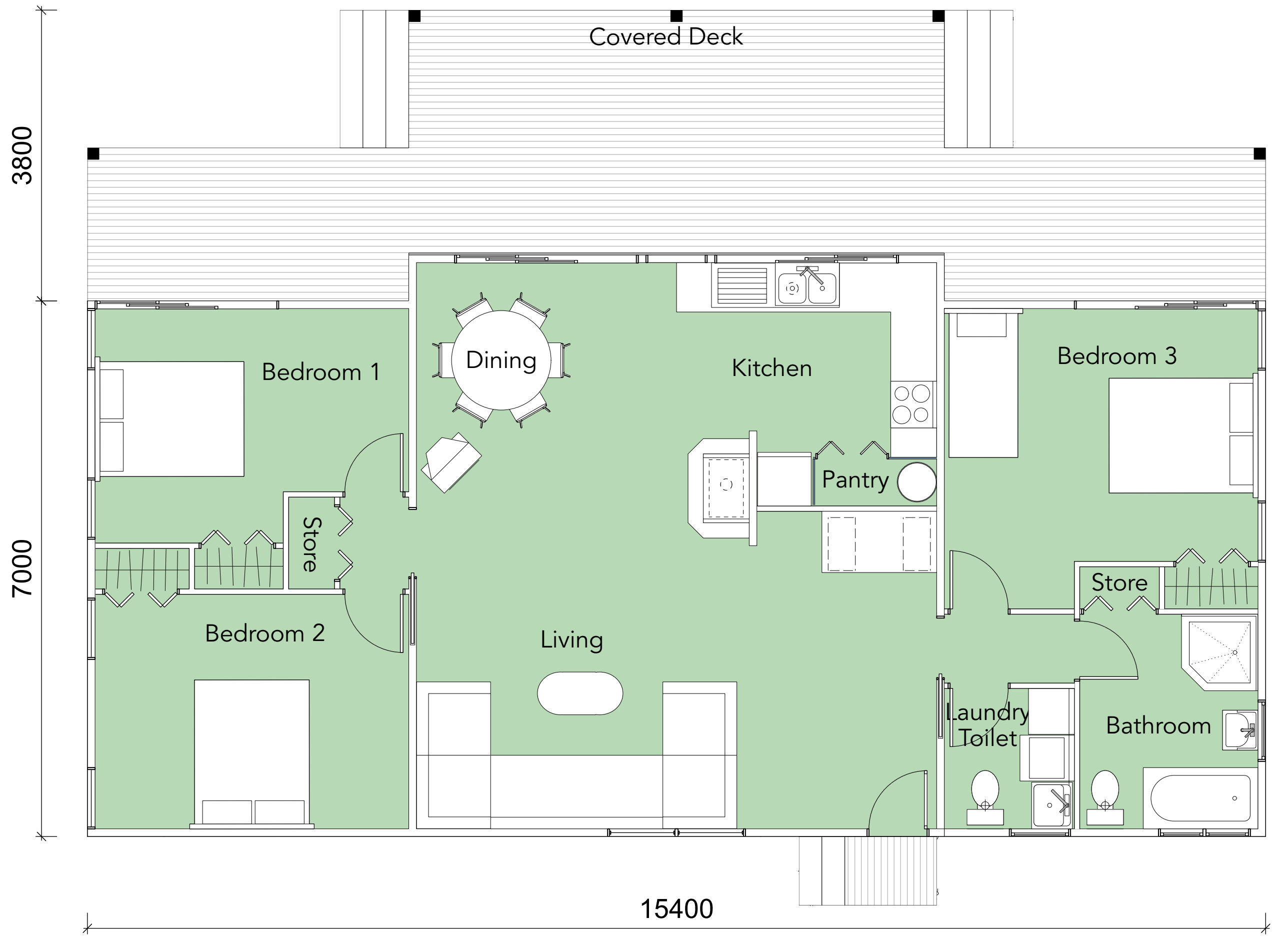
APPROVED PLAN

Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

1 Option A2 - Site Plan
Scale: 1:100



3 Secondary Dwelling
Scale: 1:50



2 Primary Dwelling
Scale: 1:50

REVISION	DATE	NOTES

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SHEET
Option A2 - South Entrance

ISSUE		ISSUE No.
Master Planning		4
DATE 7/6/22	SCALE 1:100 @A1	Half scale 1:200 @A3
DRAWN DT	CHECKED DT	
PROJECT No. 22006	DRAWING No. A2	REV / DRAWING Status

RESILIOSTUDIO

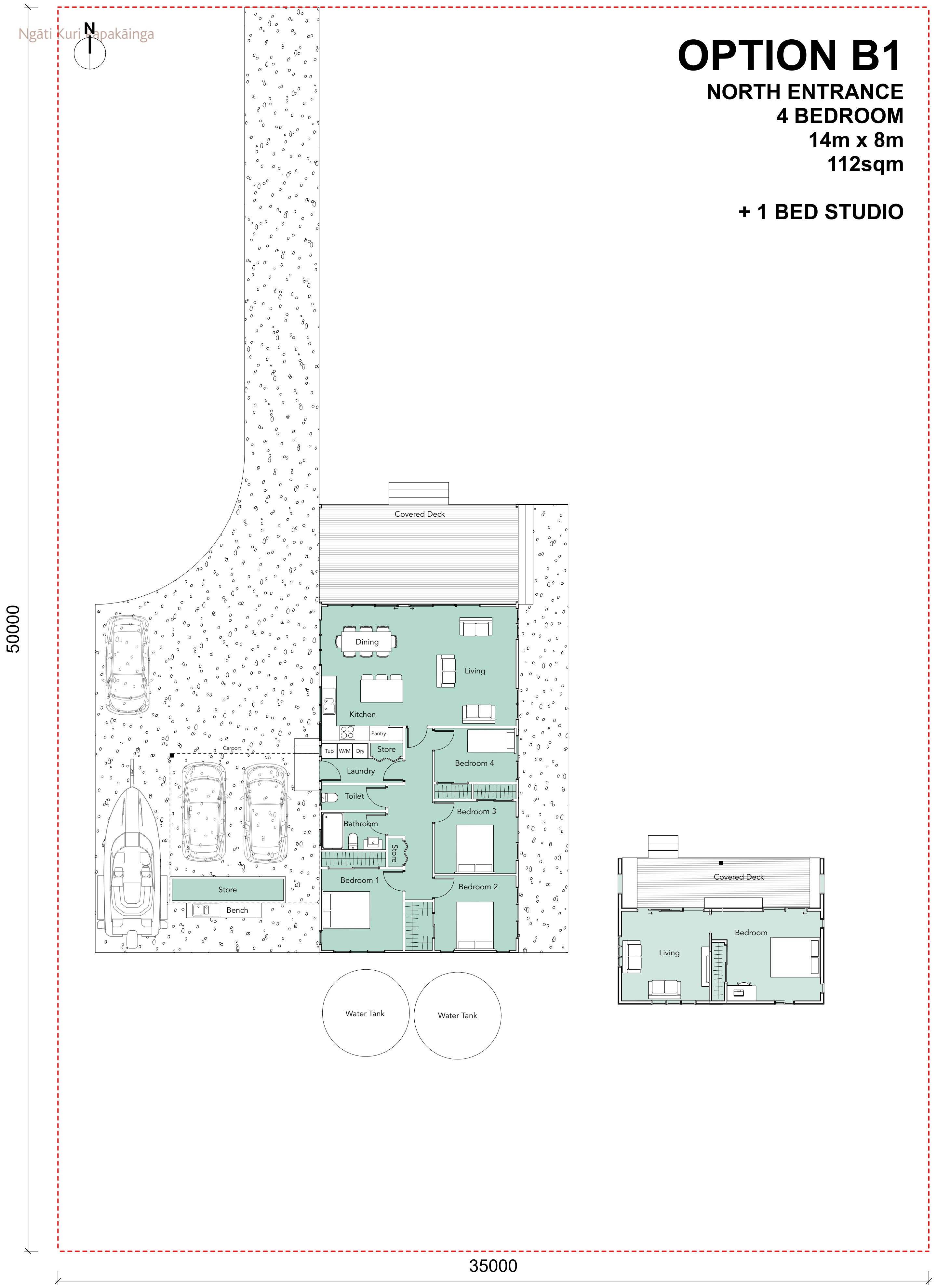
APPROVED PLAN

Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024

OPTION B1

NORTH ENTRANCE
4 BEDROOM
14m x 8m
112sqm

+ 1 BED STUDIO



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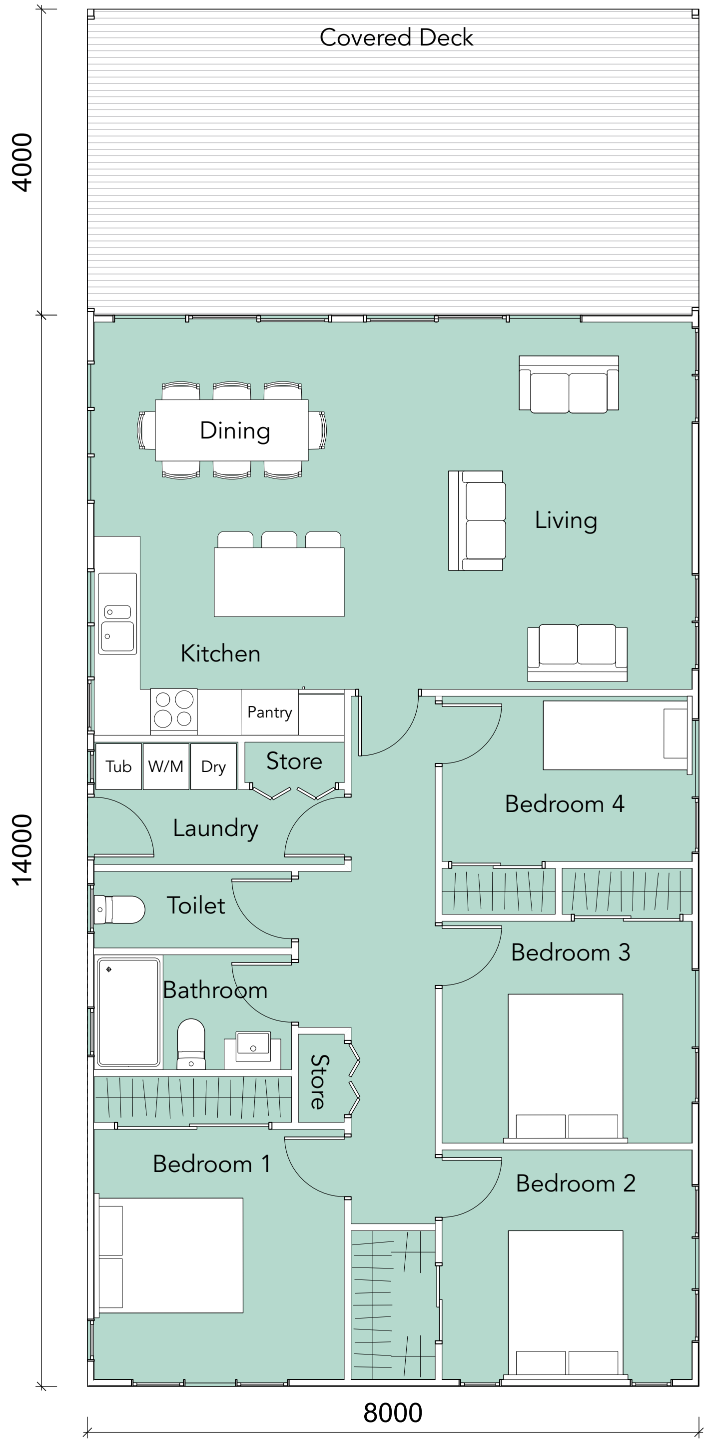

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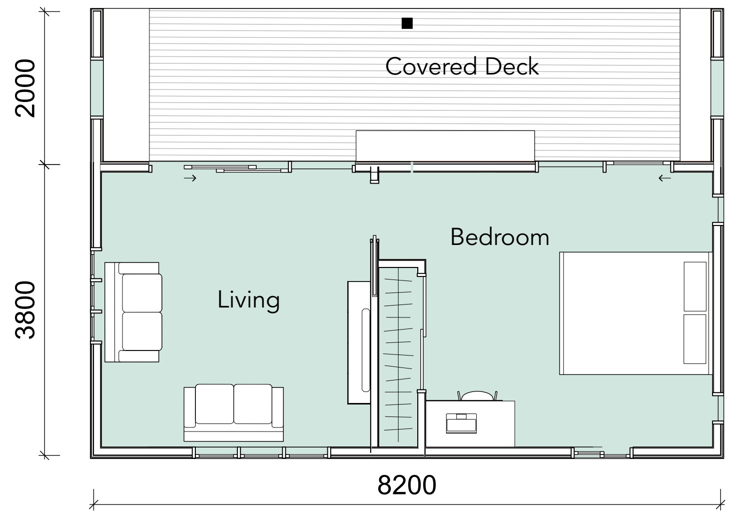

3 Secondary Dwelling
Scale: 1:50

REVISION	DATE	NOTES

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CLIENT
Ngāti Kuri

PROJECT

ADDRESS

SHEET
Option B1 - North Entrance

ISSUE		ISSUE No.
Master Planning		4
DATE 7/6/22	SCALE 1:100 @ A1	Half scale 1:200 @ A3
DRAWN DT	CHECKED DT	
PROJECT No. 22006	DRAWING No. B1 / REV	DRAWING Status

RESILIOSTUDIO

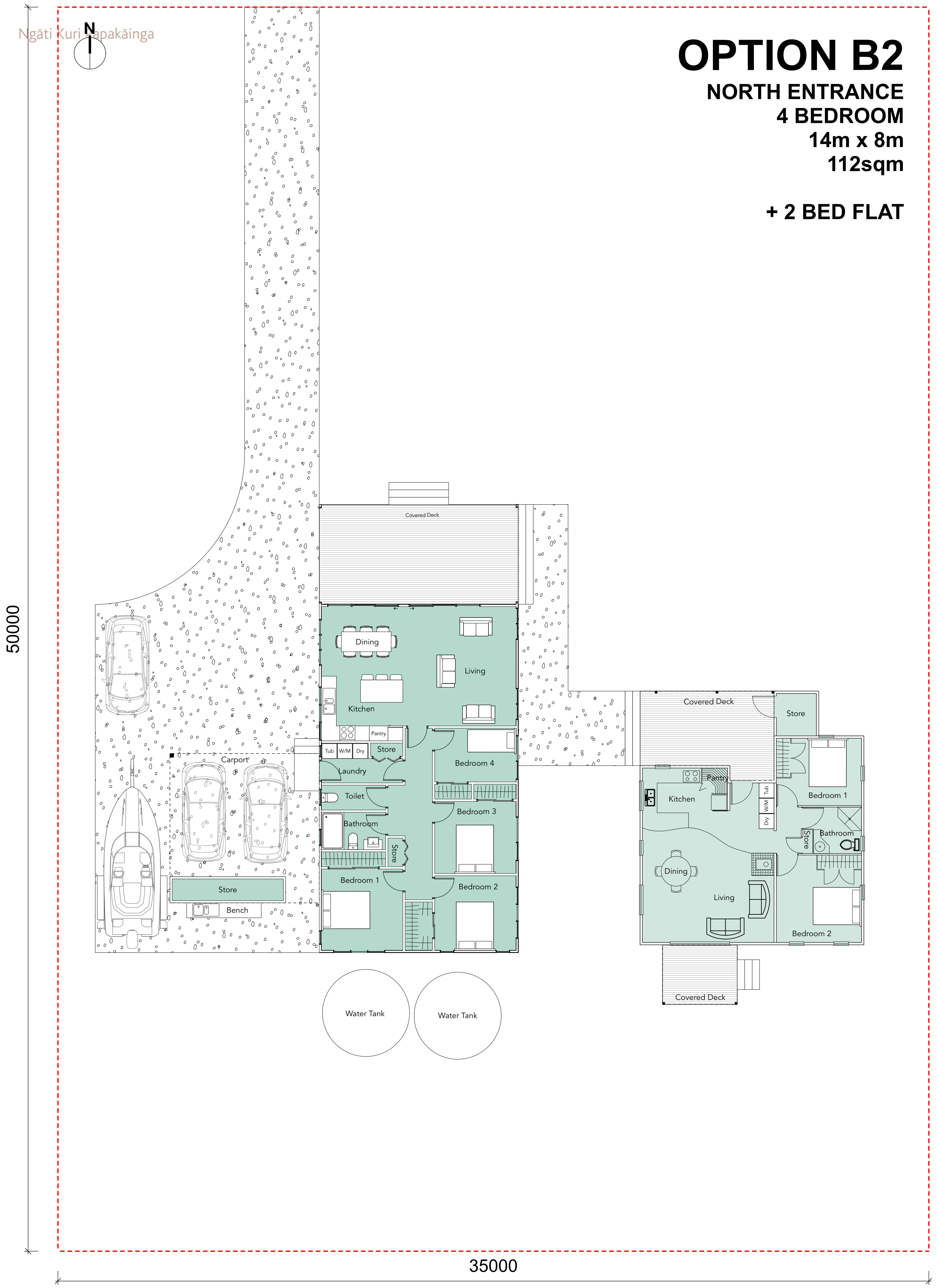
APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024

OPTION B2

NORTH ENTRANCE
4 BEDROOM
14m x 8m
112sqm

+ 2 BED FLAT



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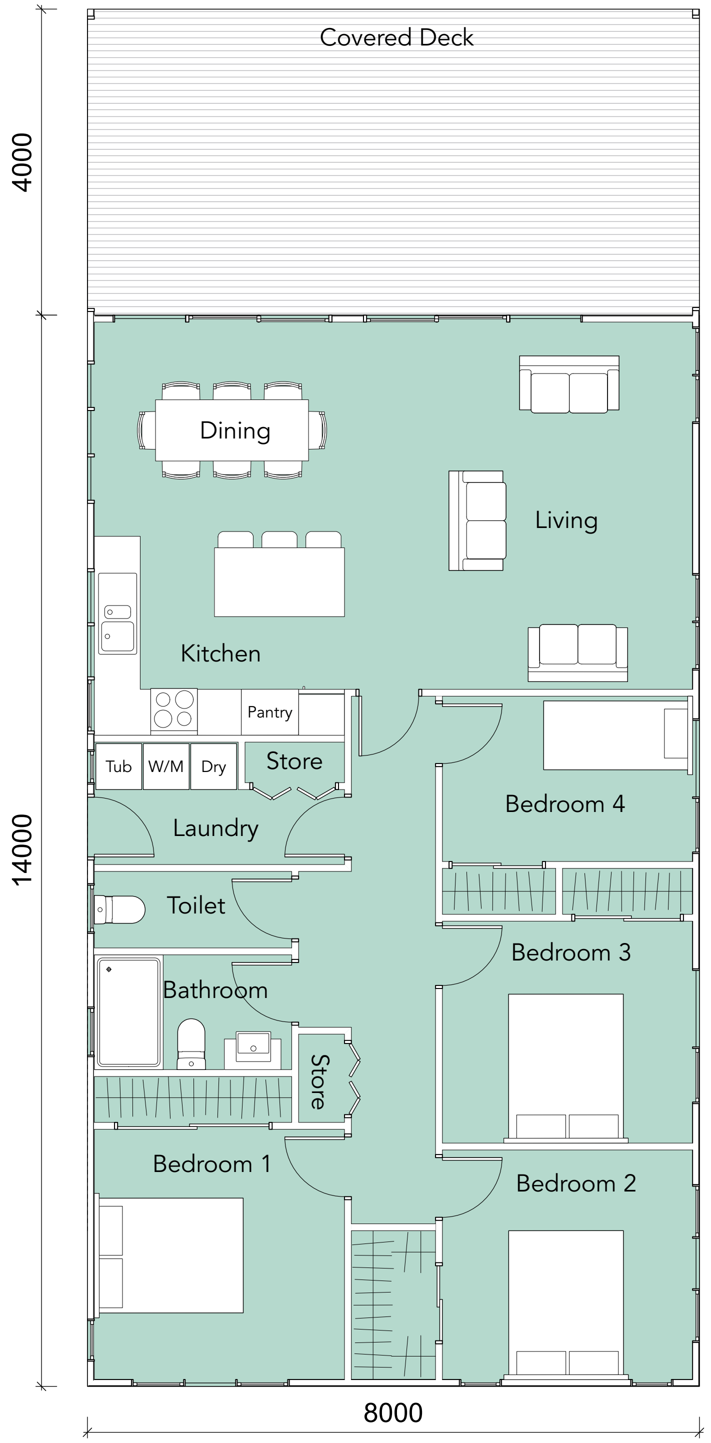

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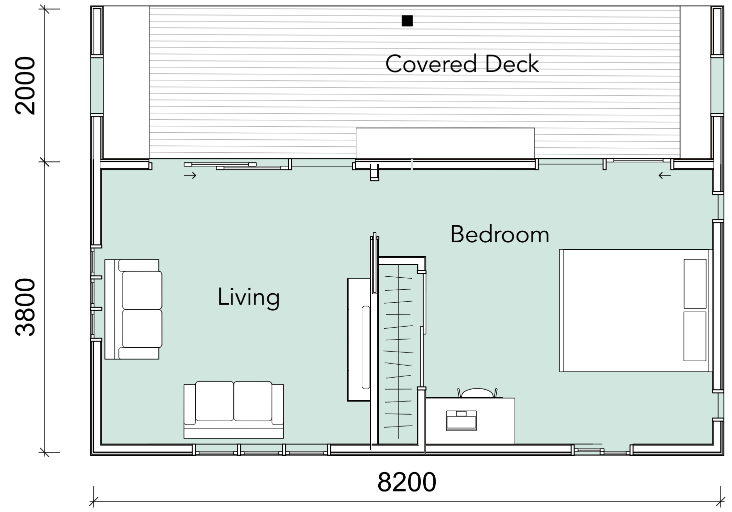

3 Secondary Dwelling
Scale: 1:50

REVISION | DATE | NOTES

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PROJECT

ADDRESS

SHEET
Option B2 - North Entrance

ISSUE
Master Planning

ISSUE No.
4

DATE
7/6/22

SCALE
1:100 @A1 1:200 @A3
Half scale

DRAWN
DT

CHECKED
DT

PROJECT No.
22006

DRAWING No.
B2

REV

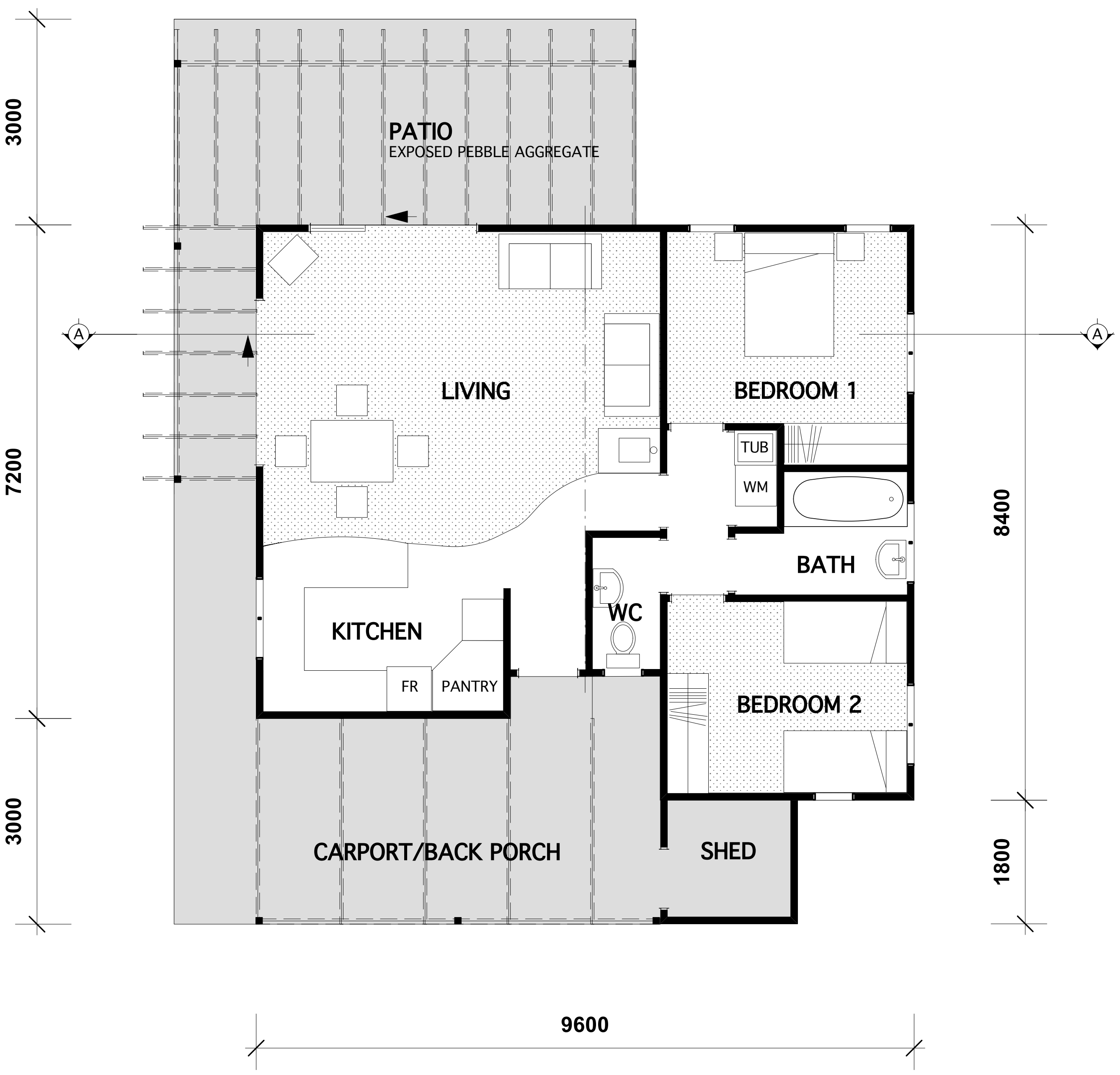
DRAWING Status

RESILIOSTUDIO

KAUMĀTUA WHARE

APPROVED PLAN

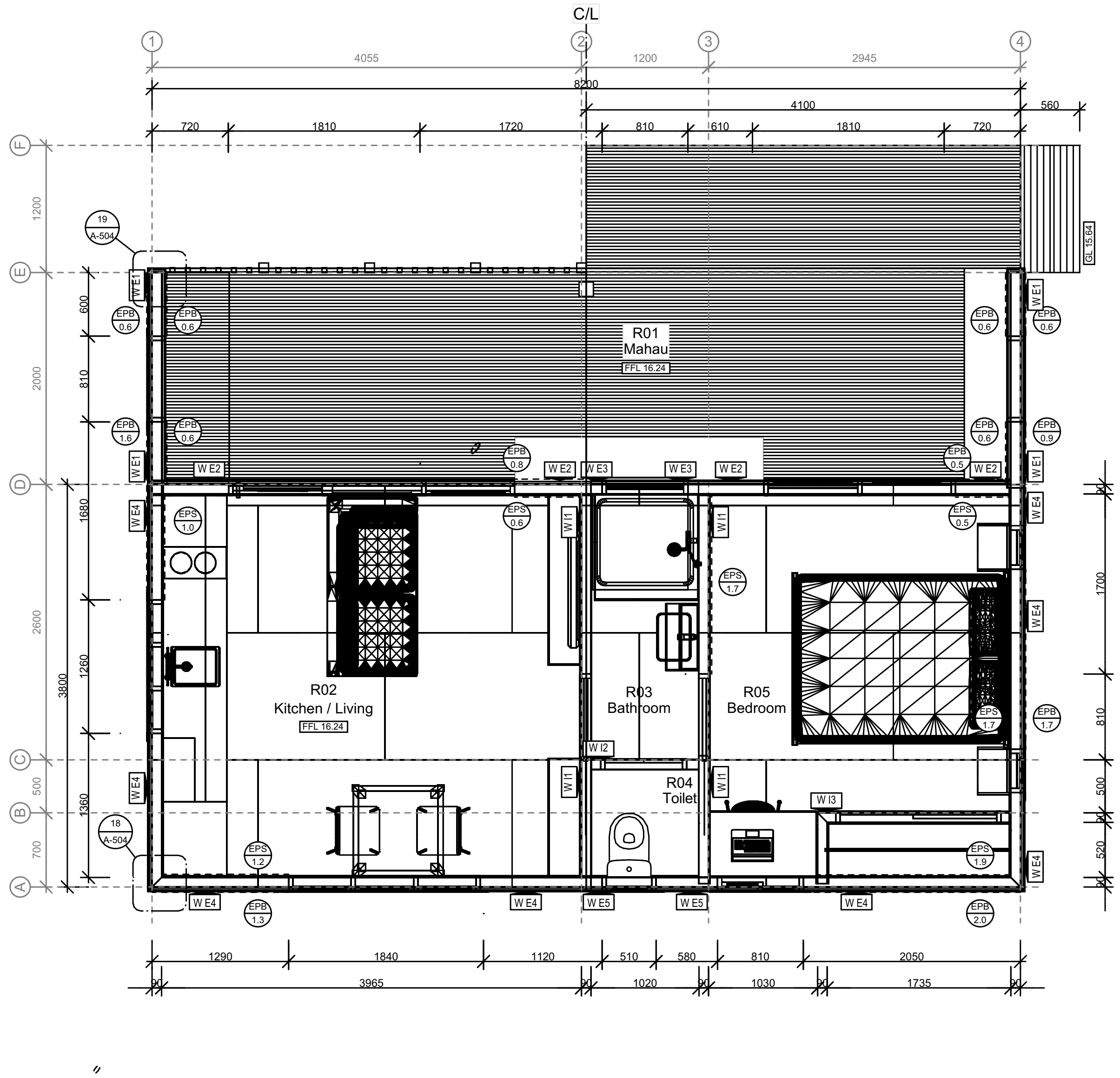
Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024



WHARE KĀHUI

APPROVED PLAN

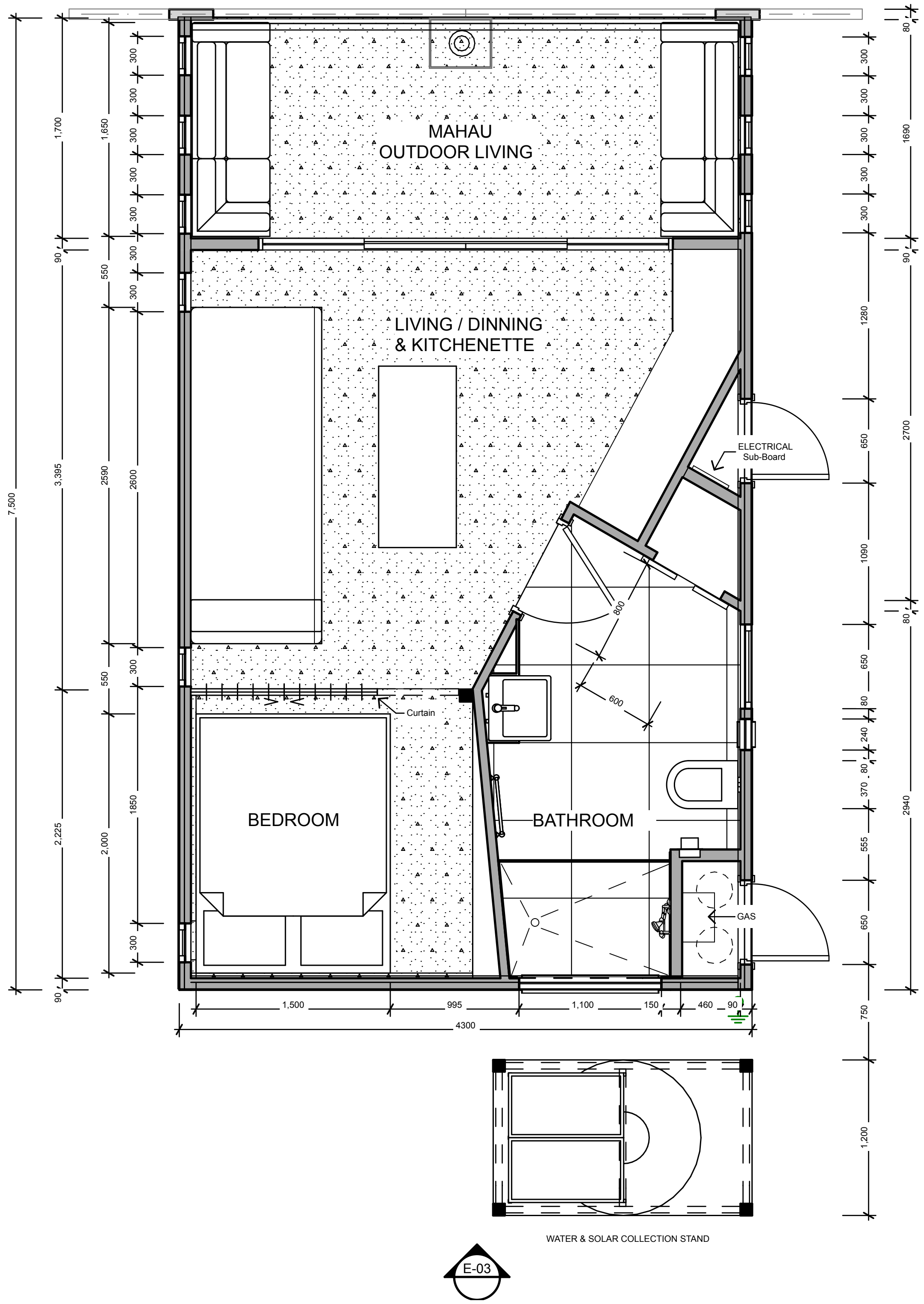
Planner: Pat Killalea
pp: Imaxwell
RC: RC 2230588
Date: 23/02/2024



WHARE PAI

APPROVED PLAN

Planner: Pat Killalea
pp: lmaxwell
RC: RC 2230588
Date: 23/02/2024



STATEMENT OF DESIGN - PS1

Issued by: Dean Hoyle
To: NGATI KURI TRUST BOARD
Copy to be supplied to: Far North District Council
In Respect of: Econotreat Domestic Onsite Wastewater and Sewage System Design
At: Te Paki Stream Rd, Te Paki
Legal Description: Section 7 & 14 SO 469373

Waterflow NZ Ltd has been engaged by NGATI KURI TRUST BOARD to provide the technical design services and details in respect of the requirements of G13/VM4 and B2 Durability of the Building Code 2004, for an Onsite Wastewater and Sewage System for their building at the above location.

The Design has been carried out in accordance with Auckland Council TP-58 Guidelines and Clause B2, G13 and G14 of the Building Regulations 2004.

The proposed building work covered by this producer statement is described on the drawings titled: NGATI KURI TRUST BOARD Onsite Wastewater Design Report, and numbered 1-42 together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:
(i) Site verification of the following design assumptions: correct installation of the system and drainage fields
(ii) All proprietary products meeting their performance specification requirements;

As an independent design professional covered by a current policy for Professional Indemnity Insurance, no less than $200,000*, I **believe on reasonable grounds** the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code.

Signed by: Dean Hoyle - PS Author '3037' Auckland Council, NZQA Onsite Wastewater Training/Opus, BOINZ OWM, HBRC & FNDC Approved Designer

Date: 25/11/2024

Signature:

Waterflow NZ Ltd
1160 State Highway 12
Maungaturoto 0520

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

Date: 29.11.2024

Client: Ngati Kuri Trust Board

Project: Te Paki Dunes Papakāinga

Address: Te Paki Stream Rd, Te paki

As requested by the Consultant (Myles Gordon, Rubix) we (Waterflow NZ Ltd), were engaged to assess the environmental and soil conditions for a suitable Onsite Wastewater Treatment System and Disposal field system for the proposed Papakainga development on Te Paki Stream Rd. We understand it is proposed to establish a papakainga involving 6 new two bedroom Kaumatua flats and 15 additional lots each with either a four bedroom dwelling and potentially a two bedroom studio or a three bedroom dwelling and potentially a one bedroom studio. Water supply for all lots is to be via roof collected rainwater stored in water tanks.

Is the site suitable for an on-site effluent treatment and disposal system?
Yes, the site is suitable for the discharge of the wastewater production as per Auckland Council TP-58 Guidelines, Australia New Zealand Standard 1547:2012 and Discretionary Activity Rule C.6.1.5 of the Proposed Regional Plan for Northland. This design report is generally in accordance with the conditions of NRC Resource Consent AUT.045424.06.01 however some consent conditions may need to be changed to suit the final onsite wastewater management design.

The project will consist of three separate onsite wastewater management systems to manage wastewater from different areas of the development. 15 of the 21 lots will drain to an EconoTreat VBB-C-2200 Secondary Wastewater Treatment System located adjacent to each lot. The Econotreat wastewater systems have a capacity of up to 2200 litres per day and will pump advanced secondary treated effluent to one of two central 22,500 litre pump stations. From each pump station secondary treated effluent will pump to one of two land application systems. The six Kaumatua flats gravity drain to a common Econotreat VBB-C-2200 TWIN and then pumps to a 1280m2 land application system.

Discharge calculations are based on the below:

System 1:

- 8 x 4 bedroom dwelling + two bedroom studio (9 people) = 8 x 9 people @ 160L per person per day = 11,520 litres per day;
- **System 1 Design Flow: 11,520 litres per day**

System 2:

- 6 x 4 bedroom dwelling + two bedroom studio (9 people) = 6 x 9 people @ 160L per person per day = 8,640 litres per day;
- 1 x 3 bedroom dwelling + one bedroom studio (6 people) = 1 x 6 people @ 160L per person per day = 960 litres per day;
- **System 2 Design Flow: 9,600 litres per day**

System 3:

- 6 x 2 bedroom dwelling (4 people) = 6 x 4 people @ 160L per person per day = 3,840 litres per day;
- System 2 Design Flow: **3,840 litres per day**

Total Design Flow (System 1 + System 2 + System 3): 24,960 Litres/day.

What are the disposal field requirements?
Each of the three systems will apply advanced secondary quality effluent to land via a pressure compensating dripline system at a design loading rate of 3L/m^2/day for silty clay loam soils. The total land disposal area is 17,280m^2 and will be made up of three separate land disposal areas of 3840m^2, 3200m^2 and 1280m^2.
The disposal area will be installed at least 100mm subsurface and at an average of 1.0m parallel row spacings and with emitters at 0.6m centres. The disposal areas will be installed more than 15m from any surface water and more than 10m from any wetlands and more than 1.5m from property boundaries.

Is Discharge Consent required?
Yes, the total design flow of 24,960 litres per day is a Discretionary Activity as per Rule C.6.1.5 of the Proposed Northland Regional Plan and therefore requires a Discharge Consent. NRC have already issued Resource Consent AUT.045424.06.01 however some consent conditions may need to be changed to suit the final onsite wastewater management design. This report is prepared to support the S127 application to change consent conditions.

TABLE OF CONTENTS

Attachments

- PS1
- Land Application System Schematics
- Pump Specification
- Electrical Diagram
- Assessment of Environmental Effects
- System & Installation Specifications
- Home Owners Care Guide

PART A: CONTACT AND PROPERTY DETAILS

A 1. Consultant / Evaluator

Name:	Matt Riddell
Company/Agency:	Waterflow New Zealand Ltd
Address:	4/525 Great South Road, Penrose, Auckland 1061
Phone:	09 431 0042
Fax:	
Email Address:	matt@waterflow.co.nz

A 2: Applicant Details

Applicant Name:	NGATI KURI TRUST BOARD
Company Name:	
Property Owner:	NGATI KURI TRUST BOARD
Owner Address:	Te Paki Stream Rd, Te Paki
Phone:	
Mobile:	
Email Address:	myles.gordon@rubix.nz

A 3: Site Information

Sited Visited by:	Caleb Pirini		**Date:**	Wednesday, 6 March 2024		
Physical Address:	Te Paki Stream Rd, Te Paki					
Territorial Authority:	Far North District Council					
Regional Council:	Northland Regional Council					
Regional Rule	C.6.1.5					
Legal Status of Activity:	**Permitted:**		**Controll**		**Discretionary:**	x
Total Property Area (m^2):	120000m ^{2}					
Map Grid Reference:	34°30'38.5"S 172°47'20.8"E					
Legal Description of Land (as on Certificate of Title):						
Lot No:	Section 7 & 14 SO 469373					
DP No:						
CT No:						

A 4: Are there any previous existing discharge consents relating to this proposal or other waste discharge/disposal on the site?

Yes:	x		**No:**	

If yes, give reference No's and description:

NRC Resource Consent AUT.045424.06.01 - Wastewater discharge:

A 5: Dwelling(s) for which on-site wastewater service is to be provided

Status of dwelling(s) to be serviced:	**New**	x	**Existing**		**Multiple**	
How many dwellings on the property?	21					
Capacity of dwellings:	**Dwelling 1**	14 x 4 bedroom units with 2 bedroom studio				
(or number of bedrooms)	**Dwelling 2**	1 x 3 bedroom units with 1 bedroom studio				
	Dwelling 3	6 x 2 bdrm Kaumatua flats				
	Other:					
Notes:	See design brief attached.					

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PART B: SITE ASSESSMENT - SURFACE EVALUATION

B 1: Site Characteristics

Performance of adjacent systems:	(Unknown)			
Estimated annual rainfall (mm):	1000 - 1250 (as per NIWA statistics)			
Seasonal variation (mm):	300-400mm			
Vegetation cover:	Grass			
Slope shape:	Flat			
Slope angle:	8 °			
Surface water drainage characteristics:	Broad overland to wetland areas			
Flooding potential?	**Yes:**		**No:**	x
If Yes, specify relevant flood levels relative to disposal area:				
Site characteristics:	**The proposed development is located on the western and eastern sides of Te Paki Stream Rd and has a total area of approximately 12 hectares. The parent lots have a legal description of Section 7 & 14 SO 469373. The site is mainly covered in rough grass and occassional vegetation. There are several overland flow paths throughout the development. The western side of the site has a high point at the north-western corner and slopes towards the east and south. The eastern side has a high point to the south and slopes towards the north and east.**			

B 2: Slope Stability

Has a slope stability assessment been carried out on the site?

Yes:		**No:**	x

If no, why not?

Low slope:	x	**No signs of instability:**	x	**Other:**

If yes, give brief details of report:

Details:	
Author:	
Company/Agency:	
Date of report:	

B 3: Site Geology

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B 4: Slope Direction
What aspect does the proposed disposal system face?

North		West	
North-West		South-West	
North-East		South-East	x
East		South	

B 5: Site Clearances if applicable (also on site plan)

	Treatment Separation Distance (m)	Disposal Field Separation Distance (m)
Boundaries:	>1.5	>1.5
Surface Water:	>15	>15
Ground Water:	>1.2	>1.2
Stands of Trees / Shrubs:	n/a	n/a
Wells/Water Bores:	>20	>20
Embankments / Retaining Walls:	>3	>3
Buildings:	>3	>3
Other:		

B 6: Please identify any site constraints applicable for this property, and indicate how the design process is to deal with these.

Constraints	Explain how constraints are being dealt with
1 Site constraints:	n/a

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PART C: SITE ASSESSMENT - SOIL INVESTIGATION

C 1: Soil Profile Determination Method

Test pit:		Depth (mm):		No. of Test pits:	
Bore hole:	x	Depth (mm):	1200	No. of Bore holes	2
Other:					

C 2: Fill Material

Was fill material intercepted during the subsoil investigation?

Yes:		No:	x

If yes, please specify the effect of the fill on wastewater disposal:

C 3: Permeability Testing

Has constant head Permeability Testing (Ksat) been carried out?

Yes:		No:	x

If yes, please indicate the details (test procedure, number of tests):

Test report attached?

Yes:		No:	x

C 4: SURFACE WATER CUT OFF DRAINS

Are surface water interception/diversion drains required?

Yes:		No:	x

C 5: DEPTH OF SEASONAL WATER TABLE:

Winter (m):	>1.2
Summer (m):	>1.2

Was this:

Measured:	✓ no sign of ground water or mottling in bore holes
Estimated:	

C 6: SHORT CIRCUITS

Are there any potential short circuit paths?

Yes:		No:	x

If yes, how have these been addressed?

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C 7: SOIL CATEGORY

Is topsoil present?

Yes:	x		**No:**	

If yes, what is the topsoil depth & soil description?

250mm dark brown silty topsoil overlying silty clay loam.

Indicate the disposal field soil category (as per AC TP-58, Table 5.1)

Category	Description	Drainage	(x)
1	Gravel, coarse sand	Rapid draining	
2	Coarse to medium sand	Free draining	
3	Medium-fine & loamy sand	Good draining	
4	Sandy loam, loam & silt loam	Moderate draining	
5	Sandy clay-loam, clay loam & silty clay-loar	Moderate to slow draining	x
6	Sandy clay, non-swelling clay & silty clay	Slow draining	
7	Swelling clay, grey clay & hardpan	Poorly or non-draining	

Reason for placing in stated category:

Result of bore hole/test pit sample	x
Profile from excavation	
Geotech report	
Other:	

C 8: SOIL STRUCTURE

Based on results of the in-situ soil profile investigation above (C7) please indicate the disposal (land application) field soil structure:

Massive	
Single grained	
Weak	
Moderate	x
Strong	

C 9: As necessary, provide qualifying notes on the relationship of Soil Category (C7) to Soil Structure (C8) and the effect this relationship will have on design loading rate selection:

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PART D: DISCHARGE DETAILS

D 1: Water supply source for the property:

Rain water (roof collection)	x
Bore/well	
Public supply	

D 2: Are water reduction fixtures being used?

Yes:		No:	x	(according to our knowledge at time of design report)

If 'yes' Please state:

Standard Fixtures include dual flush 11/5.5 or 6.3 litre toilet cisterns, and includes standard automatic washing machine, but a low water use dishwasher, no garbage grinder.

D 3: Daily volume of wastewater to be discharged:

No. of bedrooms/people:	1: (see attached design brief) 2: 3:
Design occupance (people): (as per AC TP-58, Table 6.1)	1: 2: 3:
	Black / Grey water
Per capita wastewater production (litres/person/day (as per ARC TP-58, Table 6.2)	1: 2: 3:
Total daily wastewater production (litres per day):	24960 L/day

D 4: Is daily wastewater discharge volume more than 2000 litres?

Yes:	x	No:	

D 5: Gross lot area to discharge ratio:

Gross lot area:	120000 m^2
Total daily wastewater production (litres/day):	24960 L
Lot area to discharge ratio:	4.81

D 6: Net Lot Area

Area of lot available for installation of the disposal (land application) field and reserve area:

Net lot area (m^2):	119000 m^2
Reserve area (m^2):	30%

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PART E: LAND DISPOSAL METHOD

E 1: Indicate the proposed loading method:

	Black / Grey Water
Gravity Dose:	
Dosing Siphon:	
Pump:	D53A/B

E 2: If a pump is being used please provide following information:

Total Design Head (m):	26.2
Pump Chamber Volume (litres):	22500
Emergency Storage Volume (litres):	15000

Is a high water level alarm being installed in pump chambers?

Yes:	x	No:	

E 3: Identify the type(s) of Land Disposal method proposed for this site:

	Black / Grey Water
P.C.D.I. Dripper Irrigation:	PCDI sub-surface laid
L.P.E.D. System:	
Evapo-Transpiration Beds:	
Other:	
	(as per Schematics attached)

E 4: Identify the Loading Rate proposed for option selected in E3:

as per ARC TP-58, Table 9.2 & Table 10.3	Black / Grey Water
Loading Rate (litres/m²/day):	3
Disposal Area Basal (m²):	
Areal (m²):	8320

E 6: Details and dimensions of the disposal (land application) field:

Length (m):		No. Lines:		Hole Size:	N/A
Width (m):		Spacing (m)	1.0	Hole Spacing:	N/A
Notes:	8320sqm of Sub-Surface laid PCDI dripline buried at 1m centers and covered with a minimum covering of 100mm topsoil. Installed in three separate areas. See design brief, site plan and schematic drawing attached.				

PART F: PROPOSED WASTEWATER TREATMENT SYSTEM

An Econotreat VBB-C-2200 will be installed at 15 of the 22 lots in the development. The VBB-C-2200 has a capacity of 2200 litres per day so the design flow at each lot will be well within the capacity of each treatment plant. Secondary treated effluent from each VBB-C-2200 will pump via a pressure sewer network to one of two 22500 litre pump stations. Each pump station pumps to a separate land application system. The six Kaumatua flats gravity drain to a common Econotreat VBB-C-2200 TWIN and then pumps to a 1280m2 land application system.

PART G: OPERATION AND MAINTENANCE OF SYSTEM

The operation of this complete system will be explained verbally to the owner by the Installer or Agent on Completion of Installation; also provided with Waterflow's Home Owner's Manual.

Waterflow NZ Ltd encourages the Home Owner to monitor and care for your Econotreat system yourself, with our backing and support, and by doing so you will learn how your system works and operates and how to keep it in top working order.

It is also recommended that a Maintenance Program contract is in place at all times to ensure this system is maintained at top performance at all times.

All on site wastewater systems require regular maintenance; in this case once annually is suffice and may be specified within the consent process by the Building Department of Far North District Council. This Maintenance will be recorded on hard copy and supplied to both the Owner and Far North District Council Compliance Officer if requested.

NOTE TO OWNER: All written records pertaining to the wastewater system should be retained in a safe place. When a change of ownership occurs, a full and complete history is able to be passed to the new owners.

Animals are to be physically excluded from the installed effluent field to avoid damage, and to reduce the risk of soil compaction in the vicinity of the bed.

Planting within this area is encouraged to assist with evapotranspiration by plants.

PART H: SOIL LOG PROFILE

250mm dark brown silty topsoil overlying silty clay loam. Soil Category 5, (as per AC TP-58, Table 5.1)

PART I: SITE IMAGES

WaterFlow
Bringing Clarity to Wastewater

DECLARATION

I, hereby certify that, to the best of my knowledge and belief, the information given in this application is true and complete.

Prepared By:	
Name:	**Matt Riddell - Approved Designer**
Signature:	
Date:	25/11/2024

Reviewed By:	
Name:	**Dean Hoyle - PS Author '3037' Auckland Council, NZQA Onsite Wastewater Training/Opus, BOINZ OWM, HBRC & FNDC Approved Designer**
Signature:	
Date:	25/11/2024

NOTE: The Waterflow Systems are to be installed by a registered drainlayer to the designs supplied by Waterflow NZ Ltd. All work to comply with Regional Council Water and Soil Plans.

Comments/Summary:

The disposal field will need to be protected from traffic and animal grazing. Planting this area is recommended to increase Evapotranspiration.

Suitable plants for the disposal field can be found on our website www.naturalflow.co.nz

Waterflow Treatment systems to be installed by accredited installer unless other arrangements have been made by Waterflow NZ Ltd

For more information do not hesitate to contact the team at Waterflow NZ Ltd on 0800 628 356

N

WaterFlow
Bringing Clarity to Wastewater

SITE LOCATION PLAN:

NGATI KURI TRUST BOARD
Te Paki Stream Rd
Te Paki
Section 7 & 14 SO 469373
12HA

SCALE:

1 : 74739

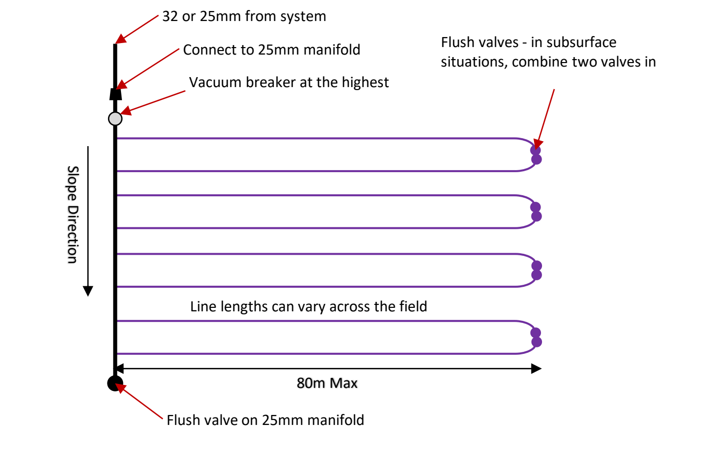
@ A3

WaterFlow
Bringing Clarity to Wastewater
PO Box 24
Maungaturoto
www.waterflow.co.nz

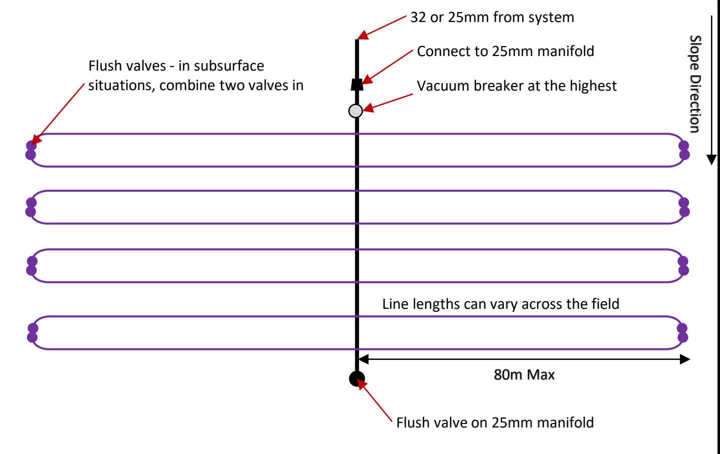
CLIENT	NGATI KURI TRUST BOARD
PROJECT	TE PAKI DUNES
TITLE	PROPOSED ONSITE WASTEWATER LAYOUT
DATE	29/11/24
DRAWN	MR
DESIGN	MR
CHECKED	CP
JOB No.	WF11616
SCALE.	1:2000@A3
DWG No.	WF11616-01
REV.	D

Common PCDI Layouts

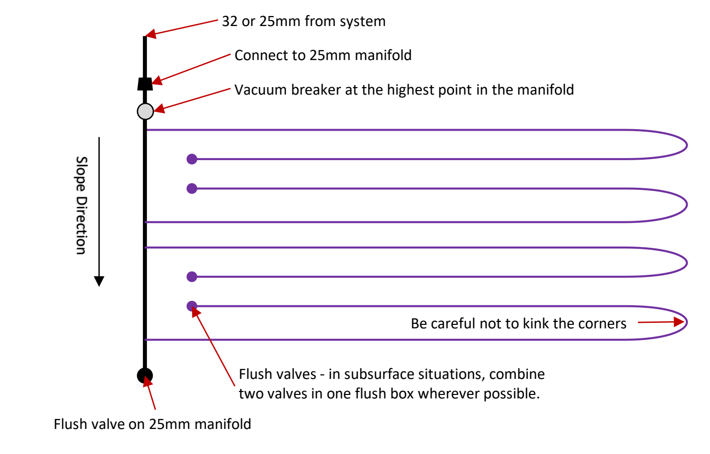
Single Side Manifold - straight



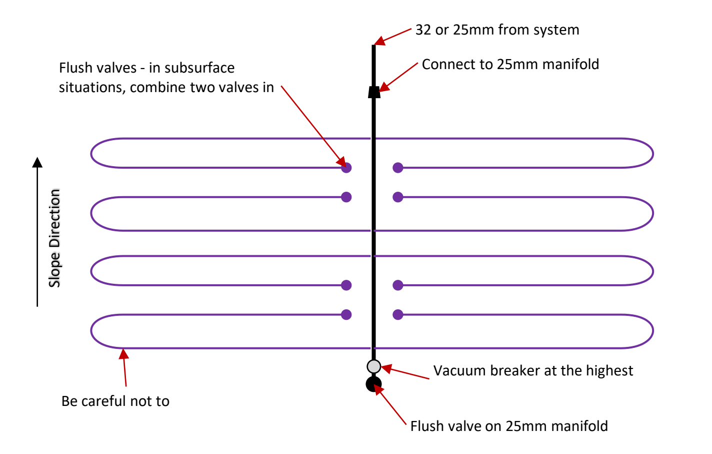
Single Center Manifold - straight



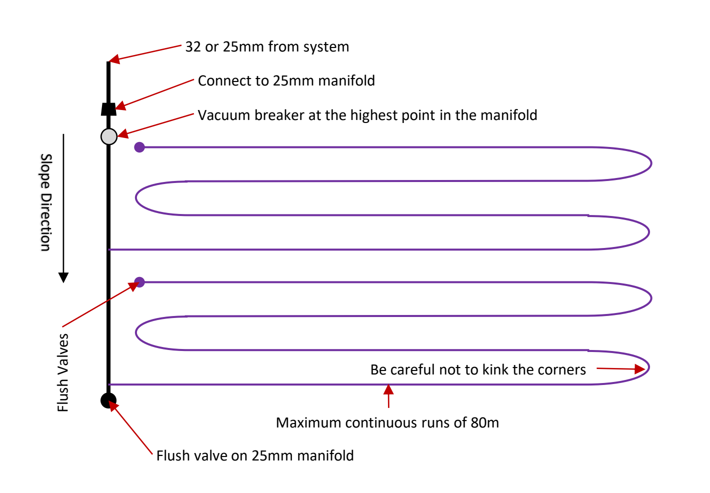
Single Side Manifold - curled



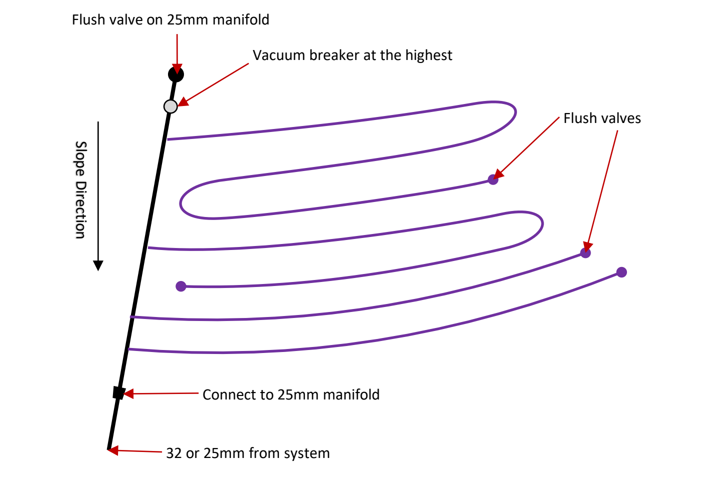
Single Center Manifold - curled



Long Single Runs



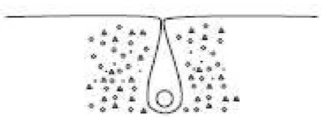
Custom Layout



Cross Sections of PCDi installation

150mm Mulch or Leaf Litter

Subsoil Buried @ 100-150mm

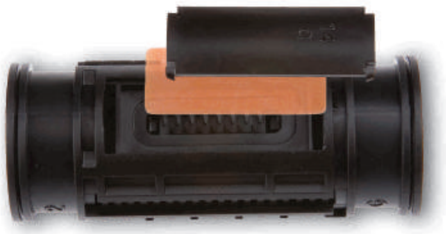


METZERPLAS

ADI

Cylindrical PC (Pressure Compensated) dripper.

- Cylindrical PC dripper, with unique regulating labyrinth with self-flushing operation at the beginning and the end of each irrigation cycle.
- Triple inlet filter with filtering area 10 times larger than any other dripper.
- High clog resistance.
- Suitable for poor quality and effluent water.
- Large pressure compensation range up to 4.3 bars.
- Dripline diameter: 16, 18 and 20 mm.
- Dripper flow rate: 1.6, 2.2 and 3.5 l/h.
- *Rootguard*® configuration available for extra root protection in SDI (Subsurface Drip Irrigation).



ADI Dripline Technical Data:

Model	Inside Diameter (mm)	Wall Thickness (mm)	Min. Working Pressure (bars)	Max. Working Pressure (bars)	KD
ADI 16	13.8	0.9	0.8	3.5	1.12
		1.15	0.8	4.3	0.95
ADI 18	15.8	1.2	0.8	4.3	0.95
ADI 20	17.4	1.0	0.8	3.5	0.85
		1.25	0.8	4.3	0.6

METZERPLAS IRRIGATION SYSTEMS
Kibbutz Metzer M.P. Heffer 38820 ISRAEL Tel: 972-4-6387001 Fax: 972-4-6385385
info@metzerplas.com • www.metzerplas.com

METZERPLAS

ADI

Cylindrical PC (Pressure Compensated) dripper.

ADI 16 mm. Maximum lateral length (I.D. 13.8 mm, W.T 0.9 mm, Inlet pressure 2.5 bars):

Nom. Flow Rate (l/h)	Spacing Between Drippers (m)						
	0.20	0.30	0.40	0.50	0.60	0.75	1.00
1.6	86	122	156	188	218	260	324
2.2	72	103	131	157	182	216	269
3.5	51	73	94	113	131	156	195

ADI 18 mm. Maximum lateral length (I.D. 15.8 mm, W.T 1.2 mm, Inlet pressure 2.5 bars):

Nom. Flow Rate (l/h)	Spacing Between Drippers (m)						
	0.20	0.30	0.40	0.50	0.60	0.75	1.00
2.0	93	134	171	205	238	284	355
3.5	65	92	118	142	166	198	247

ADI 20 mm. Maximum Lateral length (I.D. 17.4 mm, W.T 1.0 mm, Inlet pressure 2.5 bars):

Nom. Flow Rate (l/h)	Spacing Between Drippers (m)						
	0.20	0.30	0.40	0.50	0.60	0.75	1.00
1.6	128	182	234	281	325	388	484
2.2	113	159	202	242	279	331	409
3.5	76	109	140	168	196	233	291

For additional tables and data please contact Metzerplas Technical Department or visit our website: www.metzerplas.com

Packaging Data

Model	Roll Length (m)	Quantity Per Container (Rolls)		
		20	40	40 h
ADI 16	400	150	300	350
ADI 18	300	150	300	333
ADI 20	300	133	266	300

METZERPLAS
IRRIGATION SYSTEMS
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DAVEY

APPLICATIONS

> Non-potable rainwater applications
> Lawn and garden irrigation
> Sump emptying to higher heads
> Treated effluent disposal
> Water transfer from wells

D42A/B

D53A/B

Submersible Drainage Pumps

Model Numbers: D42A/B, D53A/B

Submersible sump pump with two and three impeller designs for higher pressure, up to 45m head.

WHY CHOOSE DAVEY SUBMERSIBLE DRAINAGE PUMPS?

Double mechanical seal, one in oil bath on motor and extra mechanical seal on pump
- Superior reliability
- Long service life

Corrosion resistant 304 stainless steel shaft, motor shell and fasteners
- Long service life

Cast 316 stainless steel motor caps and super tough engineered thermo plastic pump casing
- Outstanding corrosion resistance
- Long life

Centrifugal multistage 2 and 3 impeller designs
- Higher pressures and increased efficiency

Closed vane impellers with long engagement “D” drives
- Positive operation
- Long service life

Patented independently floating neck rings
- Outstanding pump performance
- Long pump life

Corrosion resistant hard wearing polycarbonate impellers
- Long service life

Corrosion resistant stainless steel fine mesh suction strainer with large surface area
- Prevents blockages of the pump by solids

In-built automatic thermal overload
- Protects the motor in the event of blockage or voltage supply problems

HO7RNF oil resistant leads, 10 metres long with 3 pin power plug
- Easy to connect to power supply
- Longer life in dirty water

proudly australian since 1934

Sump Pumps

DAVEY

OPERATING LIMITS

Type	D42A/B	D53A/B
Capacities to	120 lpm	130 lpm
Maximum total head	32m	45m
Maximum submergence	12m	
Maximum pumped water temperature	40°C	
Maximum soft solids	1.9mm O.D.	
Outlet size (BSP)	1" F	

SUITABLE FLUIDS

Clean water of neutral pH containing up to 1% small solids. Some wear should be expected while pumping hard solids in suspension.

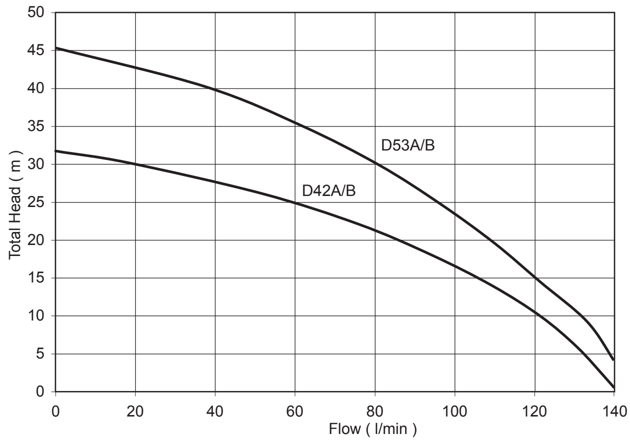
MATERIALS OF CONSTRUCTION

PART	MATERIAL
Impeller	Glass filled polycarbonate
Lock nut	304 stainless steel
Pump casing	Glass filled polycarbonate
Diffuser and blanking ring	Glass filled noryl
Mechanical seal – pump	Carbon / ceramic
Mechanical seal – motor	Silicon carbide / ceramic oil in bath
Shaft seal elastomer	Nitrile rubber
Pump shaft	304 stainless steel
O-rings	Nitrile rubber
Motor shell	304 stainless steel
Bottom bearing housing	Cast 316 stainless steel
Upper motor cover	Cast 316 stainless steel
Handle	304 stainless steel
Fasteners	304 stainless steel
Float and power supply leads	HO7RN-F oil resistant

ELECTRICAL DATA

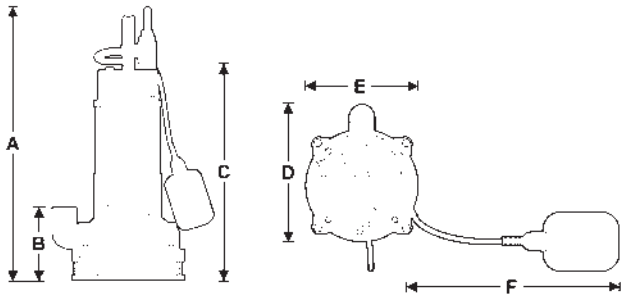
Type	D42A/B	D53A/B
Supply voltage	220-240V	
Supply frequency	50Hz single phase	
Speed	2 pole, 2850rpm	
Full load current (Run)	4.3A	5.7A
Locked rotor current (Start)	14A	
Input power (P_1)	1.00kW	1.31kW
Output power (P_2)	0.60kW	0.84kW
IP rating	X8	
Insulation class	Class F	
Starting	P.S.C.	
Lead	10m long	

HYDRAULIC PERFORMANCE



DIMENSIONS (MM)

Type	A	B	C	D	E	F	Outlet B.S.P.	Net Weight (kg)
D42A/B	475	130	370	235	195	330	1"F	10.8
D53A/B	535	170	430	235	195	330	1"F	16.5



INSTALLATION AND PRIMING

Use a rope to position and retrieve the pump. Do not lower or retrieve the pump using the power lead as this may damage the cable entry seals, causing water leaks and unsafe operation.

Do not use this product for recirculating or filtering swimming pools, spas, etc. While these pumps are built to high safety standards, they are not approved for installations where people will be in the water while they are operating.

Do not pump abrasive materials. Sand and grit in the water being pumped will accelerate wear, causing shortened pump life.

Keep your pump clean, particularly in situations where lint, hair or fibrous materials may get bound around the pump shaft. Regular inspection and cleaning will extend pump life.

Make room for the float switch to operate. Automatic models have a float switch to turn them on when the water level rises and turn them off again when it has been pumped down to the safe operating level of the pump. If the float switch is not free to rise and fall, correct pump operation may not be possible.

Do not run your pump dry. Non-automatic models must be switched off manually or by way of an external float/level switch when the water level is reduced to the top of the pump housing.

DWP0327-3/0818

Econotreat VBB-C-2200 Treatment System

System Specifications & Installation Instructions

The Treatment Process

Primary Chamber / Tank

Influent enters the chamber via the source whereby scum and solids capable of settling are separated from the raw influent. Primary treated effluent flows through a transfer port to the aeration tank. This primary tank will also act as a storage chamber for sludge returned from the Clarification Chamber.

After primary settling, the sewage passes through a Reln outlet filter.

Aeration Chamber

Water enters from the Primary Chamber. Air is introduced into this chamber via an air blower to create an environment for aerobic bacteria and other helpful organisms to consume the organic matter present. The aeration tank is designed in a manner to help prevent short circuiting of the wastewater to ensure extended aeration. Media is present in the tank to support the growth of bacteria.

Clarification Chamber

The Clarification chamber is essentially a quiescent zone where suspended particles/solids are settled out of the water. These particles are returned to the Primary chambers via a sludge return which aids in further biological reduction, denitrification and providing a constant food supply rich in microbes supporting the system through periods of limited flows.

System Performance

The Econotreat VBB-C-2200 system is capable of treating up to 2200L per day peak flow to an advanced secondary standard. The effluent is suitable for UV disinfection where required.

Benchmark Ratings
The **Waipapa Tanks Econo-Treat® VBB C-2200-2** system **achieved** the following effluent quality ratings:

Indicator Parameters	Median	Std Dev.	Rating	Rating System				
				A+	A	B	C	D
BOD (g/m^3)	3.4	1.5	A+	<5	<10	<20	<30	≥30
TSS (g/m^3)	4.98	3.49	A+	<5	<10	<20	<30	≥30
Total nitrogen TN (g/m^3)	13.6	1.3	A	<5	<15	<25	<30	≥30
Ammonia Nitrogen NH4-N (g/m^3)	1.1	1.8	A	<1	<5	<10	<20	≥20
Total phosphorus TP (g/m^3)	4.2	0.5	B	<1	<2	<5	<7	≥7
Faecal Coliforms FC (cfu/100mL)	11,200	50,196	B-	<10	<200	<10,000	<100,000	≥100,000
Energy (kWh/d) (mean)	1.8	-	B	0	<1	<2	<5	≥5

Compliance Requirements

All Econotreat Treatment Systems meet the requirements of the NZ Building Code G13-VM4.

Section 9 of AS/NZS 1546.1:2008 state that tanks constructed to these Standards will meet the requirements of the Code for Clauses B1 and B2, structure and durability.

Compliance with Section 9 of AS/NZS 1546.1:2008 and also Clauses G13.3.4 relating to on-site treatment and disposal systems and G14.3.1 and 14.3.2 relating to the control of foul water as an industrial waste.

Tank Specifications

Tanks are made of 50mpa Fiber Reinforced Concrete, which is suitable material for wastewater treatment containment meeting all the requirements of Section 4.3.3 of AS/NZS 1547:2012. These tanks have an expected lifespan of 50 years.

Dual Chamber Septic Tank
5200L Nominal Capacity
2500mm Long
1700mm Wide
1975mm High
- 3100kg

Aeration Tank
5200L Nominal Capacity
2500mm Long
1700mm Wide
1975mm High
- 2900kg

System Information
500L Pump Chamber
2120L Emergency Storage

Installation Location and Certification

These tanks are not designed for vehicle loads and shall be located no closer than 2m to a driveway, road frontage or a building. If for any reason the tank is located where vehicle traffic may drive over the tank or approach closer than 2m, or where it may be trampled on by farm stock then the tank should be protected by a concrete slab designed to support these loads. Surface water must also be diverted from flowing into the installation.

Installation must be certified to AS/NZS 1547:2012, the certificate to be issued and held by the regulatory authority.

High Water Table Installations

All tanks have been engineered and designed for maximum strength, in accordance with the NZC 3604. Clauses B1 and B2 for structure and durability, to withstand any hydraulic pressures, both lateral and uplift, created by high water table conditions.

In high water table installations, it is important to fill the tanks with water. This removes the hydraulic uplift and simplifies the installation. In extremely high-water tables, a concrete foot can be added to the tank during manufacture. Waterflow must be made aware of this early on in vies of supplying a tank that is fit for purpose.

Plumbing Pipes and Fittings

All internal plumbing is done with PVC pipes with appropriate connections according to AS/NZS 1260 and AS/NZS 4130.

Backfill and Bedding

Place and bed to NZBC G13/AS2, using compacted granular metal, in layers not exceeding 100mm.

Electrical

Where a pump is required on a flat site electrical connection must be installed according to AS/NZS 3000 and the control and alarm system must be in a weatherproof housing located in a readily visible position.

Warranty

WATERFLOW NZ LTD warrants that the Econotreat System will be free from defects in material and workmanship for the following periods of time from the date of installation as set out in the following conditions:

1. Concrete Tank 15yrs
2. Roto-Molded Tanks 15yrs
3. Nitto Blower 3yrs
4. Irrigation Pumps 2yrs
5. Warranty of Operation covers the performance of the Econotreat System as connected to the effluent inflow for which they are designed, and has been installed to the criteria as set out in the relative installation instructions and procedures, and has an assigned Service/Maintenance contract in place with Waterflow NZ Ltd or it's appointed agent/s.

Warranty excludes defects due to:

A) Failure to use the system in accordance with owner's manual.

B) A force majeure event outside the reasonable control of WATERFLOW NZ LTD such as (but not limited to) earthquake, fire, flood, soil subsidence, ground water table variations or plumbing fault.

C) Modifications to surrounding landscape contour after installation

D) The actions of a third party

E) The system required to bear loads (either hydraulic or biological) greater than that for which it was designed

F) Any modifications or repairs undertaken without the consent of WATERFLOW NZ LTD

G) Failure, where applicable, to fence and plant disposal field.

1st June 2014
Dean Hoyle
Managing Director

ECONOTREAT VBB-C-2200

System Specification & Installation Instructions

Econotreat VBB-C-2200 Installation Instructions

The Econotreat system is to be installed or signed off by a registered Drain layer to the design specified by Waterflow NZ Ltd.

The following installation instructions and procedures followed correctly will ensure System performance is not compromised in any way.

1. Excavate two 3m x 2m level platforms at an appropriate depth to ensure adequate fall for inlet pipe from the source. This has to be installed on virgin ground. The two platforms are ideally on the same level and next to each other, either side-by-side or end-on-end.
2. Lay 100mm of bedding metal on platform and place the Septic and Aeration tanks next to each other. As close as practically possible to minimize the connection distance between the tanks.
3. Connect the two tanks with 100mm PVC. If the tanks are side-by-side the connection will need supporting. This is done by tying it back to the wire on the lids with a length of rope supplied. The rope can be found in the top of the treatment tank.

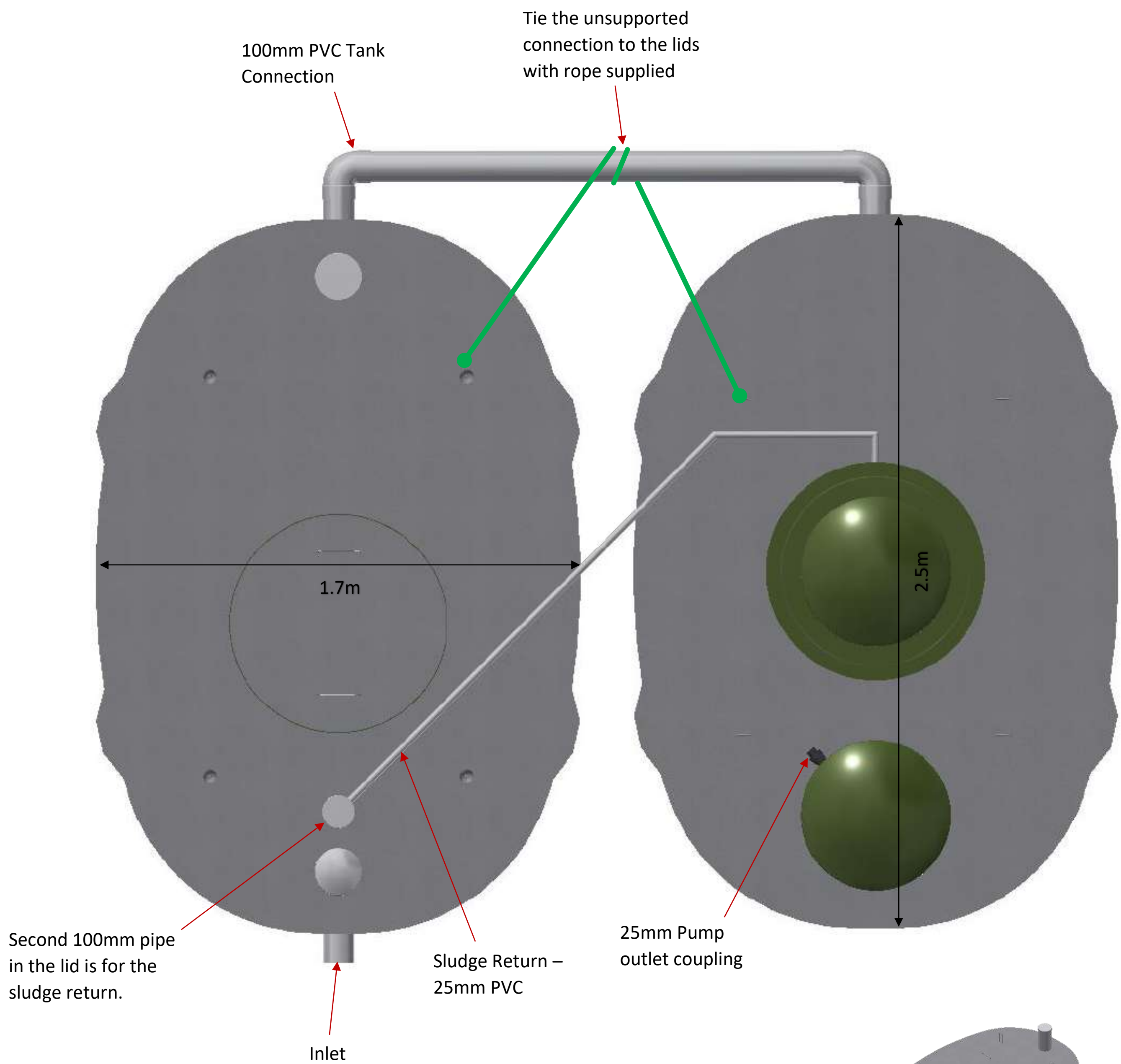
4. Next connect the sludge return. This is a 25mm PVC pipe that come out of the central riser on the treatment tank. This must be plumbed back to the second 100mm PVC at the start of the septic tank. It is important that this pipe is falling slightly or at minimum flat.
5. Trench from Dose Chamber outlet to disposal field and lay the 25mm alkathene feed line.
6. Take a minimum of 3 photos at this point to showing connections and back fill, to ensure correct installation for sign off.
7. Back fill around tanks. Using spoil from the excavation is fine, be aware that this will settle over time though.

Caution: System must be protected from excessive super imposed loads both lateral and top loads. E.g. loads from vehicular traffic. There needs to be at least 2m of clearance maintained around system.

Econotreat VBB-C-2200 Schematic Drawings

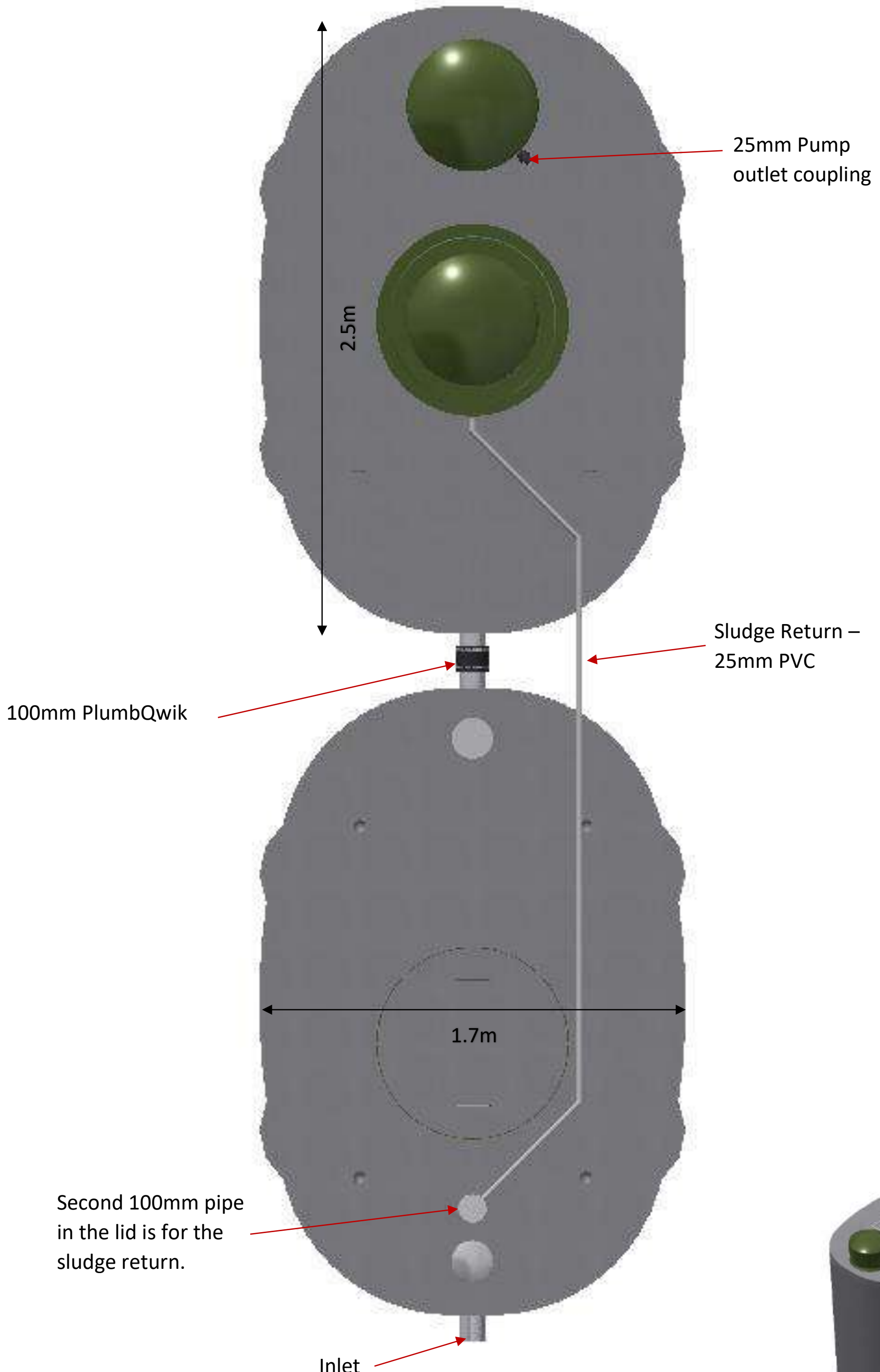
Econotreat VBB-C-2200 Schematic Drawings

Side by Side Installation



Econotreat VBB-C-2200 Schematic Drawings

End on End Installation



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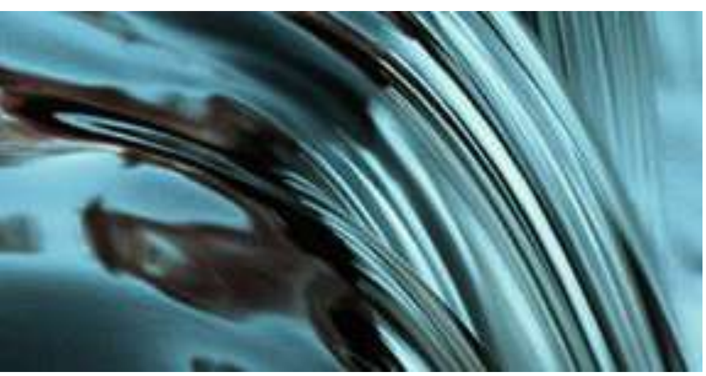
0800 SEWAGE

Or for more information www.waterflow.co.nz



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E. sales@waterflow.co.nz
www.waterflow.co.nz

Assessment of Environmental Effects

NGATI KURI TRUST BOARD of Te Paki Stream Rd, Te Paki
Section 7 & 14 SO 469373

1.1 Description of Proposal

The proposed development includes the construction of 21 new two, three and four bedroom dwellings as a part of a Papakainga development. Wastewater from 15 of the 21 dwellings will drain to it own onsite wastewater treatment plant. Each of the wastewater treatment plants will pump secondary treated wastewater to one of two pump stations. Each pump station will pump a separate land application system. The six Kaumatua flats gravity drain to a common Econotreat VBB-C-2200 TWIN and then pumps to a 1280m2 land application system.

1.2 Site Description

The proposed development is located on the western and eastern sides of Te Paki Stream Rd and has a total area of approximately 12 hectares. The parent lots have a legal description of Section 7 & 14 SO 469373. The site is mainly covered in rough grass and occassional vegetation. There are several overland flow paths throughout the development. The western side of the site has a high point at the north-western corner and slopes towards the east and south. The eastern side has a high point to the south and slopes towards the north and east.

1.3 Wastewater Volume

In calculating the wastewater flows we have allowed for a maximum occupancy of 156 persons in 21 new dwellings (as per AC TP-58, Table 6.1). Total wastewater production for the development of 24,960 litres per day is based on an allowance of 160 litres per person per day (as per ARC TP-58, Table 6.2), which is conservative given that water supply is roof collected rain water and standard water fixtures will be used throughout the new houses.

1.4 Wastewater Treatment

An Econotreat VBB-C-2200 will be installed at 15 of the 21 lots. The VBB-C-2200 has a capacity of 2200 litres per day so the design flow at each lot will be well within the capacity of each treatment plant. Secondary treated effluent from each VBB-C-2200 will pump via a pressure sewer network to one of two 22500 litre pump station. Each pump station pumps to one of two land application systems. The six Kaumatua flats gravity drain to a common Econotreat VBB-C-2200 TWIN and then pumps to a 1280m2 land application system.

The system will be capable of producing reductions in Biochemical Oxygen Demand, Total Suspended Solids, Nitrogen, and Coliforms to a standard that meets the requirements (see details below). The system will cater for the wastewater requirements of the private dwellings (domestic wastewater) and will not service any commercial or trade waste sources. Risk Minor to Nil.

1.5 Proposed Treatment System

The objective of the treatment system is to reduce and remove much of the contaminants from the wastewater prior to discharge into the receiving soil. This will improve the long-term performance of the disposal field as well as reducing the risk to the receiving environment. The system will consist of:

- Septic Tank Module
- EconoTreat VBB-C-2200
- Land Application System

The system is constructed using concrete tanks. The system produces treated effluent with BOD <20mg/l, Suspended solids <20mg/l.

1.6 Land Application System

The proposed irrigation system uses pressure-compensating dripper lines ensuring an even delivery of moisture over the entire irrigation field and a conservative DLR of 3mm. We propose the use of Metzerplas unibioline ADI16/2.2 @ 0.6m/c with the Dripline laid out at 1m centres. This Dripline will then be covered by 100mm topsoil. Densely planting this area will greatly enhance evapo-transpiration and be very beneficial especially in the wetter months of the year. This irrigation can be installed in conjunction with existing or proposed landscaping.

1.7 Surface & Ground Water

It is proposed to treat the water to a high standard prior to discharge and the proposed irrigation system will introduce the water into the topsoil horizon using PCDI irrigation. A low application rate of treated effluent into the topsoil will significantly reduce the likelihood of, any breakout or runoff or any risk of surface water contamination. With the ground water levels being >1.2m this conservative DLR also means the risk of ground water contamination is virtually nil. A majority of the undeveloped areas of this site are suitable for a PCDI disposal field when the necessary setbacks are observed. Risk Minor to Nil.

1.8 Air Quality

The proposed EconoTreat VBB-C-2200 system will produce no noticeable odour when functioning correctly. Any odour will be contained within the tanks. The PCDI irrigation system will load the soil at a rate that should not cause ponding, spraying or aerosol of the effluent that could potentially cause odours. Risk Minor to Nil.

1.9 Visual Impact

The tanks are installed wholly below ground level with only the lids being visible. The lids will protrude approximately 100mm to prevent egress of storm water into the system. The disposal field will be located in a purpose designed mulched and intensively planted disposal area. Warning signs may be installed to indicate the presence of the disposal area, although probably not necessary in a domestic situation, also the area may be fenced to restrict access.

1.10 Environmental Risks

Risks are associated with this proposal are minor. The treatment system will be automated, and the Home Owner will be given a 'Home Owners Care Guide' which explains the necessary visual checks to ensure no issues arise with the system, specifically – solids build-up - high water level – discharge failure – filter blockage.

Peak flow into the system are not expected to be significant and the system includes a large emergency storage volume.

1.11 Maintenance Requirements

The maintenance requirement of this system is minimal, with the system fully automated. The system requires little input from the operator apart from the regular cleaning of the outlet filter between the treatment system and the Dripline field. All other maintenance interventions must be carried out by service persons familiar with the operation of the system and approved by the manufacturer. Maintenance may include checking of the dissolved oxygen levels, cleaning of effluent outlet filter, removal of excess sludge volume, checking of control panel function, etc… .

The disposal field is quite possibly the most important and sensitive part of the treatment system and requires a reasonable amount of maintenance to keep it functioning well. Any leaking or damaged Dripline must be fixed quickly using the appropriate materials, the planting must be maintained, weeds removed and grass kept cut. The Dripline should be kept covered with a suitable bark, mulch, or topsoil.

Advanced Secondary Treatment

Econotreat Aerated Wastewater Systems

Home Owners Guide

Contents

To the Home Owner

Thank you for choosing an Econotreat System to treat and care for your on-site sewage and wastewater.

Your Econotreat System is fully automatic in operation and requires little owner intervention to ensure years of service. It is useful that the owner/operator of the system understand some of the broad concepts of the system operation. This manual has been written to provide this simple explanation and to serve as a future reference so that you can ensure that the system is operating effectively at all times.

We would encourage you to monitor and care for your Econotreat system with our backing and support and by doing so you will learn how your system works and operates and how to keep it in top working order. Waterflow promises consistent results year after year.

Kind regards,
The Waterflow Team

Warranty

WATERFLOW NZ LTD warrants that the Econotreat System will be free from defects in material and workmanship for the following periods of time from the date of installation as set out in the following conditions:

1. Concrete Tank 15yrs
2. Roto-Molded Tanks 15yrs
3. Nitto Blower 2yrs
4. Irrigation Pumps 2yrs
5. Warranty of Operation covers the performance of the NaturalFlow System as connected to the effluent inflow for which they are designed, and has been installed to the criteria as set out in the relative installation instructions and procedures, and has an assigned Service/Maintenance contract in place with Waterflow NZ Ltd or it’s appointed agent/s.

Warranty excludes defects due to:

A) Failure to use the system in accordance with owner’s manual.

B) A force majeure event outside the reasonable control of WATERFLOW NZ LTD such as (but not limited to) earthquake, fire, flood, soil subsidence, ground water table variations or plumbing fault.

C) Modifications to surrounding landscape contour after installation

D) The actions of a third party

E) The system required to bear loads (either hydraulic or biological) greater than that for which it was designed

F) Any modifications or repairs undertaken without the consent of WATERFLOW NZ LTD

G) Failure, where applicable, to fence and plant disposal field.

How it Works

Primary Chamber / Tank

Influent enters the chamber via the source whereby scum and solids capable of settling are separated from the raw influent. Primary treated effluent flows through a transfer port to the aeration tank. This tank will also act as a storage chamber for sludge returned via the Clarification Chamber.

Aeration Chamber

Water enters via the Primary Chamber. Air is introduced into this chamber via an air blower to create an environment for aerobic bacteria and other helpful organisms to consume the organic matter present. The aeration tank is designed in a manner to help prevent short circuiting of the wastewater to ensure extended aeration. Media is also present in the tank to support the growth of bacteria.

Clarification Chamber

The Clarification chamber is essentially a quiescent zone where suspended particles/solids are settled out of the water. These particles are returned to the Primary chambers via a sludge return which aids in further biological reduction, denitrification and providing a constant food supply rich in microbes supporting the system through periods of limited flows.

Servicing

Your Econotreat System requires annual service and maintenance inspections (this can vary depending on local council regulations). This will need to be done by our trained technicians. We will phone to arrange a suitable time to attend to your servicing needs.

A record sheet (in triplicate) will be completed by our technician at the time of service. One copy is for you the customer and available upon payment, another is sent off to Council and the third copy will be retained for our records.

Please call our office on the number listed at the back of this manual for the cost of servicing after the initial 12-month period.

1. A general inspection of tank area, irrigation and drainage.

2. Inspection of electrical equipment including timer, Low powered Blower, irrigation pump, warning lights and connections.

3. Inspection of Pump-out Chamber and septic tank, checking air lines, adjusting air supply (if necessary), operating de-sludging unit, resetting air control, operating submersible switch, checking bio-mass growth, checking sludge level.

4. Inspection of irrigation including lines, jets and outlets. Between 4 - 9 years the tank will need to be de-sludged (pumped out) as with any septic tank. We will notify you of this requirement, as the service technicians will be monitoring sludge depth annually.

Holiday Precautions

There are no precautions to take. Your Econotreat can be left to function automatically for 6 to 12 months. However, if you are likely to be away from home for more than six months you may like to contact our office, so we can make a routine check.

Responsibility

As the owner of the system, you are responsible for the correct operation and maintenance and to conform to Council's requirements.

Slowly remove irrigation cap (unscrew anti- clockwise). It is important to unscrew slowly to allow any built-up pressure to be relieved. Watch out for the O-ring inside the cap, be careful not to drop this in the tank.

Problem Solving

To ensure the most effective operation of your Econotreat System you should familiarize yourself with the contents of this manual. The Econotreat has been designed to include additional safety margins and minor mishaps and normal household usage will not usually affect the operation of the system.

However, if the alarm sounds or strong odors persist Please call your service agent.

Area of Concern	Potential Cause	Remedial Action
Alarm sounds	Irrigation pump not working Air supply not working No power at the tank	Check water levels Listen for the air compressor Check power supply source
Water around tank	Irrigation pump not working Irrigation lines blocked or kinked	Check water levels Check irrigation lines and clear sprinklers
Excessive foaming	Too much laundry detergent Too many washes	Use recommended quantities Spread wash loads over different days
Persistent odors	Too much water usage Excessive chemicals in use	Add biologic starter pack Install water saving devices System will recover
Irrigation system not working	Pump failure Irrigation lines blocked	Check water level Clear irrigation lines
Water ponding on irrigation field	Irrigation line blocked Excessive water use Broken irrigation pipe	Installation should comply with original approval Install water saving devices Repair irrigation pipe

Do not flush baby wipes down toilets

Caring for Your Wastewater System

Components of Your Complete Wastewater Septic System

A typical wastewater septic system has two main components: a Wastewater Treatment System and a Land Application System (or disposal field). This is simply treatment then discharge.

Efficient Water Use – 'it does make a difference'

Average indoor water use in the typical single-family home is approximately 180ltrs per person per day. The more water a household conserves, the less water enters the septic system. Efficient water use can improve the operation of the wastewater system and reduce any risk of disposal field overload.

High-efficiency toilets

Toilet use accounts for 25 to 30 percent of household water use.

Do you know how many liters of water your toilet uses to flush? Most older homes have toilets with 11+ liter reservoirs, while newer high-efficiency dual flush toilets use 6.3/5.5ltrs or down to 4.5/3ltrs of water per flush. N.B. Did you know leaky toilets can waste as much as 700ltrs each day.

Consider reducing the volume of water in the toilet tank with a volume displacer (fancy name for a brick, stone etc!) if you don't have a high-efficiency model or replacing your existing toilets with high efficiency models.

Check to make sure your toilet's reservoir isn't leaking into the bowl. Add five drops of liquid food coloring to the reservoir before bed. If the dye is in the bowl the next morning, the reservoir is leaking, and repairs are needed.

Water fixtures

A small drip from a faucet may add many liters of unnecessary water to your system every day. To see how much a leak adds to your water usage, place a cup under the drip for 10 minutes. Multiply the amount of water in the cup by 144 (the number of minutes in 24 hours, divided by 10). This is the total amount of clean water travelling to your septic system each day from that little leak.

Faucet aerators and high efficiency showerheads

Faucet aerators help reduce water use and the volume of water entering your septic system. High-efficiency showerheads also reduce water use.

Washing machines

By selecting the proper load size, you'll reduce wastewater. Washing small loads of laundry on the large-load cycle wastes precious water and energy. If you can't select load size, run only full loads of laundry. N.B. A new Energy Star washing machine uses 35 percent less energy and 50 percent less water than a standard model.

Watch your drains!

What goes down the drain can have a major impact on how well your wastewater system works.

What shouldn't you flush down your toilet?

Dental floss, feminine hygiene products, diapers, cotton swabs, cigarette butts, cat litter, and other kitchen and bathroom items that can clog and potentially damage septic system components if they become trapped. Flushing household chemicals, gasoline, oil, pesticides, antifreeze, and paint can also stress or destroy the biological treatment taking place in the system or might contaminate surface or ground waters.

Care for your Land Application System

Your land application system is an important part of your wastewater system. Here are a few things you should do to maintain it:

- Flush driplines regularly – every 3 months recommended
- Plant only recommended wetland plants over and near your wastewater system. Roots from nearby trees or shrubs might clog and damage the drain field
- Don't drive or park vehicles on any part of your wastewater system. Doing so can compact the soil
- in your drain field or damage the pipes, tank, or other septic system components
- Do not build any structures over it or seal it with concrete, asphalt etc.
- Keep roof drains, basement sump pump drains, and other rainwater or surface water drainage systems away from the drain field. Flooding the drain field with excessive water slows down or stops treatment processes and can cause plumbing fixtures to back up
- Trees with very aggressive roots, such as willows, should be kept well away from the disposal system, see page 11 for list of recommended planting
- A soggy drain field won't absorb and neutralize liquid waste. Plan landscaping, roof gutters and foundation drains so that excess water is diverted away from the Land Application System

Household Cleaning Chemicals

Effects on Wastewater and Disposal System Receiving Environments

Use of many cleaning chemicals in facilities served by on-site disposal systems, can result in high concentrations of the constituents in those cleaning agents being discharged into the receiving soils. These chemicals and constituents can have a massive impact on the quality and condition of the receiving soils over time.

Many of the chemicals can disrupt soil structure and decrease hydraulic conductivity while others can act as bactericides, destroying the essential micro-organisms required to achieve the high level of biodegradation in the treatment and disposal systems.

The following matters need to be considered when using cleaning agents in a domestic situation:

- Laundry powders are often extremely high in sodium which will destroy the salt balance in the soils. Check the labels for low sodium and phosphorous contents.

- Wastewater flow from dishwashing machines can have an impact on wastewater treatment systems, in terms of the strong cleaning chemicals used, so check labels for low sodium products

- Highly corrosive cleaners (such as toilet and drain cleaners) that have precautionary labels warning users to minimize direct contact, are an indication that they can adversely affect the wastewater treatment system. Up to 1 cup of bactericides such as bleach can be sufficient to impact on all the microorganisms/bugs in a septic system.

Recommended Cleaning Brands:

eco STORE

earthwise
caring for your world

Cleaning Substitutes

Substitutes for Household Cleaning Chemicals (Ref TP58)

Use of the following readily biodegradable substitutes for common potentially harmful household cleaning chemicals will reduce the stress on any wastewater system, significantly enhance the performance of the whole system and increase the life of the land application system, while reducing the potential effects of the receiving soils.

General Cleaners

Use soft soap cleaners and bio-degradable cleaners and those low in chlorine levels.

Ammonia-Based Cleaners

Instead sprinkle baking soda on a damp sponge.

Disinfectants

In preference use Borax (sold in most Bin Inn stores): ½ cup in 4-litres of water.

Drain De-Cloggers

Avoid using de-clogging chemicals. Instead use a plunger or metal snake or remove and clean trap.

Scouring Cleaners and Powders

Instead sprinkle baking soda on a damp sponge or add 4-Tbs baking soda to 1-Litre warm water. It's cheaper and won't scratch.

Toilet Cleaners

Sprinkle on baking soda, then scrub with toilet brush.

Laundry Detergent

Choose one with a zero-phosphate content and low in alkaline salts (in particular, a low sodium level) and no chlorine.

Oven Cleaners

Sprinkle salt on drips, then scrub. Use baking soda and scouring pads on older spills.

In a Nutshell

Because your system is fully automatic there is no need for the owner to be concerned. However, there are some simple precautions to observe:

DO

- Avoid using strong acids, alkalis, oils and chemicals in your toilet, bathroom, laundry and kitchen (too much can kill off the working "bugs").
- Limit the use of water in the dwelling.
- Try to spread wash loads over different days.
- Try to avoid using the washing machine and shower at the same time.
- Front loader washing machines reduce water usage.
- If your system requires power supply make sure this remains on continuously, unless system is being serviced.
- Check faucets and toilets for leaks; make repairs if necessary.
- Use low flush toilets where possible.
- Use a 'displacer' to reduce the amount of water needed to flush older toilets.
- Use aerators on faucets and flow reducer nozzles on showers to help lower water consumption.
- Reduce water levels for small loads of laundry.
- Wait until the dishwasher is full to run it.
- Densely plant your field to maximize transpiration.
- Perform regular monthly visual checks of your system and field.
- Grass should be mowed or trimmed regularly to optimize growth and prevent the grass from becoming rank.
- Use signs, fences and/or plantings to prevent any vehicle or stock access.
- Keep records of all maintenance undertaken on the wastewater systems.
- Monitor and care for your Wastewater System as per instructions in the home owner's manual.

DON'T

- Switch off power unless servicing
- Use chlorine-based disinfectant & cleaning products in the toilets or kitchen sink (Cleaners high in chlorine, phosphorous or ammonia must not be used)
- Over use heavy cleaners that kill beneficial bacteria in the septic system
- Pour any toxic/strong chemicals (paint, oil, grease, paint thinners or pesticides) down any drains
- Flush down your toilet – Dental floss, feminine hygiene products, diapers, cotton swabs, cigarette butts, cat litter, and other kitchen and bathroom items
- Discard any drugs down the sink or toilet
- Alter or add any part of your system without Waterflow NZ LTD's approval
- Never turn the system off, even when away on holidays.

Plants Suitable for Onsite Wastewater Disposal Systems

Plantings that will soon have your field looking magnificent!

Below are some of the most common of native and other plant species that are tolerant or fond of moist conditions, such as those associated with wastewater disposal fields.

Cordyline australis

Apodasia similis

Alocasis nigrescens

Carexx secta

- Alocasia nigrescens (Black Taro)
- Apodasmia similis (Oioi)
- Arthropodium Matapouri Bay
- (Rengarenga Lily)
- Carex dispacea
- Carex dissita
- Carex maorica
- Carex secta
- Carex tenuiculmis
- Carex virgata
- Cordyline australis (Cabbage Tree)
- Cordyline Midnight Star
- Leptospermum Burgundy Queen
- (Flowering Ti Tree)
- Lomandra Tanika
- Phomium Surfer

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Memo

Date: 13 December 2024
Our Ref: 15656

To:	Mike Yelavich	Project Manager | Far North Roading
Prepared By:	Nat Jull	Civil Engineer | Chester

Subject: 2230588-RMALUC – Amendment to Consent

1 Introduction

Chester has been engaged by Far North Roading Limited to provide design support for the implementation of civil works consented under 2230588-RMALUC by the FNDC for the Ngāti Kuri Trust Board. Our scope is limited to stormwater, roading and associated earthworks. We have not completed any specific geotechnical investigation or assessment.

The propose of this memo is to provide civil engineering comment on the proposed layout changes with respect to stormwater, roading and earthworks. It is intended to support an application to amend the consent.

2 Background

Through early contractor engagement and detailed design, it has been identified that a change to the general layout of Lots 16 to 20 (as shown on the consented pans by Geologix) is beneficial to the project. Please refer to attachments A & B for comparison between the two layouts.

In general, the changes look to:

- Maintain the existing access point to Te Paki Stream Road.
- Extend the road up the hill and then traverse along the contour to enable the houses to be situated on flatter ground. Reducing overall earthworks and complexity associated with positioning houses on steep slopes.
- Maintain stormwater discharge to the sites existing flow paths with specifically designed erosion and scour control measures.

3 Statement

We believe that the proposed layout changes regarding access, stormwater, and earthworks align with the overall intent and recommendations of the initial technical reports submitted for consent. Therefore, these changes are consistent with the anticipated and approved construction activities.

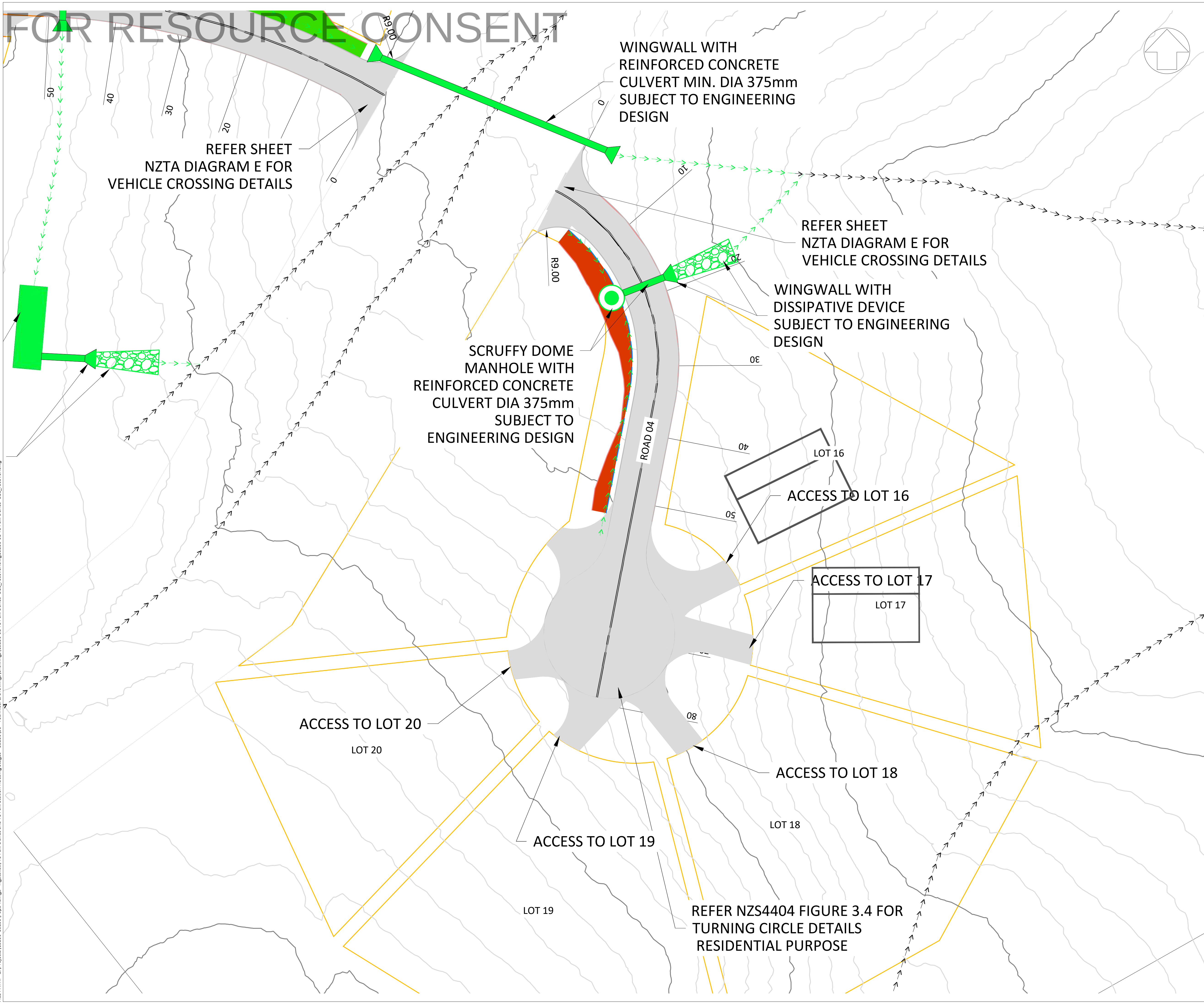
Nat Jull

Civil Engineer

List of Appendices

A. Geologix Consented Site Plan
B. Draft Proposed Site Plan

Attachment A – Geologix Consented Site Plan



GENERAL NOTES

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

CUT
FILL
CARRIAGEWAY EXTENT
PROPOSED SWALE DRAIN & FLOW DIRECTION
EXISTING OVERLAND FLOWPATH
PROPOSED SW PIPE & MANHOLE
PROPOSED DISSIPATIVE DEVICE
PROPOSED POND
PROPOSED WINGWALL & CULVERT

Meters
5 0 5 10
1:500

Revision	Issue	Date
B	CONSENT	12/09/2023
A	CONSENT	16/06/2023

geologix consulting engineers
AUCKLAND | NORTHLAND

Project Name and Address
TE PAKI DUNES
SECTION 14 SO 469373, SECTION 23 SO 46937
SECTION 7 SO 469373

Project: C0286
Drawn By: TI & GC

Client
NGATA KURI TRUST BOARD

Sheet Title
ROAD 04 CH 0.0 - 80.0

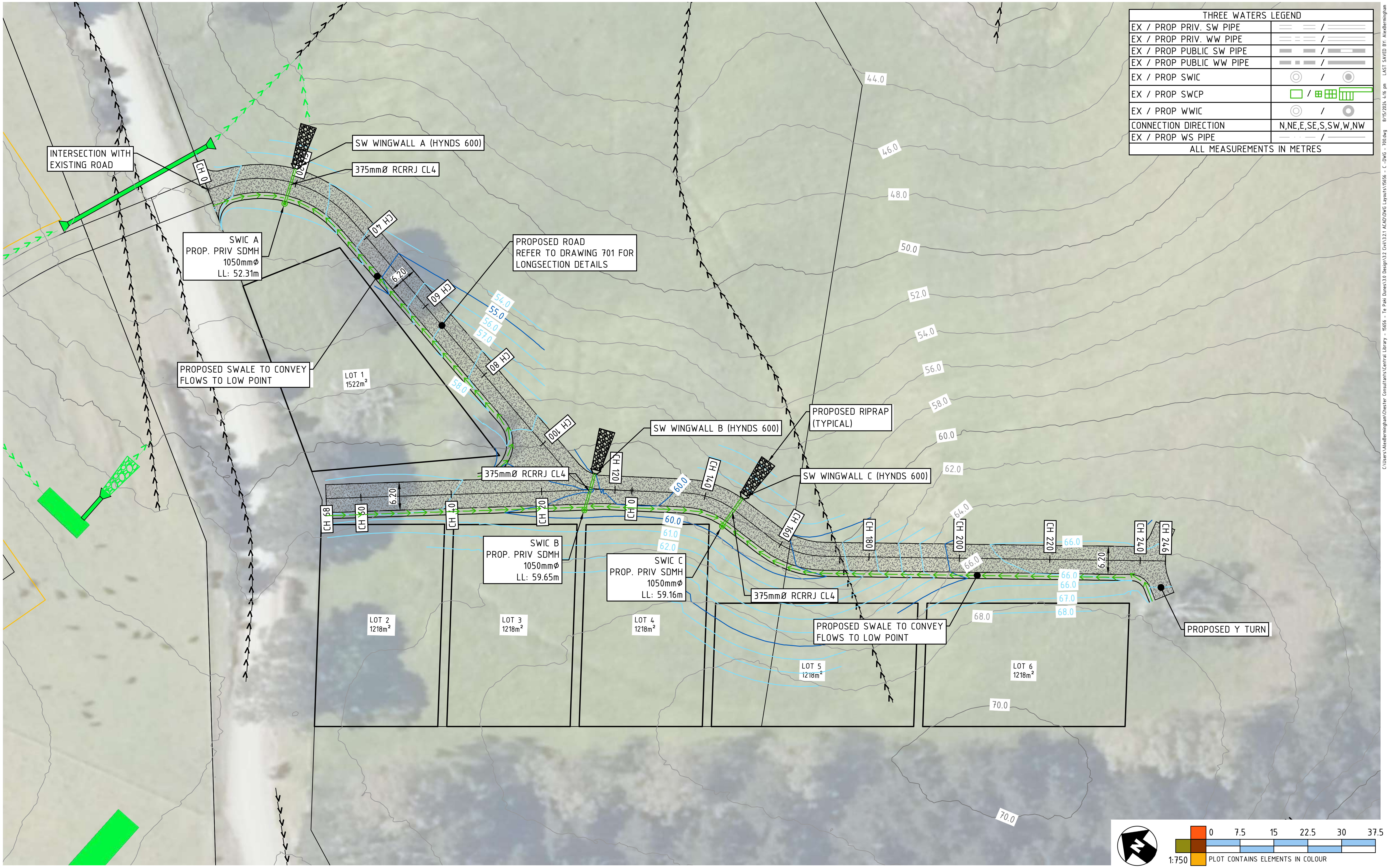
Sheet
1014

FILE PATH: Z:\Projects\C0200-C0299\Papā Kāinga - Ngātakaiti, Te Paki Dunes and Te Paki Station Housing Stages - C0286\06 - Technical & Drawings\Drawings\C0286-01 Te Paki Dunes- EGL_recover.dwg\C0286-01 Te Paki Dunes- EGL_recover.dwg

PLOTTED: 03/04/2022

Appendix A – Draft Proposed Site Plan

CHESTER CONSULTANTS LTD
E: ADMIN@CHESTER.CO.NZ P: +64 9 481 0024
LEVEL 1, CHESTER BUILDING, 28 THE WAREHOUSE WAY, NORTHCOTE, AUCKLAND 0627
PO BOX 34405, AUCKLAND 0746
WWW.CHESTER.CO.NZ



Drafter: A BERMINGHAM	Job Title: CIVIL DESIGN - PUBLIC DRAINAGE & COMMON ACCESS WAY	Drawing: 700	Rev: 0
Designer: P LIEBENBERG	Client: FAR NORTH ROADING GROUP LTD	Scale: 1:750 @ A3	
Checker: R LUNDY	Address: TE PAKI STREAM ROAD, TE PAKI	Project: 15656	
Date: 15/08/2024	Drawing Title: ROADING PLAN	Issue: COORDINATION	

Rev	Date	Amendments	By

DRAFT
FOR COMMENT ONLY

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Te Paki Dunes – Landscape Memorandum

Date: 18/12/2024

Prepared for: Myles Gordon, Northern Regional Lead, Rubix

Site Location: Te Paki Dunes, Cape Reinga

Memo Number:
2412_NGATI_KURI_PAPAKAINGA_TE_PAKI_DUNES_MEMO_LSCAPE_FINAL_R00

Status: FINAL

Revision: 00

Memo Author: Chris Campbell

QA/QC Check: Richard Greenwood

Qualifications of author

This memorandum was prepared by Christopher 'Chris' Campbell. Chris has 18 years of professional experience as a landscape architect (BLA (Hons.) – Lincoln University, NZ (2004) and is a Senior Associate at Greenwood Associates. Chris heads our landscape assessment department and has personally authored 65 landscape assessment reports since early 2020. Chris has appeared as an expert witness at resource consent hearings and has recently been accepted as a commissioner through the 'making good decisions' programme.

Purpose of this memorandum

This memorandum has been prepared to support a change in layout at the eastern extents of the Te Paki Dunes development. The extent of this change is outlined below and has seen the previous 'rotary arrangement' of six (6) dwellings be modified to a linear arrangement. The amount of dwellings remains unchanged.

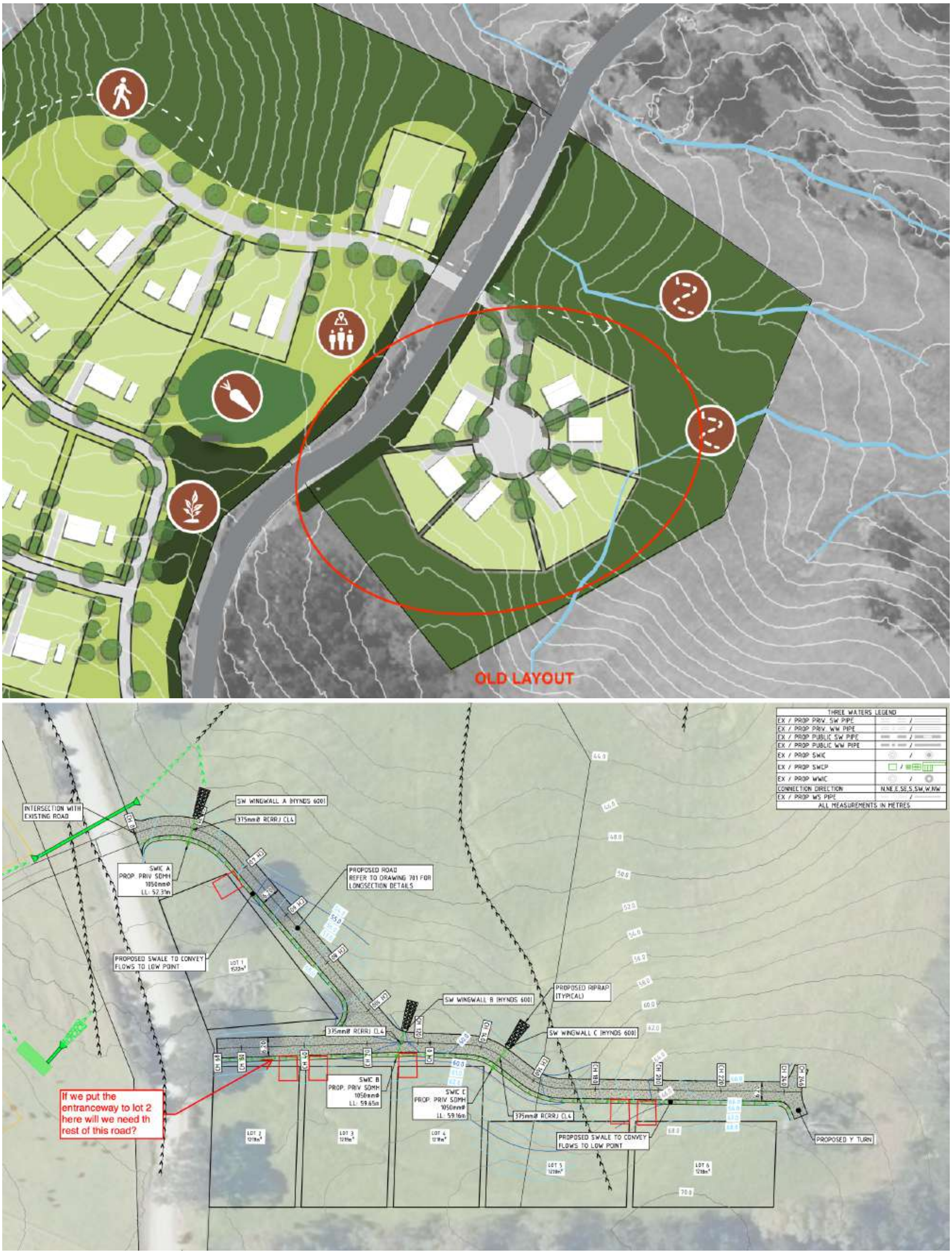


Figure 1: Comparison of original layout (top images) and modified layout (lower image)

I have reviewed the original landscape assessment *'Ngāti Kuri Te Paki Dunes Papakāinga – Landscape Visual Impact Assessment'* authored by Gary Marshall and dated 19th September 2023 and will use this as the basis of my assessment.

Original Landscape Assessment

Section 10 – Conclusion

Through his conclusions (section 10 – original landscape assessment) Mr. Marshall has stated the following;

'……The Papakāinga design is sympathetic to the local landscape, taking the underlying hydrological and ecological patterns as a core design driver and enabling Ngāti Kuri customary relationships to the whenua…..'

'……On balance, the papakāinga development is understood as having far more positive effects on the overall landscape values for the immediate site and the wider context than adverse impacts, aligning the landscape character of the site with the underlying Natural Open Space/Conservation zoning and Treaty Settlement Overlay.'

Section 8.2 – Visual Envelope, Viewpoints and Landscape Effects

In terms of the area of change, Mr. Marshall has provided two viewpoints, viewpoint 2 and viewpoint 3, that will view the area of change from the north and south respectively.

Section 8.2.2 – Viewpoint 02: Te Paki Stream Road, Te Paki

The original text prepared by Mr. Marshall is outlined below, I have added ***emphasis*** to the portions that I consider have the potential to be effected by the aforementioned change in building arrangement

'Viewing Audience
The viewing audience consists of tāngata who whakapapa to Ngāti Kuri Rohe, people who work and or live in the area, and visitors to the area who are travelling to Te Paki Dunes or other local attractions by car.

Context
The site is located on two sections of sloped pasture flanking either side of Te Paki Stream Road – a small unsealed road located off State Highway 1, Cape Reinga Road, and the main access road to Te Paki Dunes. This area sits within the conservation zone, but is predominantly rural in character and use, with little formal infrastructure outside of the metal road and farm fencing.

Landscape Character
The Te Paki Dunes site is characterised by rolling exotic grasslands with some erodible slopes, forming shallow gullies, stream channels and wetlands. The

surrounding area is predominantly used for ruminant grazing, but also includes small isolated patches of regenerating indigenous scrub alongside stands of ageing Macrocarpa, Eucalyptus and Wilding Pine. The working rural landscape is punctuated by occasional houses, farm buildings, fences and races.
The nearby Te Paki Dunes are a unique ecological context, with significant areas of indigenous scrub and gumlands clustered around the dunes, beach and freshwater wetlands. As an area rich in natural resources, there is a long history of Ngāti Kuri occupation, evidenced by both Iwi and Hapu histories and archeological evidence.30 As outlined in the AEE, the selected development area is not known to have archaeological sites present; however, an Accidental Discovery Protocol is advised as being sufficient from Ngāti Kuri in case these resources are present.

Visual Effects
This viewpoint photo looks across the site, showing rolling hills covered in pasture, with some exotic trees, piles of dead logs, scrub and distant vegetated ridgelines. ***During and immediately after construction, the Papakāinga will be visible****. Once construction is complete and* ***planting of screening and shelter trees and revegetation have had time to grow, it is likely that only view shafts down the entrances of the Papakāinga will allow views of the building footprint****.*
The ***scale of the proposed development relative to the surrounding vegetation and existing buildings means the proposal will have a Moderate effect for transitory viewing audiences due to the fleeting nature in which they will encounter the development****. For* ***viewing audiences who have a more enduring relationship with the local landscape****, including Ngāti Kuri members who whakapapa to Te Paki Whenua and the local community****, the development can be considered as having a Low - Moderate visual effect in the short term during and immediately after construction (0-5 years) ; and a Low to Positive effect over the medium to long term (10-15 years) as the ngahere revegetation establishes, helping the built form to recede into the surrounding landscape and establishing a sense of character more in keeping with the local ecology and conservation/natural open space zoning.***

Landscape Effects

The proposed development will introduce new Papakāinga into a relatively typical, far-north rural landscape character.
For the ***transitory viewing audience*** *driving along Te Paki Stream Road, the introduction of Papakāinga and the associated infrastructure and ecological restoration will be experienced primarily through visual effects.* ***For this viewing audience, the introduction of Papakāinga will be experienced driving along Te Paki Stream Rd, in fleeting glimpses as part of a longer journey.*** *The development* ***is likely to be visible from Te Paki Stream Rd and therefore has a Moderate effect in the short term (1-5 years). In the medium to longer-term (5-15 years), as the ngahere revegetation establishes****, the development and associated infrastructure will recede into the landscape, and the* ***visual effect for this group will be Low****.*

*For **people who work and or live in the area**, the introduction of Papakāinga and the associated infrastructure and ecological restoration is **likely to have a Low - Moderate effect in the short term (0-5 years), with the development introducing a higher level of residential density than previously experienced in this context. However, in the Medium (5-10 years) and Long Term (10-15 years), this effect is likely to become Low - Positive, recognising that this Papakāinga development incorporates significant revegetation, including the protection and maintenance of water bodies and the preservation of Taonga Species**. It is anticipated that many of the people who live or work in this area are either Ngāti Kuri Whanau or conservation and scientific research professionals due to the location of the site within both a unique ecological context and a block of customary Ngāti Kuri land. As a result, it is assumed that this group of people will support the overall ecological and cultural goals that underpin the Papakāinga design within this context.*

For Tāngata who whakapapa to Ngāti Kuri Rohe and Te Paki Whenua, the introduction of Papakāinga and the associated infrastructure and ecological restoration will have a Positive effect, as this development will help to fulfil Ngāti Kuri landscape values and aspirations around Whenua, Rangatiratanga, Mātauranga, Kaitiakitanga, Taonga Tuku Iho and Ahikāroa.

Landscape Mitigation Measures

*The **Papakāinga development will not be visible from this viewpoint, however the overall adverse landscape effects that may arise from the development of this Papakāinga will be mitigated through screening and the use of natural tones and recessive colours of the buildings inspired by the Ngāti Kuri Rohe. Extensive revegetation planting will progress concurrently with the early stages of dwelling development. It will surround and screen the development over the medium to long term (5-15 years), improving the existing landscape's local biodiversity and vegetative cover**.*

In addition to mitigating the visual effects of the development during construction, the Papakāinga development integrates a wide range of ecological and cultural features into the design that provides positive landscape effects.

These include:

- *Native revegetation planting*
- *Native shelterbelts*
- *Specimen trees*
- *Māra kai*
- *Batter Planting*
- *Areas to highlight and protect Ngāti Kuri taonga species*
- *A blue-green network, including wastewater dispersal field planted with native vegetation, vegetated stormwater conveyance and detention devices, wetland restoration.*

Summary of Effects

In summary, the ***effects on the landscape character and values range from Moderate for a transitory viewing audience in the short term (0-5) years, and Low for a transitory viewing audience in the medium to long term (5-15 years) as the proposed revegetation screens the development and adds to the overall ecological character of the landscape.***

For people who work and or live in the area and Tāngata who whakapapa to Ngāti Kuri Rohe and Te Paki Whenua, the effects on landscape character are Very Low-Positive*. While the proposed Papakāinga will have some effect on the landscape's character and values in the short term (0-5years),* ***the extensive mitigation planting will have an overall positive impact on the indigenous biodiversity values for the site*** *and local environs which is more in keeping with the Conservation Zoning of the current FNDPO and Natural Open Space Zoning and Treaty Settlement overlay of the Future FNDPP than the existing rural character. In line with this, the long term aspirations for the site will help to fulfil Ngāti Kuri landscape values and aspirations around Whenua, Rangatiratanga, Mātauranga, Kaitiakitanga, Taonga Tuku Iho and Ahikāroa.'*

Having reviews the above, I note that Mr. Marshall makes no mention of the physical layout of the anticipated built-form but rather refers to the proposed planting for mitigation of any potential adverse effects arising from the implementation of built-form within the landscape.

Having reviewed the landscape architectural drawings (*'Planting Landscape Package for Ngāti Kuri Trust Board' dated 04/09/2024')*, drawings 1875/01 and 1875/11 demonstrate that a vast area of native planting is to be planted around the affected area of change. The change from a rotary layout to a linear layout does not affect the ability to achieve this level of planting mitigation across the landscape.

Therefore, I am of the opinion that the change from a rotary layout to a linear layout will not increase (nor decrease) the level of effects outlined by Mr. Marshall for 'viewpoint 2'

Section 8.2.3 – Viewpoint 03: Te Paki Stream Road, Te Paki

Mr. Marshall has identified the 'viewing audience', 'context', 'landscape character'. 'visual effects', 'landscape effects', 'landscape mitigation measures' and 'summary of effects' as being the same as viewpoint 02.

Therefore, my assessment with regards to viewpoint 02 outlined above can also be considered applicable to viewpoint 03.

Remainder of original Landscape Assessment Report

Having reviewed the remainder of the report (outside of the above aforementioned sections), Mr. Marshall does not make mention of the layout of the affected area of change, but does make multiple mentions of the proposed planting and the fact that it will provide visual screening towards the development during both the earthwork stage and when the development is completed.

Therefore, it can be concluded that it is the landscape response to the site, as opposed to the layout of built-form that Mr. Marshall has relied on to ascribe his rating of effects.

Conclusion

Having reviewed the original landscape assessment, I am of the opinion that Mr. Marshall has relied on the proposed planting response to ascribe is rating of effects to the proposal.

Having reviewed the landscape architectural plans, I am of the opinion that the same level of mitigation through planting can be achieved with the amended linear layout of the six (6) kaumatua housing units as could be achieved with the original rotary layout.

Therefore, I am of the opinion that the conclusions reached by Mr. Marshall in the original landscape assessment remain applicable to the modified layout of the site and remain unchanged.

Chris Campbell BLA(Hons.)
Senior Associate - Landscape Architect

2 Te Paia Lane, Kaitaia
Phone (09) 408 0979
PO Box 62, Awanui 0451
GST No: 107-240-918

19th November 2024
Att: Parson Architecture & PanelLock

To Whom it may Concern

Good Ground Report for Proposed New Dwelling at Lot 16 Te Paki Stream Road, Cape Reinga.

FNR Consulting have been engaged by Ngati Kuri to carry out geotechnical testing for a proposed new dwelling with an approximate floor area of 82m^2. A total of four scala penetrometer tests were conducted, while one hand auger was tested under a neighboring dwelling in Lot 17.

Testing was carried out in general accordance with the requirements of NZS 3604 and NZS 4402.

The test locations are shown in the attached plans and photographs, with the test results also attached to this document.

The NZLI Soils Map describes the soils in this area as: **Rangiuru Clay**.

Observations

The site soils appeared to be consistent with the NZLI Soils Map description, with clay observed in the hand auger testing across the subdivision. Based on the soil samples, the clay appeared to have a high plasticity and was moderately sensitive. In general, the clay was also loose to medium dense and has a firm consistency. The soil appeared to be either dry or moist, while the ground water level (GWL) was not reached over the 2.0m depth tested. Refer to the attached hand auger results for a full soil profile of the nearest hand auger conducted in the centre of the building in Lot 17.

The site had been levelled, with material excavated to the existing ground level (i.e. the tests were performed in the undisturbed natural ground not fill material). Topsoil had not been spread over the house site at the time of testing.

There are no visual signs of slope instability in the vicinity of the building site and the proposed position of the building relative to the adjacent slope is appropriate and does not pose a risk in terms of slope stability.

The site classification based on site reactivity in accordance with AS2870-2011 Table 2.1 is **Class S – Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.**

Liquefaction Risk

A desk-top study of liquefaction risk for this site has been undertaken.

"The area of Northland is identified to be at low risk of seismic hazard. There are no active faults known in the Far North. Small earthquakes will give short duration shaking that may not have enough cycles to cause liquefaction. Microzoning studies are probably not required as the hazard is low (GNS 2004)" - Regional Liquefaction Vulnerability Assessment – Far North District, prepared by Vision Consulting for FNDC 20/01/2023.

According to the above referenced report, and associated mapping, the Liquefaction Vulnerability Category for this site is "unlikely". This indicates that "there is a probability of more than 85% that liquefaction-induced ground damage will be None to Minor for 500-year shaking".

Based on the above it is considered that the liquefaction vulnerability for this site is low and that the expected degree of liquefaction induced ground damage is none to minor.

Scala Results

The penetrometer testing (attached below) indicated that the in-situ soils did not achieve “Good Ground” (as per the NZS 3604 definition) criteria in two of the test locations along the southern side of the building over the 1.95m test depth tested. “Good Ground” was reached in the remaining two test locations 1.40m and 1.55m below the current ground surface. It is recommended that a specific engineered design is used when designing the foundations for this building.

Yours Sincerely

Manu Burkhardt Macrae
BE, CMEngNZ, 253797
Attachments:

- *Site Plan and Test Locations; Photos; Scala Test Reports, Hand Auger Test Results, FNDC Liquefaction Risk Map.*

Site Plan

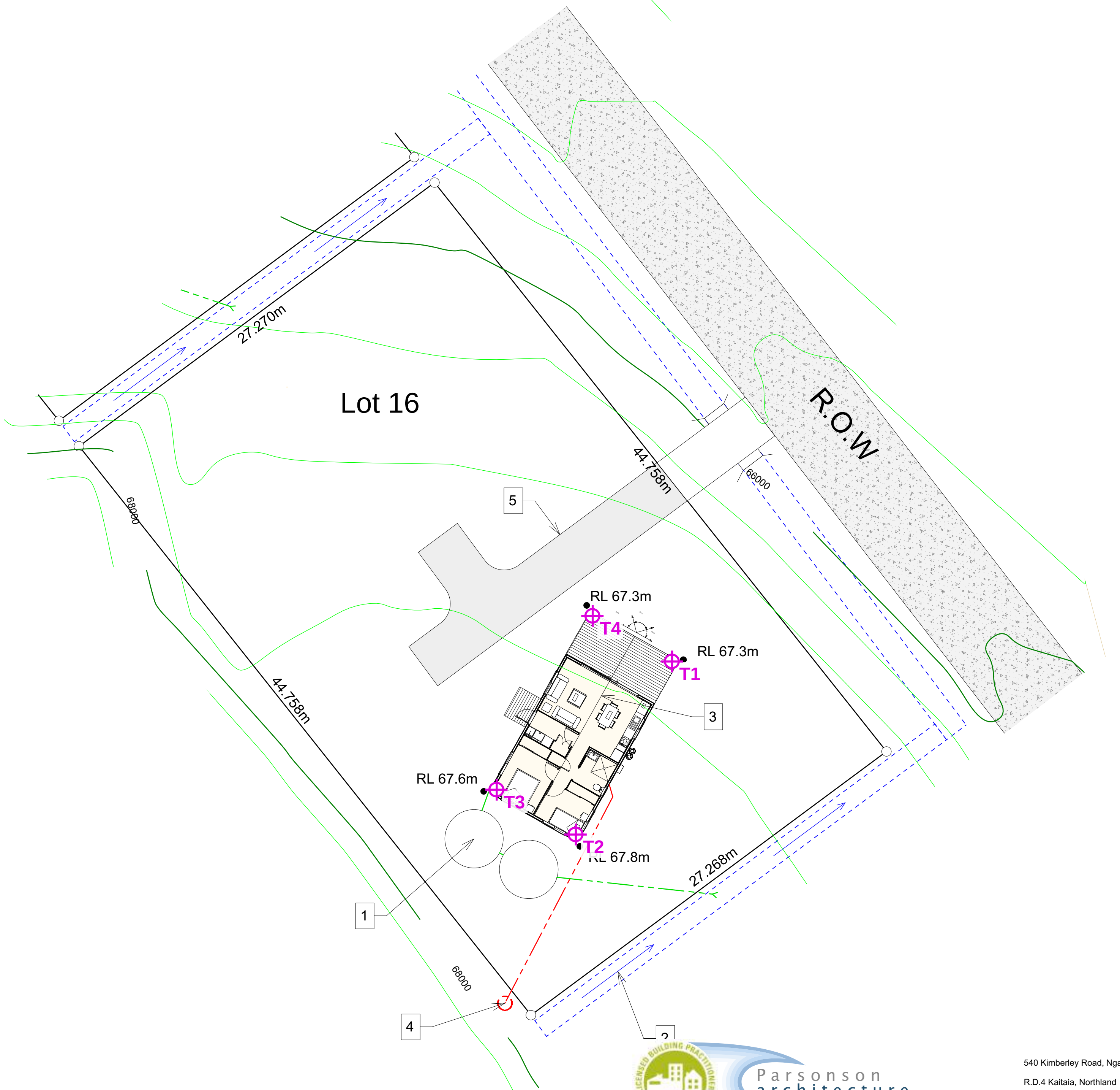
Notes

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN
126524

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:1000	DWG # A01
DWG	Te Paki Dunes Locality Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

Test Locations



N

Notes

1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 68.510
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	71m2
Impermeable Surfaces	=	153m2
Total Site Coverage	=	12%

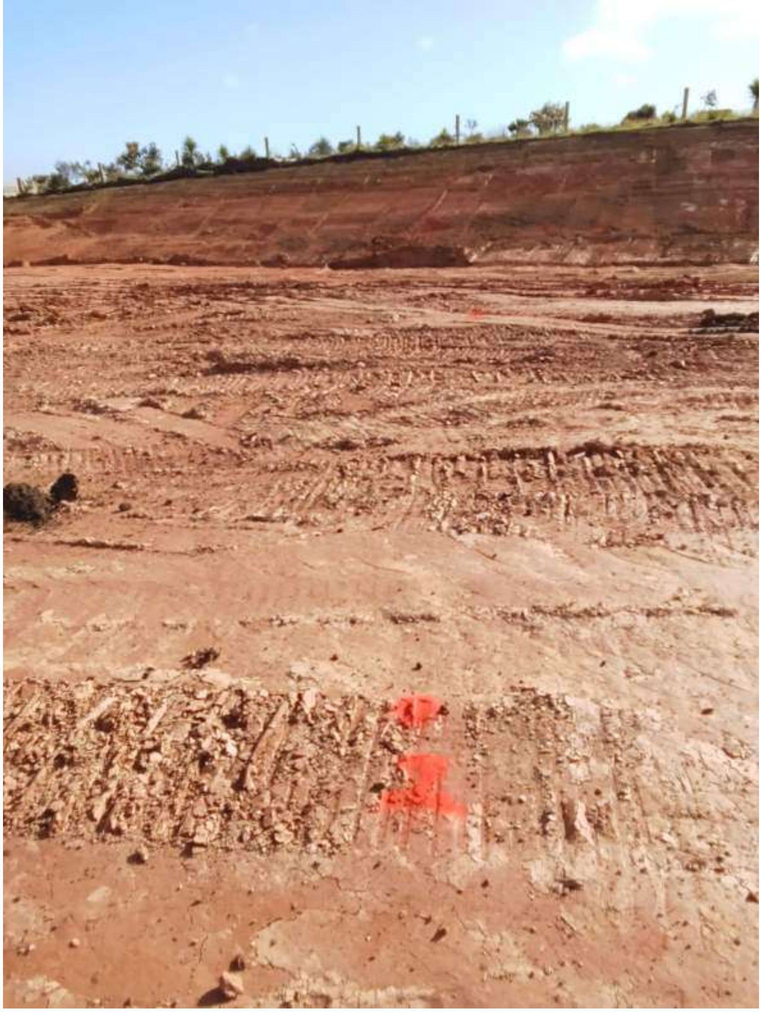
126524

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

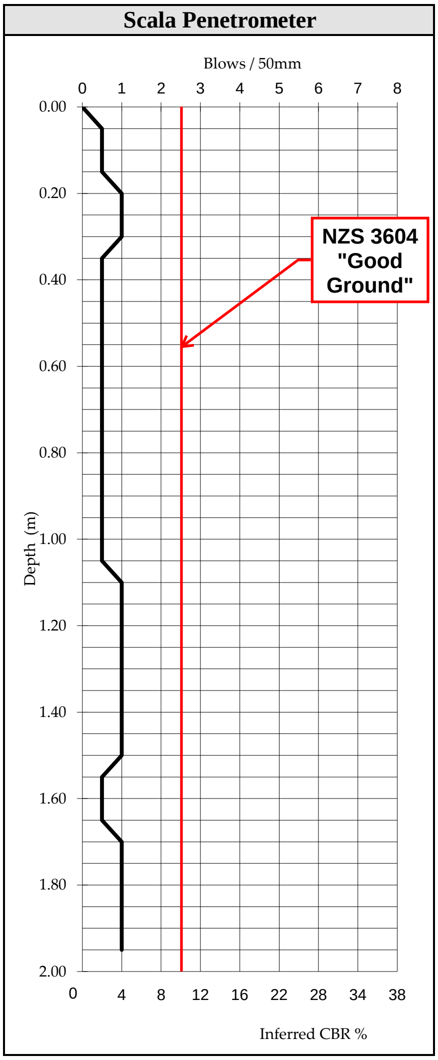
ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:250	DWG # A07
DWG	Te Paki Dunes Site 6 Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

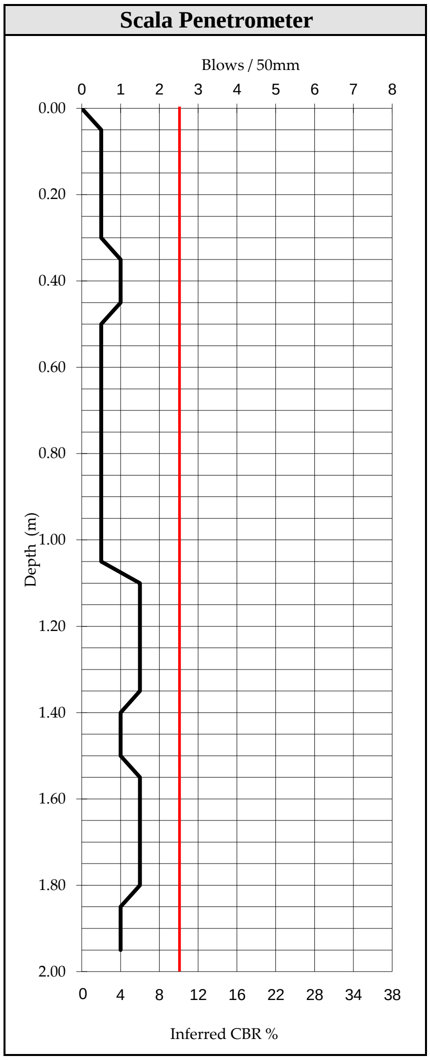
Scala Test Locations 1 - 4

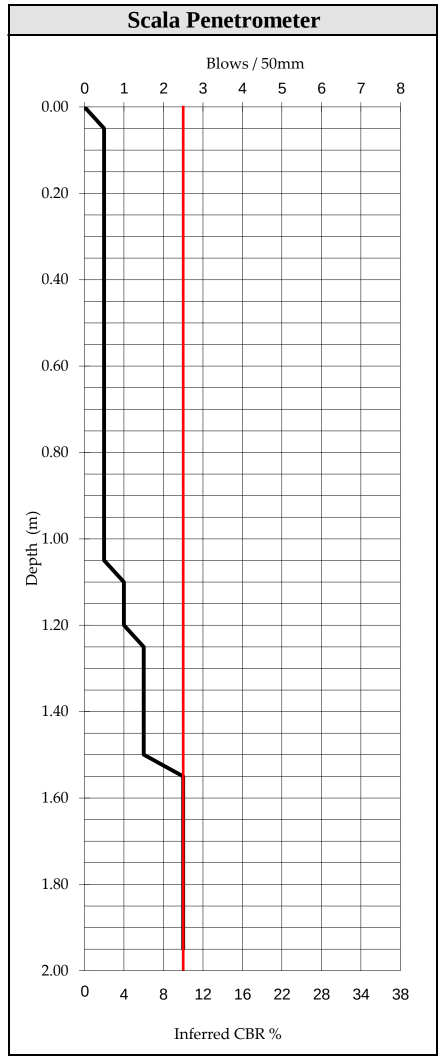


SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	1	Test number :	2	Test number :	3
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	Ex. GL	Reduced level :	Ex. GL







Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2

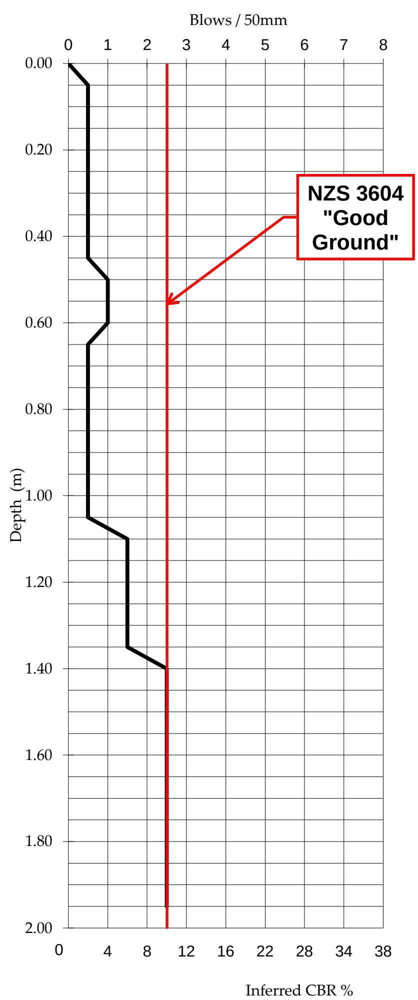
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

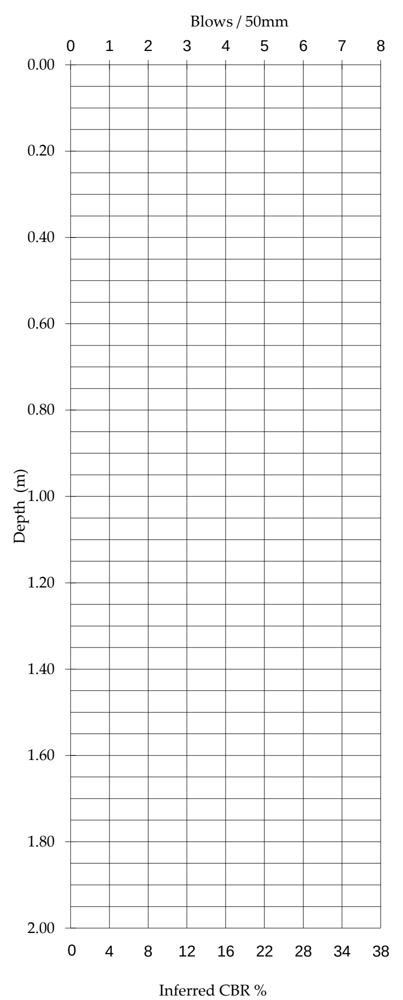
SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 16, Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	4	Test number :	N/A	Test number :	N/A
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	N/A	Reduced level :	N/A

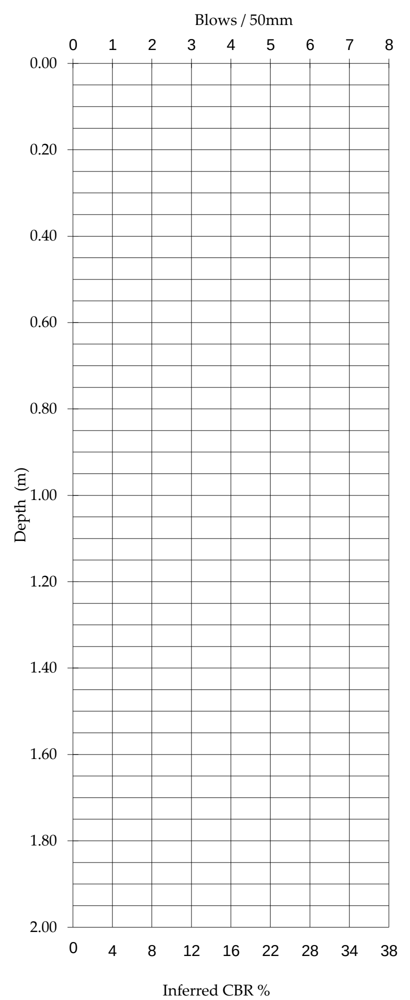
Scala Penetrometer



Scala Penetrometer



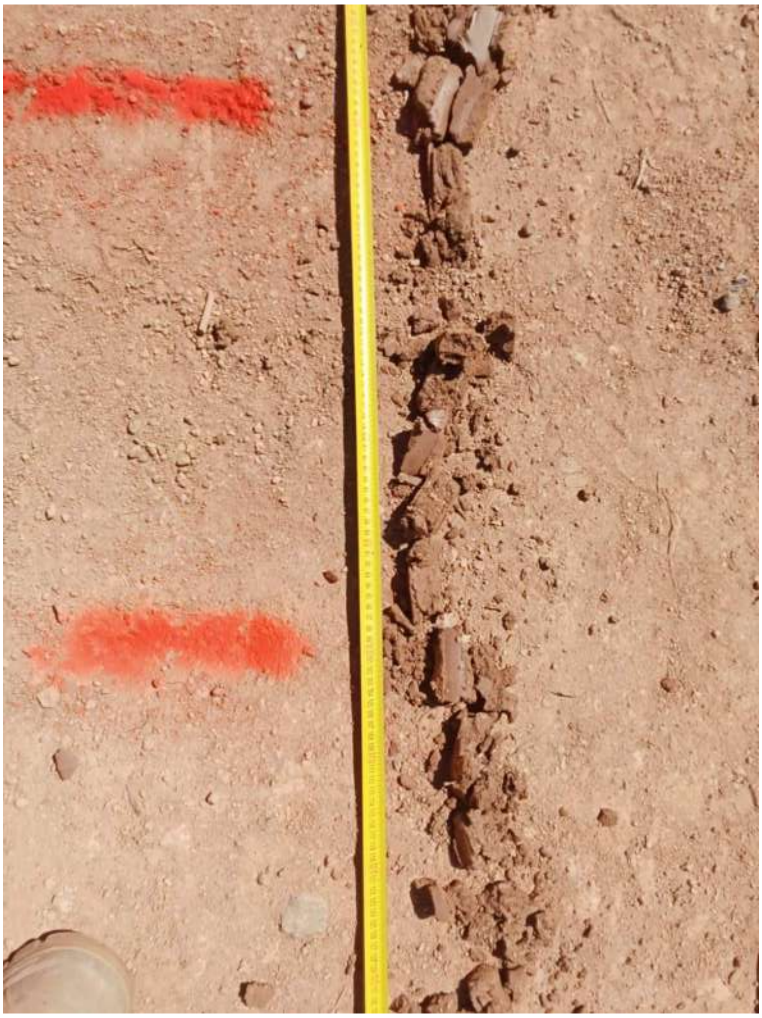
Scala Penetrometer

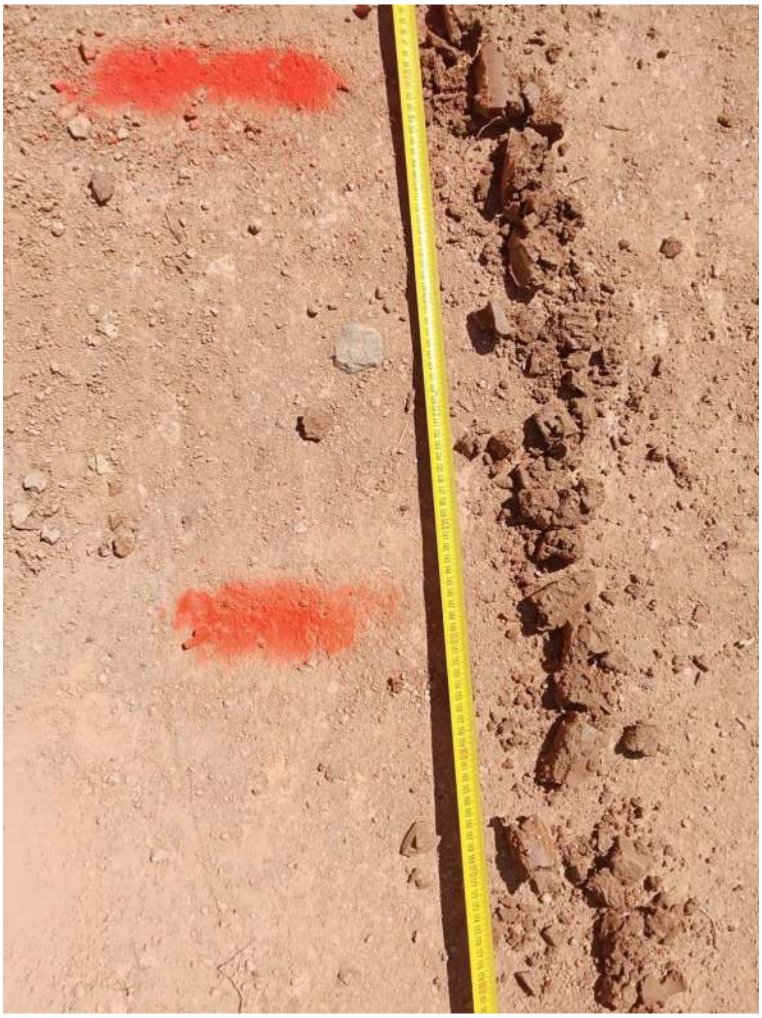


Test Methods
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

Hand Auger Samples to a Depth of 2.0m for Lot 17

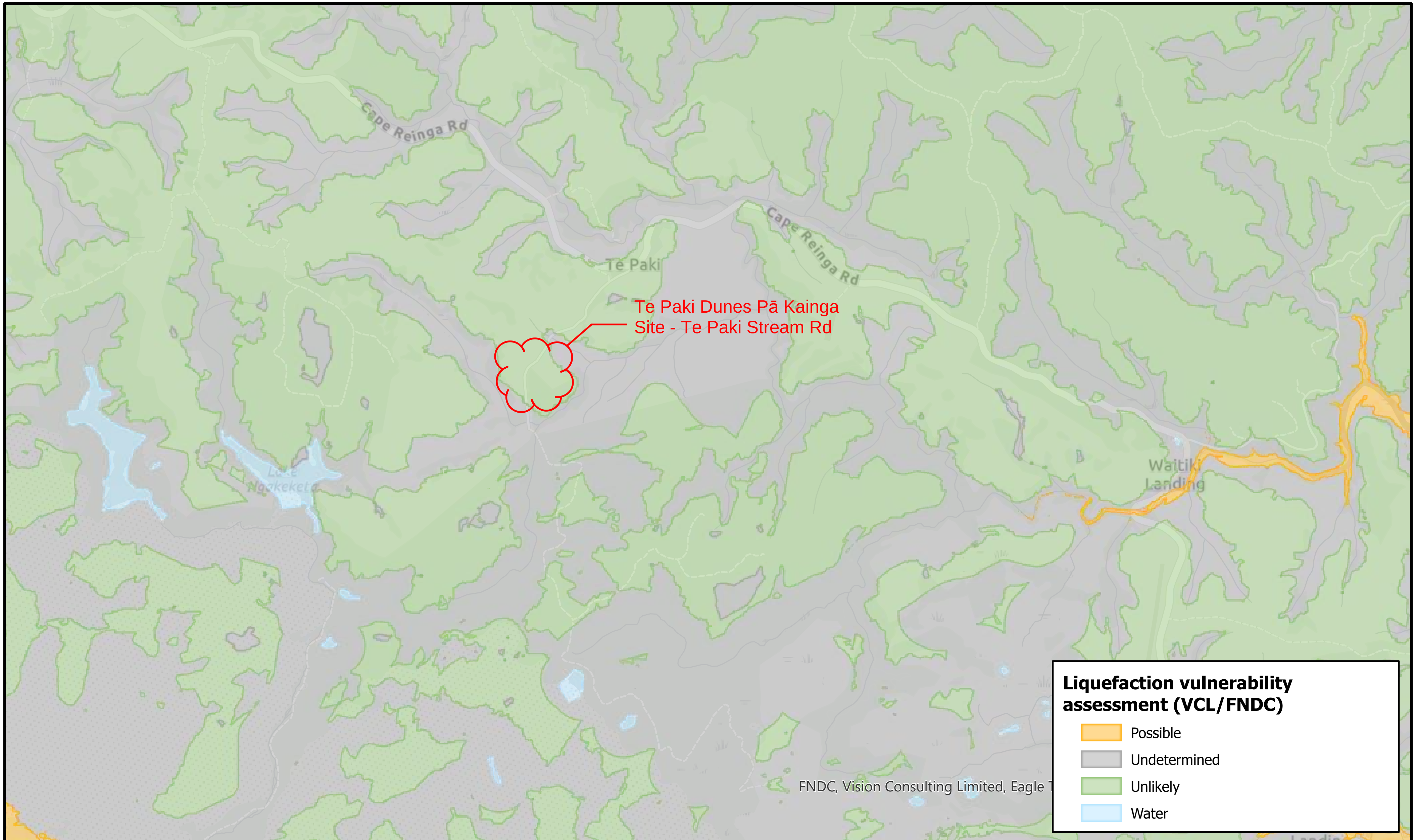




Soil Profile for Hand Auger in Lot 17

Test Location	Depth of Sample / Test [m]	Corrected Shear Vane Results		Soil Description / Classification
		Undisturbed [kPa]	Disturbed [kPa]	
A17	Existing Ground Level			
	0.0 - 0.5	63	39	CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Moist.
	0.5 - 1.0	89	48	CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Moist.
	1.0 - 1.5	119	65	CLAY, Reddish brown, Medium Dense, Firm, High plasticity, Moderately sensitive, Moist.
	1.5 - 2.0	104	51	CLAY, Reddish brown, Medium Dense, Firm, High plasticity, Moderately sensitive, Moist, GWL not reached.

FNDC Liquefaction Risk Map



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

Far North Maps

0 1 2 3 km

Projection NZTM2000. Datum NZGD2000. Scale:1:36,112

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: 22/11/2024

PRODUCER STATEMENT – PS1
DESIGN

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** J000595

ISSUED BY: Structus Consulting Limited
(Engineering Design Firm)

TO: Ngati Kuri
(Owner/Developer)

TO BE SUPPLIED TO: Far North District Council
(Building Consent Authority)

IN RESPECT OF: Proposed relocatable dwelling pile foundations
(Description of Building Work)

AT: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland
(Address, Town/City)

LEGAL DESCRIPTION: **N/A** ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*:
Refer attached particulars dated 10 December 2024 for scope of works
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only , as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment *(Verification method/acceptable solution)* B1/VM1, B1/VM4 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to attached particulars dated 10 December 2024 .
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 2 level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Darren Andew Mitchell , am:

- ☑ CPEng number 1007610

and hold the following qualifications BEng (Hons), CPEng, CMEngNZ

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Darren Andew Mitchell
(Signature below):

ON BEHALF OF *(Engineering Design Firm)*: Structus Consulting Limited Date: 10/12/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer attached particulars dated 10 December 2024

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1. Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2. NZIA Standard Conditions of Contract SCC 2011
3. Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4. PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

Structus Consulting Limited
PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 E info@structus.co.nz
www.structus.co.nz

Far North District Council

10 December 2024

Lots 16-21, Te Paki Stream Road, Cape Reinga – PS1 Producer Statement Attached Particulars

Structus have been commissioned to provide structural engineering design services for the relocatable dwelling foundation piles at Lots 16-21, Te Paki Stream Road, Cape Reinga, Northland for Ngati Kuri.

The structural design covered by this producer statement comprises the following only:

- Pile foundations
- SED Anchor pile to bearer connections.

Refer the following schedule listing the structural drawings and calculation report covered by this producer statement.

Drawing Title	**No.**	**Rev**	**Structus Stamp Dated**
Papakainga Development 16-21 Te Paki Dunes (Lot 16 Foundation Plan)	SK01	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 17 Foundation Plan)	SK02	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 18 Foundation Plan)	SK03	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 19 Foundation Plan)	SK04	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lots 20 & 21 Foundation Plan)	SK05	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes Structural Calculation Report		A	10/12/2024

Exclusions
The following items have not been included in this producer statement:

- Geotechnical engineering, including design parameters for pile foundations structural design
- Temporary propping, shoring or other temporary structures
- Waterproofing and cladding
- Any proprietary structures are to be designed by the supplier
- Civil engineering, such as earthworks, external pavement and drainage
- All structures above the pile foundations.

Assumptions

The design is based on the following assumptions:

- The design has been undertaken, and the ground conditions are, in accordance with the advice provided in the following FNR Geotechnical Investigation Reports:
    - Lot 16 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 17 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 18 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 19 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 20 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 21 Te Paki Stream Road, Cape Reinga – 21 November 2024
- The proposed building structure is in accordance with the architectural drawings by PanelLock dated 2/9/2024
- Seismic subsoil class E is assumed
- The Lots 16-21, Te Paki Stream Road structural works are designed for Importance Level 2 with a 50 year design life.

Alternative Solutions
The following alternative solutions to the NZ Building Code have been used on this project:

- None

B2 Compliance
A Producer Statement for Clause B2 – Structural Durability of the Building Code has been requested. We are not able to provide this because there is no verification method for B2 contained within the Building Code.

The purpose of this compliance clarification is to confirm that direct construction monitoring by Structus Consulting Limited in relation to Clause B2 (Durability) of the Building Code for the above project, has been limited in that material protection or treatment is typically carried out by specialist suppliers and requires specific quality assurance by the suppliers. However, we can confirm the specifically designed structural elements that were included in the design documentation prepared by the Structus Consulting Limited comply with the applicable verification methods.

<u>Timber</u> (means of compliance B1/VM1)
The timber has been specified in accordance with NZS3640:2004. The quality of timber treatment is dependent on the QA systems of manufacturers, suppliers and the onsite contractors and sub-contractors. Refer to the contractor's PS3 and QA records where available.

<u>Concrete</u> (means of compliance B1/VM1)
Compliance with cover and concrete quality requirements for B1/VM1 are in accordance with NZS3101:2006.

<u>Mild Steel</u> (means of compliance B1/VM1)
Protective coatings have been specified in accordance with AS/NZS 2312:2014 and SNZ TS 3404:2018.

The corrosion category and the years to first major maintenance have been identified for the structural steel work in accordance with SNZ TS 3404:2018. This allows the contractor to procure the suitable corrosion protections systems to meet AS/NZS 2312:2014 and SNZ TS 3404:2018 requirements. The quality of mild steel protective coatings is dependent on:

- Paint supplier confirming that the paint can perform to the standard as required by AS/NZS 2312:2014 and SNZ TS 3404:2018 based on the stipulated corrosion category and years to first maintenance
- Steel preparation
- Quality and production consistency of the coating products
- QA of the application and curing
- QA of the handling, protection and repair

Refer to:

- Contractor's and sub-contractor's PS3s and QA records where available
- Third party inspection and test results
- On-going maintenance plan (attached)

Applicability
The advice covered by this producer statement has been prepared by Structus at the request of its client, for the particular brief and on the terms and conditions agreed with our client and is exclusively for use and reliance by Structus' client. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of, or reliance by any third party, on the advice (in whole or in part) covered by this producer statement.

No express or implied warranty is made as to the advice contained in the information covered by this producer statement. To the extent that any information provided to Structus is inaccurate, incomplete, or inadequate, Structus takes no responsibility and disclaims all liability for any loss or damage that results from any conclusions based on information that has been provided to Structus.

Yours Sincerely
Structus Consulting Limited

Darren Mitchell
Director

STRUCTUS

Lots 16-21, Te Paki Dunes – Structural Maintenance Schedule

This schedule of ongoing inspection and maintenance of structural elements shall be included with the O&M manuals and provided to the Owner/Body Corporate and building managers.

Inspection/Maintenance timeframe and item	
(a) Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Sub-ground floor mild-steel structures such as beams.
(b) 5-yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings.
(c) 10-yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. **Note that 10 years is the expected useful life for many sealants.**
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
(d) 25-yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above.

STRUCTURAL CALCULATION REPORT

PAPAKAINGA DEVLOPMENT
TE PAKI DUNES

Prepared for: **NGATI KURI**

Date: **10 DECEMBER 2024** Reference: **J000595** Revision: **A**

STRUCTUS

DOCUMENT CONTROL RECORD

Document prepared by:

Structus Consulting Limited

Victoria Park Market, Unit 69
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Auckland 1142
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New Zealand

T +64 09 869 2073
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W structus.co.nz

Report Title	Structural Engineering Calculation Report		
Client	NGATI KURI	**Job Number**	J000595

Rev	Date	Revision Details	Author	Verifier	Approver
A	10 December 2024	Building Consent	A. Motara	C. Bell	D. Mitchell

Current Revision	A

Approval			
Author Signature		Approver Signature	
Name	A. Motara	Name	D. Mitchell
Title	Structural Engineer	Title	Director

A person using Structus documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Structus.

Job: Papakainga Development		**Job No:**	J000595
		Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report		**Author:**	A. Motara
		Pages:	2

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		Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report		**Author:**	A. Motara
		Pages:	4

1 Design Overview & Philosophy

Structus was engaged by Ngati Kuri to undertake structural design and detailing for the proposed Subfloor Piles/Foundation Design at Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland. The proposed project is in the figure below. This is a calculation report in support of a building consent submission. This report is to be read in conjunction with:

- Structus marked up Architectural Drawings A1-A13 dated 06/12/24Parsonson Architecture Te Paki Dunes and Ngataki consent issue drawings A01 to A13 dated 15 /11/24
- PanelLock transportable dwelling drawings A1 to A13 dated 02 September 2024
- FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

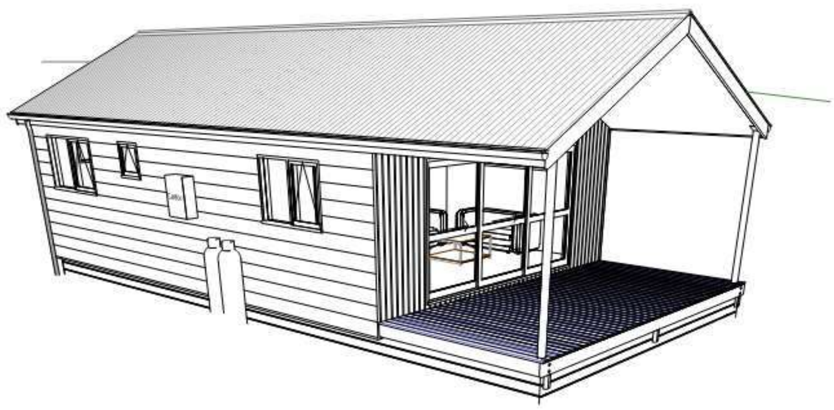


Figure 1-1: Building Overview

1.1 Location of building

Address: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland

Figure 1-2: Map View

1.2 Description of Buildings

The proposed buildings are transportable single storey dwellings of 82m^2 floor area. The dwellings at each lot are of similar floor plans and construction. The cladding is of lightweight construction supported by timber roof trusses and timber wall framing. The subfloor construction is of timber joists and timber piles encased in concrete.

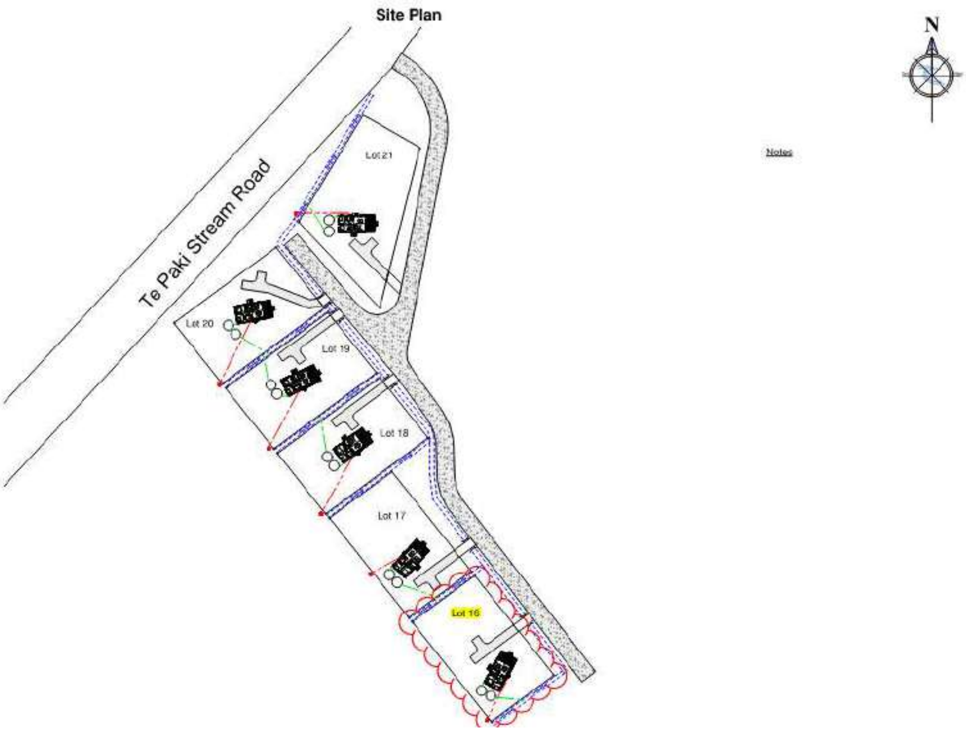


Figure 1-3: Site Plan

1.2.1 Gravity System

The gravity system is typically timber roof trusses supported by load bearing walls supported by conventional timber subfloor joists, bearers and bored timber piles.

1.2.2 Lateral Stability

Lateral stability is provided typically by roof, wall and subfloor bracing. The subfloor bracing is provided by specifically designed cantilever piles based on NZS3604 methodology for bracing demands.

1.2.3 Seismic Design

Seismic bracing demand is obtained based on NZS3604

1.2.4 Foundation

Foundations are timber piles encased in concrete. The foundations are typically embedded to a level that achieves good ground to NZS3604 or as required to achieve a suitable bracing capacity.

1.2.5 Geotechnical Investigation

- Geotechnical report reference - FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

Existing Soil Parameters	*Description*
y = 18kN/m^3	Soil density (Assumed)
s_u = 40-60kPa	Based on B1/VM4 Varies each lot - Refer to Foundation Calculations
Soil Class D or E	(Assumed/No information available)
Expansive Soil Class S	To AS:2870
Allowable end bearing = 204-300kPa	Capacity and depth varies at each Lot
Reduction factor = 0.5	Gravity case reduction factor
Reduction factor = 0.8	Seismic case reduction factor
Ground water – N/A	Ground water level not encountered

Further key points

- Liquefaction risk (Low)

2 Safety in Design

Safety in Design is required under the Health and Safety at Work Act 2015 (HSWA) and integrates risk management into the design process to identify, assess and treat Health and Safety risks to people over the life of an asset.

The HSWA requires designers to ensure, so far as is reasonably practicable, that any structure they design is without risks to the health and safety of persons who:

- Use the structure at a workplace (end users/customers);
- Construct the structure at a workplace;
- Carry out the manufacture, assembly, use, maintenance, proper demolition and disposal of the structure at a workplace; or
- Are in the vicinity of a workplace and are exposed to the structure, or whose health and safety may be affected by an activity related to the structure.

Structus has considered Safety in Design throughout the design process. Some risks have been designed out throughout the design process and therefore have been eliminated, however, other residual risks do exist. The residual risks are as follows:

- Open excavations/pile holes during construction.

The Safe Design report has identified hazards relating to the design of the structural works shown on the documents that would not normally be expected in other designs of the same type of structure.

The method of construction and maintaining safety during construction are the responsibility of the builder. If any of the structure in our designs is considered to present an unreasonable risk in respect to construction safety, the matter shall be referred to Structus for resolution before proceeding with the work.

This report is prepared solely for the purposes of the person conducting the business or undertaking who commissioned the design and is not prepared for the benefit of any other party or for any other purpose.

3 Loading and Material Properties

3.1 Importance Level

*The Importance Level is determined using Table 3.2 of AS/NZS 1170.0 and will be used to determine the required return periods of wind and seismic loading.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2

Figure 3-1: Importance Levels for Building Types

The residence is a (normal structure) and is classified as an Importance Level 2 building for design.

Design life of the building is 50 years therefore. From Table 3.3 of AS/NZS1170.0, the required Annual Probabilities of Exceedance are as follows:

Load	Importance Level	Annual probability of exceedance
Wu – Wind Loading Ultimate	2	1/500
Eu – Earthquake Loading Ultimate		1/500
Eu – Earthquake Loading Ultimate (Parts & Components)		1/500
All SLS loads		1/25

TABLE 3.3

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1	1/25	1/25	1/25	—	
	2	1/100	1/50	1/100	1/25	
	3	1/250	1/100	1/250	1/25	
	4	1/1000	1/250	1/1000	1/25	
5 years	1	1/25	1/25	1/25	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
25 years	1	1/50	1/25	1/50	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
50 years	1	1/100	1/50	1/100	—	—
	2	1/500	1/150	1/500	1/25	—
	3	1/1000	1/250	1/1000	1/25	—
	4	1/2500	1/500	1/2500	1/25	1/500

Figure 3-2: Annual Probability of Exceedance

3.2 Loadings

3.2.1 Self-Weight of Elements (SW):

- Concrete piles = 24kN/m3
- Perimeter cladding = 0.2kPa

Elements with self-weight (G)	*Description*
G_{roof} = 0.33 kPa	Roof build-up Metalcraft T-Rib roofing (assuming 0.55mm) 0.065kPa, Timber Trusses @900crs 0.07kPa, 0.04kPa Purlins, 0.05kPa Insulation blanket, 0.11kPa 18mm Triboard Ceiling.
G_{floor}= 0.30 kPa	Floor Build-up (0.14kPa 240x45 joists @ 400 crs + 0.1kPa 20mm particle boardT&G + 0.05kPa Insulation, misc 0.01kPa.
G_{int_wall} = 0.22kPa	36mm Triboard Wall panel.
G_{ext_wall} = 0.44 kPa	0.13kPa 7.5mm Hardi plank Weatherboards, 0.04kPa 90x45 framing, 0.05kPa insulation, 0.22kPa 36mm Triboard Wall panel

3.2.2 Superimposed Dead Loads (SDL)

SDL (G)	*Description*
G_{SDL}= 0.35 kPa	Nominal (Residential floor incl. floor coverings).

3.2.3 Imposed Loads (Q)

The following imposed / live loads are as per T3.1 of AS/NZS1170.1

Live Load (Q)	*Description*
Q_{RF} = 0.25 kPa	Roof life load
Q_{Floor} = 1.5kPa or 1.8kN	Residential Floor
Q_{Deck} = 2.0kPa	Residential balcony

3.2.4 Wind Loading

Wind Loading to be worked out using NZS3604 as per GIB spreadsheet – See Later Sections.

3.2.5 Seismic Loading

Seismic Load to be determined using NZS3604 and modified as required for the anchor pile design.

3.2.6 Load Combinations

The ultimate limit state combinations are considered as per AS/NZS 1170.0 section 4.2.

ULS Load Combinations	*Commentary*
[1.35G]	Permanent action
[1.2G, 1.5Q]	Permanent and imposed
[1.2G, W_u, $\psi_c Q$]	Downward wind ULS case
[0.9G, W_u]	Upward wind ULS case
[G, $\psi_E Q$, E_u]	Earthquake case

3.3 Material Properties

3.3.1 Concrete Strengths

- Foundations: 30 MPa

3.3.2 Reinforcing Steel

- Reinforcing Steel (High Yield) 500 MPa Micro Alloy Grade E
- Reinforcing Steel (Mild Steel) 300 MPa Micro Alloy Grade E

3.3.3 Structural Steel

3.3.3.1 Steel Grade

- Rolled Steel Sections: 300 MPa – Grade 300 to AS/NZS 3679
- Steel Plate General 250 MPa – Grade 250 to AS1594
- Steel Plate (special) 300 MPa – Grade 300 AS/NZS 3678
- StelTech Beams 300MPa – Grade 300 AS/NZS 3679
- CHS Hollow Sections 350MPa – Grade C350 AS 1163
- RHS Hollow Sections: AS 1163 - Grade C350 AS 1163
- Bolt Grades: Grade 4.6 mild steel and grade 8.8 high strength
- Tensioning requirements for 8.8 bolts S, TB, TF as required

3.3.3.2 Steel Corrosion Category

Durability Zone D (Far North) to NZS3604

3.3.4 Structural Timber

All timber shall be Pinus Radiata SG8 or SG6 grade and meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber.

Job: Papakainga Development	Job No:	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author:	A. Motara
	Pages:	14

4 Structural Load Path

Below is the typical structure for a single storey dwelling supported by trusses, load bearing walls, floor joists and shallow gravity piles with anchor piles for bracing.

Figure 4-1: Typical Roof Plan

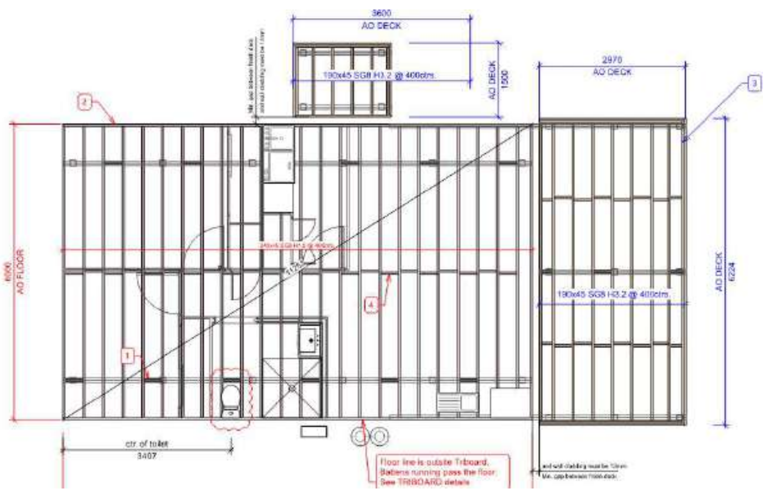


Figure 4-2: Typical Floor Plan

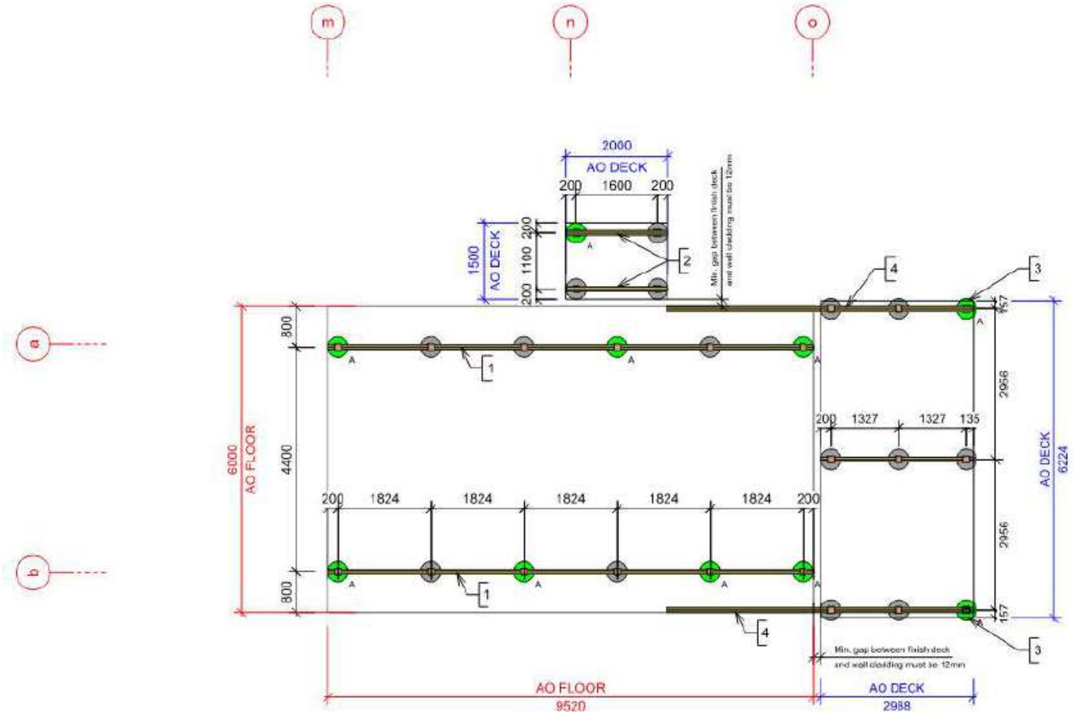
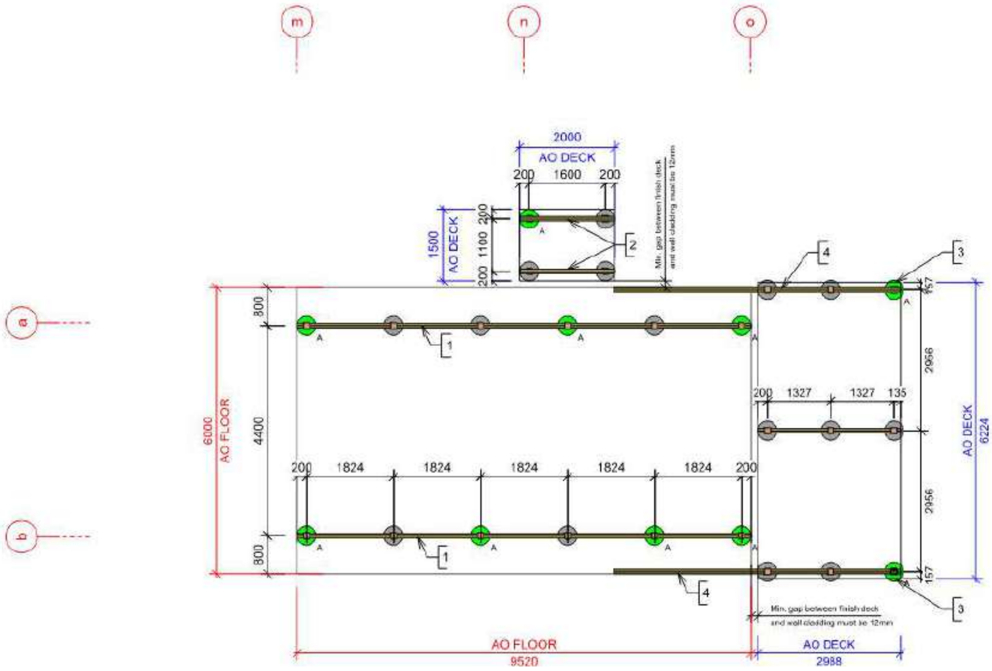


Figure 4-3: **Typical Lateral System Plan**

5 Subfloor Bracing Design

5.1 Bracing Design

Verification of the bracing plan below based on NZS3604 design loads.



For all Piles minimum Footing plan dimensions Ø480mm

Anchor Pile Ordinary Pile Brace Pile

Building Specification

Number of Storeys	Single
Floor Loading	2 kPa
Foundation Type	Subfloor
Sub Floor Cladding	Light

	Single
Cladding Weight ?	Light
Roof Weight ?	Light
Room in Roof Space	No
Roof Pitch (degrees) ?	25
Roof Height above Eaves (m)	1.4
Building Height to Apex (m)	4.05
Ground to Lower Floor (m)	0.71
Stud Height (m)	2.4
Building Length (m)	10
Building Width (m)	6

Building Location

Wind Zone = High

Wind Zone or Consent Authority	Not Available
Wind Region ?	A
Lee Zone	No
Ground Roughness ?	Open
Site Exposure ?	Exposed
Topography ?	T1

? Earthquake Zone	1
Soil Type	D & E (Deep to Very Soft)
Annual Prob. of Exceedance	1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	224	304
Subfloor Level	401	600

Bracing Units required for Earthquake

	Along and Across
Single	395
Subfloor Level	547

SubFloor Along

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)	Wind	Earthquake
									Demand	
									401	**547**
									Resistance	
									960 239%	**720 132%**
A		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK
B		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK

SubFloor Across

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)	Wind	Earthquake
									Demand	
									600	**547**
									Resistance	
									960 160%	**720 132%**
M		1	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
N		2	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
O		3	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK

Hence across direction is critical

Note re-check line O for additional demand from the deck.

7.4.2.2

Decks which project more than 2 m from the building shall have *subfloor bracing* provided by anchor and/or *braced piles*, at half the *bracing demand* required by table 5.8 for "light/light/light" *cladding*, for 0° *roof* slope and for "subfloor structures".

Anchor piles rating per pile	120 BUs for earthquake 160 BUs for wind

Table 5.8 – Bracing demand for various combinations of cladding on single-storey buildings on subfloor framing (2 kPa floor load, soil type D/E, earthquake zone 3) (see 5.3.1)

Roof cladding	Single-storey cladding	Subfloor cladding	Roof pitch degrees	Subfloor structure	Single-storey walls
				BU/m²	
Light roof	Light	Light and Medium	0-25 25-45 45-60	15 16 17	11 11 13
		Heavy	0-25 25-45 45-60	17 18 19	11 12 13
		Medium	0-25 25-45 45-60	18 18 19	12 13 14

Multiplication factors		EQ zone			
Soil class		1	2	3	4
A & B	Rock	0.3	0.5	0.6	0.9
C	Shallow	0.4	0.6	0.7	1.1
D & E	Deep to Very soft	0.5	0.8	1.0	1.5
NOTE – See 5.3.4 for additional bracing demand.					

Area of deck = 6.2x3=18.6m^2

Demand = ½ (0.5 x 16 x 18.6) = 74 BU (Total)

Demand/line = 74/2 = 37 BUs

From the bracing spreadsheet in the critical across direction

Capacity of Line O = 240 Bus

Demand based on tributary width = 547/3 lines = 182 BUS

Reserve capacity = 240-182 = 58 BUS > 37 BUs Hence OK

No additional piles required for the deck along the house line

For other lines

Nominal 1 AP at corner locations providing 120BUs > 37 BUs OK

Refer to the Anchor Pile specific design for pile design.

6 Foundation Design

6.1 Ground Conditions Summary

The following has been summarised from the geotechnical report.

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Notes –

Bearing capacity based on geotechnical engineer/soil report

Undrained shear strength derived from on B1/VM4 bearing capacity equations Qult =Nc x Su (based on ultimate bearing capacity)

6.2 Gravity Piles

6.2.1 Loading

Typical Pile (Central) — Pile Spacing (s) 1.82 m

		Dist Load		line Load		Pile Point Load w x s		
Element	Trib Width	G	Q	G	Q	G	Q	
Roof	3	0.35		1.05		1.911		
Ext. Wall	2.4	0.44		1.056		1.92192		
Floor	3	0.3	1.5	0.9	4.5	1.638	8.19	
Floor SDL	3	0.35		1.05		1.911		
					Totals	7.4	8.19	kN

Factored Loads	ULS	1.2G+1.5Q	**21.1** kN
		1.35G	**10.0** kN
	SLS	G+0.7Q	**13** kN

6.2.2 Gravity Pile Design Lots 16-21

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**16**		
Ultimate Pile Capacity Q_ult	**204**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.7**	m	
Pile Area	0.38	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	12.0		
ULS Pile Load = P + 1.2xW_pile	35.6	kN	
SLS Pile Load = P_s+W_pile	25.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**39.3**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**25.9**		**OK**
Adopt	**700 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**17**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	6.1		
ULS Pile Load = P + 1.2xW_pile	28.5	kN	
SLS Pile Load = P_s+W_pile	19.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	18		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.6	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.8		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	10.3		
ULS Pile Load = P + 1.2xW_pile	33.5	kN	
SLS Pile Load = P_s+W_pile	23.4	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550dia piles 1.8m deep		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	19		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.5	m	
Pile Area	0.20	m^2	
Depth to a (La)	0.65	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	0.85		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	4.0		
ULS Pile Load = P + 1.2xW_pile	25.9	kN	
SLS Pile Load = P_s+W_pile	17.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	29.5		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	19.4		OK
Adopt	500 dia piles 0.85m deep		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	20&21		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.4	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.6		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	9.1		
ULS Pile Load = P + 1.2xW_pile	32.1	kN	
SLS Pile Load = P_s+W_pile	22.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550 dia piles 1.6m deep		

Gravity Piles Summary

Pile Gravity Design Summary

Lot	Pile Diameter mm	Pile Depth m
16	700	1.3
17	500	1.3
18	550	1.8
19	500	0.85
20	550	1.6
21	550	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles

<u>For Simplicity of Design – Consider typical piles to be Ø550 for Lot 17-21 & Ø700 for Lot 16 with depth as per the table</u>

6.3 Cantilever Anchor Pile

From the Engineering Basis of NZS 3604 the following tables are provided

3.4.2 Design for safety (ultimate limit state - ULS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	Deflection (mm)
Anchor pile	120	6.0	30	160	8.0	30
Braced pile	120	6.0	50	160	8.0	50
Cantilever pile	30	1.5	25	70	3.5	45

3.4.3 Design for serviceability (serviceability limit state - SLS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	rating Deflection (mm)
Anchor pile	20	1.0	3	120	6.0	10
Braced pile	20	1.0	3	120	6.0	13
Cantilever pile	5	0.4	1	45	2.25	4

1) Consider capacity design actions on the piles

Components – timber pile; bolted connection, soil.

Assuming the ductile demand = 120BU = 6kN (Typical anchor pile capacity)

Consider the pile design to be nominally ductile

From NZS3604 design basis – the design ductility is 3.5; Sp = 0.7; k_mew = 2.4

For Nominally ductile loads T=0.4, mew = 1.25, Sp=0.925, k_mew= 1.14

Elastic load factor = k_mew(3.5) /Sp = 2.4/0.7 = 3.43

Reduce by nominally ductile factor = 3.43 x (0.925/1.14) = 2.78

6kN x 2.78 = 16.6kN

Notes – EZI brace design is about 132% over strength for EQ

Hence reduce by demands 32% (for capacity just meeting demand)

Revised demand = 16.6/1.32 = 12.5 kN (Minimum demand on each pile)

Height above ground = height to FFL – Joist Depth – floor boards = 710-240-20 = 450mm

Wind is not critical due to the scaling factor applied to the loads.

Design philosophy of piles.

- If good ground is very deep (>1.5df)– consider the using lower bound soil capacity (Q_ult = 204kPa→ Su=40kPa) with eo=1.5df (All cases except Lot 19)
- If good ground found is relatively shallow <1.5df (~ 0.6-0.8m) use the higher values for good ground. (Lot 19)
- Consider the max bending moment to be at the location in the ground as per the Broms formula ignoring strength of concrete.
- Use the same pile diameter as the gravity piles for simplicity.

6.3.1 Anchor Pile Design 16-21

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Capacity of 200x200 SG6 Square pole Wet Condition

Fb(SG6) = 7.5 MPa

Notes – Phi = 1.0 for capacity designed elements.

Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x200x200^2/6 = 10.0 kNm

For 250x250 SG6

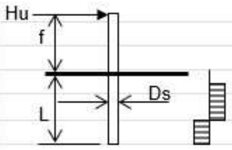
Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x250x250^2/6 = 19.5 kNm (Governs most designs)

Notes – Phi factor = 0.8 for seismic overstrength loads applied to the shear strength of soils

Lot 16

Use Ø700 Pile as per the gravity piles for this lot.

NZBC Method Section 4.3.2a

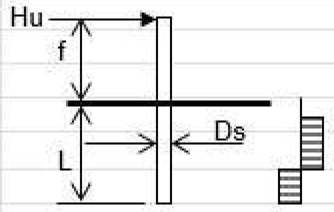


Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.9718	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.12426	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.0136	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	12.732	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11315	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 12.7 kN > 12.5 kN accept

Job: Papakainga Development		**Job No:**	J000595
		Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report		**Author:**	A. Motara
		Pages:	24

Recheck for the max allowable height (600mm is typically OK for all other sites – hence try 600mm)

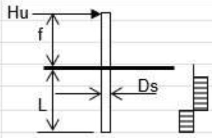


NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	13.882	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11886	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.3832	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	11.6154	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.10762	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

11.6kN < 12.5kN (92% capacity – within 10% Acceptable) but limit to 450mm.

<u>Adopt 250x250 SG6 Pile in 1.8m deep xØ700 pile for Lot 16(max height 450mm to GL-CL of fixing)</u>

<u>Lot 17,18,20,21</u>



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	14.7551	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91815	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

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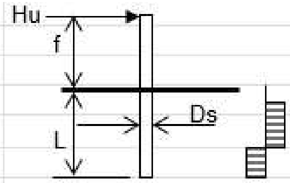
Capacity = 14 kN > 12.5 kN accept

Try 600mm height

NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	*1.5Ds*
Short Free Head Pile:				
Ultimate Lateral Load	Hu	12.976	kN	*=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))*
Depth to Max Pile Shaft Moment	g_c	0.90692	m	*=Hu/(9*su*Ds)+fo*
Maximum Pile Moment	M_{max}	19.0223	kNm	*=Hu*(f+fo+Hu/(18*su*Ds))*
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	13.2928	kN	*=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))*
Depth to Max Pile Shaft Moment	g_c	0.90892	m	*=Hul/(9*su*Ds)+fo*
Maximum Pile Moment	M_{max}	=Mult		

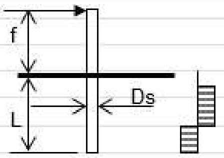
13.0kN>12.5kN (OK)

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 17,18,20,21(max height 600mm to GL-CL of fixing)</u>

<u>Notes – adopt 1.8m for Lot 18 as gravity piles are deeper.</u>

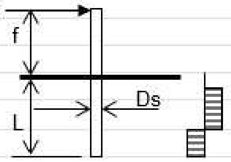
<u>Lot 19</u>

300kPa strength found @ 0.65m on this lot



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	15.9122	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89488	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	20.8441	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	14.9112	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89049	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.5832	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88905	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	21.2481	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	13.4072	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88388	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.4kN > 12.5kN (OK)

Hence 1.5m depth required. hence keep to 1.6m as per typical lots for simplicity (max height 600mm to GL-CL of fixing)

Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 19

6.3.1.1 Deck Piles

Check typical deck anchor piles if design can be reduced

Demand from NZS3604 from before per pile = 37 BUs

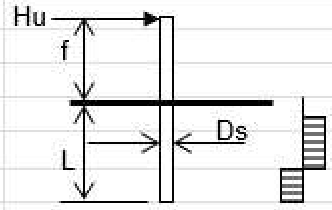
Scaled up demands = 37/20BU x 2.78 = 5.14 kN

Based on other lots – check the design using the lower bound values.

Bending Capacity of 125x125 post = 0.8 x 10 x 125x125^2/6 = 2.6kNm

Bending Capacity of 150x150 post = 0.8 x 10 x 150x150^2/6 = 4.5kNm

Pile depths are typically minimum 1.6m for anchor piles



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	3.4	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	2.64929	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.84173	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

<u>2.6kN < 5.1 kN demand (N.G – hence requires greater pile 200SQ min size – since there are only two deck piles – keep the same size throughout – i.e. 250 SQ.</u>

Note – since the house demands are overall just meeting <u>– adopt one additional pile along line of house</u>

(deck demand = 74BU/20 x 2.78 = 10.3kN < 12.5kN for one pile OK.

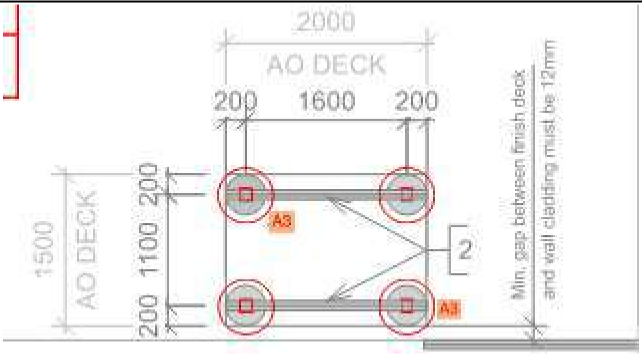
<u>Check min required for uplift of deck post.</u>

Volume of concrete = 0.4m^3 (To Arch.)

Lreq = 0.4 / (pi x 0.55^2/4 – 0.25^2) = 2.3m > 1.6m (hence increase depth to 2.3 meters for deck piles with Ø550 dia piles and post above.

Lreq(700dia) = 0.4 / (pi x 0.7^2/4 – 0.25^2) = 1.24m < 1.8m (hence 1.8 m OK for 700 dia piles)

6.3.1.2 Small Deck Piles



A_Deck = 1.5x2 = 3m^2

A_pile = 0.75m^2

For gravity – simply adopt the typical pile depths and diameter for simplicity.

Bracing demand – typically standard anchor piles to NZS3604 will be OK by inspection of 900mm depth or greater if required by the typical gravity piles.

6.3.1.3 Pile Design Summary Overall

Pile Design Summary Final Lot 16-21

Lot	Pile Diameter mm	Pile Depth m	Anchor Pile
16	700	1.3	1.8
17	550	1.3	1.6
18	550	1.8	1.8
19	550	0.9	1.6
20	550	1.6	1.6
21	550	1.6	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles & 250SQ H5 for Anchor Piles
Min strength SG6

Deck piles sized for uplift min 2.3m deep for 550 piles and 1.8m for 700piles

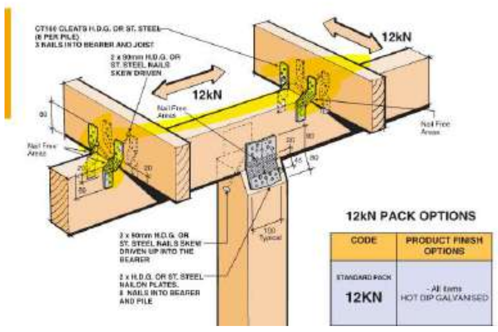
6.3.2 Connection Design

The overstrength seismic demand is 12.5 kN

This is comparable to 12kN NZS3604 connection (96%) Capacity

Hence typical connections may be substituted.

For joists to bearer connection use standard CT160 connections or similar.



However, for completeness provide the bolted connection design to the pile due to the larger size.

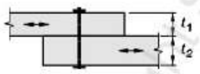
Since the loads are nominally ductile – consider the simplified method for design of bolted connections to AS/NZS1720.

<u>Case 1</u>

Load direction parallel to grain

TABLE 4.9(A)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SYSTEM CAPACITY

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{sk})
(1) Two member 	b_{eff} equals smaller of t_1 and t_2	Q_{k1}

Member = 2/190x45 SG8

Be = 90mm

Try 2/M16 Bolts

TABLE 4.9(C)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{k1}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
JD5	25	2 100	2 800	3 500	4 200	5 600	7 000	8 400	10 500	12 60
	35	2 200	3 900	4 900	5 900	7 800	9 800	11 800	14 700	17 60
	40	2 200	3 900	5 600	6 700	9 000	11 200	13 400	16 800	20 20
	45	2 200	3 900	6 200	7 600	10 100	12 600	15 100	18 900	22 70
	70	2 200	3 900	6 200	8 900	15 700	19 600	23 500	29 400	35 30
	90	2 200	3 900	6 200	8 900	15 800	24 600	30 200	37 800	45 40
	105	2 200	3 900	6 200	8 900	15 800	24 600	35 300	44 100	52 90
	120	2 200	3 900	6 200	8 900	15 800	24 600	35 500	50 400	60 50

Qskl=Qkl=15.8kN /bolt

$$N_{d,j} = \phi\, k_1\, k_{16}\, k_{17}\, n\, Q_{sk} \qquad \ldots 4.4(3)$$

and

N^* = design action effect in shear

ϕ = capacity factor (see Clause 2.3)

k_1 = factor for duration of load for fasteners (see Clause 2.4.1.1)

k_{16} = 1.2 for bolts that transfer load through metal side plates (see Figure 4.7) of adequate strength, and the bolts are a close fit to the holes in these plates provided that $b_{eff}/D > 5$ for loads acting parallel to the grain and $b_{eff}/D > 10$ for loads acting perpendicular to the grain (where b_{eff} denotes the effective timber thickness and D is the bolt diameter)

= 1.0 otherwise

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k_{17} = factor for multiple bolted joint given in Table 4.12

n = number of bolts resisting design action effect in shear

Q_{sk} = characteristic capacities as derived in Clause 4.4.2.4. See also Clauses 4.4.4 and 4.4.5

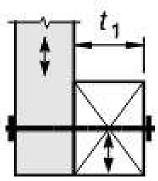
(e) For connections designed using the simplified method set out in ZZ4.1 to ZZ4.5: ϕ = 0.8.

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 15.8 = 25.3 kN > 12.5kN (OK)

<u>Case 2</u>

Check strength of pile connection.

Member = 250x160 (recessed) SG6, Unseasoned J5

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skp})
(1) Two member 	b_{eff} equals $2t_1$	Q_{kp}

Be = 160x2=320mm

Qskp=Qkp

Try 2/M16 Bolts

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.7 = 9.12 kN < 12.5kN (N.G)

Try use 4/M16

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.72 = 18.3 kN > 12.5kN (OK)

Hence Adopt 4-M16 Bolts for the pile bearer connection.

Minimum edge distances

To the loaded side of timber = 5xD = 5 x 16 = 80mm

C-C spacing = 5D = 80mm

Timber width required = 80+80+80 = 260mm > 250mm (Close – Accept as the bolts are not fully loaded & greater than elastic capacity can be achieved).

<u>Case 3</u>

For anchor piles loaded perp to direction of the bearers – check washer capacity

3.2.6 Bearing capacity

3.2.6.1 *Design capacity in bearing perpendicular to the grain*

The design capacity in bearing perpendicular to the grain ($N_{d,p}$) of a structural element (see Figure 3.8), for strength limit state, shall satisfy the following:

$$N_{d,p} \geq N_p^* \quad \ldots 3.2(15)$$

where

$$N_{d,p} = \phi\, k_1\, k_4\, k_6\, k_7\, f_p'\, A_p \quad \ldots 3.2(16)$$

and

ϕ = capacity factor (see Clause 2.3)

N_p^* = design load effect in bearing (see Figure 3.8 and Clause 1.4.2.2)

k_1 to k_7 = modification factors given in Section 2

f_p' = characteristic value in bearing perpendicular to grain

A_p = bearing area for loading perpendicular to grain.

For SG6/No. 1 Framing fp = 5.3MPa

Using 4 No. 60mm Square washers

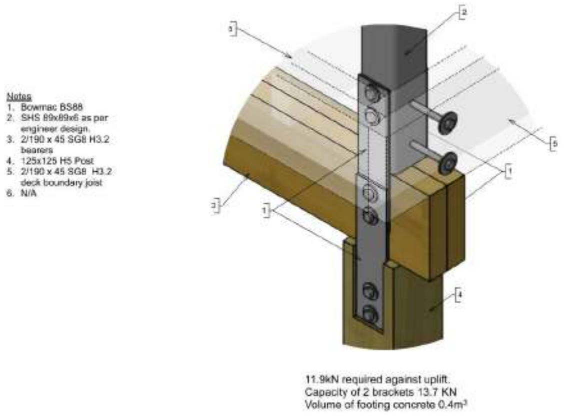
Phi_Nd,p = 0.8 x 1.0 x 1.0 x 1.0 x 1.0 x 5.3 x 4 x 60^2= 61 kN >>12.5 kN (OK)

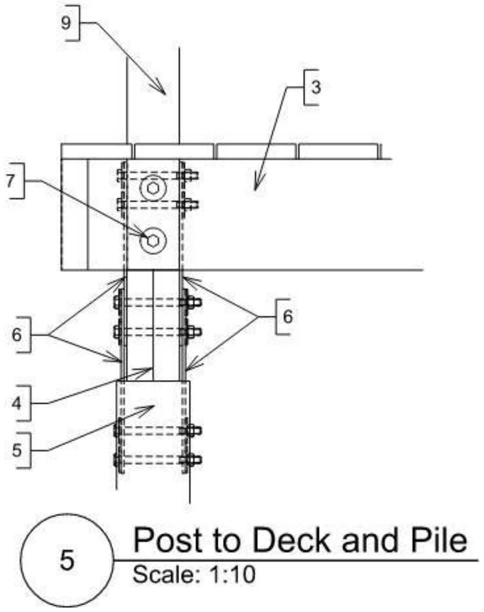
Using minimum 4mm Thk washer as per code (OK by inspection).

Adopt minimum 60mm x 4mm Square washers to M16 Bolts.

6.3.2.1 Connection at Deck Post

The architect has provided a connection detail for the external post. Check for compatibility with anchor pile design (note uplift requirements check by other engineer)





The connection in the square post is critical.

Slot cut the post to achieve double shear

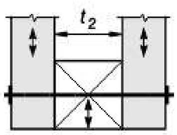
(2) Three member, Type A 	b_{eff} equals t_2	$2Q_{kp}$

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N — Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Be = 90mm

Qskp = 2 x 2.11kN = 4.22kN/12mm bolt

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 4.22 = 6.7 kN > 5.14kN (OK)

Hence OK to adopt the architect detail for the anchor piles of the deck. (i.e. 2/M12 bolts slot cut in timber pile)

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GST No: 107-240-918

19th November 2024
Att: Parson Architecture & PanelLock

To Whom it may Concern

Good Ground Report for Proposed New Dwelling at Lot 17 Te Paki Stream Road, Cape Reinga.

FNR Consulting have been engaged by Ngati Kuri to carry out geotechnical testing for a proposed new dwelling with an approximate floor area of $82m^2$. A total of four scala penetrometer tests and one hand auger were conducted.

Testing was carried out in general accordance with the requirements of NZS 3604 and NZS 4402.

The test locations are shown in the attached plans and photographs, with the test results also attached to this document.

The NZLI Soils Map describes the soils in this area as: **Rangiuru Clay**.

Observations

The site soils appeared to be consistent with the NZLI Soils Map description, with clay observed in the hand auger testing across the subdivision. Based on the soil samples, the clay appeared to have a high plasticity and was moderately sensitive. In general, the clay was also loose to medium dense and has a firm consistency. The soil appeared to be either dry or moist, while the ground water level (GWL) was not reached over the 2.0m depth tested. Refer to the attached hand auger results for a full soil profile of the hand auger conducted in the centre of the building.

The site had been levelled, with material excavated to the existing ground level (i.e. the tests were performed in the undisturbed natural ground not fill material). Topsoil had not been spread over the house site at the time of testing.

There are no visual signs of slope instability in the vicinity of the building site and the proposed position of the building relative to the adjacent slope is appropriate and does not pose a risk in terms of slope stability.

The site classification based on site reactivity in accordance with AS2870-2011 Table 2.1 is **Class S – Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.**

Liquefaction Risk

A desk-top study of liquefaction risk for this site has been undertaken.

"The area of Northland is identified to be at low risk of seismic hazard. There are no active faults known in the Far North. Small earthquakes will give short duration shaking that may not have enough cycles to cause liquefaction. Microzoning studies are probably not required as the hazard is low (GNS 2004)" - Regional Liquefaction Vulnerability Assessment – Far North District, prepared by Vision Consulting for FNDC 20/01/2023.

According to the above referenced report, and associated mapping, the Liquefaction Vulnerability Category for this site is "unlikely". This indicates that "there is a probability of more than 85% that liquefaction-induced ground damage will be None to Minor for 500-year shaking".

Based on the above it is considered that the liquefaction vulnerability for this site is low and that the expected degree of liquefaction induced ground damage is none to minor.

Scala Results

The penetrometer testing (attached below) indicated that the in-situ soils achieve “Good Ground” (as per the NZS 3604 definition) criteria between approximately 0.95m and 1.10m below the current ground surface.

Yours Sincerely

M. Burkhardt Macrae.

Manu Burkhardt Macrae
BE, CMEngNZ, 253797
Attachments:

- *Site Plan and Test Locations; Photos; Scala Test Reports, Hand Auger Test Results, FNDC Liquefaction Risk Map.*

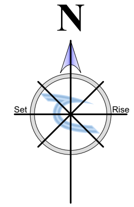
Site Plan

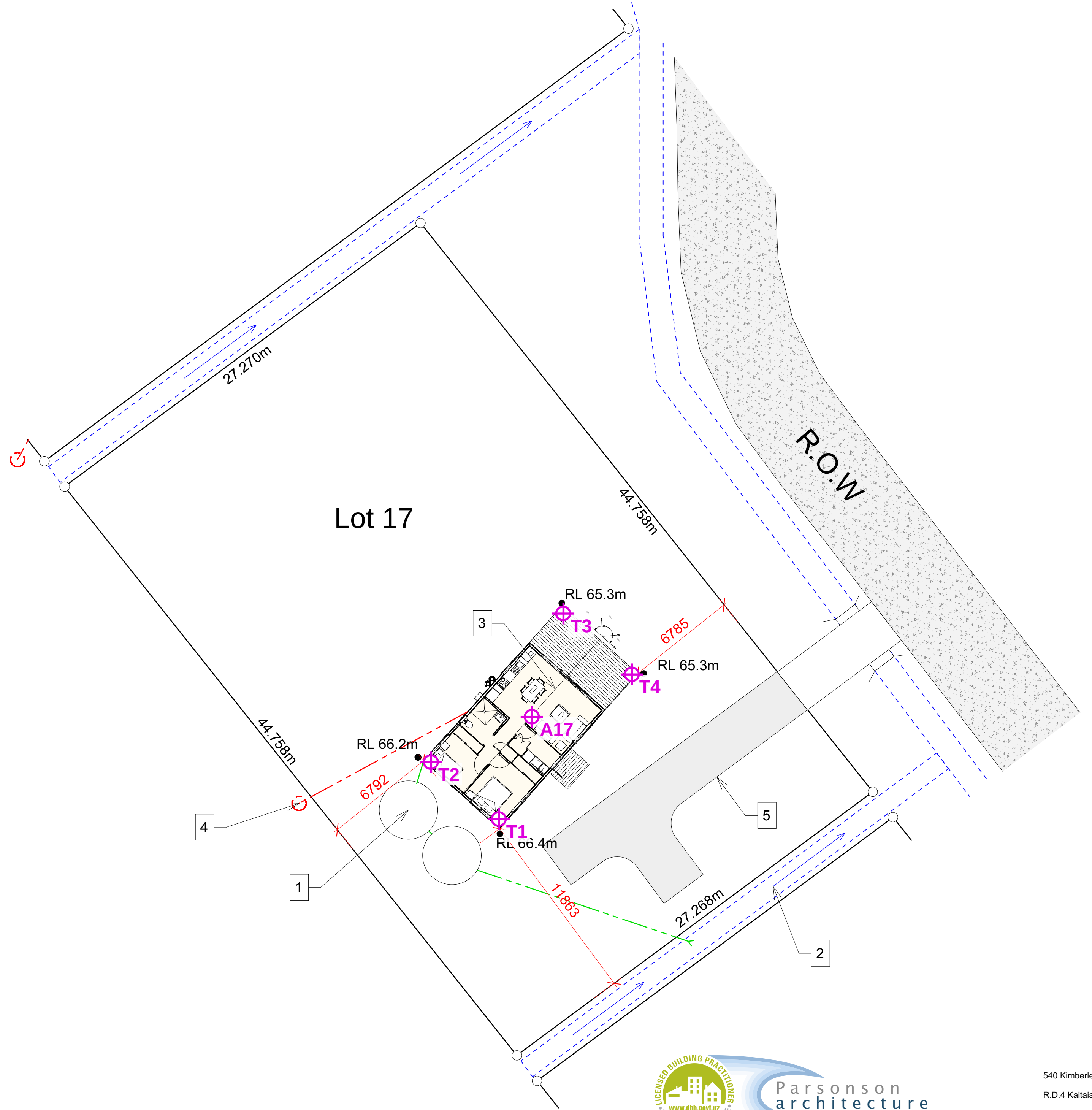
Notes

126524
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # SCALE @ A3 1:1000	DWG # A01
DWG	Te Paki Dunes Locality Plan	DRAWN JP CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

Test Locations





Notes
1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 67.110
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	68m2
Impermeable Surfaces	=	150m2
Total Site Coverage	=	12%

LICENSED BUILDING PRACTITIONER www.dbh.govt.nz 126524 BUILDING CONFIDENCE

Parsonson architecture ARCHITECTURAL & STRUCTURAL DESIGN

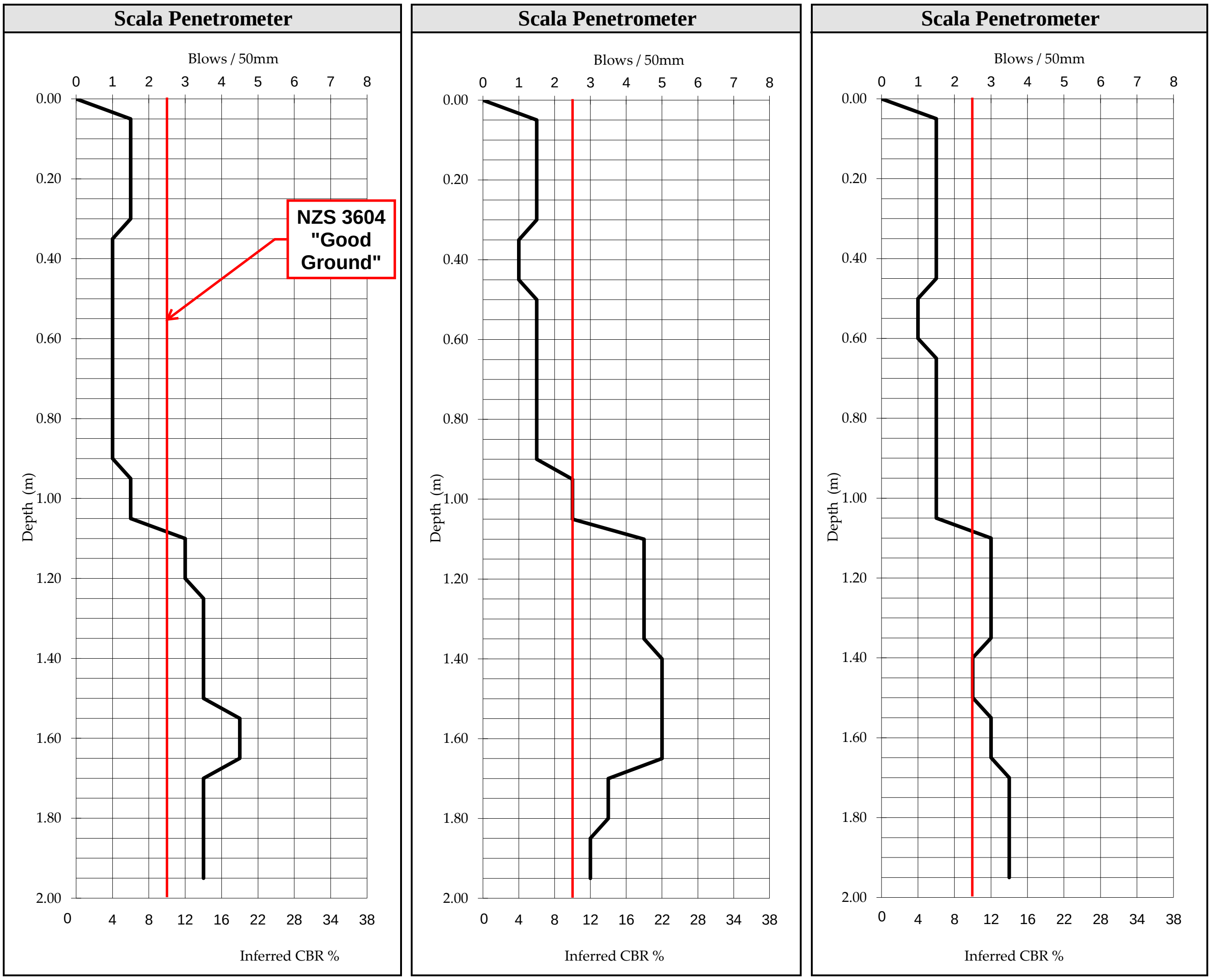
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	SCALE @ A3 1:250	DWG # A06
DWG	Te Paki Dunes Site 5 Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

Scala Test Location's 1 - 4

SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 17 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	1	Test number :	2	Test number :	3
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	Ex. GL	Reduced level :	Ex. GL

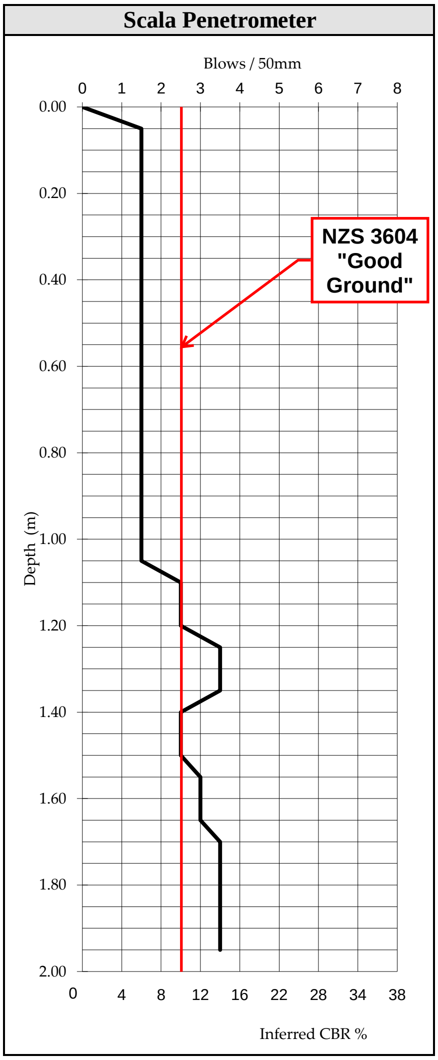


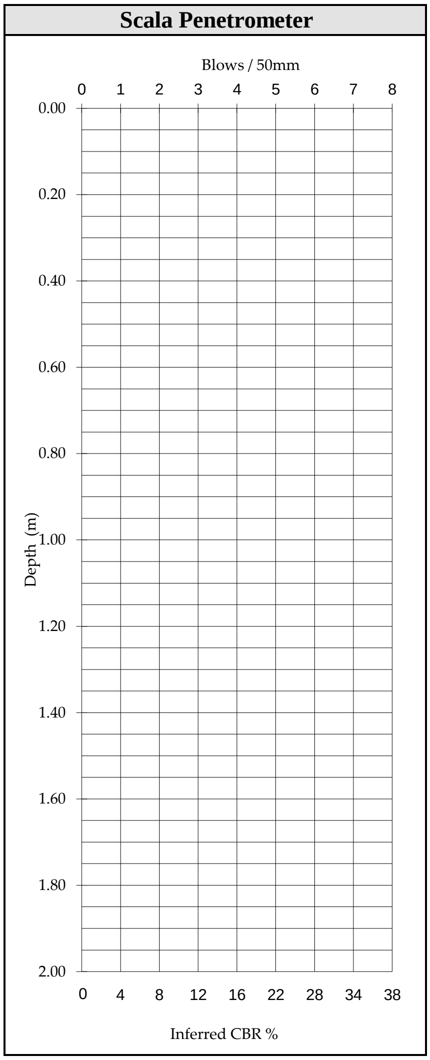
Test Methods
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

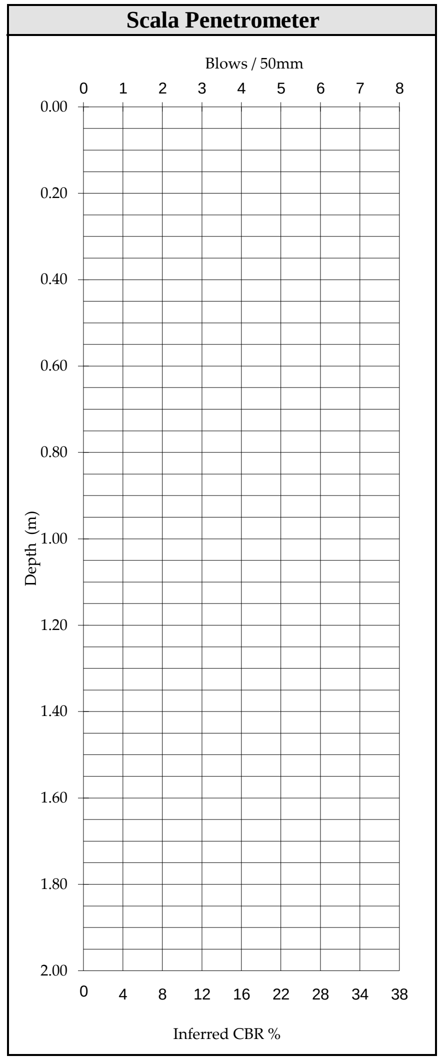
Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 17 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	4	Test number :	N/A	Test number :	N/A
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	N/A	Reduced level :	N/A



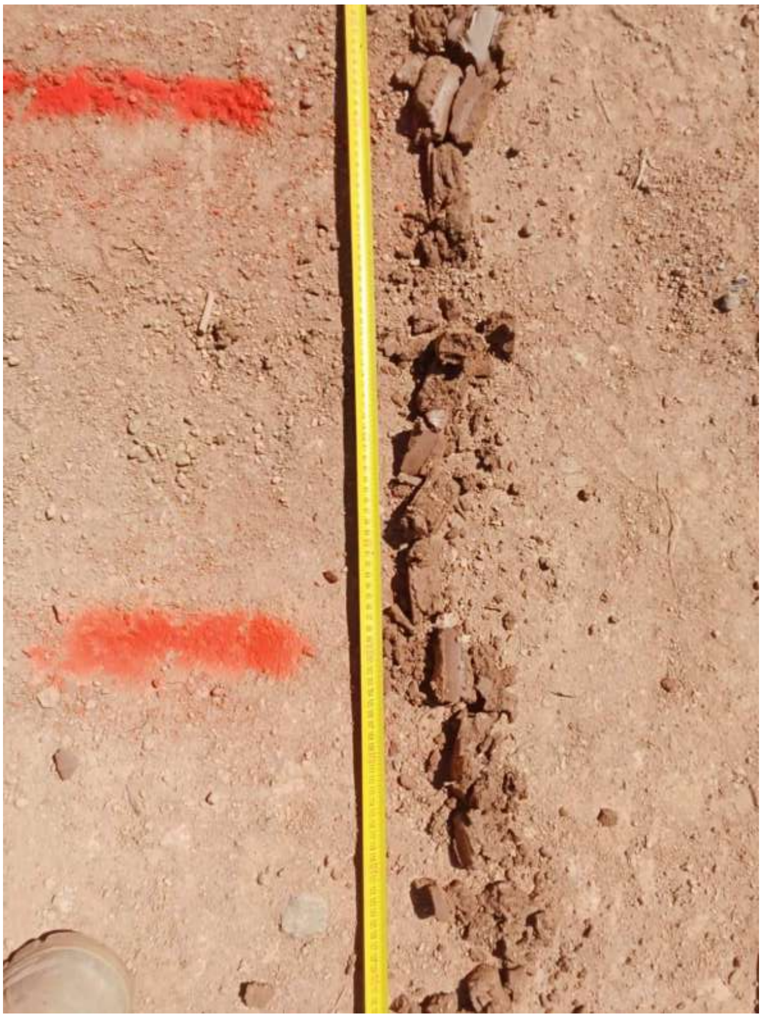


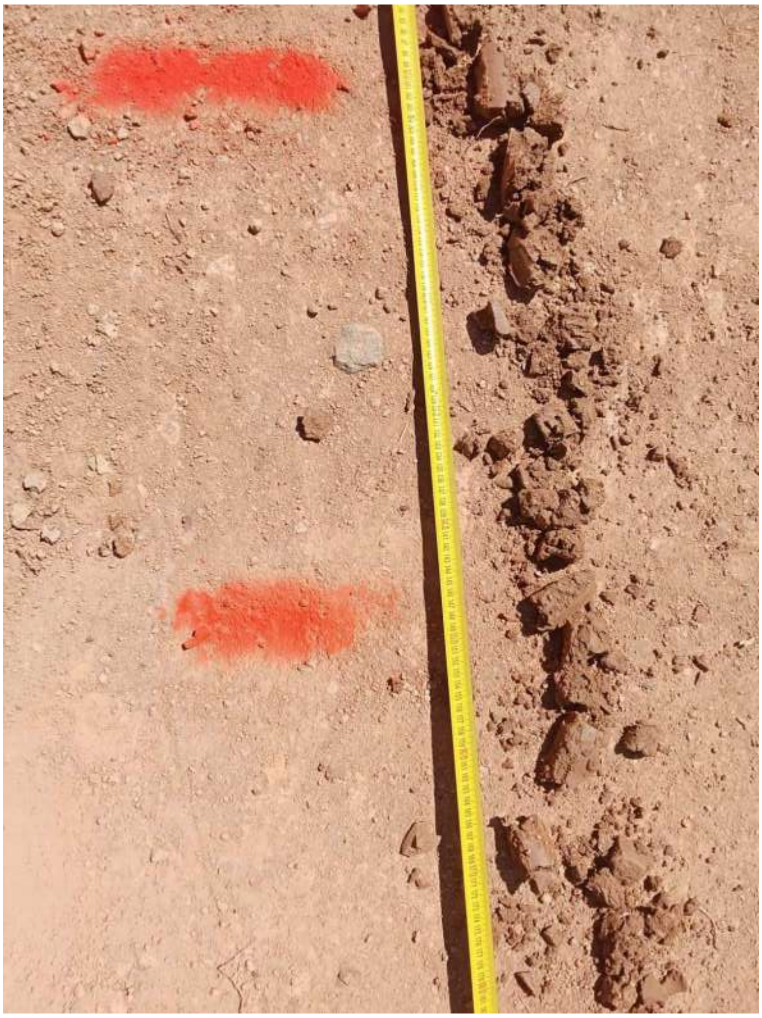


Test Methods
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

Hand Auger Samples to a Depth of 2.0m for Lot 17

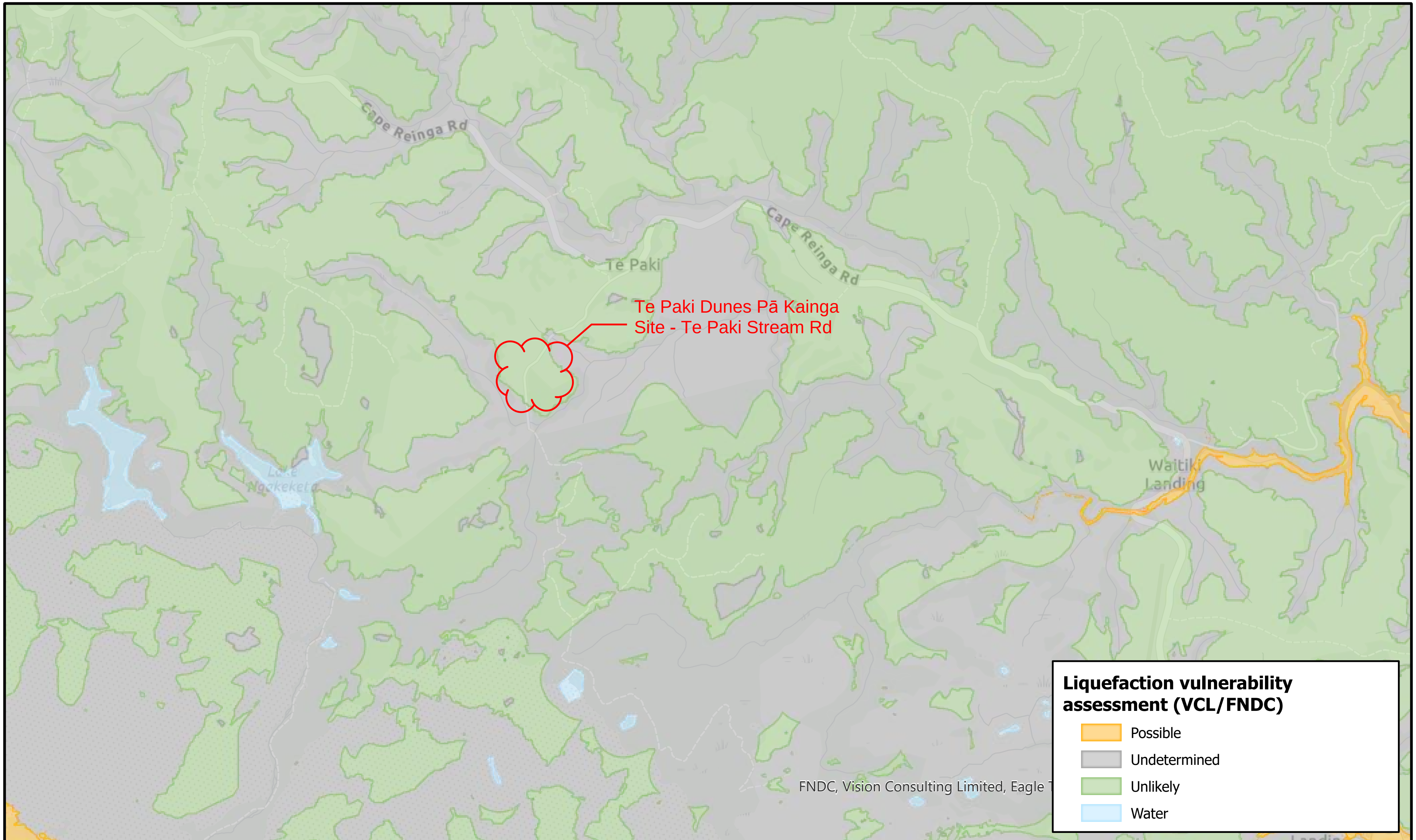




Soil Profile for Hand Auger in Lot 17

Test Location	Depth of Sample / Test [m]	Corrected Shear Vane Results		Soil Description / Classification
		Undisturbed [kPa]	Disturbed [kPa]	
A17	Existing Ground Level			
	0.0 - 0.5	63	39	CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Moist.
	0.5 - 1.0	89	48	CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Moist.
	1.0 - 1.5	119	65	CLAY, Reddish brown, Medium Dense, Firm, High plasticity, Moderately sensitive, Moist.
	1.5 - 2.0	104	51	CLAY, Reddish brown, Medium Dense, Firm, High plasticity, Moderately sensitive, Moist, GWL not reached.

FNDC Liquefaction Risk Map



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

Far North Maps

0 1 2 3 km

Projection NZTM2000. Datum NZGD2000. Scale:1:36,112

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: 22/11/2024

PRODUCER STATEMENT – PS1
DESIGN

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** J000595
ISSUED BY: Structus Consulting Limited
(Engineering Design Firm)
TO: Ngati Kuri
(Owner/Developer)
TO BE SUPPLIED TO: Far North District Council
(Building Consent Authority)
IN RESPECT OF: Proposed relocatable dwelling pile foundations
(Description of Building Work)
AT: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland
(Address, Town/City)
LEGAL DESCRIPTION: **N/A** ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*:
Refer attached particulars dated 10 December 2024 for scope of works
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only , as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment *(Verification method/acceptable solution)* B1/VM1, B1/VM4 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to attached particulars dated 10 December 2024 .
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 2 level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Darren Andew Mitchell , am:

- ☑ CPEng number 1007610

and hold the following qualifications BEng (Hons), CPEng, CMEngNZ

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Darren Andew Mitchell
(Signature below):

ON BEHALF OF *(Engineering Design Firm)*: Structus Consulting Limited Date: 10/12/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer attached particulars dated 10 December 2024

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1. Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2. NZIA Standard Conditions of Contract SCC 2011
3. Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4. PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

Structus Consulting Limited
PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 E info@structus.co.nz
www.structus.co.nz

Far North District Council

10 December 2024

Lots 16-21, Te Paki Stream Road, Cape Reinga – PS1 Producer Statement Attached Particulars

Structus have been commissioned to provide structural engineering design services for the relocatable dwelling foundation piles at Lots 16-21, Te Paki Stream Road, Cape Reinga, Northland for Ngati Kuri.

The structural design covered by this producer statement comprises the following only:

- Pile foundations
- SED Anchor pile to bearer connections.

Refer the following schedule listing the structural drawings and calculation report covered by this producer statement.

Drawing Title	No.	Rev	Structus Stamp Dated
Papakainga Development 16-21 Te Paki Dunes (Lot 16 Foundation Plan)	SK01	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 17 Foundation Plan)	SK02	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 18 Foundation Plan)	SK03	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 19 Foundation Plan)	SK04	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lots 20 & 21 Foundation Plan)	SK05	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes Structural Calculation Report		A	10/12/2024

Exclusions

The following items have not been included in this producer statement:

- Geotechnical engineering, including design parameters for pile foundations structural design
- Temporary propping, shoring or other temporary structures
- Waterproofing and cladding
- Any proprietary structures are to be designed by the supplier
- Civil engineering, such as earthworks, external pavement and drainage
- All structures above the pile foundations.

Assumptions

The design is based on the following assumptions:

- The design has been undertaken, and the ground conditions are, in accordance with the advice provided in the following FNR Geotechnical Investigation Reports:
  - Lot 16 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 17 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 18 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 19 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 20 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 21 Te Paki Stream Road, Cape Reinga – 21 November 2024
- The proposed building structure is in accordance with the architectural drawings by PanelLock dated 2/9/2024
- Seismic subsoil class E is assumed
- The Lots 16-21, Te Paki Stream Road structural works are designed for Importance Level 2 with a 50 year design life.

Alternative Solutions
The following alternative solutions to the NZ Building Code have been used on this project:

- None

B2 Compliance
A Producer Statement for Clause B2 – Structural Durability of the Building Code has been requested. We are not able to provide this because there is no verification method for B2 contained within the Building Code.

The purpose of this compliance clarification is to confirm that direct construction monitoring by Structus Consulting Limited in relation to Clause B2 (Durability) of the Building Code for the above project, has been limited in that material protection or treatment is typically carried out by specialist suppliers and requires specific quality assurance by the suppliers. However, we can confirm the specifically designed structural elements that were included in the design documentation prepared by the Structus Consulting Limited comply with the applicable verification methods.

<u>Timber</u> (means of compliance B1/VM1)
The timber has been specified in accordance with NZS3640:2004. The quality of timber treatment is dependent on the QA systems of manufacturers, suppliers and the onsite contractors and sub-contractors. Refer to the contractor's PS3 and QA records where available.

<u>Concrete</u> (means of compliance B1/VM1)
Compliance with cover and concrete quality requirements for B1/VM1 are in accordance with NZS3101:2006.

<u>Mild Steel</u> (means of compliance B1/VM1)
Protective coatings have been specified in accordance with AS/NZS 2312:2014 and SNZ TS 3404:2018.

The corrosion category and the years to first major maintenance have been identified for the structural steel work in accordance with SNZ TS 3404:2018. This allows the contractor to procure the suitable corrosion protections systems to meet AS/NZS 2312:2014 and SNZ TS 3404:2018 requirements. The quality of mild steel protective coatings is dependent on:

- Paint supplier confirming that the paint can perform to the standard as required by AS/NZS 2312:2014 and SNZ TS 3404:2018 based on the stipulated corrosion category and years to first maintenance
- Steel preparation
- Quality and production consistency of the coating products
- QA of the application and curing
- QA of the handling, protection and repair

Refer to:

- Contractor's and sub-contractor's PS3s and QA records where available
- Third party inspection and test results
- On-going maintenance plan (attached)

Applicability

The advice covered by this producer statement has been prepared by Structus at the request of its client, for the particular brief and on the terms and conditions agreed with our client and is exclusively for use and reliance by Structus' client. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of, or reliance by any third party, on the advice (in whole or in part) covered by this producer statement.

No express or implied warranty is made as to the advice contained in the information covered by this producer statement. To the extent that any information provided to Structus is inaccurate, incomplete, or inadequate, Structus takes no responsibility and disclaims all liability for any loss or damage that results from any conclusions based on information that has been provided to Structus.

Yours Sincerely
Structus Consulting Limited

Darren Mitchell
Director

Lots 16-21, Te Paki Dunes – Structural Maintenance Schedule

This schedule of ongoing inspection and maintenance of structural elements shall be included with the O&M manuals and provided to the Owner/Body Corporate and building managers.

Inspection/Maintenance timeframe and item	
(a) Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Sub-ground floor mild-steel structures such as beams.
(b) 5-yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings.
(c) 10-yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. **Note that 10 years is the expected useful life for many sealants.**
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
(d) 25-yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above.

STRUCTURAL CALCULATION REPORT

PAPAKAINGA DEVLOPMENT
TE PAKI DUNES

Prepared for: **NGATI KURI**

Date: **10 DECEMBER 2024** Reference: **J000595** Revision: **A**

STRUCTUS

DOCUMENT CONTROL RECORD

Document prepared by:

Structus Consulting Limited

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New Zealand

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Report Title	Structural Engineering Calculation Report		
Client	NGATI KURI	Job Number	J000595

Rev	Date	Revision Details	Author	Verifier	Approver
A	10 December 2024	Building Consent	A. Motara	C. Bell	D. Mitchell

Current Revision	A

Approval			
Author Signature		Approver Signature	
Name	A. Motara	Name	D. Mitchell
Title	Structural Engineer	Title	Director

Job: Papakainga Development	Job No: J000595
	Date: 10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author: A. Motara
	Pages: 2

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Job: Papakainga Development	**Job No:**	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	**Author:**	A. Motara
	Pages:	4

1 Design Overview & Philosophy

Structus was engaged by Ngati Kuri to undertake structural design and detailing for the proposed Subfloor Piles/Foundation Design at Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland. The proposed project is in the figure below. This is a calculation report in support of a building consent submission. This report is to be read in conjunction with:

- Structus marked up Architectural Drawings A1-A13 dated 06/12/24Parsonson Architecture Te Paki Dunes and Ngataki consent issue drawings A01 to A13 dated 15 /11/24
- PanelLock transportable dwelling drawings A1 to A13 dated 02 September 2024
- FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

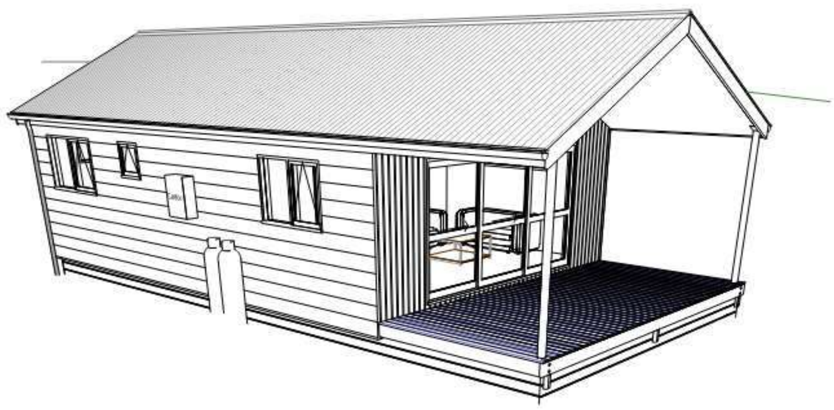

Figure 1-1: Building Overview

1.1 Location of building

Address: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland

Figure 1-2: Map View

1.2 Description of Buildings

The proposed buildings are transportable single storey dwellings of 82m² floor area. The dwellings at each lot are of similar floor plans and construction. The cladding is of lightweight construction supported by timber roof trusses and timber wall framing. The subfloor construction is of timber joists and timber piles encased in concrete.

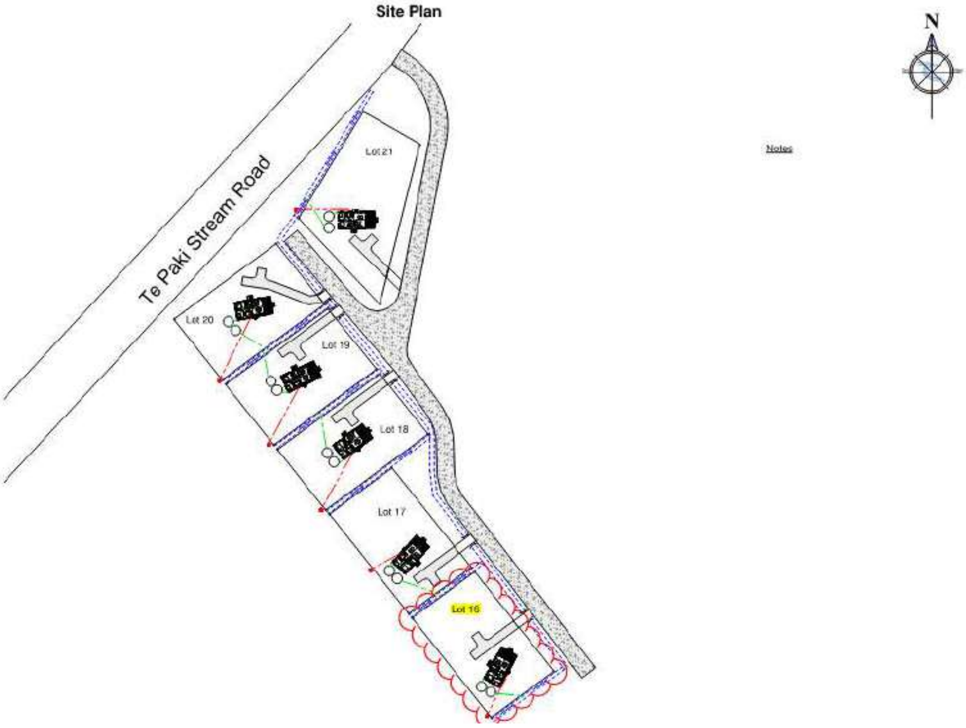

Figure 1-3: Site Plan

1.2.1 Gravity System

The gravity system is typically timber roof trusses supported by load bearing walls supported by conventional timber subfloor joists, bearers and bored timber piles.

1.2.2 Lateral Stability

Lateral stability is provided typically by roof, wall and subfloor bracing. The subfloor bracing is provided by specifically designed cantilever piles based on NZS3604 methodology for bracing demands.

1.2.3 Seismic Design

Seismic bracing demand is obtained based on NZS3604

1.2.4 Foundation

Foundations are timber piles encased in concrete. The foundations are typically embedded to a level that achieves good ground to NZS3604 or as required to achieve a suitable bracing capacity.

1.2.5 Geotechnical Investigation

- Geotechnical report reference - FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

Existing Soil Parameters	*Description*
y = 18kN/m^3	Soil density (Assumed)
s_u = 40-60kPa	Based on B1/VM4 Varies each lot - Refer to Foundation Calculations
Soil Class D or E	(Assumed/No information available)
Expansive Soil Class S	To AS:2870
Allowable end bearing = 204-300kPa	Capacity and depth varies at each Lot
Reduction factor = 0.5	Gravity case reduction factor
Reduction factor = 0.8	Seismic case reduction factor
Ground water – N/A	Ground water level not encountered

Further key points

- Liquefaction risk (Low)

2 Safety in Design

Safety in Design is required under the Health and Safety at Work Act 2015 (HSWA) and integrates risk management into the design process to identify, assess and treat Health and Safety risks to people over the life of an asset.

The HSWA requires designers to ensure, so far as is reasonably practicable, that any structure they design is without risks to the health and safety of persons who:

- Use the structure at a workplace (end users/customers);
- Construct the structure at a workplace;
- Carry out the manufacture, assembly, use, maintenance, proper demolition and disposal of the structure at a workplace; or
- Are in the vicinity of a workplace and are exposed to the structure, or whose health and safety may be affected by an activity related to the structure.

Structus has considered Safety in Design throughout the design process. Some risks have been designed out throughout the design process and therefore have been eliminated, however, other residual risks do exist. The residual risks are as follows:

- Open excavations/pile holes during construction.

The Safe Design report has identified hazards relating to the design of the structural works shown on the documents that would not normally be expected in other designs of the same type of structure.

The method of construction and maintaining safety during construction are the responsibility of the builder. If any of the structure in our designs is considered to present an unreasonable risk in respect to construction safety, the matter shall be referred to Structus for resolution before proceeding with the work.

This report is prepared solely for the purposes of the person conducting the business or undertaking who commissioned the design and is not prepared for the benefit of any other party or for any other purpose.

3 Loading and Material Properties

3.1 Importance Level

*The Importance Level is determined using Table 3.2 of AS/NZS 1170.0 and will be used to determine the required return periods of wind and seismic loading.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2

Figure 3-1: Importance Levels for Building Types

The residence is a (normal structure) and is classified as an Importance Level 2 building for design.

Design life of the building is 50 years therefore. From Table 3.3 of AS/NZS1170.0, the required Annual Probabilities of Exceedance are as follows:

Load	Importance Level	Annual probability of exceedance
Wu – Wind Loading Ultimate	2	1/500
Eu – Earthquake Loading Ultimate		1/500
Eu – Earthquake Loading Ultimate (Parts & Components)		1/500
All SLS loads		1/25

TABLE 3.3

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1	1/25	1/25	1/25	—	
	2	1/100	1/50	1/100	1/25	
	3	1/250	1/100	1/250	1/25	
	4	1/1000	1/250	1/1000	1/25	
5 years	1	1/25	1/25	1/25	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
25 years	1	1/50	1/25	1/50	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
50 years	1	1/100	1/50	1/100	—	—
	2	1/500	1/150	1/500	1/25	—
	3	1/1000	1/250	1/1000	1/25	—
	4	1/2500	1/500	1/2500	1/25	1/500

Figure 3-2: Annual Probability of Exceedance

3.2 Loadings

3.2.1 Self-Weight of Elements (SW):

- Concrete piles = 24kN/m3
- Perimeter cladding = 0.2kPa

Elements with self-weight (G)	*Description*
G_{roof} = 0.33 kPa	Roof build-up Metalcraft T-Rib roofing (assuming 0.55mm) 0.065kPa, Timber Trusses @900crs 0.07kPa, 0.04kPa Purlins, 0.05kPa Insulation blanket, 0.11kPa 18mm Triboard Ceiling.
G_{floor}= 0.30 kPa	Floor Build-up (0.14kPa 240x45 joists @ 400 crs + 0.1kPa 20mm particle boardT&G + 0.05kPa Insulation, misc 0.01kPa.
G_{int_wall} = 0.22kPa	36mm Triboard Wall panel.
G_{ext_wall} = 0.44 kPa	0.13kPa 7.5mm Hardi plank Weatherboards, 0.04kPa 90x45 framing, 0.05kPa insulation, 0.22kPa 36mm Triboard Wall panel

3.2.2 Superimposed Dead Loads (SDL)

SDL (G)	*Description*
G_{SDL}= 0.35 kPa	Nominal (Residential floor incl. floor coverings).

3.2.3 Imposed Loads (Q)

The following imposed / live loads are as per T3.1 of AS/NZS1170.1

Live Load (Q)	*Description*
Q_{RF} = 0.25 kPa	Roof life load
Q_{Floor} = 1.5kPa or 1.8kN	Residential Floor
Q_{Deck} = 2.0kPa	Residential balcony

3.2.4 Wind Loading

Wind Loading to be worked out using NZS3604 as per GIB spreadsheet – See Later Sections.

3.2.5 Seismic Loading

Seismic Load to be determined using NZS3604 and modified as required for the anchor pile design.

3.2.6 Load Combinations

The ultimate limit state combinations are considered as per AS/NZS 1170.0 section 4.2.

ULS Load Combinations	*Commentary*
[1.35G]	Permanent action
[1.2G, 1.5Q]	Permanent and imposed
[1.2G, W_u, ψ_cQ]	Downward wind ULS case
[0.9G, W_u]	Upward wind ULS case
[G, ψ_EQ, E_u]	Earthquake case

3.3 Material Properties

3.3.1 Concrete Strengths

- Foundations: 30 MPa

3.3.2 Reinforcing Steel

- Reinforcing Steel (High Yield) 500 MPa Micro Alloy Grade E
- Reinforcing Steel (Mild Steel) 300 MPa Micro Alloy Grade E

3.3.3 Structural Steel

3.3.3.1 Steel Grade

- Rolled Steel Sections: 300 MPa – Grade 300 to AS/NZS 3679
- Steel Plate General 250 MPa – Grade 250 to AS1594
- Steel Plate (special) 300 MPa – Grade 300 AS/NZS 3678
- StelTech Beams 300MPa – Grade 300 AS/NZS 3679
- CHS Hollow Sections 350MPa – Grade C350 AS 1163
- RHS Hollow Sections: AS 1163 - Grade C350 AS 1163
- Bolt Grades: Grade 4.6 mild steel and grade 8.8 high strength
- Tensioning requirements for 8.8 bolts S, TB, TF as required

3.3.3.2 Steel Corrosion Category

Durability Zone D (Far North) to NZS3604

3.3.4 Structural Timber

All timber shall be Pinus Radiata SG8 or SG6 grade and meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber.

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4 Structural Load Path

Below is the typical structure for a single storey dwelling supported by trusses, load bearing walls, floor joists and shallow gravity piles with anchor piles for bracing.

Figure 4-1: Typical Roof Plan

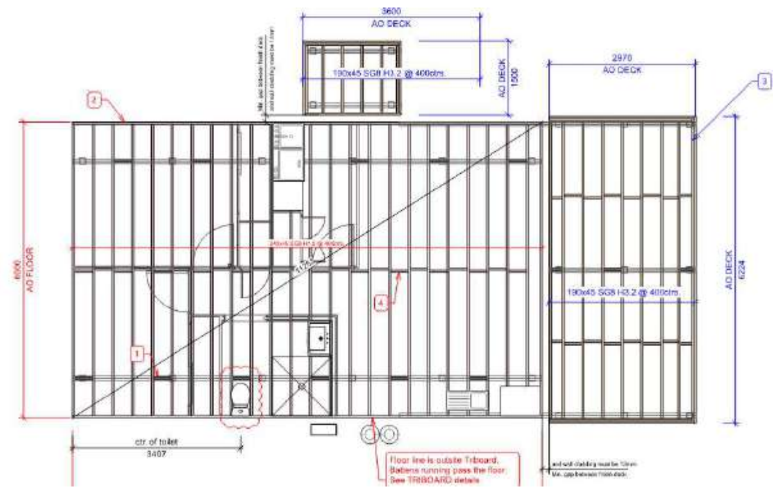


Figure 4-2**: Typical Floor Plan**

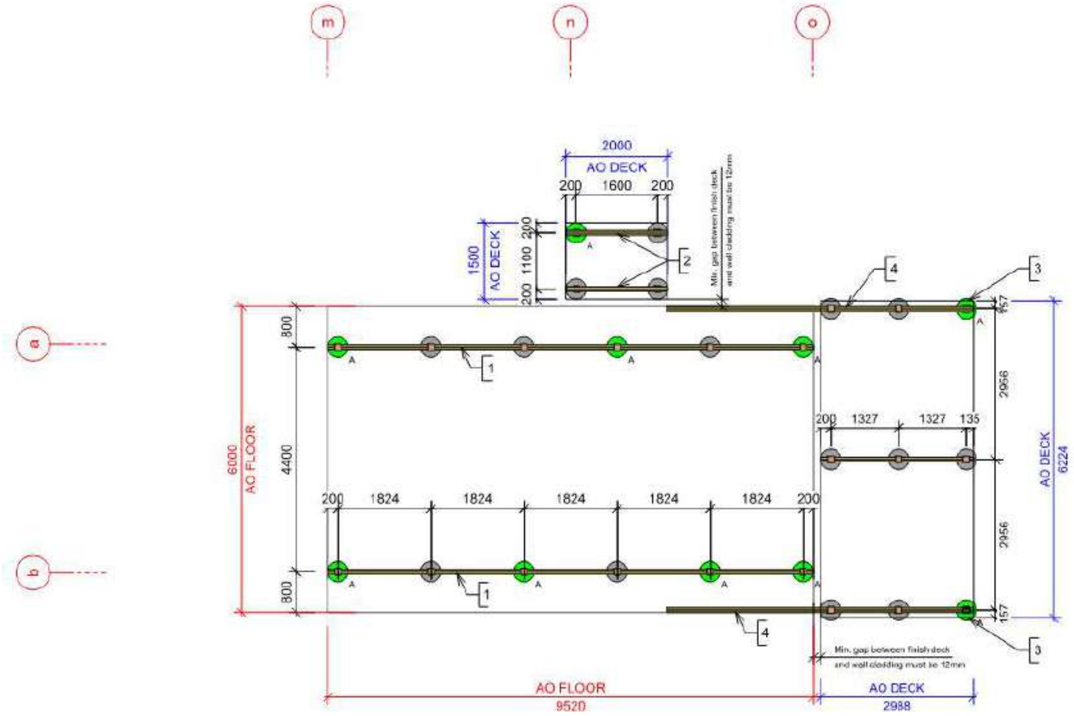
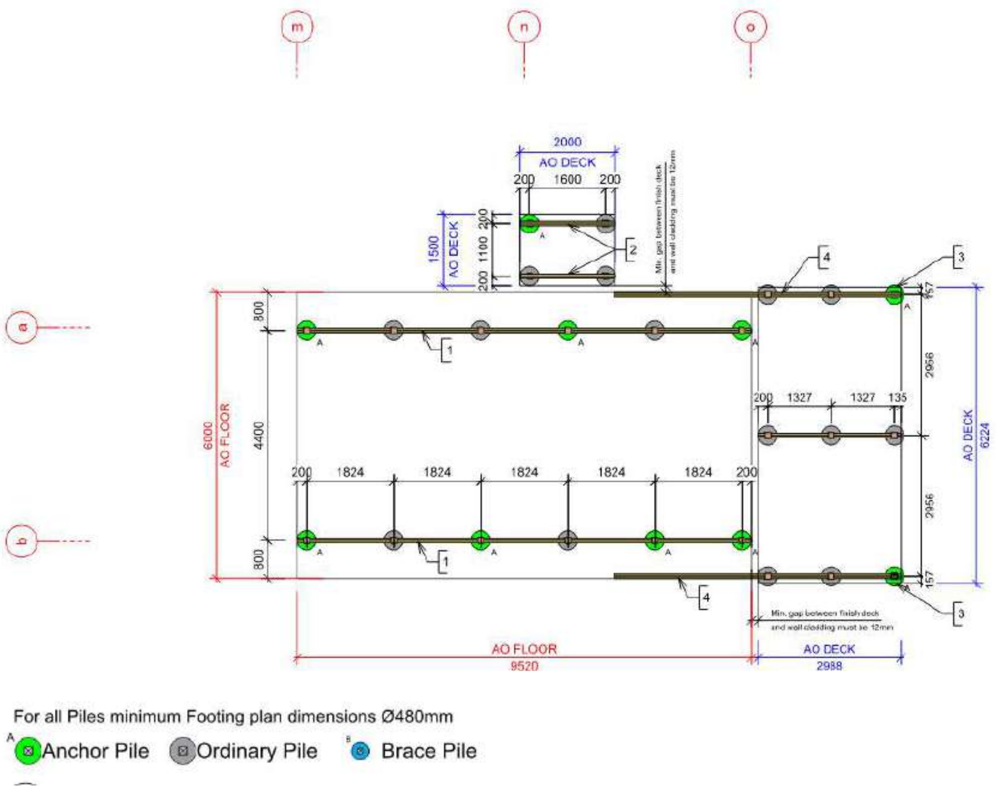


Figure 4-3: Typical Lateral System Plan

5 Subfloor Bracing Design

5.1 Bracing Design

Verification of the bracing plan below based on NZS3604 design loads.



Job: Papakainga Development		**Job No:**	J000595
		Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report		**Author:**	A. Motara
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Building Specification

Number of Storeys	Single
Floor Loading	2 kPa
Foundation Type	Subfloor
Sub Floor Cladding	Light

	Single
Cladding Weight ?	Light
Roof Weight ?	Light
Room in Roof Space	No
Roof Pitch (degrees) ?	25
Roof Height above Eaves (m)	1.4
Building Height to Apex (m)	4.05
Ground to Lower Floor (m)	0.71
Stud Height (m)	2.4
Building Length (m)	10
Building Width (m)	6

Building Location

Wind Zone = High

Wind Zone or Consent Authority	Not Available
Wind Region ?	A
Lee Zone	No
Ground Roughness ?	Open
Site Exposure ?	Exposed
Topography ?	T1

? Earthquake Zone	1
Soil Type	D & E (Deep to Very Soft)
Annual Prob. of Exceedance	1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	224	304
Subfloor Level	401	600

Bracing Units required for Earthquake

	Along and Across
Single	395
Subfloor Level	547

SubFloor Along

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)	Wind	Earthquake
									Demand	
									401	547
									Resistance	
									960 239%	720 132%
A		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK
B		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK

SubFloor Across

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)	Wind	Earthquake
									Demand	
									600	547
									Resistance	
									960 160%	720 132%
M		1	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
N		2	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
O		3	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK

Hence across direction is critical

Note re-check line O for additional demand from the deck.

7.4.2.2

Decks which project more than 2 m from the building shall have *subfloor bracing* provided by anchor and/or *braced piles*, at half the *bracing demand* required by table 5.8 for "light/light/light" *cladding*, for 0° *roof* slope and for "subfloor structures".

Anchor piles rating per pile	120 BUs for earthquake 160 BUs for wind

Table 5.8 – Bracing demand for various combinations of cladding on single-storey buildings on subfloor framing (2 kPa floor load, soil type D/E, earthquake zone 3) (see 5.3.1)

Roof cladding	Single-storey cladding	Subfloor cladding	Roof pitch degrees	Subfloor structure	Single-storey walls
				BU/m²	
Light roof	Light	Light and Medium	0-25 25-45 45-60	15 16 17	11 11 13
		Heavy	0-25 25-45 45-60	17 18 19	11 12 13
		Medium	0-25 25-45 45-60	18 18 19	12 13 14

Multiplication factors		EQ zone			
Soil class		1	2	3	4
A & B	Rock	0.3	0.5	0.6	0.9
C	Shallow	0.4	0.6	0.7	1.1
D & E	Deep to Very soft	0.5	0.8	1.0	1.5
NOTE – See 5.3.4 for additional bracing demand.					

Area of deck = 6.2x3=18.6m^2

Demand = ½ (0.5 x 16 x 18.6) = 74 BU (Total)

Demand/line = 74/2 = 37 BUs

From the bracing spreadsheet in the critical across direction

Capacity of Line O = 240 Bus

Demand based on tributary width = 547/3 lines = 182 BUS

Reserve capacity = 240-182 = 58 BUS > 37 BUs Hence OK

No additional piles required for the deck along the house line

For other lines

Nominal 1 AP at corner locations providing 120BUs > 37 BUs OK

Refer to the Anchor Pile specific design for pile design.

6 Foundation Design

6.1 Ground Conditions Summary

The following has been summarised from the geotechnical report.

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Notes –

Bearing capacity based on geotechnical engineer/soil report

Undrained shear strength derived from on B1/VM4 bearing capacity equations Qult =Nc x Su (based on ultimate bearing capacity)

6.2 Gravity Piles

6.2.1 Loading

Typical Pile (Central)						Pile Spacing (s)		1.82 m
		Dist Load		line Load		Pile Point Load w x s		
Element	Trib Width	G	Q	G	Q	G	Q	
Roof	3	0.35		1.05		1.911		
Ext. Wall	2.4	0.44		1.056		1.92192		
Floor	3	0.3	1.5	0.9	4.5	1.638	8.19	
Floor SDL	3	0.35		1.05		1.911		
					Totals	7.4	8.19	kN
		Factored Loads		ULS	1.2G+1.5Q	**21.1**	kN	
					1.35G	**10.0**	kN	
				SLS	G+0.7Q	**13**	kN	

6.2.2 Gravity Pile Design Lots 16-21

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	**16**		
Ultimate Pile Capacity Q_ult	**204**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.7**	m	
Pile Area	0.38	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	12.0		
ULS Pile Load = P + 1.2xW_pile	35.6	kN	
SLS Pile Load = P_s+W_pile	25.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**39.3**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**25.9**		**OK**
Adopt	**700 dia piles 1.3m deep**		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	**17**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	6.1		
ULS Pile Load = P + 1.2xW_pile	28.5	kN	
SLS Pile Load = P_s+W_pile	19.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	18		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.6	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.8		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	10.3		
ULS Pile Load = P + 1.2xW_pile	33.5	kN	
SLS Pile Load = P_s+W_pile	23.4	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550dia piles 1.8m deep		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	19		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.5	m	
Pile Area	0.20	m^2	
Depth to a (La)	0.65	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	0.85		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	4.0		
ULS Pile Load = P + 1.2xW_pile	25.9	kN	
SLS Pile Load = P_s+W_pile	17.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	29.5		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	19.4		OK
Adopt	500 dia piles 0.85m deep		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	20&21		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.4	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.6		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	9.1		
ULS Pile Load = P + 1.2xW_pile	32.1	kN	
SLS Pile Load = P_s+W_pile	22.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550 dia piles 1.6m deep		

Gravity Piles Summary

Pile Gravity Design Summary

Lot	Pile Diameter mm	Pile Depth m
16	700	1.3
17	500	1.3
18	550	1.8
19	500	0.85
20	550	1.6
21	550	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles

<u>For Simplicity of Design – Consider typical piles to be Ø550 for Lot 17-21 & Ø700 for Lot 16 with depth as per the table</u>

6.3 Cantilever Anchor Pile

From the Engineering Basis of NZS 3604 the following tables are provided

3.4.2 Design for safety (ultimate limit state - ULS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	Deflection (mm)
Anchor pile	120	6.0	30	160	8.0	30
Braced pile	120	6.0	50	160	8.0	50
Cantilever pile	30	1.5	25	70	3.5	45

3.4.3 Design for serviceability (serviceability limit state - SLS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	rating Deflection (mm)
Anchor pile	20	1.0	3	120	6.0	10
Braced pile	20	1.0	3	120	6.0	13
Cantilever pile	5	0.4	1	45	2.25	4

1) Consider capacity design actions on the piles

Components – timber pile; bolted connection, soil.

Assuming the ductile demand = 120BU = 6kN (Typical anchor pile capacity)

Consider the pile design to be nominally ductile

From NZS3604 design basis – the design ductility is 3.5; Sp = 0.7; k_mew = 2.4

For Nominally ductile loads T=0.4, mew = 1.25, Sp=0.925, k_mew= 1.14

Elastic load factor = k_mew(3.5) /Sp = 2.4/0.7 = 3.43

Reduce by nominally ductile factor = 3.43 x (0.925/1.14) = 2.78

6kN x 2.78 = 16.6kN

Notes – EZI brace design is about 132% over strength for EQ

Hence reduce by demands 32% (for capacity just meeting demand)

Revised demand = 16.6/1.32 = 12.5 kN (Minimum demand on each pile)

Height above ground = height to FFL – Joist Depth – floor boards = 710-240-20 = 450mm

Wind is not critical due to the scaling factor applied to the loads.

Design philosophy of piles.

- If good ground is very deep (>1.5df)– consider the using lower bound soil capacity (Q_ult = 204kPa➔ Su=40kPa) with eo=1.5df (All cases except Lot 19)
- If good ground found is relatively shallow <1.5df (~ 0.6-0.8m) use the higher values for good ground. (Lot 19)
- Consider the max bending moment to be at the location in the ground as per the Broms formula ignoring strength of concrete.
- Use the same pile diameter as the gravity piles for simplicity.

6.3.1 Anchor Pile Design 16-21

Ground Condition Summary (Lot 16-21)

					Nc = 5.14 (undrained condition) Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)	
Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Capacity of 200x200 SG6 Square pole Wet Condition

Fb(SG6) = 7.5 MPa

Notes – Phi = 1.0 for capacity designed elements.

Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x200x200^2/6 = 10.0 kNm

For 250x250 SG6

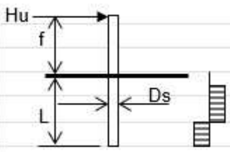
Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x250x250^2/6 = 19.5 kNm (Governs most designs)

Notes – Phi factor = 0.8 for seismic overstrength loads applied to the shear strength of soils

Lot 16

Use Ø700 Pile as per the gravity piles for this lot.

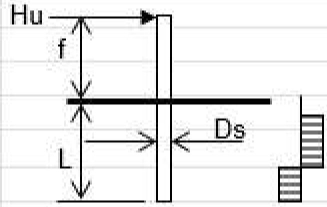
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.9718	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.12426	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.0136	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	12.732	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11315	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 12.7 kN > 12.5 kN accept

Recheck for the max allowable height (600mm is typically OK for all other sites – hence try 600mm)

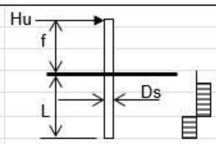


NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	13.882	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11886	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.3832	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	11.6154	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.10762	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

11.6kN < 12.5kN (92% capacity – within 10% Acceptable) but limit to 450mm.

<u>Adopt 250x250 SG6 Pile in 1.8m deep xØ700 pile for Lot 16(max height 450mm to GL-CL of fixing)</u>

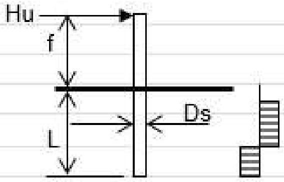
<u>Lot 17,18,20,21</u>



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	14.7551	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91815	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 14 kN > 12.5 kN accept

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	12.976	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90692	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	19.0223	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	13.2928	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90892	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.0kN>12.5kN (OK)

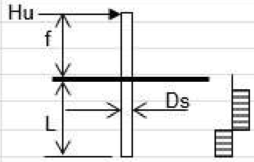
<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 17,18,20,21(max height 600mm to GL-CL of fixing)</u>

<u>Notes – adopt 1.8m for Lot 18 as gravity piles are deeper.</u>

<u>Lot 19</u>

300kPa strength found @ 0.65m on this lot

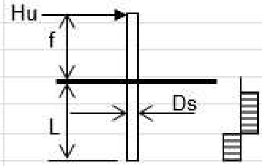
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	15.9122	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89488	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	20.8441	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	14.9112	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89049	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Try 600mm height

NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.5832	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88905	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	21.2481	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	13.4072	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88388	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.4kN > 12.5kN (OK)

<u>Hence 1.5m depth required. hence keep to 1.6m as per typical lots for simplicity (max height 600mm to GL-CL of fixing)</u>

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 19</u>

6.3.1.1 Deck Piles

Check typical deck anchor piles if design can be reduced

Demand from NZS3604 from before per pile = 37 BUs

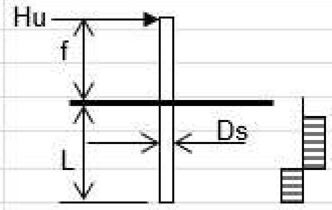
Scaled up demands = 37/20BU x 2.78 = 5.14 kN

Based on other lots – check the design using the lower bound values.

Bending Capacity of 125x125 post = 0.8 x 10 x 125x125^2/6 = 2.6kNm

Bending Capacity of 150x150 post = 0.8 x 10 x 150x150^2/6 = 4.5kNm

Pile depths are typically minimum 1.6m for anchor piles



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	3.4	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	2.64929	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.84173	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

<u>2.6kN < 5.1 kN demand (N.G – hence requires greater pile 200SQ min size – since there are only two deck piles – keep the same size throughout – i.e. 250 SQ.</u>

Note – since the house demands are overall just meeting <u>– adopt one additional pile along line of house</u>

(deck demand = 74BU/20 x 2.78 = 10.3kN < 12.5kN for one pile OK.

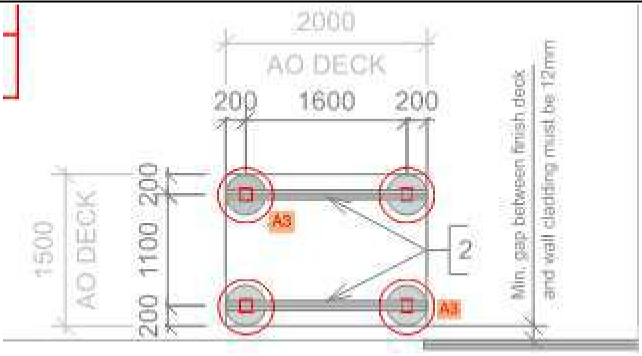
<u>Check min required for uplift of deck post.</u>

Volume of concrete = 0.4m^3 (To Arch.)

Lreq = 0.4 / (pi x 0.55^2/4 – 0.25^2) = 2.3m > 1.6m (hence increase depth to 2.3 meters for deck piles with Ø550 dia piles and post above.

Lreq(700dia) = 0.4 / (pi x 0.7^2/4 – 0.25^2) = 1.24m < 1.8m (hence 1.8 m OK for 700 dia piles)

6.3.1.2 Small Deck Piles



A_Deck = 1.5x2 = 3m^2

A_pile = 0.75m^2

For gravity – simply adopt the typical pile depths and diameter for simplicity.

Bracing demand – typically standard anchor piles to NZS3604 will be OK by inspection of 900mm depth or greater if required by the typical gravity piles.

6.3.1.3 Pile Design Summary Overall

Pile Design Summary Final Lot 16-21

Lot	Pile Diameter mm	Pile Depth m	Anchor Pile
16	700	1.3	1.8
17	550	1.3	1.6
18	550	1.8	1.8
19	550	0.9	1.6
20	550	1.6	1.6
21	550	1.6	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles & 250SQ H5 for Anchor Piles
Min strength SG6

Deck piles sized for uplift min 2.3m deep for 550 piles and 1.8m for 700piles

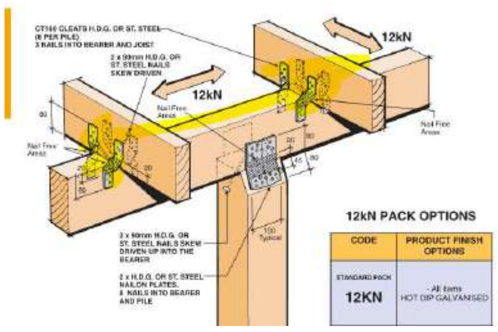
6.3.2 Connection Design

The overstrength seismic demand is 12.5 kN

This is comparable to 12kN NZS3604 connection (96%) Capacity

Hence typical connections may be substituted.

For joists to bearer connection use standard CT160 connections or similar.



However, for completeness provide the bolted connection design to the pile due to the larger size.

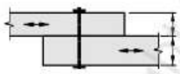
Since the loads are nominally ductile – consider the simplified method for design of bolted connections to AS/NZS1720.

<u>Case 1</u>

Load direction parallel to grain

TABLE 4.9(A)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SYSTEM CAPACITY

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{sk1})
(1) Two member 	b_{eff} equals smaller of t_1 and t_2	Q_{k1}

Member = 2/190x45 SG8

Be = 90mm

Try 2/M16 Bolts

TABLE 4.9(C)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{k1}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
JD5	25	2 100	2 800	3 500	4 200	5 600	7 000	8 400	10 500	12 60
	35	2 200	3 900	4 900	5 900	7 800	9 800	11 800	14 700	17 60
	40	2 200	3 900	5 600	6 700	9 000	11 200	13 400	16 800	20 20
	45	2 200	3 900	6 200	7 600	10 100	12 600	15 100	18 900	22 70
	70	2 200	3 900	6 200	8 900	15 700	19 600	23 500	29 400	35 30
	90	2 200	3 900	6 200	8 900	15 800	24 600	30 200	37 800	45 40
	105	2 200	3 900	6 200	8 900	15 800	24 600	35 300	44 100	52 90
	120	2 200	3 900	6 200	8 900	15 800	24 600	35 500	50 400	60 50

Qskl=Qkl=15.8kN /bolt

$$N_{d,j} = \phi\, k_1\, k_{16}\, k_{17}\, n\, Q_{sk} \qquad \ldots 4.4(3)$$

and

N^* = design action effect in shear

ϕ = capacity factor (see Clause 2.3)

k_1 = factor for duration of load for fasteners (see Clause 2.4.1.1)

k_{16} = 1.2 for bolts that transfer load through metal side plates (see Figure 4.7) of adequate strength, and the bolts are a close fit to the holes in these plates provided that $b_{eff}/D > 5$ for loads acting parallel to the grain and $b_{eff}/D > 10$ for loads acting perpendicular to the grain (where b_{eff} denotes the effective timber thickness and D is the bolt diameter)
= 1.0 otherwise

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k_{17} = factor for multiple bolted joint given in Table 4.12

n = number of bolts resisting design action effect in shear

Q_{sk} = characteristic capacities as derived in Clause 4.4.2.4. See also Clauses 4.4.4 and 4.4.5

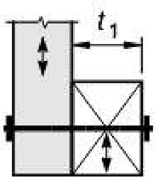
(e) For connections designed using the simplified method set out in ZZ4.1 to ZZ4.5: ϕ = 0.8.

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 15.8 = 25.3 kN > 12.5kN (OK)

<u>Case 2</u>

Check strength of pile connection.

Member = 250x160 (recessed) SG6, Unseasoned J5

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skp})
(1) Two member 	b_{eff} equals $2t_1$	Q_{kp}

Be = 160x2=320mm

Qskp=Qkp

Try 2/M16 Bolts

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.7 = 9.12 kN < 12.5kN (N.G)

Try use 4/M16

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.72 = 18.3 kN > 12.5kN (OK)

Hence Adopt 4-M16 Bolts for the pile bearer connection.

Minimum edge distances

To the loaded side of timber = 5xD = 5 x 16 = 80mm

C-C spacing = 5D = 80mm

Timber width required = 80+80+80 = 260mm > 250mm (Close – Accept as the bolts are not fully loaded & greater than elastic capacity can be achieved).

<u>Case 3</u>

For anchor piles loaded perp to direction of the bearers – check washer capacity

3.2.6 Bearing capacity

3.2.6.1 *Design capacity in bearing perpendicular to the grain*

The design capacity in bearing perpendicular to the grain ($N_{d,p}$) of a structural element (see Figure 3.8), for strength limit state, shall satisfy the following:

$$N_{d,p} \geq N_p^* \qquad \ldots 3.2(15)$$

where

$$N_{d,p} = \phi\, k_1\, k_4\, k_6\, k_7\, f_p'\, A_p \qquad \ldots 3.2(16)$$

and

ϕ = capacity factor (see Clause 2.3)

N_p^* = design load effect in bearing (see Figure 3.8 and Clause 1.4.2.2)

k_1 to k_7 = modification factors given in Section 2

f_p' = characteristic value in bearing perpendicular to grain

A_p = bearing area for loading perpendicular to grain.

For SG6/No. 1 Framing fp = 5.3MPa

Using 4 No. 60mm Square washers

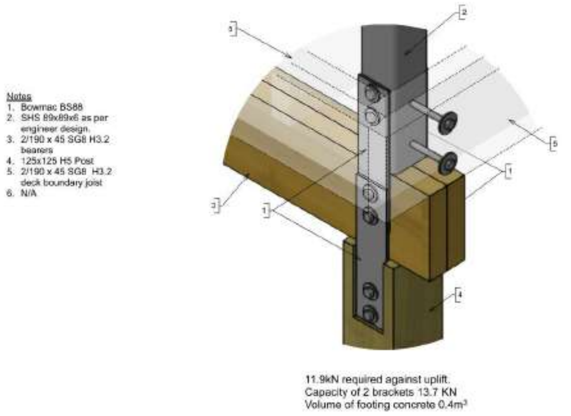
Phi_Nd,p = 0.8 x 1.0 x 1.0 x 1.0 x 1.0 x 5.3 x 4 x 60^2= 61 kN >>12.5 kN (OK)

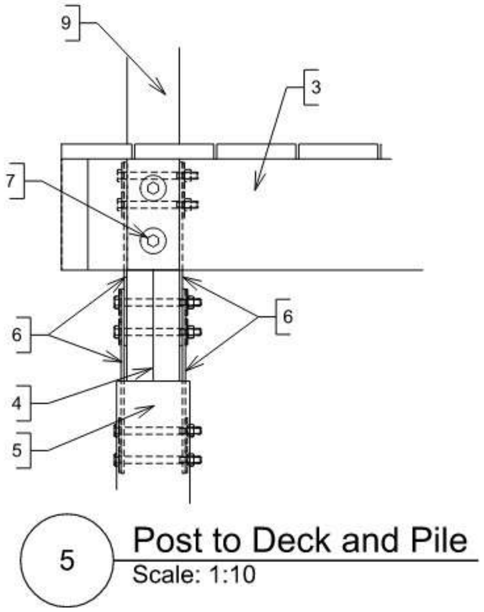
Using minimum 4mm Thk washer as per code (OK by inspection).

Adopt minimum 60mm x 4mm Square washers to M16 Bolts.

6.3.2.1 Connection at Deck Post

The architect has provided a connection detail for the external post. Check for compatibility with anchor pile design (note uplift requirements check by other engineer)





The connection in the square post is critical.

Slot cut the post to achieve double shear

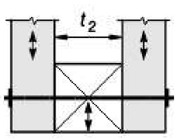
(2) Three member, Type A 	b_{eff} equals t_2	$2Q_{kp}$

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N — Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Be = 90mm

Qskp = 2 x 2.11kN = 4.22kN/12mm bolt

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 4.22 = 6.7 kN > 5.14kN (OK)

Hence OK to adopt the architect detail for the anchor piles of the deck. (i.e. 2/M12 bolts slot cut in timber pile)

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PO Box 62, Awanui 0451
GST No: 107-240-918

19th November 2024
Att: Parson Architecture & PanelLock

To Whom it may Concern

Good Ground Report for Proposed New Dwelling at Lot 18 Te Paki Stream Road, Cape Reinga.

FNR Consulting have been engaged by Ngati Kuri to carry out geotechnical testing for a proposed new dwelling with an approximate floor area of 82m^2. A total of four scala penetrometer tests and one hand auger were conducted.

Testing was carried out in general accordance with the requirements of NZS 3604 and NZS 4402.

The test locations are shown in the attached plans and photographs, with the test results also attached to this document.

The NZLI Soils Map describes the soils in this area as: **Rangiuru Clay**.

Observations

The site soils appeared to be consistent with the NZLI Soils Map description, with clay observed in the hand auger testing across the subdivision. Based on the soil samples, the clay appeared to have a high plasticity and was moderately sensitive. In general, the clay was also loose to medium dense and had a soft consistency. The soil appeared to be either dry or moist, while the ground water level (GWL) was not reached over the 2.0m depth tested. Refer to the attached hand auger results for a full soil profile of the hand auger conducted in the centre of the building.

The site had been levelled, with material excavated to the existing ground level (i.e. the tests were performed in the undisturbed natural ground not fill material). Topsoil had not been spread over the house site at the time of testing.

There are no visual signs of slope instability in the vicinity of the building site and the proposed position of the building relative to the adjacent slope is appropriate and does not pose a risk in terms of slope stability.

The site classification based on site reactivity in accordance with AS2870-2011 Table 2.1 is **Class S – Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.**

Liquefaction Risk

A desk-top study of liquefaction risk for this site has been undertaken.

"The area of Northland is identified to be at low risk of seismic hazard. There are no active faults known in the Far North. Small earthquakes will give short duration shaking that may not have enough cycles to cause liquefaction. Microzoning studies are probably not required as the hazard is low (GNS 2004)" - Regional Liquefaction Vulnerability Assessment – Far North District, prepared by Vision Consulting for FNDC 20/01/2023.

According to the above referenced report, and associated mapping, the Liquefaction Vulnerability Category for this site is "unlikely". This indicates that "there is a probability of more than 85% that liquefaction-induced ground damage will be None to Minor for 500-year shaking".

Based on the above it is considered that the liquefaction vulnerability for this site is low and that the expected degree of liquefaction induced ground damage is none to minor.

Scala Results

The penetrometer testing (attached below) indicated that the in-situ soils achieve “Good Ground” (as per the NZS 3604 definition) criteria between approximately 1.40m and 1.55m below the original ground surface.

Yours Sincerely

M. Burkhardt Macrae.

Manu Burkhardt Macrae
BE, CMEngNZ, 253797
Attachments:

- *Site Plan and Test Locations; Photos; Scala Test Reports, Hand Auger Test Results, FNDC Liquefaction Risk Assessment.*

Site Plan

Notes

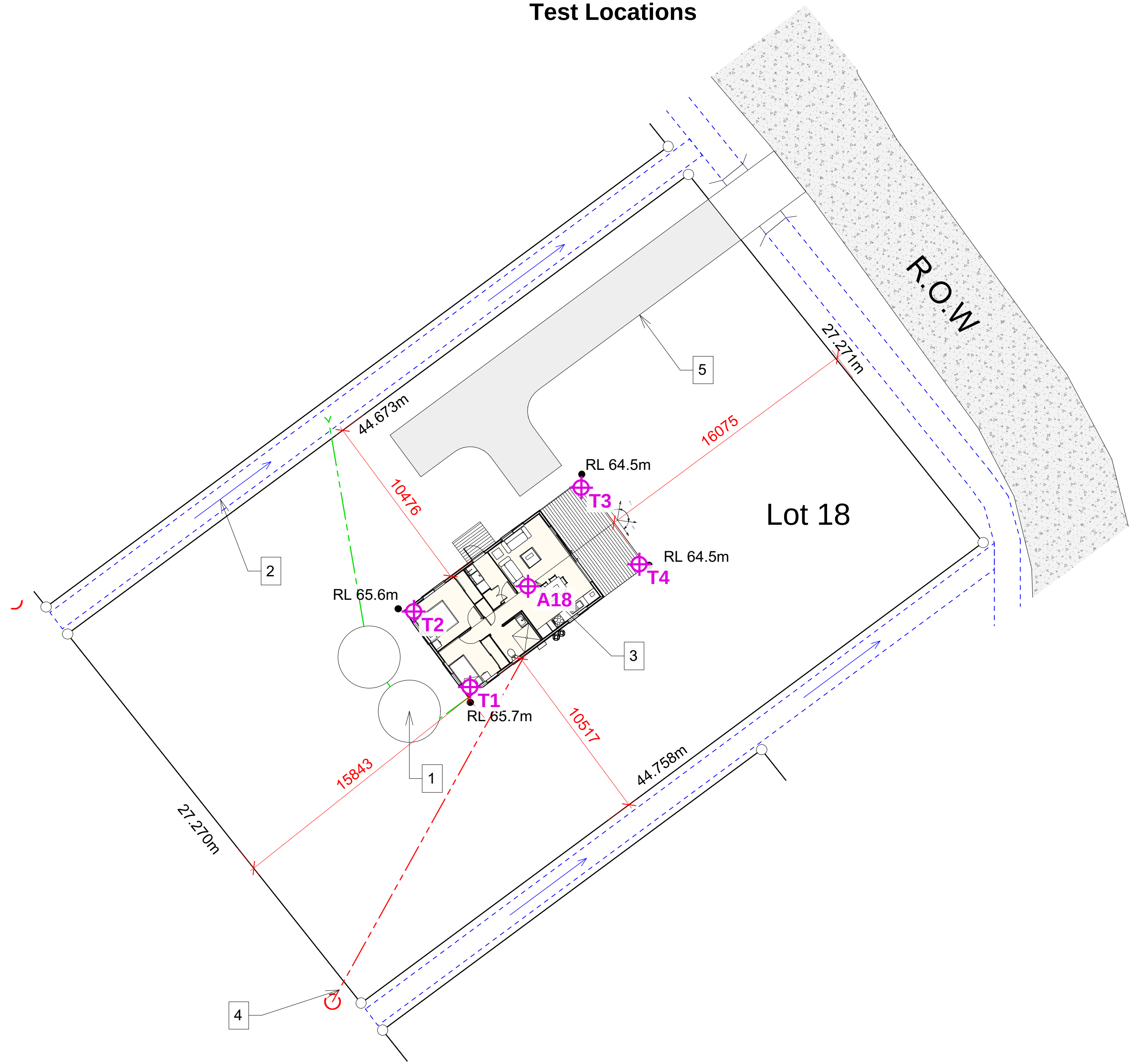
126524

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:1000	DWG # A01
DWG	Te Paki Dunes Locality Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

Test Locations



Notes
1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 66.410
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	83m2
Impermeable Surfaces	=	165m2
Total Site Coverage	=	14%

126524
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

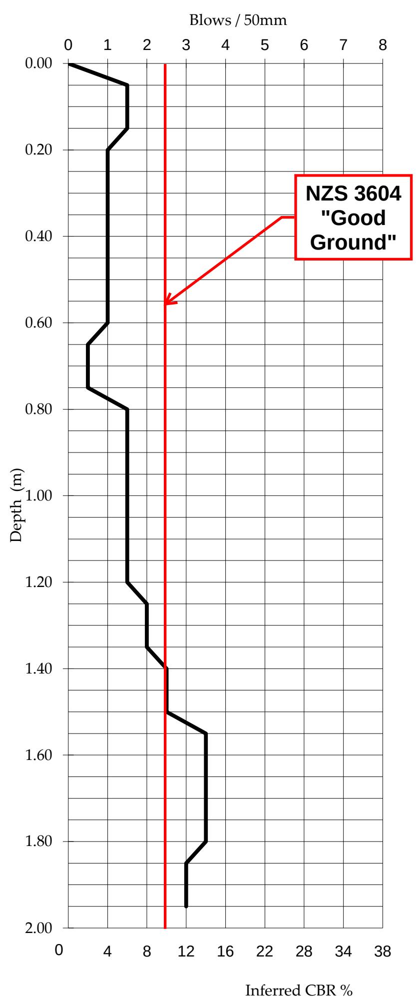
ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	SCALE @ A3 1:250	DWG # A05
DWG	Te Paki Dunes Site 4 Plan	DRAWN JP	
STATUS	CONSENT ISSUE 31-10-2024		

Scala Test Location's 1 - 4

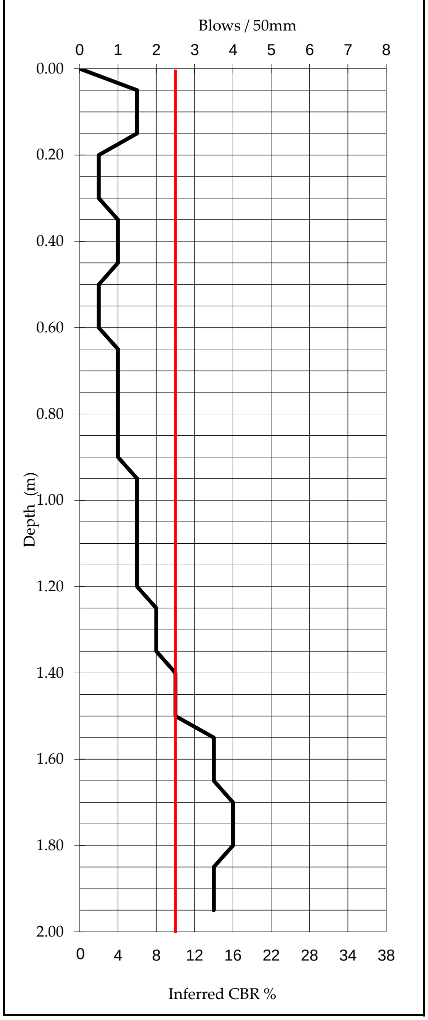
SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 18 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	1	Test number :	2	Test number :	3
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	Ex. GL	Reduced level :	Ex. GL

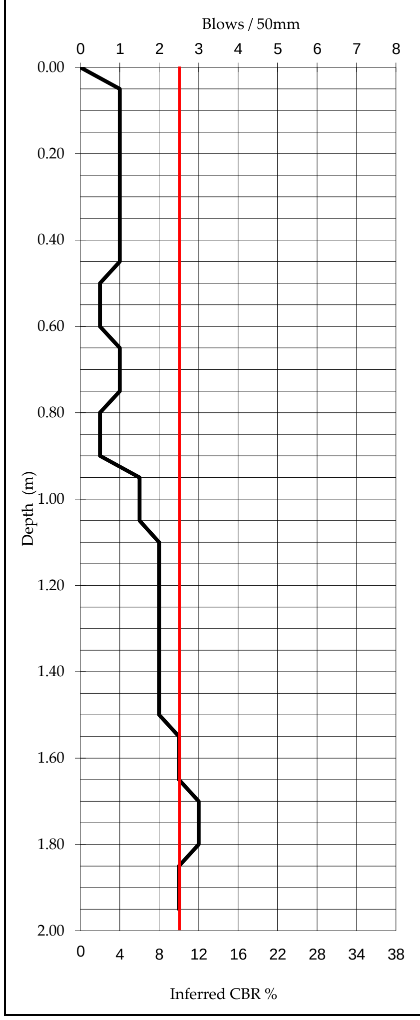
Scala Penetrometer



Scala Penetrometer



Scala Penetrometer

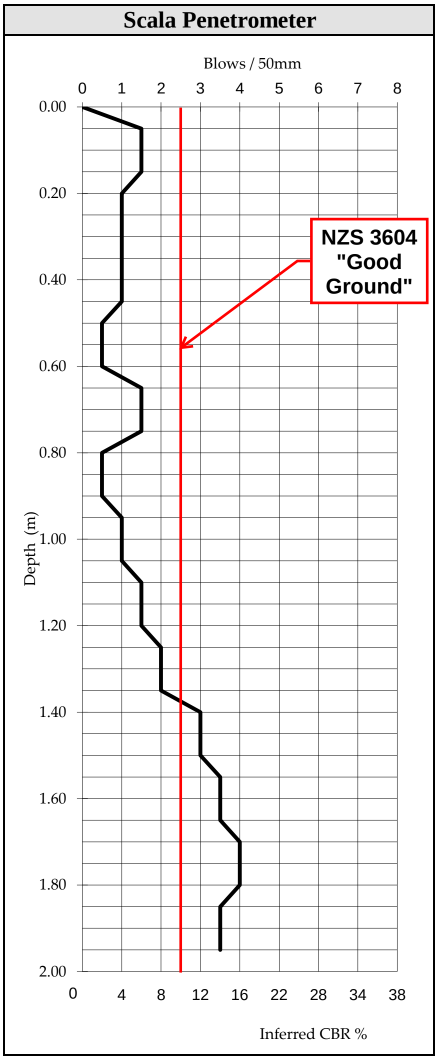


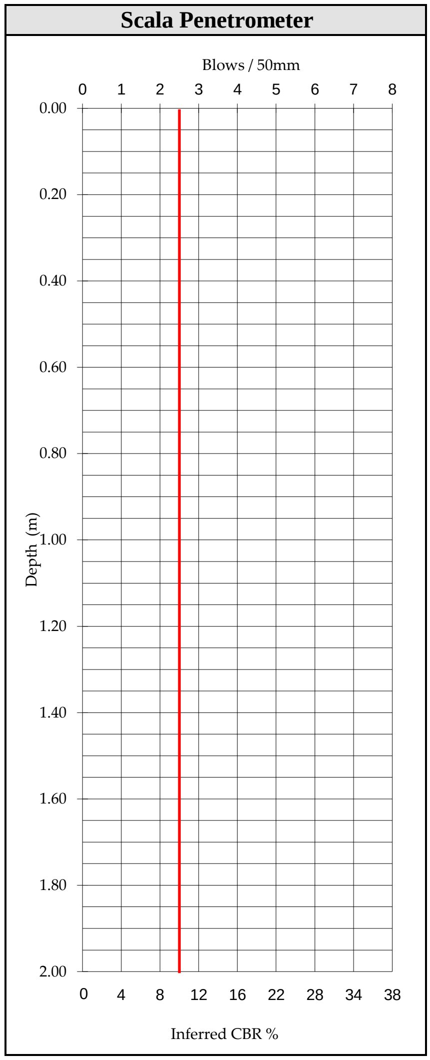
Test Methods
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

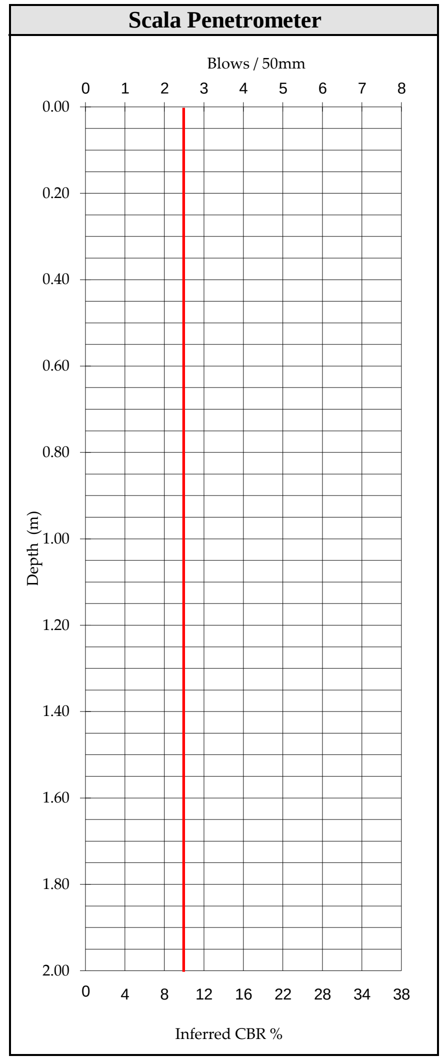
Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 18 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	4	Test number :	N/A	Test number :	N/A
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	N/A	Reduced level :	N/A







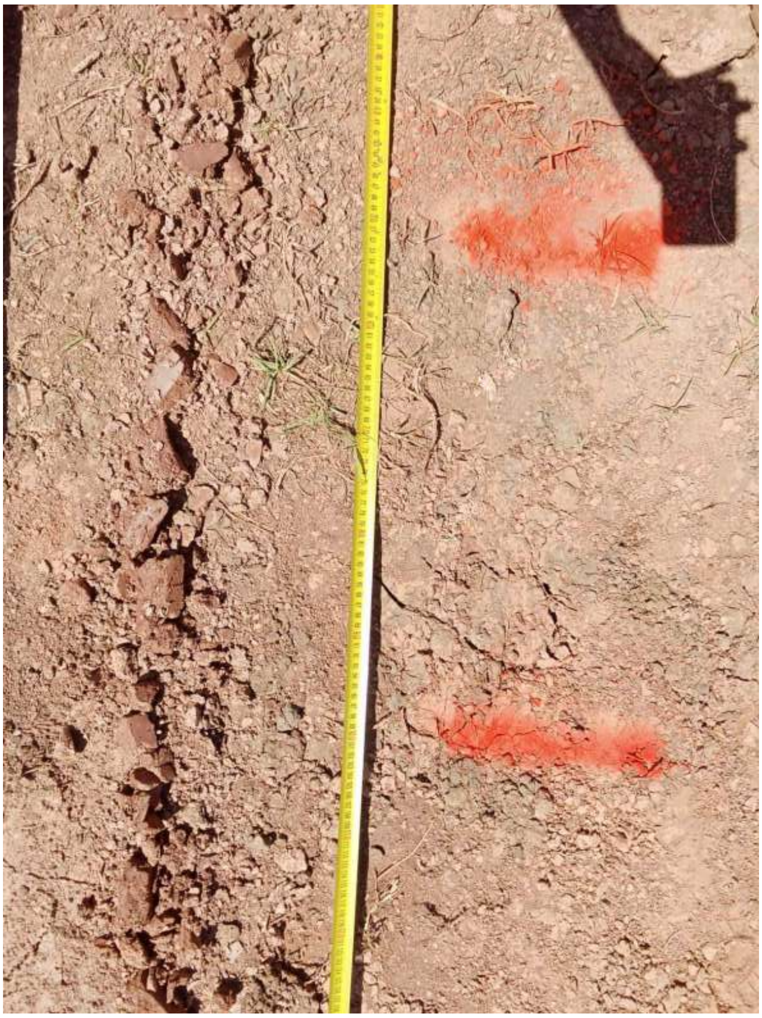
Test Methods

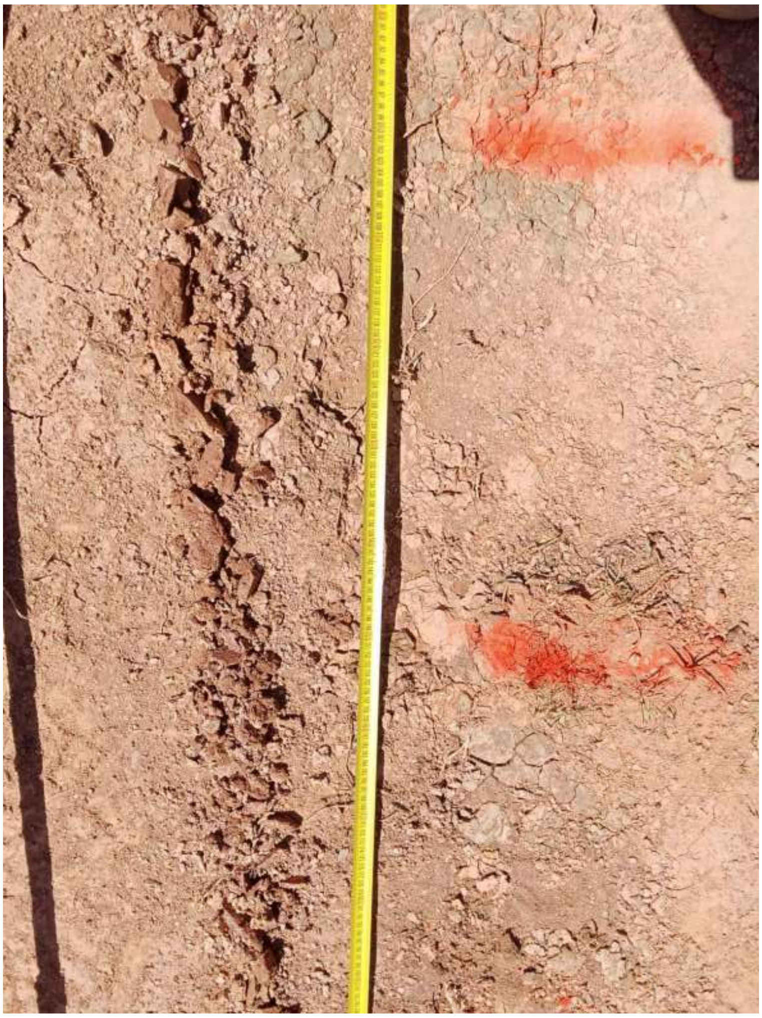
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2

Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

Hand Auger Samples to 2.0m for Lot 18

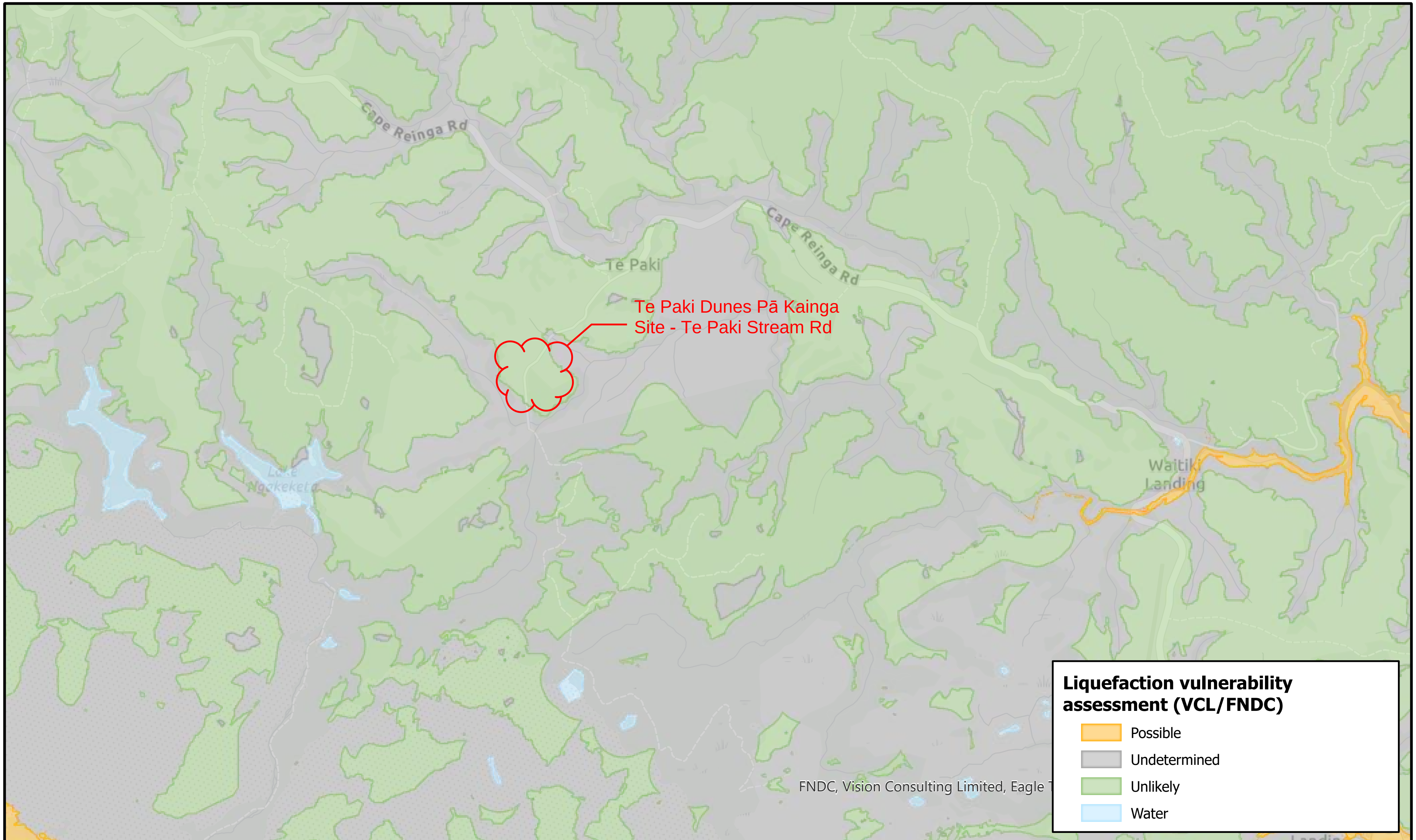




Soil Profile for Hand Auger in Lot 18

Test Location	Depth of Sample / Test [m]	Corrected Shear Vane Results		Soil Description / Classification
		Undisturbed [kPa]	Disturbed [kPa]	
A18	Existing Ground Level			
	0.0 - 0.5	104	46	CLAY, Reddish brown, Loose, Soft, High plasticity, Moderately sensitive, Moist.
	0.5 - 1.0	89	51	CLAY, Reddish brown, Loose, Soft, High plasticity, Moderately sensitive, Moist.
	1.0 - 1.5	74	30	CLAY, Reddish brown, Medium Dense, Soft, High plasticity, moderately sensitive, Moist.
	1.5 - 2.0	116	54	CLAY, Reddish brown getting lighter with depth, Medium Dense, Soft, High plasticity, moderately sensitive, Moist, GWL not reached.

FNDC Liquefaction Risk Map



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

Far North Maps

0 1 2 3 km

Projection NZTM2000. Datum NZGD2000. Scale:1:36,112

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: 22/11/2024

PRODUCER STATEMENT – PS1
DESIGN

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** J000595
ISSUED BY: Structus Consulting Limited
(Engineering Design Firm)
TO: Ngati Kuri
(Owner/Developer)
TO BE SUPPLIED TO: Far North District Council
(Building Consent Authority)
IN RESPECT OF: Proposed relocatable dwelling pile foundations
(Description of Building Work)
AT: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland
(Address, Town/City)
LEGAL DESCRIPTION: **N/A** ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*:
Refer attached particulars dated 10 December 2024 for scope of works
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only, as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment *(Verification method/acceptable solution)* B1/VM1, B1/VM4 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to attached particulars dated 10 December 2024.
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 2 level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Darren Andew Mitchell, am:

- ☑ CPEng number 1007610

and hold the following qualifications BEng (Hons), CPEng, CMEngNZ

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Darren Andew Mitchell
(Signature below):

ON BEHALF OF *(Engineering Design Firm)*: Structus Consulting Limited Date: 10/12/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer attached particulars dated 10 December 2024

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional

This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance

As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase

There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2 NZIA Standard Conditions of Contract SCC 2011
3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4 PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

Structus Consulting Limited
PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 E info@structus.co.nz
www.structus.co.nz

Far North District Council

10 December 2024

Lots 16-21, Te Paki Stream Road, Cape Reinga – PS1 Producer Statement Attached Particulars

Structus have been commissioned to provide structural engineering design services for the relocatable dwelling foundation piles at Lots 16-21, Te Paki Stream Road, Cape Reinga, Northland for Ngati Kuri.

The structural design covered by this producer statement comprises the following only:

- Pile foundations
- SED Anchor pile to bearer connections.

Refer the following schedule listing the structural drawings and calculation report covered by this producer statement.

Drawing Title	No.	Rev	Structus Stamp Dated
Papakainga Development 16-21 Te Paki Dunes (Lot 16 Foundation Plan)	SK01	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 17 Foundation Plan)	SK02	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 18 Foundation Plan)	SK03	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 19 Foundation Plan)	SK04	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lots 20 & 21 Foundation Plan)	SK05	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes Structural Calculation Report		A	10/12/2024

Exclusions

The following items have not been included in this producer statement:

- Geotechnical engineering, including design parameters for pile foundations structural design
- Temporary propping, shoring or other temporary structures
- Waterproofing and cladding
- Any proprietary structures are to be designed by the supplier
- Civil engineering, such as earthworks, external pavement and drainage
- All structures above the pile foundations.

Assumptions

The design is based on the following assumptions:

- The design has been undertaken, and the ground conditions are, in accordance with the advice provided in the following FNR Geotechnical Investigation Reports:
  - Lot 16 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 17 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 18 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 19 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 20 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 21 Te Paki Stream Road, Cape Reinga – 21 November 2024
- The proposed building structure is in accordance with the architectural drawings by PanelLock dated 2/9/2024
- Seismic subsoil class E is assumed
- The Lots 16-21, Te Paki Stream Road structural works are designed for Importance Level 2 with a 50 year design life.

Alternative Solutions
The following alternative solutions to the NZ Building Code have been used on this project:

- None

B2 Compliance
A Producer Statement for Clause B2 – Structural Durability of the Building Code has been requested. We are not able to provide this because there is no verification method for B2 contained within the Building Code.

The purpose of this compliance clarification is to confirm that direct construction monitoring by Structus Consulting Limited in relation to Clause B2 (Durability) of the Building Code for the above project, has been limited in that material protection or treatment is typically carried out by specialist suppliers and requires specific quality assurance by the suppliers. However, we can confirm the specifically designed structural elements that were included in the design documentation prepared by the Structus Consulting Limited comply with the applicable verification methods.

Timber (means of compliance B1/VM1)
The timber has been specified in accordance with NZS3640:2004. The quality of timber treatment is dependent on the QA systems of manufacturers, suppliers and the onsite contractors and sub-contractors. Refer to the contractor's PS3 and QA records where available.

Concrete (means of compliance B1/VM1)
Compliance with cover and concrete quality requirements for B1/VM1 are in accordance with NZS3101:2006.

Mild Steel (means of compliance B1/VM1)
Protective coatings have been specified in accordance with AS/NZS 2312:2014 and SNZ TS 3404:2018.

The corrosion category and the years to first major maintenance have been identified for the structural steel work in accordance with SNZ TS 3404:2018. This allows the contractor to procure the suitable corrosion protections systems to meet AS/NZS 2312:2014 and SNZ TS 3404:2018 requirements. The quality of mild steel protective coatings is dependent on:

- Paint supplier confirming that the paint can perform to the standard as required by AS/NZS 2312:2014 and SNZ TS 3404:2018 based on the stipulated corrosion category and years to first maintenance
- Steel preparation
- Quality and production consistency of the coating products
- QA of the application and curing
- QA of the handling, protection and repair

Refer to:

- Contractor’s and sub-contractor’s PS3s and QA records where available
- Third party inspection and test results
- On-going maintenance plan (attached)

Applicability

The advice covered by this producer statement has been prepared by Structus at the request of its client, for the particular brief and on the terms and conditions agreed with our client and is exclusively for use and reliance by Structus’ client. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of, or reliance by any third party, on the advice (in whole or in part) covered by this producer statement.

No express or implied warranty is made as to the advice contained in the information covered by this producer statement. To the extent that any information provided to Structus is inaccurate, incomplete, or inadequate, Structus takes no responsibility and disclaims all liability for any loss or damage that results from any conclusions based on information that has been provided to Structus.

Yours Sincerely
Structus Consulting Limited

Darren Mitchell
Director

STRUCTUS

Lots 16-21, Te Paki Dunes – Structural Maintenance Schedule

This schedule of ongoing inspection and maintenance of structural elements shall be included with the O&M manuals and provided to the Owner/Body Corporate and building managers.

Inspection/Maintenance timeframe and item	
(a) Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Sub-ground floor mild-steel structures such as beams.
(b) 5-yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings.
(c) 10-yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. **Note that 10 years is the expected useful life for many sealants.**
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
(d) 25-yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above.

STRUCTURAL CALCULATION REPORT

PAPAKAINGA DEVLOPMENT
TE PAKI DUNES

Prepared for: **NGATI KURI**

Date: **10 DECEMBER 2024** Reference: **J000595** Revision: **A**

STRUCTUS

DOCUMENT CONTROL RECORD

Document prepared by:

Structus Consulting Limited

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Auckland 1142
PO Box 911-111
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Auckland 1142
New Zealand

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Report Title	Structural Engineering Calculation Report		
Client	NGATI KURI	**Job Number**	J000595

Rev	**Date**	**Revision Details**	**Author**	**Verifier**	**Approver**
A	10 December 2024	Building Consent	A. Motara	C. Bell	D. Mitchell

Current Revision	A

Approval			
Author Signature		Approver Signature	
Name	A. Motara	Name	D. Mitchell
Title	Structural Engineer	Title	Director

A person using Structus documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Structus.

STRUCTUS

Job: Papakainga Development	Job No:	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author:	A. Motara
	Pages:	2

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PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 | E info@structus.co.nz | www.structus.co.nz

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Job: Papakainga Development	**Job No:**	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	**Author:**	A. Motara
	Pages:	4

1 Design Overview & Philosophy

Structus was engaged by Ngati Kuri to undertake structural design and detailing for the proposed Subfloor Piles/Foundation Design at Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland. The proposed project is in the figure below. This is a calculation report in support of a building consent submission. This report is to be read in conjunction with:

- Structus marked up Architectural Drawings A1-A13 dated 06/12/24Parsonson Architecture Te Paki Dunes and Ngataki consent issue drawings A01 to A13 dated 15 /11/24
- PanelLock transportable dwelling drawings A1 to A13 dated 02 September 2024
- FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

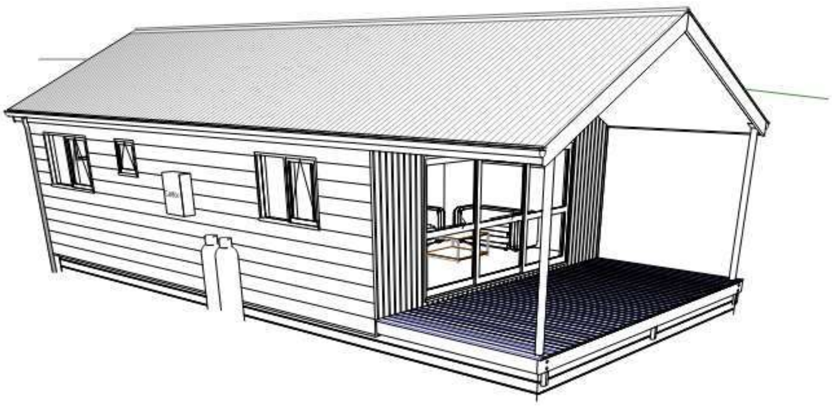


Figure 1-1: Building Overview

1.1 Location of building

Address: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland

Figure 1-2: Map View

1.2 Description of Buildings

The proposed buildings are transportable single storey dwellings of 82m² floor area. The dwellings at each lot are of similar floor plans and construction. The cladding is of lightweight construction supported by timber roof trusses and timber wall framing. The subfloor construction is of timber joists and timber piles encased in concrete.

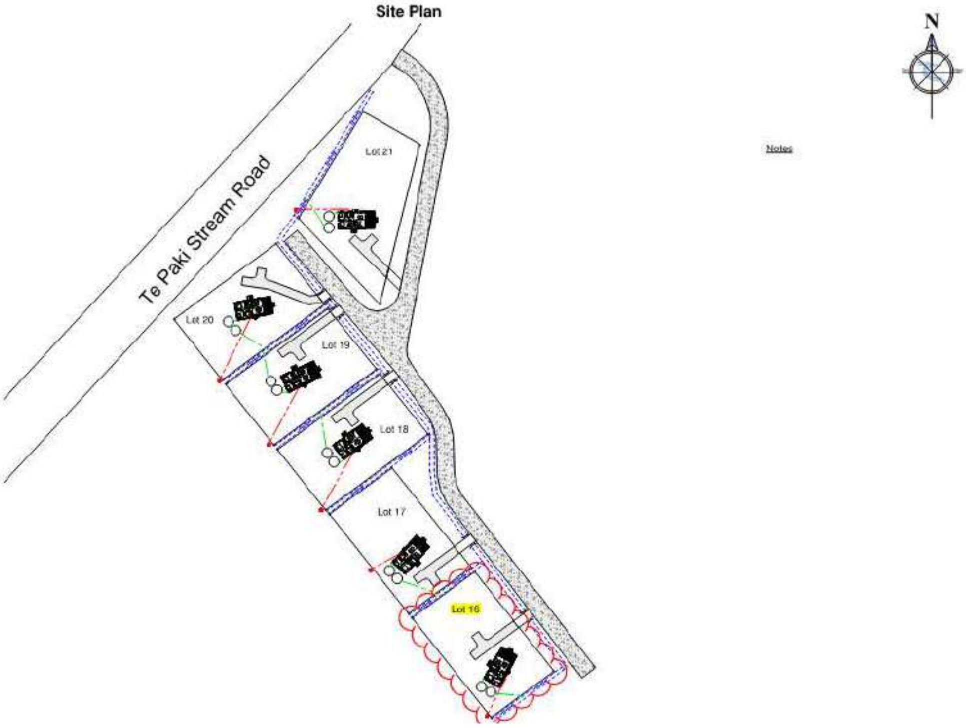


Figure 1-3: Site Plan

1.2.1 Gravity System

The gravity system is typically timber roof trusses supported by load bearing walls supported by conventional timber subfloor joists, bearers and bored timber piles.

1.2.2 Lateral Stability

Lateral stability is provided typically by roof, wall and subfloor bracing. The subfloor bracing is provided by specifically designed cantilever piles based on NZS3604 methodology for bracing demands.

1.2.3 Seismic Design

Seismic bracing demand is obtained based on NZS3604

1.2.4 Foundation

Foundations are timber piles encased in concrete. The foundations are typically embedded to a level that achieves good ground to NZS3604 or as required to achieve a suitable bracing capacity.

1.2.5 Geotechnical Investigation

- Geotechnical report reference - FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

Existing Soil Parameters	*Description*
y = 18kN/m^3	Soil density (Assumed)
s_u = 40-60kPa	Based on B1/VM4 Varies each lot - Refer to Foundation Calculations
Soil Class D or E	(Assumed/No information available)
Expansive Soil Class S	To AS:2870
Allowable end bearing = 204-300kPa	Capacity and depth varies at each Lot
Reduction factor = 0.5	Gravity case reduction factor
Reduction factor = 0.8	Seismic case reduction factor
Ground water – N/A	Ground water level not encountered

Further key points

- Liquefaction risk (Low)

2 Safety in Design

Safety in Design is required under the Health and Safety at Work Act 2015 (HSWA) and integrates risk management into the design process to identify, assess and treat Health and Safety risks to people over the life of an asset.

The HSWA requires designers to ensure, so far as is reasonably practicable, that any structure they design is without risks to the health and safety of persons who:

- Use the structure at a workplace (end users/customers);
- Construct the structure at a workplace;
- Carry out the manufacture, assembly, use, maintenance, proper demolition and disposal of the structure at a workplace; or
- Are in the vicinity of a workplace and are exposed to the structure, or whose health and safety may be affected by an activity related to the structure.

Structus has considered Safety in Design throughout the design process. Some risks have been designed out throughout the design process and therefore have been eliminated, however, other residual risks do exist. The residual risks are as follows:

- Open excavations/pile holes during construction.

The Safe Design report has identified hazards relating to the design of the structural works shown on the documents that would not normally be expected in other designs of the same type of structure.

The method of construction and maintaining safety during construction are the responsibility of the builder. If any of the structure in our designs is considered to present an unreasonable risk in respect to construction safety, the matter shall be referred to Structus for resolution before proceeding with the work.

This report is prepared solely for the purposes of the person conducting the business or undertaking who commissioned the design and is not prepared for the benefit of any other party or for any other purpose.

3 Loading and Material Properties

3.1 Importance Level

*The Importance Level is determined using Table 3.2 of AS/NZS 1170.0 and will be used to determine the required return periods of wind and seismic loading.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2

Figure 3-1: Importance Levels for Building Types

The residence is a (normal structure) and is classified as an Importance Level 2 building for design.

Design life of the building is 50 years therefore. From Table 3.3 of AS/NZS1170.0, the required Annual Probabilities of Exceedance are as follows:

Load	Importance Level	Annual probability of exceedance
Wu – Wind Loading Ultimate	2	1/500
Eu – Earthquake Loading Ultimate		1/500
Eu – Earthquake Loading Ultimate (Parts & Components)		1/500
All SLS loads		1/25

TABLE 3.3

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1	1/25	1/25	1/25	—	
	2	1/100	1/50	1/100	1/25	
	3	1/250	1/100	1/250	1/25	
	4	1/1000	1/250	1/1000	1/25	
5 years	1	1/25	1/25	1/25	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
25 years	1	1/50	1/25	1/50	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
50 years	1	1/100	1/50	1/100	—	—
	2	1/500	1/150	1/500	1/25	—
	3	1/1000	1/250	1/1000	1/25	—
	4	1/2500	1/500	1/2500	1/25	1/500

Figure 3-2: Annual Probability of Exceedance

3.2 Loadings

3.2.1 Self-Weight of Elements (SW):

- Concrete piles = 24kN/m3
- Perimeter cladding = 0.2kPa

Elements with self-weight (G)	*Description*
G_{roof} = 0.33 kPa	Roof build-up Metalcraft T-Rib roofing (assuming 0.55mm) 0.065kPa, Timber Trusses @900crs 0.07kPa, 0.04kPa Purlins, 0.05kPa Insulation blanket, 0.11kPa 18mm Triboard Ceiling.
G_{floor}= 0.30 kPa	Floor Build-up (0.14kPa 240x45 joists @ 400 crs + 0.1kPa 20mm particle boardT&G + 0.05kPa Insulation, misc 0.01kPa.
G_{int_wall} = 0.22kPa	36mm Triboard Wall panel.
G_{ext_wall} = 0.44 kPa	0.13kPa 7.5mm Hardi plank Weatherboards, 0.04kPa 90x45 framing, 0.05kPa insulation, 0.22kPa 36mm Triboard Wall panel

3.2.2 Superimposed Dead Loads (SDL)

SDL (G)	*Description*
G_{SDL}= 0.35 kPa	Nominal (Residential floor incl. floor coverings).

3.2.3 Imposed Loads (Q)

The following imposed / live loads are as per T3.1 of AS/NZS1170.1

Live Load (Q)	*Description*
Q_{RF} = 0.25 kPa	Roof life load
Q_{Floor} = 1.5kPa or 1.8kN	Residential Floor
Q_{Deck} = 2.0kPa	Residential balcony

3.2.4 Wind Loading

Wind Loading to be worked out using NZS3604 as per GIB spreadsheet – See Later Sections.

3.2.5 Seismic Loading

Seismic Load to be determined using NZS3604 and modified as required for the anchor pile design.

3.2.6 Load Combinations

The ultimate limit state combinations are considered as per AS/NZS 1170.0 section 4.2.

ULS Load Combinations	*Commentary*
[1.35G]	Permanent action
[1.2G, 1.5Q]	Permanent and imposed
[1.2G, W_u, ψ_cQ]	Downward wind ULS case
[0.9G, W_u]	Upward wind ULS case
[G, ψ_EQ, E_u]	Earthquake case

3.3 Material Properties

3.3.1 Concrete Strengths

- Foundations: 30 MPa

3.3.2 Reinforcing Steel

- Reinforcing Steel (High Yield) 500 MPa Micro Alloy Grade E
- Reinforcing Steel (Mild Steel) 300 MPa Micro Alloy Grade E

3.3.3 Structural Steel

3.3.3.1 Steel Grade

- Rolled Steel Sections: 300 MPa – Grade 300 to AS/NZS 3679
- Steel Plate General 250 MPa – Grade 250 to AS1594
- Steel Plate (special) 300 MPa – Grade 300 AS/NZS 3678
- StelTech Beams 300MPa – Grade 300 AS/NZS 3679
- CHS Hollow Sections 350MPa – Grade C350 AS 1163
- RHS Hollow Sections: AS 1163 - Grade C350 AS 1163
- Bolt Grades: Grade 4.6 mild steel and grade 8.8 high strength
- Tensioning requirements for 8.8 bolts S, TB, TF as required

3.3.3.2 Steel Corrosion Category

Durability Zone D (Far North) to NZS3604

3.3.4 Structural Timber

All timber shall be Pinus Radiata SG8 or SG6 grade and meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber.

4 Structural Load Path

Below is the typical structure for a single storey dwelling supported by trusses, load bearing walls, floor joists and shallow gravity piles with anchor piles for bracing.

Figure 4-1: Typical Roof Plan

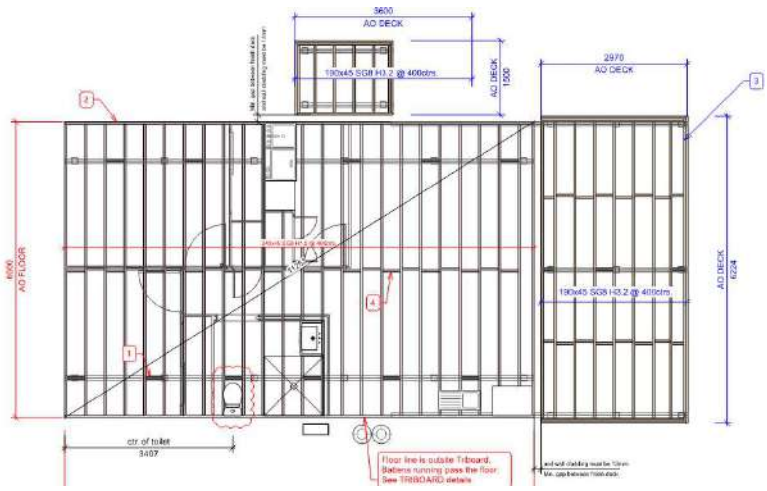


Figure 4-2: Typical Floor Plan

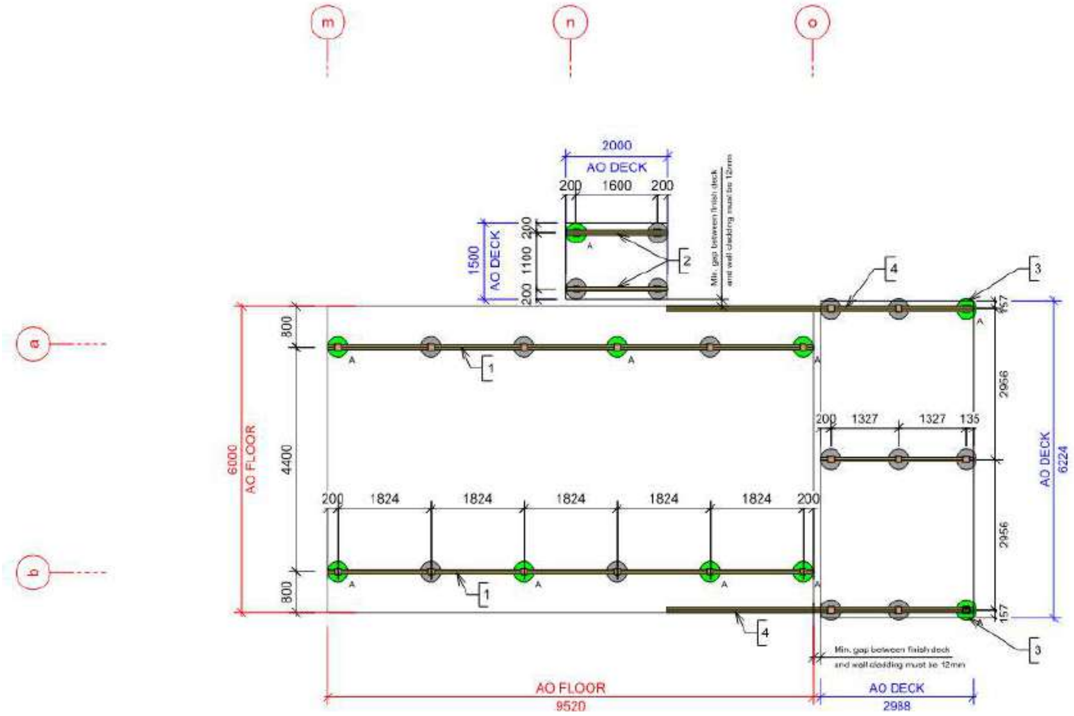
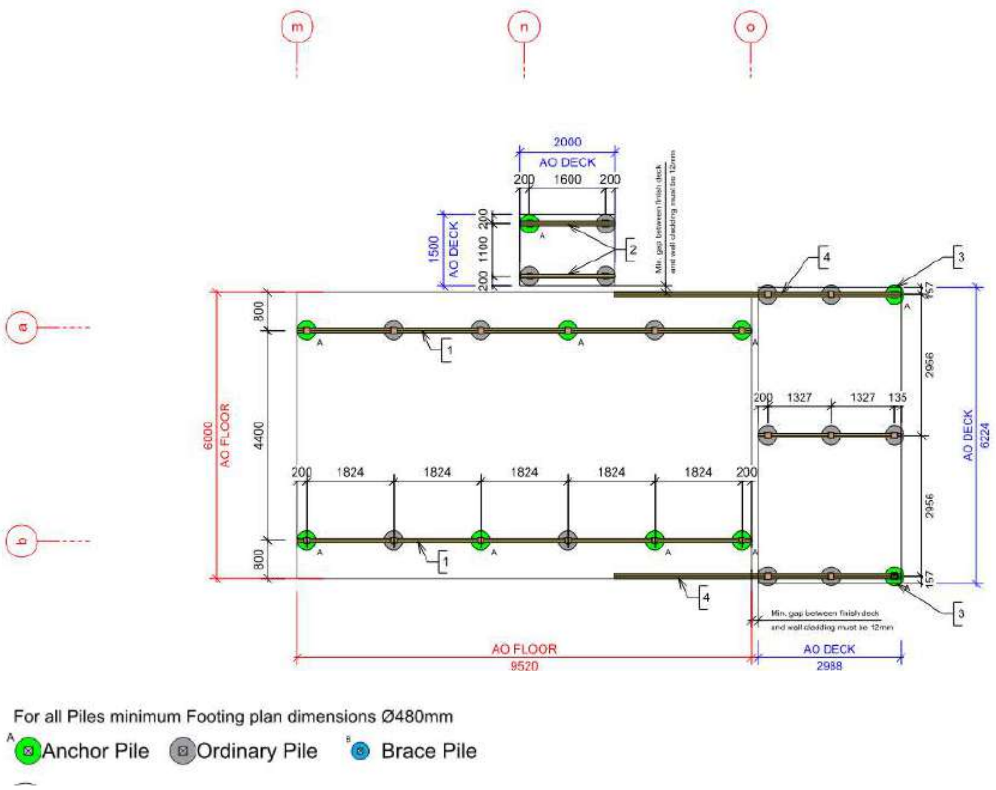


Figure 4-3: Typical Lateral System Plan

5 Subfloor Bracing Design

5.1 Bracing Design

Verification of the bracing plan below based on NZS3604 design loads.



Building Specification

Number of Storeys	Single
Floor Loading	2 kPa
Foundation Type	Subfloor
Sub Floor Cladding	Light

	Single
Cladding Weight	Light
Roof Weight	Light
Room in Roof Space	No
Roof Pitch (degrees)	25
Roof Height above Eaves (m)	1.4
Building Height to Apex (m)	4.05
Ground to Lower Floor (m)	0.71
Stud Height (m)	2.4
Building Length (m)	10
Building Width (m)	6

Building Location

Wind Zone = High

Wind Zone or Consent Authority	Not Available
Wind Region	A
Lee Zone	No
Ground Roughness	Open
Site Exposure	Exposed
Topography	T1

Earthquake Zone	1
Soil Type	D & E (Deep to Very Soft)
Annual Prob. of Exceedance	1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	224	304
Subfloor Level	401	600

Bracing Units required for Earthquake

	Along and Across
Single	395
Subfloor Level	547

SubFloor Along

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)
A		1	3		Anchor Pile	NZS3604	480	360
B		1	3		Anchor Pile	NZS3604	480	360

Wind	**Earthquake**
Demand	
401	**547**
Resistance	
960 **239%**	**720** **132%**
480 OK	360 OK
480 OK	360 OK

SubFloor Across

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)
M		1	2		Anchor Pile	NZS3604	320	240
N		2	2		Anchor Pile	NZS3604	320	240
O		3	2		Anchor Pile	NZS3604	320	240

Wind	**Earthquake**
Demand	
600	**547**
Resistance	
960 **160%**	**720** **132%**
320 OK	240 OK
320 OK	240 OK
320 OK	240 OK

Hence across direction is critical

Note re-check line O for additional demand from the deck.

7.4.2.2

Decks which project more than 2 m from the building shall have *subfloor bracing* provided by anchor and/or *braced piles*, at half the *bracing demand* required by table 5.8 for "light/light/light" *cladding*, for 0° *roof* slope and for "subfloor structures".

Anchor piles rating per pile	120 BUs for earthquake 160 BUs for wind

Table 5.8 – Bracing demand for various combinations of cladding on single-storey buildings on subfloor framing (2 kPa floor load, soil type D/E, earthquake zone 3) (see 5.3.1)

Roof cladding	Single-storey cladding	Subfloor cladding	Roof pitch degrees	Subfloor structure	Single-storey walls
				BU/m²	
Light roof	Light	Light and Medium	0-25 25-45 45-60	15 16 17	11 11 13
		Heavy	0-25 25-45 45-60	17 18 19	11 12 13
		Medium	0-25 25-45 45-60	18 18 19	12 13 14

Multiplication factors		EQ zone			
Soil class		1	2	3	4
A & B	Rock	0.3	0.5	0.6	0.9
C	Shallow	0.4	0.6	0.7	1.1
D & E	Deep to Very soft	0.5	0.8	1.0	1.5

NOTE – See 5.3.4 for additional bracing demand.

Area of deck = 6.2x3=18.6m^2

Demand = ½ (0.5 x 16 x 18.6) = 74 BU (Total)

Demand/line = 74/2 = 37 BUs

From the bracing spreadsheet in the critical across direction

Capacity of Line O = 240 Bus

Demand based on tributary width = 547/3 lines = 182 BUS

Reserve capacity = 240-182 = 58 BUS > 37 BUs Hence OK

No additional piles required for the deck along the house line

For other lines

Nominal 1 AP at corner locations providing 120BUs > 37 BUs OK

Refer to the Anchor Pile specific design for pile design.

6 Foundation Design

6.1 Ground Conditions Summary

The following has been summarised from the geotechnical report.

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Notes –

Bearing capacity based on geotechnical engineer/soil report

Undrained shear strength derived from on B1/VM4 bearing capacity equations Qult =Nc x Su (based on ultimate bearing capacity)

6.2 Gravity Piles

6.2.1 Loading

Typical Pile (Central) — Pile Spacing (s) 1.82 m

		Dist Load		line Load		Pile Point Load w x s		
Element	Trib Width	G	Q	G	Q	G	Q	
Roof	3	0.35		1.05		1.911		
Ext. Wall	2.4	0.44		1.056		1.92192		
Floor	3	0.3	1.5	0.9	4.5	1.638	8.19	
Floor SDL	3	0.35		1.05		1.911		
					Totals	7.4	8.19	kN

Factored Loads	ULS	1.2G+1.5Q	**21.1**	kN
		1.35G	**10.0**	kN
	SLS	G+0.7Q	**13**	kN

6.2.2 Gravity Pile Design Lots 16-21

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**16**		
Ultimate Pile Capacity Q_ult	**204**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.7**	m	
Pile Area	0.38	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	12.0		
ULS Pile Load - P + 1.2xW_pile	35.6	kN	
SLS Pile Load - P_s+W_pile	25.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**39.3**		**OK**
SLS Pile Capacity - phi_allow. x Q_ult x A_pile	**25.9**		**OK**
Adopt	**700 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**17**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile - A x L x (gamma_conc)	6.1		
ULS Pile Load - P + 1.2xW_pile	28.5	kN	
SLS Pile Load = P_s+W_pile	19.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity - phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 1.3m deep**		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	18		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.6	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.8		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	10.3		
ULS Pile Load = P + 1.2xW_pile	33.5	kN	
SLS Pile Load = P_s+W_pile	23.4	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550dia piles 1.8m deep		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	19		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.5	m	
Pile Area	0.20	m^2	
Depth to a (La)	0.65	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	0.85		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	4.0		
ULS Pile Load = P + 1.2xW_pile	25.9	kN	
SLS Pile Load = P_s+W_pile	17.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	29.5		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	19.4		OK
Adopt	500 dia piles 0.85m deep		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	20&21		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.4	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.6		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	9.1		
ULS Pile Load = P + 1.2xW_pile	32.1	kN	
SLS Pile Load = P_s+W_pile	22.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550 dia piles 1.6m deep		

Gravity Piles Summary

Pile Gravity Design Summary

Lot	Pile Diameter mm	Pile Depth m
16	700	1.3
17	500	1.3
18	550	1.8
19	500	0.85
20	550	1.6
21	550	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles

For Simplicity of Design – Consider typical piles to be Ø550 for Lot 17-21 & Ø700 for Lot 16 with depth as per the table

6.3 Cantilever Anchor Pile

From the Engineering Basis of NZS 3604 the following tables are provided

3.4.2 Design for safety (ultimate limit state - ULS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	Deflection (mm)
Anchor pile	120	6.0	30	160	8.0	30
Braced pile	120	6.0	50	160	8.0	50
Cantilever pile	30	1.5	25	70	3.5	45

3.4.3 Design for serviceability (serviceability limit state - SLS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	rating Deflection (mm)
Anchor pile	20	1.0	3	120	6.0	10
Braced pile	20	1.0	3	120	6.0	13
Cantilever pile	5	0.4	1	45	2.25	4

1) Consider capacity design actions on the piles

Components – timber pile; bolted connection, soil.

Assuming the ductile demand = 120BU = 6kN (Typical anchor pile capacity)

Consider the pile design to be nominally ductile

From NZS3604 design basis – the design ductility is 3.5; Sp = 0.7; k_mew = 2.4

For Nominally ductile loads T=0.4, mew = 1.25, Sp=0.925, k_mew= 1.14

Elastic load factor = k_mew(3.5) /Sp = 2.4/0.7 = 3.43

Reduce by nominally ductile factor = 3.43 x (0.925/1.14) = 2.78

6kN x 2.78 = 16.6kN

Notes – EZI brace design is about 132% over strength for EQ

Hence reduce by demands 32% (for capacity just meeting demand)

Revised demand = 16.6/1.32 = 12.5 kN (Minimum demand on each pile)

Height above ground = height to FFL – Joist Depth – floor boards = 710-240-20 = 450mm

Wind is not critical due to the scaling factor applied to the loads.

Design philosophy of piles.

- If good ground is very deep (>1.5df)– consider the using lower bound soil capacity (Q_ult = 204kPa→ Su=40kPa) with eo=1.5df (All cases except Lot 19)
- If good ground found is relatively shallow <1.5df (~ 0.6-0.8m) use the higher values for good ground. (Lot 19)
- Consider the max bending moment to be at the location in the ground as per the Broms formula ignoring strength of concrete.
- Use the same pile diameter as the gravity piles for simplicity.

6.3.1 Anchor Pile Design 16-21

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Capacity of 200x200 SG6 Square pole Wet Condition

Fb(SG6) = 7.5 MPa

Notes – Phi = 1.0 for capacity designed elements.

Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x200x200^2/6 = 10.0 kNm

For 250x250 SG6

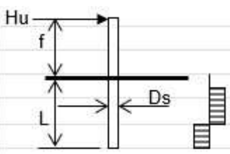
Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x250x250^2/6 = 19.5 kNm (Governs most designs)

Notes – Phi factor = 0.8 for seismic overstrength loads applied to the shear strength of soils

Lot 16

Use Ø700 Pile as per the gravity piles for this lot.

NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.9718	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.12426	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.0136	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	12.732	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11315	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 12.7 kN > 12.5 kN accept

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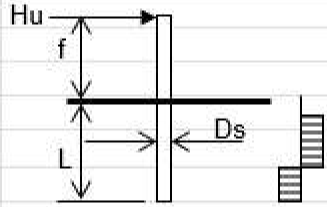
Recheck for the max allowable height (600mm is typically OK for all other sites – hence try 600mm)

NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	13.882	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11886	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.3832	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	11.6154	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.10762	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

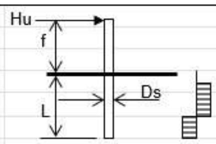


11.6kN < 12.5kN (92% capacity – within 10% Acceptable) but limit to 450mm.

Adopt 250x250 SG6 Pile in 1.8m deep xØ700 pile for Lot 16(max height 450mm to GL-CL of fixing)

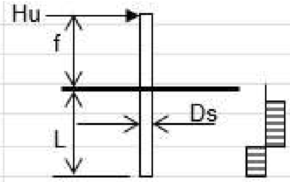
Lot 17,18,20,21

NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	14.7551	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91815	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		



Capacity = 14 kN > 12.5 kN accept

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	12.976	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90692	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	19.0223	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	13.2928	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90892	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.0kN>12.5kN (OK)

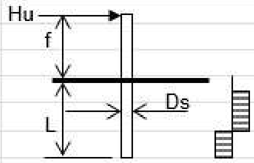
<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 17,18,20,21(max height 600mm to GL-CL of fixing)</u>

<u>Notes – adopt 1.8m for Lot 18 as gravity piles are deeper.</u>

<u>Lot 19</u>

300kPa strength found @ 0.65m on this lot

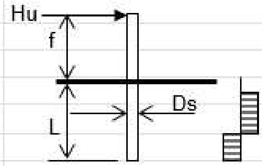
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	15.9122	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89488	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	20.8441	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	14.9112	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89049	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Try 600mm height

NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.5832	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88905	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	21.2481	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	13.4072	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88388	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.4kN > 12.5kN (OK)

<u>Hence 1.5m depth required. hence keep to 1.6m as per typical lots for simplicity (max height 600mm to GL-CL of fixing)</u>

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 19</u>

6.3.1.1 Deck Piles

Check typical deck anchor piles if design can be reduced

Demand from NZS3604 from before per pile = 37 BUs

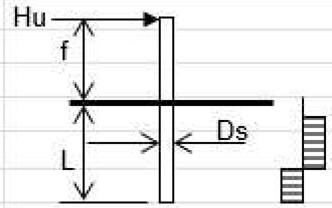
Scaled up demands = 37/20BU x 2.78 = 5.14 kN

Based on other lots – check the design using the lower bound values.

Bending Capacity of 125x125 post = 0.8 x 10 x 125x125^2/6 = 2.6kNm

Bending Capacity of 150x150 post = 0.8 x 10 x 150x150^2/6 = 4.5kNm

Pile depths are typically minimum 1.6m for anchor piles



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	3.4	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	2.64929	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.84173	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

<u>2.6kN < 5.1 kN demand (N.G – hence requires greater pile 200SQ min size – since there are only two deck piles – keep the same size throughout – i.e. 250 SQ.</u>

Note – since the house demands are overall just meeting <u>– adopt one additional pile along line of house</u>

(deck demand = 74BU/20 x 2.78 = 10.3kN < 12.5kN for one pile OK.

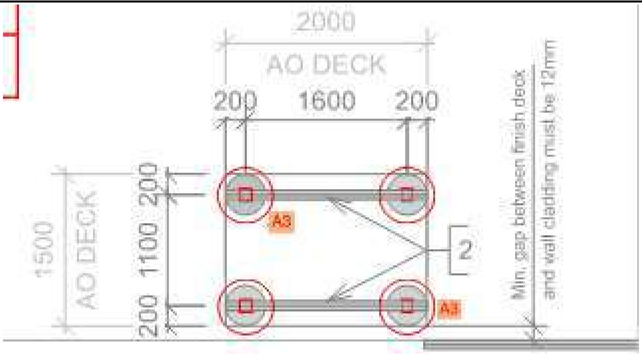
<u>Check min required for uplift of deck post.</u>

Volume of concrete = 0.4m^3 (To Arch.)

Lreq = 0.4 / (pi x 0.55^2/4 – 0.25^2) = 2.3m > 1.6m (hence increase depth to 2.3 meters for deck piles with Ø550 dia piles and post above.

Lreq(700dia) = 0.4 / (pi x 0.7^2/4 – 0.25^2) = 1.24m < 1.8m (hence 1.8 m OK for 700 dia piles)

6.3.1.2 Small Deck Piles



A_Deck = 1.5x2 = 3m^2

A_pile = 0.75m^2

For gravity – simply adopt the typical pile depths and diameter for simplicity.

Bracing demand – typically standard anchor piles to NZS3604 will be OK by inspection of 900mm depth or greater if required by the typical gravity piles.

6.3.1.3 Pile Design Summary Overall

Pile Design Summary Final Lot 16-21

Lot	Pile Diameter mm	Pile Depth m	Anchor Pile
16	700	1.3	1.8
17	550	1.3	1.6
18	550	1.8	1.8
19	550	0.9	1.6
20	550	1.6	1.6
21	550	1.6	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles & 250SQ H5 for Anchor Piles
Min strength SG6

<u>Deck piles sized for uplift min 2.3m deep for 550 piles and 1.8m for 700piles</u>

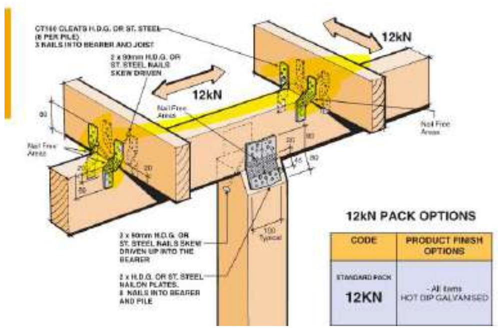
6.3.2 Connection Design

The overstrength seismic demand is 12.5 kN

This is comparable to 12kN NZS3604 connection (96%) Capacity

Hence typical connections may be substituted.

For joists to bearer connection use standard CT160 connections or similar.



However, for completeness provide the bolted connection design to the pile due to the larger size.

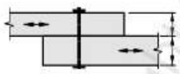
Since the loads are nominally ductile – consider the simplified method for design of bolted connections to AS/NZS1720.

<u>Case 1</u>

Load direction parallel to grain

TABLE 4.9(A)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SYSTEM CAPACITY

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skl})
(1) Two member 	b_{eff} equals smaller of t_1 and t_2	Q_{k1}

Member = 2/190x45 SG8

Be = 90mm

Try 2/M16 Bolts

TABLE 4.9(C)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kl}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
JD5	25	2 100	2 800	3 500	4 200	5 600	7 000	8 400	10 500	12 60
	35	2 200	3 900	4 900	5 900	7 800	9 800	11 800	14 700	17 60
	40	2 200	3 900	5 600	6 700	9 000	11 200	13 400	16 800	20 20
	45	2 200	3 900	6 200	7 600	10 100	12 600	15 100	18 900	22 70
	70	2 200	3 900	6 200	8 900	15 700	19 600	23 500	29 400	35 30
	90	2 200	3 900	6 200	8 900	15 800	24 600	30 200	37 800	45 40
	105	2 200	3 900	6 200	8 900	15 800	24 600	35 300	44 100	52 90
	120	2 200	3 900	6 200	8 900	15 800	24 600	35 500	50 400	60 50

Qskl=Qkl=15.8kN /bolt

$$N_{d,j} = \phi\, k_1\, k_{16}\, k_{17}\, n\, Q_{sk} \quad \ldots 4.4(3)$$

and

N^* = design action effect in shear

ϕ = capacity factor (see Clause 2.3)

k_1 = factor for duration of load for fasteners (see Clause 2.4.1.1)

k_{16} = 1.2 for bolts that transfer load through metal side plates (see Figure 4.7) of adequate strength, and the bolts are a close fit to the holes in these plates provided that $b_{eff}/D > 5$ for loads acting parallel to the grain and $b_{eff}/D > 10$ for loads acting perpendicular to the grain (where b_{eff} denotes the effective timber thickness and D is the bolt diameter)
= 1.0 otherwise

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k_{17} = factor for multiple bolted joint given in Table 4.12

n = number of bolts resisting design action effect in shear

Q_{sk} = characteristic capacities as derived in Clause 4.4.2.4. See also Clauses 4.4.4 and 4.4.5

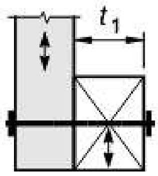
(e) For connections designed using the simplified method set out in ZZ4.1 to ZZ4.5: ϕ = 0.8.

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 15.8 = 25.3 kN > 12.5kN (OK)

Case 2

Check strength of pile connection.

Member = 250x160 (recessed) SG6, Unseasoned J5

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skp})
(1) Two member 	b_{eff} equals $2t_1$	Q_{kp}

Be = 160x2=320mm

Qskp=Qkp

Try 2/M16 Bolts

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.7 = 9.12 kN < 12.5kN (N.G)

Try use 4/M16

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.72 = 18.3 kN > 12.5kN (OK)

Hence Adopt 4-M16 Bolts for the pile bearer connection.

Minimum edge distances

To the loaded side of timber = 5xD = 5 x 16 = 80mm

C-C spacing = 5D = 80mm

Timber width required = 80+80+80 = 260mm > 250mm (Close – Accept as the bolts are not fully loaded & greater than elastic capacity can be achieved).

Case 3

For anchor piles loaded perp to direction of the bearers – check washer capacity

3.2.6 Bearing capacity

3.2.6.1 *Design capacity in bearing perpendicular to the grain*

The design capacity in bearing perpendicular to the grain ($N_{d,p}$) of a structural element (see Figure 3.8), for strength limit state, shall satisfy the following:

$$N_{d,p} \geq N_p^* \qquad \ldots 3.2(15)$$

where

$$N_{d,p} = \phi\, k_1\, k_4\, k_6\, k_7\, f'_p\, A_p \qquad \ldots 3.2(16)$$

and

ϕ = capacity factor (see Clause 2.3)

N_p^* = design load effect in bearing (see Figure 3.8 and Clause 1.4.2.2)

k_1 to k_7 = modification factors given in Section 2

f'_p = characteristic value in bearing perpendicular to grain

A_p = bearing area for loading perpendicular to grain.

For SG6/No. 1 Framing fp = 5.3MPa

Using 4 No. 60mm Square washers

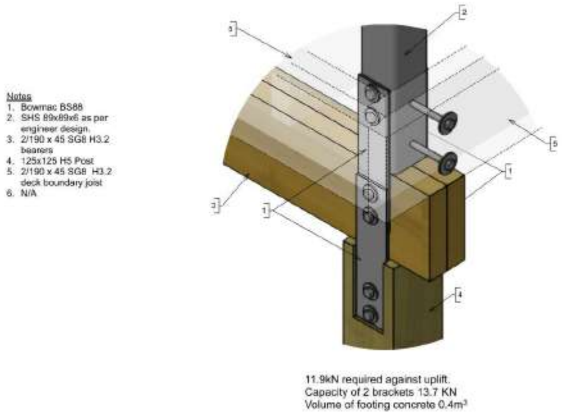
Phi_Nd,p = 0.8 x 1.0 x 1.0 x 1.0 x 1.0 x 5.3 x 4 x 60^2= 61 kN >>12.5 kN (OK)

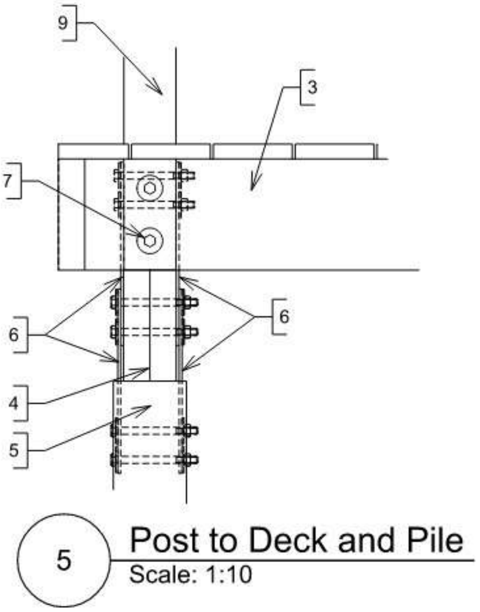
Using minimum 4mm Thk washer as per code (OK by inspection).

Adopt minimum 60mm x 4mm Square washers to M16 Bolts.

6.3.2.1 Connection at Deck Post

The architect has provided a connection detail for the external post. Check for compatibility with anchor pile design (note uplift requirements check by other engineer)





The connection in the square post is critical.

Slot cut the post to achieve double shear

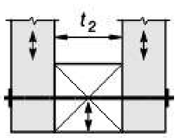
(2) Three member, Type A 	b_{eff} equals t_2	$2Q_{kp}$

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N — Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

B_e = 90mm

Qskp = 2 x 2.11kN = 4.22kN/12mm bolt

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 4.22 = 6.7 kN > 5.14kN (OK)

Hence OK to adopt the architect detail for the anchor piles of the deck. (i.e. 2/M12 bolts slot cut in timber pile)

Structus Consulting Limited
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T 09 869 2073 M 021 059 5683 E info@structus.co.nz

2 Te Paia Lane, Kaitaia
Phone (09) 408 0979
PO Box 62, Awanui 0451
GST No: 107-240-918

19th November 2024
Att: Parson Architecture & PanelLock

To Whom it may Concern

Good Ground Report for Proposed New Dwelling at Lot 19 Te Paki Stream Road, Cape Reinga.

FNR Consulting have been engaged by Ngati Kuri to carry out geotechnical testing for a proposed new dwelling with an approximate floor area of 82m^2. A total of four scala penetrometer tests and one hand auger were conducted.

Testing was carried out in general accordance with the requirements of NZS 3604 and NZS 4402.

The test locations are shown in the attached plans and photographs, with the test results also attached to this document.

The NZLI Soils Map describes the soils in this area as: **Rangiuru Clay**.

Observations

The site soils appeared to be consistent with the NZLI Soils Map description, with clay observed in the hand auger testing across the subdivision. Based on the soil samples, the clay appeared to have a high plasticity and was moderately sensitive. In general, the clay was also loose to medium dense and had a soft to firm consistency. The soil appeared was moist, while the ground water level (GWL) was not reached over the 2.0m depth tested. Refer to the attached hand auger results for a full soil profile of the hand auger conducted in the centre of the building.

The site has not been levelled, and the tests were performed in the undisturbed natural ground (not fill material).

There are no visual signs of slope instability in the vicinity of the building site and the proposed position of the building relative to the adjacent slope is appropriate and does not pose a risk in terms of slope stability.

The site classification based on site reactivity in accordance with AS2870-2011 Table 2.1 is **Class S – Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.**

Liquefaction Risk

A desk-top study of liquefaction risk for this site has been undertaken.

"The area of Northland is identified to be at low risk of seismic hazard. There are no active faults known in the Far North. Small earthquakes will give short duration shaking that may not have enough cycles to cause liquefaction. Microzoning studies are probably not required as the hazard is low (GNS 2004)" - Regional Liquefaction Vulnerability Assessment – Far North District, prepared by Vision Consulting for FNDC 20/01/2023.

According to the above referenced report, and associated mapping, the Liquefaction Vulnerability Category for this site is "unlikely". This indicates that "there is a probability of more than 85% that liquefaction-induced ground damage will be None to Minor for 500-year shaking".

Based on the above it is considered that the liquefaction vulnerability for this site is low and that the expected degree of liquefaction induced ground damage is none to minor.

Scala Results

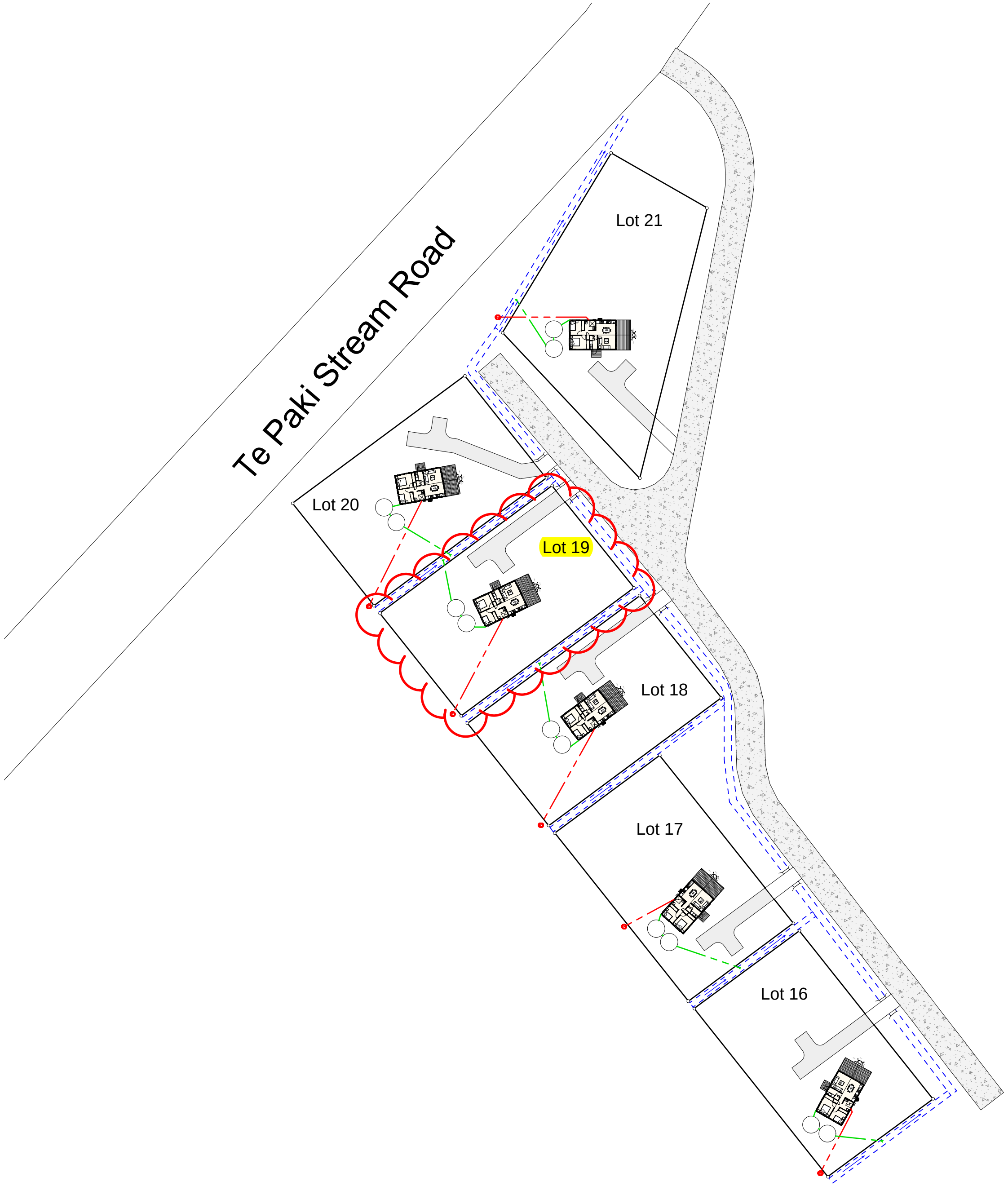
The penetrometer testing (attached below) indicated that the in-situ soils achieve “Good Ground” (as per the NZS 3604 definition) criteria between approximately 0.35m and 0.65m below the original ground surface. Refusal (>10 blows per 50mm), was encountered in two of the test locations along the western side of the building approximately 1.25m below the original ground surface.

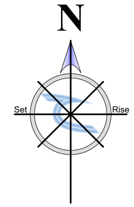
Yours Sincerely

Manu Burkhardt Macrae
BE, CMEngNZ, 253797
Attachments:

- *Site Plan and Test Locations; Photos; Scala Test Reports, Hand Auger Test Results, FNDC Liquefaction Risk Map.*

Site Plan





Notes

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN
LICENSED BUILDING PRACTITIONER www.dbh.govt.nz 126524 BUILDING CONFIDENCE

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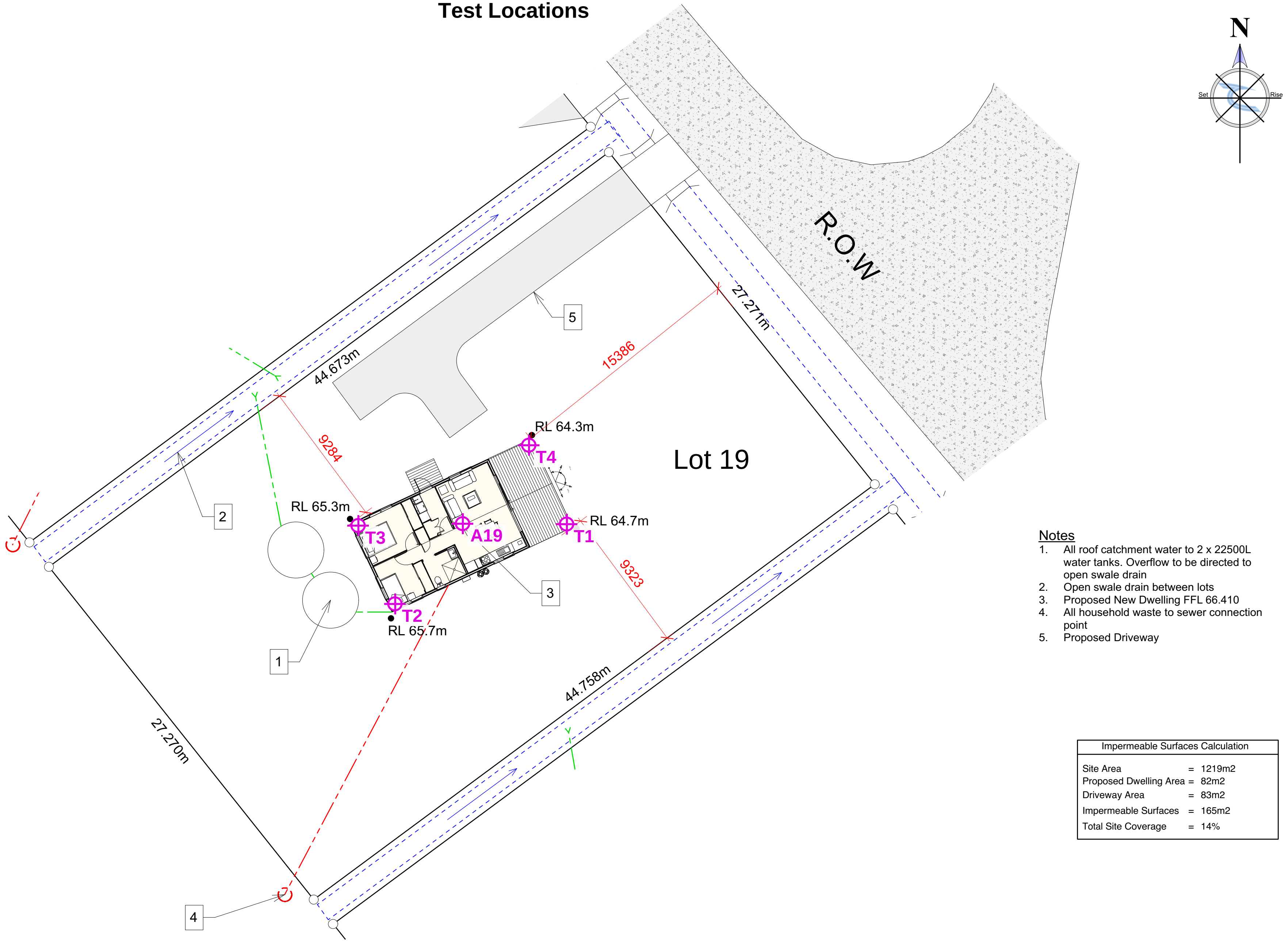
ISSUE	DATE	REVISION	
PROJECT Proposed New Papakainga Development			PROJECT # NK-1024
CLIENT Ngati Kuri	DATE #		DWG # A01
	SCALE @ A3	1:1000	
DWG Te Paki Dunes Locality Plan	DRAWN	JP	
	CHKD		REVISION
STATUS CONSENT ISSUE 31-10-2024			

Test Locations



Notes
1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 66.410
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	83m2
Impermeable Surfaces	=	165m2
Total Site Coverage	=	14%

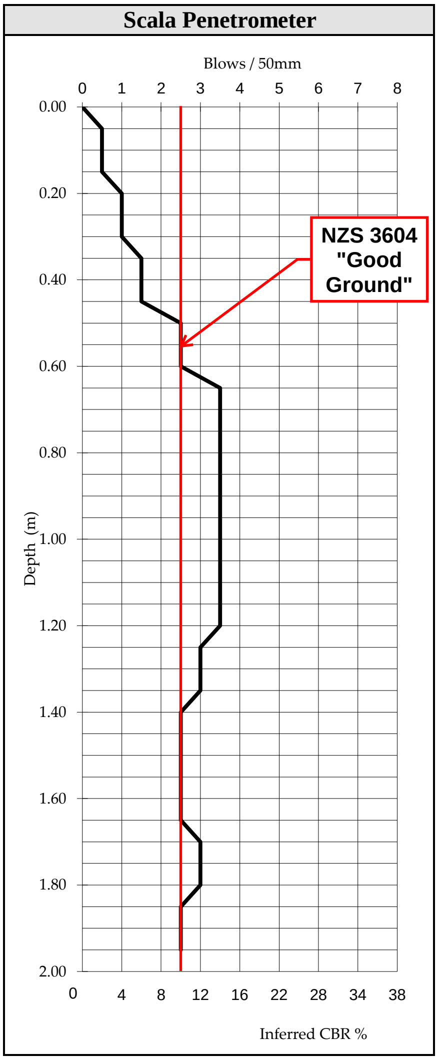
126524
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

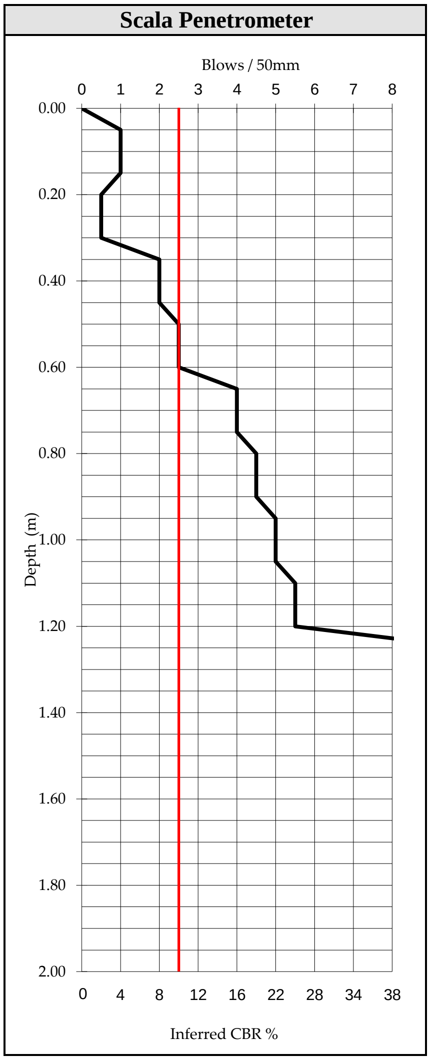
ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development	PROJECT #	NK-1024
CLIENT	Ngati Kuri	SCALE @ A3 1:250	DWG # A04
DWG	Te Paki Dunes Site 3 Plan	DRAWN JP	
STATUS	CONSENT ISSUE 31-10-2024		

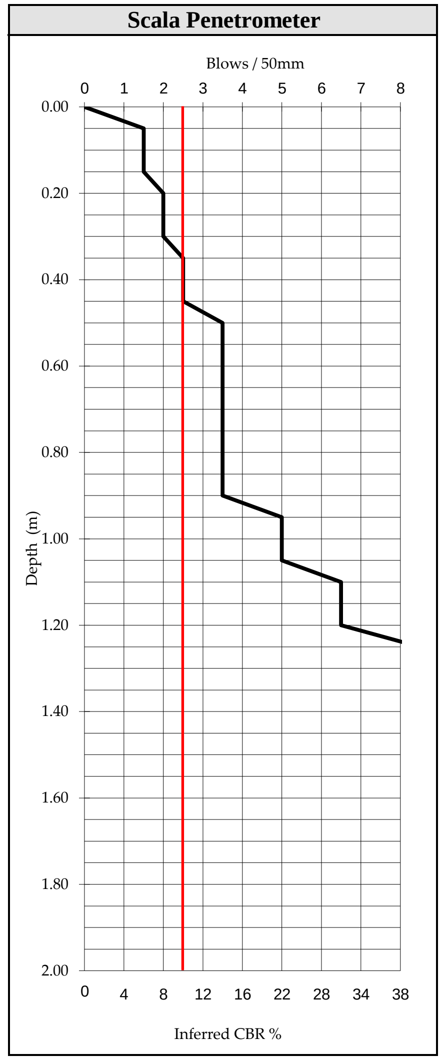
Scala Test Locations

SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 19 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	1	Test number :	2	Test number :	3
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	Ex. GL	Reduced level :	Ex. GL







Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2

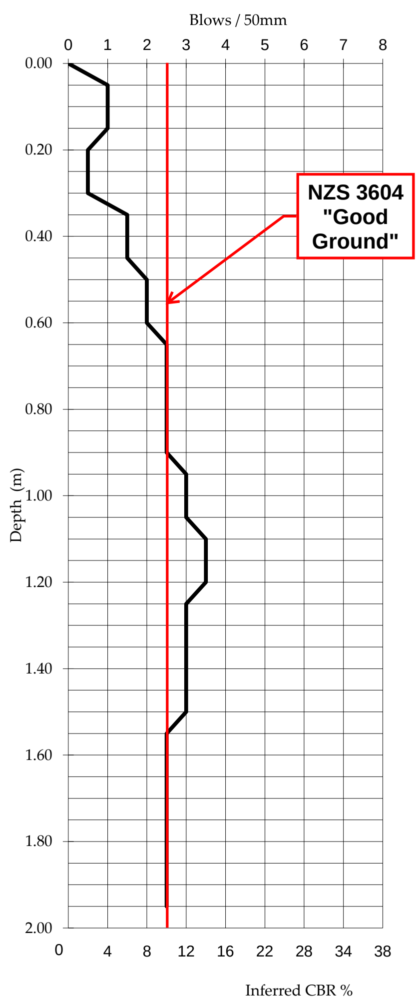
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

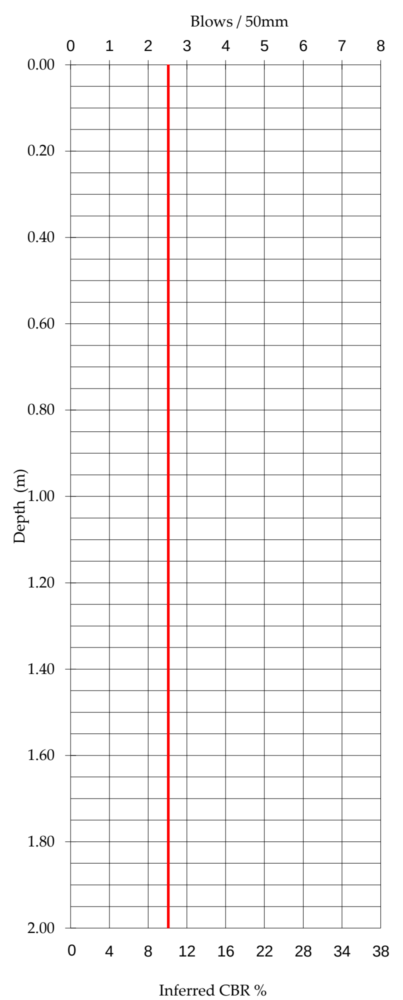
SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 19 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	4	Test number :	N/A	Test number :	N/A
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	N/A	Reduced level :	N/A

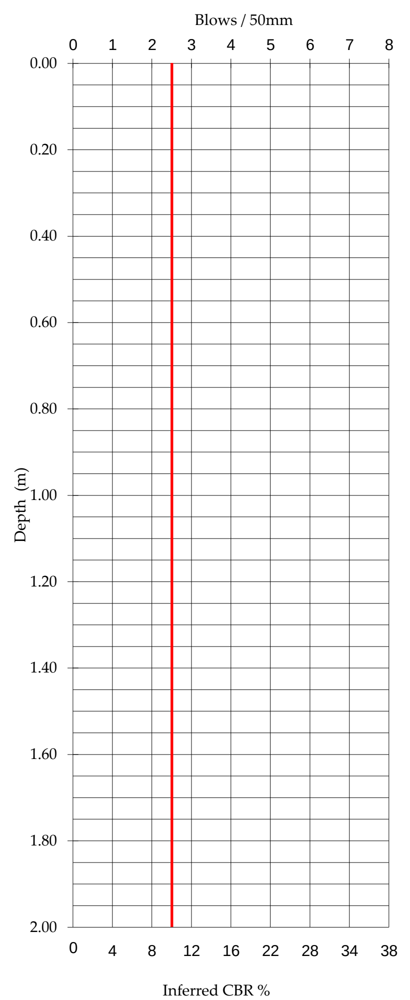
Scala Penetrometer



Scala Penetrometer



Scala Penetrometer



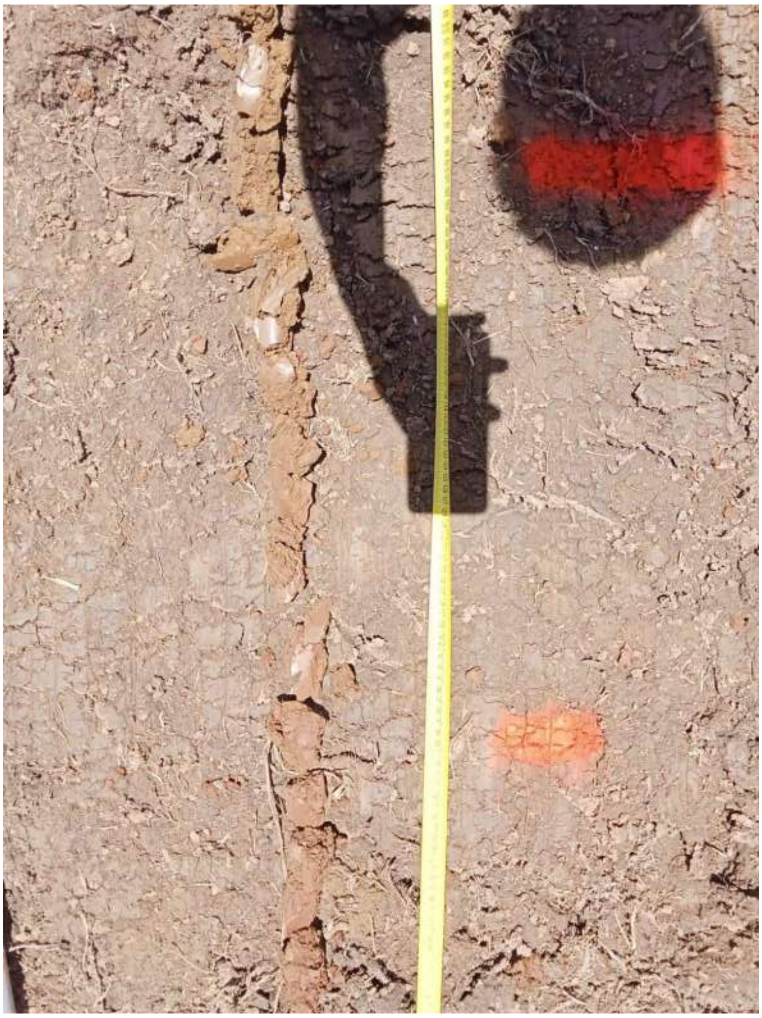
Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2

Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

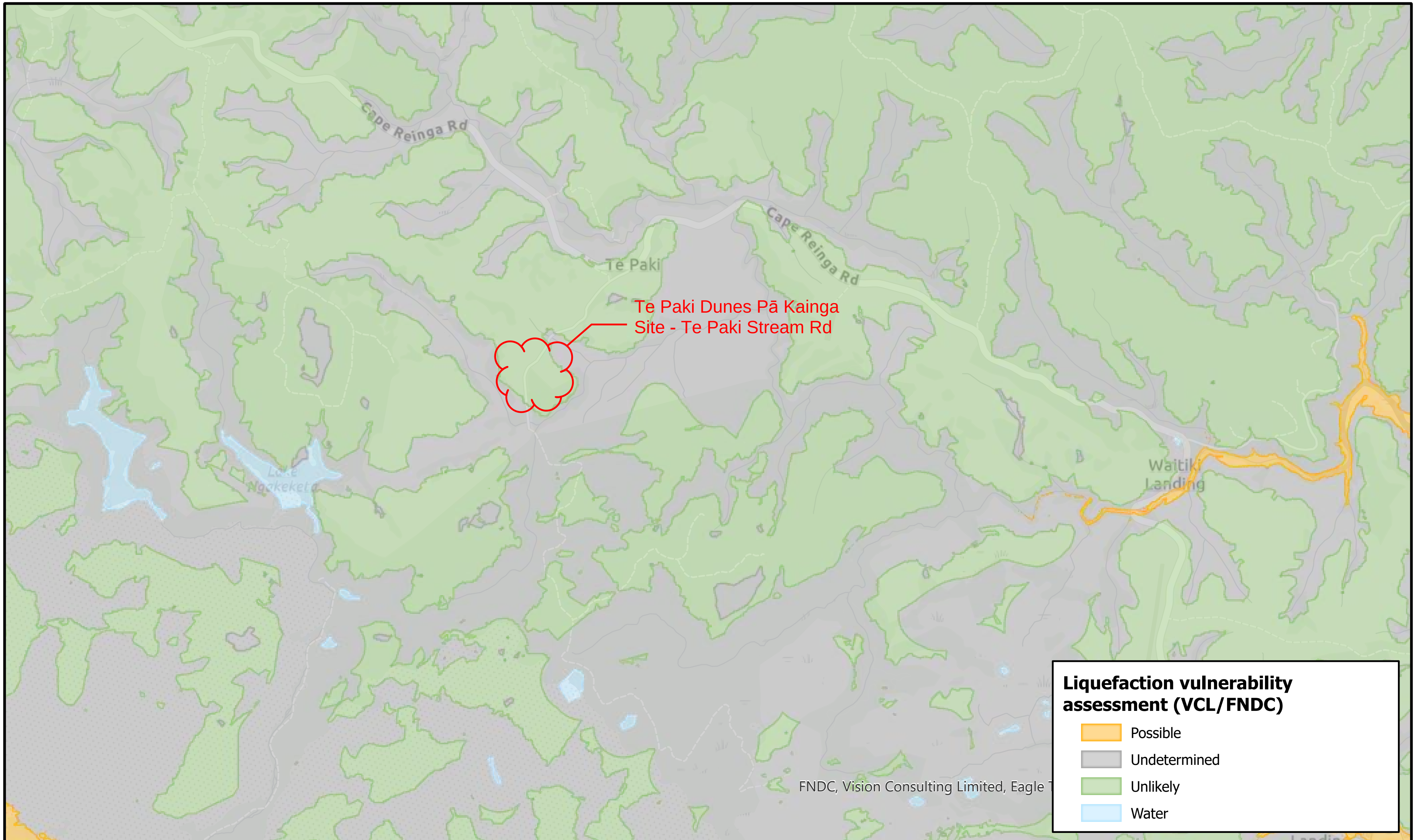
Hand Auger Samples to a depth of 2.0m for Lot 19



Soil Profile for Hand Auger in Lot 19

Test Location	Depth of Sample / Test [m]	Corrected Shear Vane Results		Soil Description / Classification
		Undisturbed [kPa]	Disturbed [kPa]	
A19	Existing Ground Level			
	0.0 - 0.5	60	51	**0.0 – 0.3m:** Topsoil, Dark brown, Uniformly graded, Moist. **0.3 – 0.5m:** CLAY, Reddish brown, Loose, Soft, High plasticity, Moderately sensitive, Moist.
	0.5 - 1.0	149	122	CLAY, Reddish brown, Loose, Soft, High plasticity, Moderately sensitive, Moist.
	1.0 - 1.5	125	89	CLAY, Reddish brown, Medium Dense, Firm, High plasticity, Moderately sensitive, Moist.
	1.5 - 2.0	125	95	CLAY, Reddish brown, Medium Dense, Firm, High plasticity, Moderately sensitive, Moist, GWL not reached.

FNDC Liquefaction Risk Map



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

Far North Maps

0 1 2 3 km

Projection NZTM2000. Datum NZGD2000. Scale:1:36,112

Created: 22/11/2024

PRODUCER STATEMENT – PS1
DESIGN

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** J000595
ISSUED BY: Structus Consulting Limited
(Engineering Design Firm)
TO: Ngati Kuri
(Owner/Developer)
TO BE SUPPLIED TO: Far North District Council
(Building Consent Authority)
IN RESPECT OF: Proposed relocatable dwelling pile foundations
(Description of Building Work)
AT: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland
(Address, Town/City)
LEGAL DESCRIPTION: **N/A** ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*:
Refer attached particulars dated 10 December 2024 for scope of works
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only, as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment *(Verification method/acceptable solution)* B1/VM1, B1/VM4 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to attached particulars dated 10 December 2024.
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 2 level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Darren Andew Mitchell, am:

- ☑ CPEng number 1007610

and hold the following qualifications BEng (Hons), CPEng, CMEngNZ

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Darren Andew Mitchell
(Signature below):

ON BEHALF OF *(Engineering Design Firm)*: Structus Consulting Limited Date: 10/12/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer attached particulars dated 10 December 2024

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1. Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2. NZIA Standard Conditions of Contract SCC 2011
3. Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4. PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

Structus Consulting Limited
PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 E info@structus.co.nz
www.structus.co.nz

Far North District Council

10 December 2024

Lots 16-21, Te Paki Stream Road, Cape Reinga – PS1 Producer Statement Attached Particulars

Structus have been commissioned to provide structural engineering design services for the relocatable dwelling foundation piles at Lots 16-21, Te Paki Stream Road, Cape Reinga, Northland for Ngati Kuri.

The structural design covered by this producer statement comprises the following only:

- Pile foundations
- SED Anchor pile to bearer connections.

Refer the following schedule listing the structural drawings and calculation report covered by this producer statement.

Drawing Title	**No.**	**Rev**	**Structus Stamp Dated**
Papakainga Development 16-21 Te Paki Dunes (Lot 16 Foundation Plan)	SK01	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 17 Foundation Plan)	SK02	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 18 Foundation Plan)	SK03	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 19 Foundation Plan)	SK04	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lots 20 & 21 Foundation Plan)	SK05	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes Structural Calculation Report		A	10/12/2024

Exclusions
The following items have not been included in this producer statement:

- Geotechnical engineering, including design parameters for pile foundations structural design
- Temporary propping, shoring or other temporary structures
- Waterproofing and cladding
- Any proprietary structures are to be designed by the supplier
- Civil engineering, such as earthworks, external pavement and drainage
- All structures above the pile foundations.

Assumptions

The design is based on the following assumptions:

- The design has been undertaken, and the ground conditions are, in accordance with the advice provided in the following FNR Geotechnical Investigation Reports:
    - Lot 16 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 17 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 18 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 19 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 20 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 21 Te Paki Stream Road, Cape Reinga – 21 November 2024
- The proposed building structure is in accordance with the architectural drawings by PanelLock dated 2/9/2024
- Seismic subsoil class E is assumed
- The Lots 16-21, Te Paki Stream Road structural works are designed for Importance Level 2 with a 50 year design life.

Alternative Solutions

The following alternative solutions to the NZ Building Code have been used on this project:

- None

B2 Compliance

A Producer Statement for Clause B2 – Structural Durability of the Building Code has been requested. We are not able to provide this because there is no verification method for B2 contained within the Building Code.

The purpose of this compliance clarification is to confirm that direct construction monitoring by Structus Consulting Limited in relation to Clause B2 (Durability) of the Building Code for the above project, has been limited in that material protection or treatment is typically carried out by specialist suppliers and requires specific quality assurance by the suppliers. However, we can confirm the specifically designed structural elements that were included in the design documentation prepared by the Structus Consulting Limited comply with the applicable verification methods.

<u>Timber</u> (means of compliance B1/VM1)

The timber has been specified in accordance with NZS3640:2004. The quality of timber treatment is dependent on the QA systems of manufacturers, suppliers and the onsite contractors and sub-contractors. Refer to the contractor's PS3 and QA records where available.

<u>Concrete</u> (means of compliance B1/VM1)

Compliance with cover and concrete quality requirements for B1/VM1 are in accordance with NZS3101:2006.

<u>Mild Steel</u> (means of compliance B1/VM1)

Protective coatings have been specified in accordance with AS/NZS 2312:2014 and SNZ TS 3404:2018.

The corrosion category and the years to first major maintenance have been identified for the structural steel work in accordance with SNZ TS 3404:2018. This allows the contractor to procure the suitable corrosion protections systems to meet AS/NZS 2312:2014 and SNZ TS 3404:2018 requirements. The quality of mild steel protective coatings is dependent on:

- Paint supplier confirming that the paint can perform to the standard as required by AS/NZS 2312:2014 and SNZ TS 3404:2018 based on the stipulated corrosion category and years to first maintenance
- Steel preparation
- Quality and production consistency of the coating products
- QA of the application and curing
- QA of the handling, protection and repair

Refer to:

- Contractor's and sub-contractor's PS3s and QA records where available
- Third party inspection and test results
- On-going maintenance plan (attached)

Applicability

The advice covered by this producer statement has been prepared by Structus at the request of its client, for the particular brief and on the terms and conditions agreed with our client and is exclusively for use and reliance by Structus' client. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of, or reliance by any third party, on the advice (in whole or in part) covered by this producer statement.

No express or implied warranty is made as to the advice contained in the information covered by this producer statement. To the extent that any information provided to Structus is inaccurate, incomplete, or inadequate, Structus takes no responsibility and disclaims all liability for any loss or damage that results from any conclusions based on information that has been provided to Structus.

Yours Sincerely
Structus Consulting Limited

Darren Mitchell
Director

Lots 16-21, Te Paki Dunes – Structural Maintenance Schedule

This schedule of ongoing inspection and maintenance of structural elements shall be included with the O&M manuals and provided to the Owner/Body Corporate and building managers.

Inspection/Maintenance timeframe and item	
(a) Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Sub-ground floor mild-steel structures such as beams.
(b) 5-yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings.
(c) 10-yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. **Note that 10 years is the expected useful life for many sealants.**
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
(d) 25-yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above.

STRUCTURAL CALCULATION REPORT

PAPAKAINGA DEVLOPMENT
TE PAKI DUNES

Prepared for: **NGATI KURI**

Date: **10 DECEMBER 2024** Reference: **J000595** Revision: **A**

STRUCTUS

DOCUMENT CONTROL RECORD

Document prepared by:

Structus Consulting Limited

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Report Title	Structural Engineering Calculation Report		
Client	NGATI KURI	**Job Number**	J000595

Rev	Date	Revision Details	Author	Verifier	Approver
A	10 December 2024	Building Consent	A. Motara	C. Bell	D. Mitchell

Current Revision	A

Approval			
Author Signature		Approver Signature	
Name	A. Motara	Name	D. Mitchell
Title	Structural Engineer	Title	Director

A person using Structus documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Structus.

Job: Papakainga Development	Job No: J000595
	Date: 10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author: A. Motara
	Pages: 2

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	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author:	A. Motara
	Pages:	4

1 Design Overview & Philosophy

Structus was engaged by Ngati Kuri to undertake structural design and detailing for the proposed Subfloor Piles/Foundation Design at Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland. The proposed project is in the figure below. This is a calculation report in support of a building consent submission. This report is to be read in conjunction with:

- Structus marked up Architectural Drawings A1-A13 dated 06/12/24Parsonson Architecture Te Paki Dunes and Ngataki consent issue drawings A01 to A13 dated 15 /11/24
- PanelLock transportable dwelling drawings A1 to A13 dated 02 September 2024
- FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

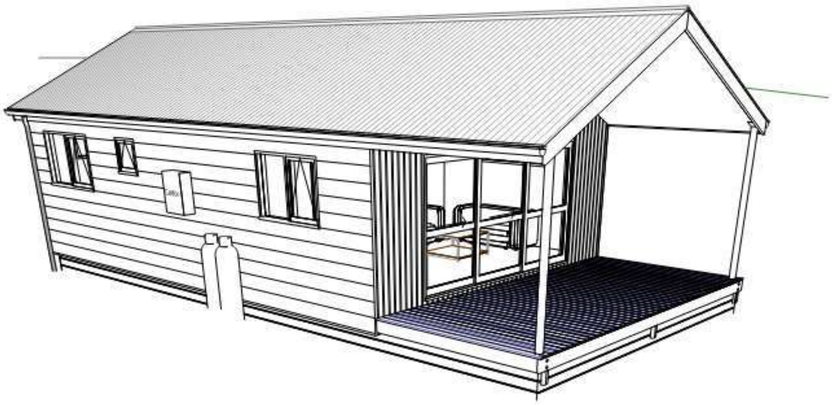


Figure 1-1: Building Overview

1.1 Location of building

Address: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland

Figure 1-2: Map View

1.2 Description of Buildings

The proposed buildings are transportable single storey dwellings of 82m^2 floor area. The dwellings at each lot are of similar floor plans and construction. The cladding is of lightweight construction supported by timber roof trusses and timber wall framing. The subfloor construction is of timber joists and timber piles encased in concrete.

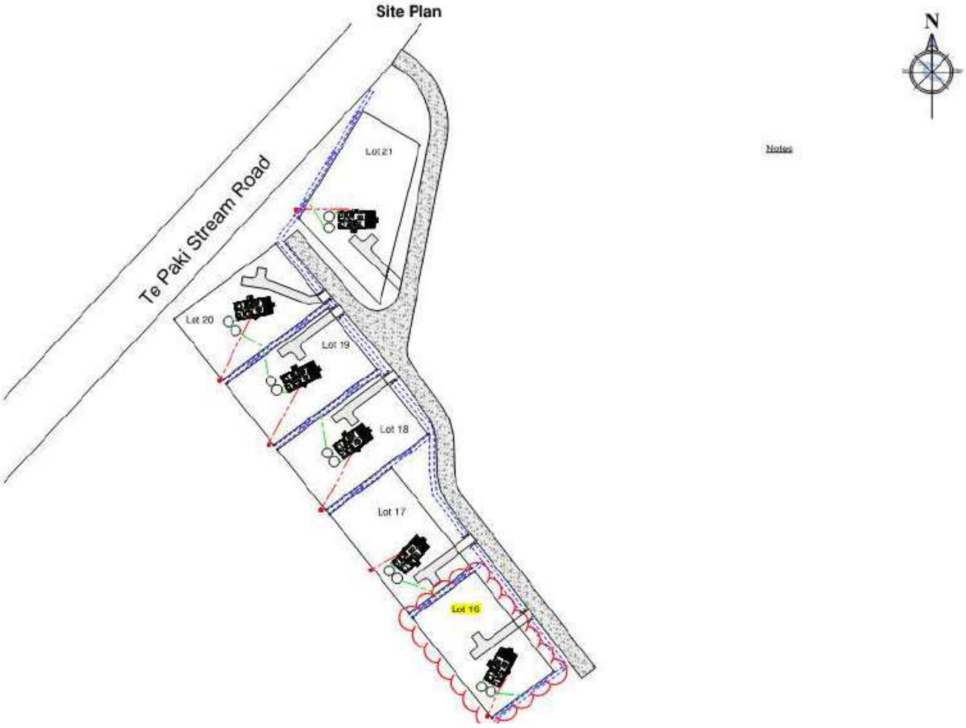


Figure 1-3: Site Plan

1.2.1 Gravity System

The gravity system is typically timber roof trusses supported by load bearing walls supported by conventional timber subfloor joists, bearers and bored timber piles.

1.2.2 Lateral Stability

Lateral stability is provided typically by roof, wall and subfloor bracing. The subfloor bracing is provided by specifically designed cantilever piles based on NZS3604 methodology for bracing demands.

1.2.3 Seismic Design

Seismic bracing demand is obtained based on NZS3604

1.2.4 Foundation

Foundations are timber piles encased in concrete. The foundations are typically embedded to a level that achieves good ground to NZS3604 or as required to achieve a suitable bracing capacity.

1.2.5 Geotechnical Investigation

- Geotechnical report reference - FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

Existing Soil Parameters	*Description*
y = 18kN/m^3	Soil density (Assumed)
s_u = 40-60kPa	Based on B1/VM4 Varies each lot - Refer to Foundation Calculations
Soil Class D or E	(Assumed/No information available)
Expansive Soil Class S	To AS:2870
Allowable end bearing = 204-300kPa	Capacity and depth varies at each Lot
Reduction factor = 0.5	Gravity case reduction factor
Reduction factor = 0.8	Seismic case reduction factor
Ground water – N/A	Ground water level not encountered

Further key points

- Liquefaction risk (Low)

2 Safety in Design

Safety in Design is required under the Health and Safety at Work Act 2015 (HSWA) and integrates risk management into the design process to identify, assess and treat Health and Safety risks to people over the life of an asset.

The HSWA requires designers to ensure, so far as is reasonably practicable, that any structure they design is without risks to the health and safety of persons who:

- Use the structure at a workplace (end users/customers);
- Construct the structure at a workplace;
- Carry out the manufacture, assembly, use, maintenance, proper demolition and disposal of the structure at a workplace; or
- Are in the vicinity of a workplace and are exposed to the structure, or whose health and safety may be affected by an activity related to the structure.

Structus has considered Safety in Design throughout the design process. Some risks have been designed out throughout the design process and therefore have been eliminated, however, other residual risks do exist. The residual risks are as follows:

- Open excavations/pile holes during construction.

The Safe Design report has identified hazards relating to the design of the structural works shown on the documents that would not normally be expected in other designs of the same type of structure.

The method of construction and maintaining safety during construction are the responsibility of the builder. If any of the structure in our designs is considered to present an unreasonable risk in respect to construction safety, the matter shall be referred to Structus for resolution before proceeding with the work.

This report is prepared solely for the purposes of the person conducting the business or undertaking who commissioned the design and is not prepared for the benefit of any other party or for any other purpose.

3 Loading and Material Properties

3.1 Importance Level

*The Importance Level is determined using Table 3.2 of AS/NZS 1170.0 and will be used to determine the required return periods of wind and seismic loading.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2

Figure 3-1: Importance Levels for Building Types

The residence is a (normal structure) and is classified as an Importance Level 2 building for design.

Design life of the building is 50 years therefore. From Table 3.3 of AS/NZS1170.0, the required Annual Probabilities of Exceedance are as follows:

Load	Importance Level	Annual probability of exceedance
Wu – Wind Loading Ultimate	2	1/500
Eu – Earthquake Loading Ultimate		1/500
Eu – Earthquake Loading Ultimate (Parts & Components)		1/500
All SLS loads		1/25

TABLE 3.3

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1	1/25	1/25	1/25	—	
	2	1/100	1/50	1/100	1/25	
	3	1/250	1/100	1/250	1/25	
	4	1/1000	1/250	1/1000	1/25	
5 years	1	1/25	1/25	1/25	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
25 years	1	1/50	1/25	1/50	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
50 years	1	1/100	1/50	1/100	—	—
	2	1/500	1/150	1/500	1/25	—
	3	1/1000	1/250	1/1000	1/25	—
	4	1/2500	1/500	1/2500	1/25	1/500

Figure 3-2: Annual Probability of Exceedance

3.2 Loadings

3.2.1 Self-Weight of Elements (SW):

- Concrete piles = 24kN/m3
- Perimeter cladding = 0.2kPa

Elements with self-weight (G)	*Description*
G_{roof} = 0.33 kPa	Roof build-up Metalcraft T-Rib roofing (assuming 0.55mm) 0.065kPa, Timber Trusses @900crs 0.07kPa, 0.04kPa Purlins, 0.05kPa Insulation blanket, 0.11kPa 18mm Triboard Ceiling.
G_{floor}= 0.30 kPa	Floor Build-up (0.14kPa 240x45 joists @ 400 crs + 0.1kPa 20mm particle boardT&G + 0.05kPa Insulation, misc 0.01kPa.
G_{int_wall} = 0.22kPa	36mm Triboard Wall panel.
G_{ext_wall} = 0.44 kPa	0.13kPa 7.5mm Hardi plank Weatherboards, 0.04kPa 90x45 framing, 0.05kPa insulation, 0.22kPa 36mm Triboard Wall panel

3.2.2 Superimposed Dead Loads (SDL)

SDL (G)	*Description*
G_{SDL}= 0.35 kPa	Nominal (Residential floor incl. floor coverings).

3.2.3 Imposed Loads (Q)

The following imposed / live loads are as per T3.1 of AS/NZS1170.1

Live Load (Q)	*Description*
Q_{RF} = 0.25 kPa	Roof life load
Q_{Floor} = 1.5kPa or 1.8kN	Residential Floor
Q_{Deck} = 2.0kPa	Residential balcony

3.2.4 Wind Loading

Wind Loading to be worked out using NZS3604 as per GIB spreadsheet – See Later Sections.

3.2.5 Seismic Loading

Seismic Load to be determined using NZS3604 and modified as required for the anchor pile design.

3.2.6 Load Combinations

The ultimate limit state combinations are considered as per AS/NZS 1170.0 section 4.2.

ULS Load Combinations	*Commentary*
[1.35G]	Permanent action
[1.2G, 1.5Q]	Permanent and imposed
[1.2G, W_u, ψ_cQ]	Downward wind ULS case
[0.9G, W_u]	Upward wind ULS case
[G, ψ_EQ, E_u]	Earthquake case

3.3 Material Properties

3.3.1 Concrete Strengths

▪ Foundations:	30 MPa	

3.3.2 Reinforcing Steel

▪ Reinforcing Steel (High Yield)	500 MPa	Micro Alloy Grade E
▪ Reinforcing Steel (Mild Steel)	300 MPa	Micro Alloy Grade E

3.3.3 Structural Steel

3.3.3.1 Steel Grade

▪ Rolled Steel Sections:	300 MPa – Grade 300 to AS/NZS 3679
▪ Steel Plate General	250 MPa – Grade 250 to AS1594
▪ Steel Plate (special)	300 MPa – Grade 300 AS/NZS 3678
▪ StelTech Beams	300MPa – Grade 300 AS/NZS 3679
▪ CHS Hollow Sections	350MPa – Grade C350 AS 1163
▪ RHS Hollow Sections:	AS 1163 - Grade C350 AS 1163
▪ Bolt Grades:	Grade 4.6 mild steel and grade 8.8 high strength
▪ Tensioning requirements for 8.8 bolts	S, TB, TF as required

3.3.3.2 Steel Corrosion Category

Durability Zone D (Far North) to NZS3604

3.3.4 Structural Timber

All timber shall be Pinus Radiata SG8 or SG6 grade and meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber.

4 Structural Load Path

Below is the typical structure for a single storey dwelling supported by trusses, load bearing walls, floor joists and shallow gravity piles with anchor piles for bracing.

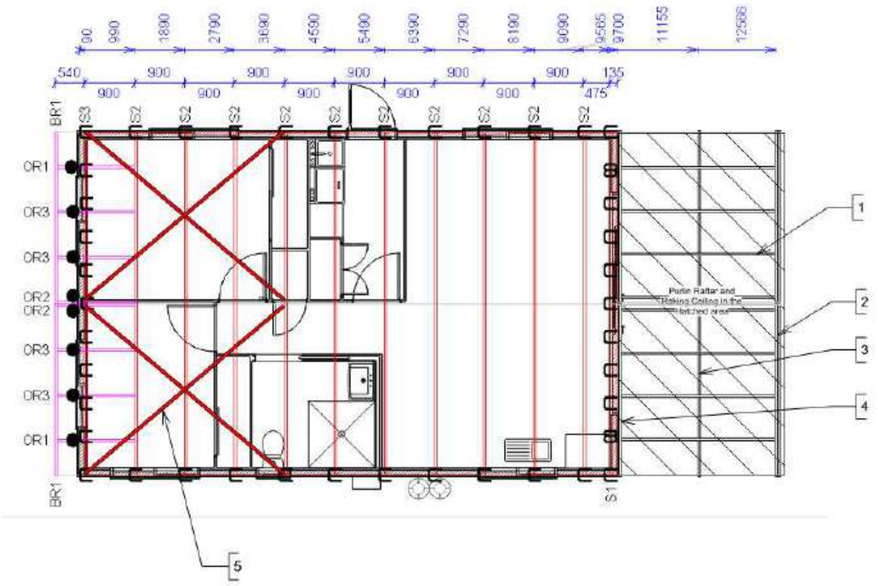


Figure 4-1: Typical Roof Plan

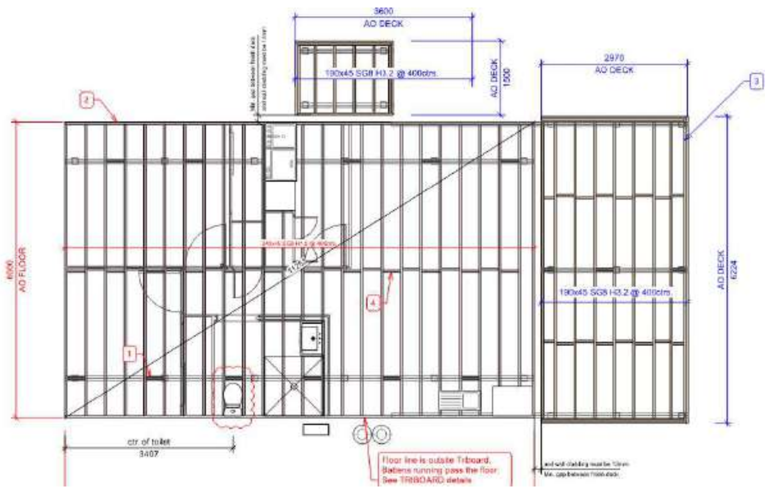


Figure 4-2: Typical Floor Plan

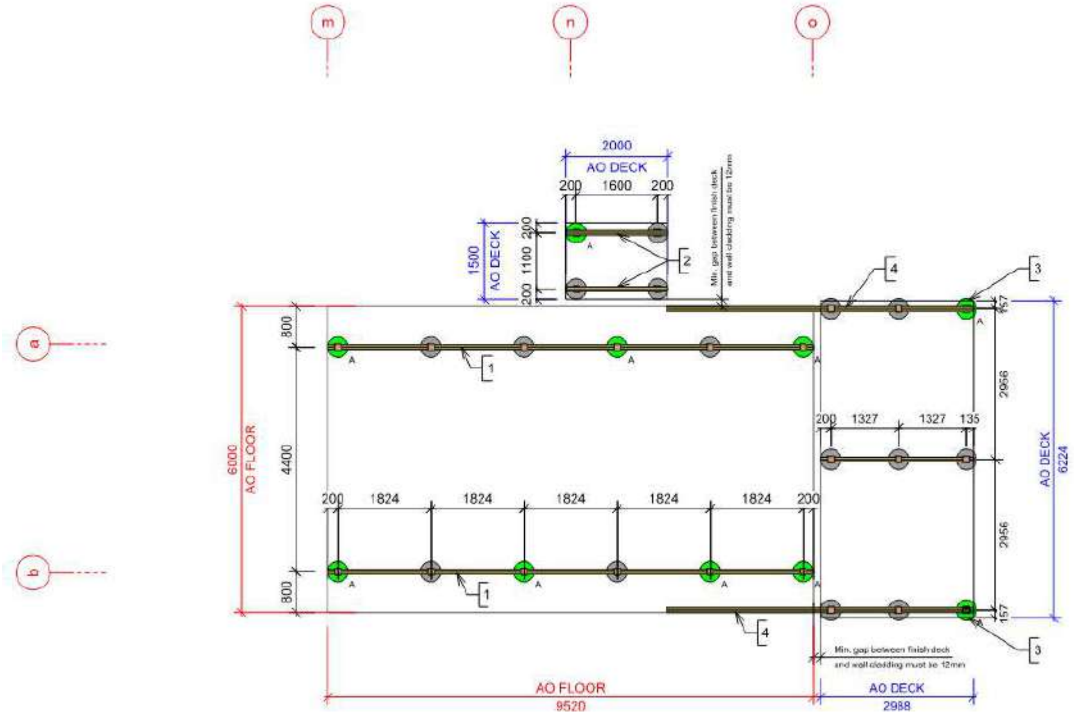
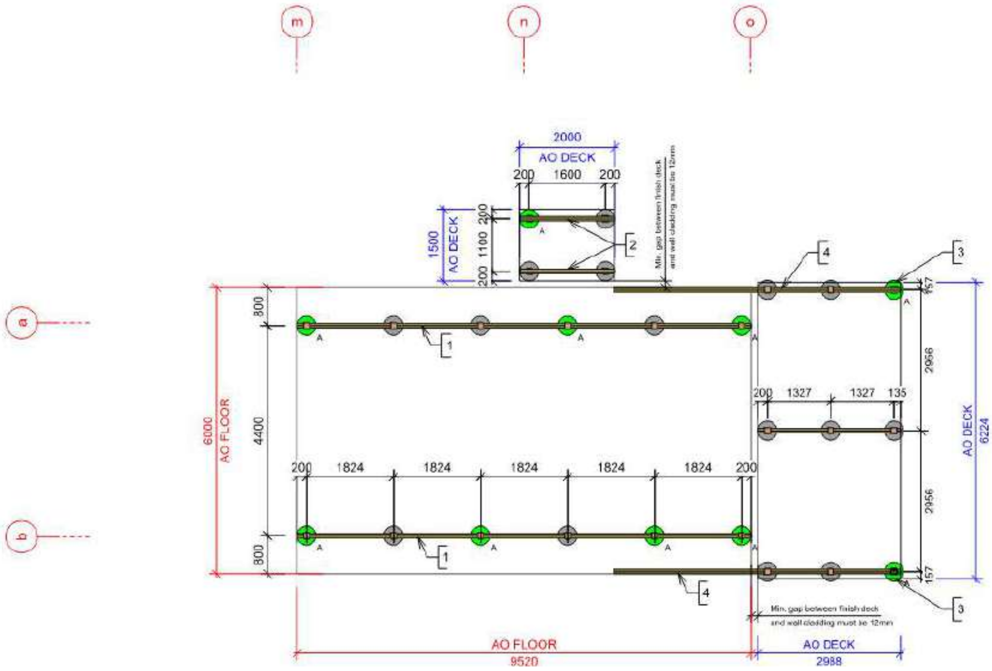


Figure 4-3: **Typical Lateral System Plan**

5 Subfloor Bracing Design

5.1 Bracing Design

Verification of the bracing plan below based on NZS3604 design loads.



For all Piles minimum Footing plan dimensions Ø480mm

Anchor Pile Ordinary Pile Brace Pile

Job: Papakainga Development	Job No:	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author:	A. Motara
	Pages:	17

Building Specification

Number of Storeys	Single
Floor Loading	2 kPa
Foundation Type	Subfloor
Sub Floor Cladding	Light
	Single
Cladding Weight ?	Light
Roof Weight ?	Light
Room in Roof Space	No
Roof Pitch (degrees) ?	25
Roof Height above Eaves (m)	1.4
Building Height to Apex (m)	4.05
Ground to Lower Floor (m)	0.71
Stud Height (m)	2.4
Building Length (m)	10
Building Width (m)	6

Building Location

Wind Zone = High

Wind Zone or Consent Authority	Not Available
Wind Region ?	A
Lee Zone	No
Ground Roughness ?	Open
Site Exposure ?	Exposed
Topography ?	T1

? Earthquake Zone	1
Soil Type	D & E (Deep to Very Soft)
Annual Prob. of Exceedance	1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	224	304
Subfloor Level	401	600

Bracing Units required for Earthquake

	Along and Across
Single	395
Subfloor Level	547

SubFloor Along

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

	Wind	Earthquake
Demand	401	547
Resistance	960 239%	720 132%

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)		
A		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK
B		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK

SubFloor Across

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

	Wind	Earthquake
Demand	600	547
Resistance	960 160%	720 132%

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)		
M		1	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
N		2	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
O		3	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK

Hence across direction is critical

Note re-check line O for additional demand from the deck.

7.4.2.2

Decks which project more than 2 m from the building shall have *subfloor bracing* provided by anchor and/or *braced piles*, at half the *bracing demand* required by table 5.8 for "light/light/light" *cladding*, for 0° *roof* slope and for "subfloor structures".

Anchor piles rating per pile	120 BUs for earthquake 160 BUs for wind

Table 5.8 – Bracing demand for various combinations of cladding on single-storey buildings on subfloor framing (2 kPa floor load, soil type D/E, earthquake zone 3) (see 5.3.1)

Roof cladding	Single-storey cladding	Subfloor cladding	Roof pitch degrees	Subfloor structure (BU/m²)	Single-storey walls (BU/m²)
Light roof	Light	Light and Medium	0-25 25-45 45-60	15 16 17	11 11 13
		Heavy	0-25 25-45 45-60	17 18 19	11 12 13
		Medium	0-25 25-45 45-60	18 18 19	12 13 14

Multiplication factors		EQ zone			
Soil class		1	2	3	4
A & B	Rock	0.3	0.5	0.6	0.9
C	Shallow	0.4	0.6	0.7	1.1
D & E	Deep to Very soft	0.5	0.8	1.0	1.5
NOTE – See 5.3.4 for additional bracing demand.					

Area of deck = 6.2x3=18.6m^2

Demand = ½ (0.5 x 16 x 18.6) = 74 BU (Total)

Demand/line = 74/2 = 37 BUs

From the bracing spreadsheet in the critical across direction

Capacity of Line O = 240 Bus

Demand based on tributary width = 547/3 lines = 182 BUS

Reserve capacity = 240-182 = 58 BUS > 37 BUs Hence OK

No additional piles required for the deck along the house line

For other lines

Nominal 1 AP at corner locations providing 120BUs > 37 BUs OK

Refer to the Anchor Pile specific design for pile design.

6 Foundation Design

6.1 Ground Conditions Summary

The following has been summarised from the geotechnical report.

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Notes –

Bearing capacity based on geotechnical engineer/soil report

Undrained shear strength derived from on B1/VM4 bearing capacity equations Qult =Nc x Su (based on ultimate bearing capacity)

6.2 Gravity Piles

6.2.1 Loading

Typical Pile (Central)						Pile Spacing (s)		1.82 m
		Dist Load		line Load		Pile Point Load w x s		
Element	Trib Width	G	Q	G	Q	G	Q	
Roof	3	0.35		1.05		1.911		
Ext. Wall	2.4	0.44		1.056		1.92192		
Floor	3	0.3	1.5	0.9	4.5	1.638	8.19	
Floor SDL	3	0.35		1.05		1.911		
					Totals	7.4	8.19	kN
		Factored Loads		ULS	1.2G+1.5Q	**21.1**	kN	
					1.35G	**10.0**	kN	
				SLS	G+0.7Q	**13**	kN	

6.2.2 Gravity Pile Design Lots 16-21

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	**16**		
Ultimate Pile Capacity Q_ult	**204**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.7**	m	
Pile Area	0.38	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	12.0		
ULS Pile Load = P + 1.2xW_pile	35.6	kN	
SLS Pile Load = P_s+W_pile	25.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**39.3**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**25.9**		**OK**
Adopt	**700 dia piles 1.3m deep**		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	**17**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	6.1		
ULS Pile Load = P + 1.2xW_pile	28.5	kN	
SLS Pile Load = P_s+W_pile	19.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 1.3m deep**		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	18		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.6	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.8		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	10.3		
ULS Pile Load = P + 1.2xW_pile	33.5	kN	
SLS Pile Load = P_s+W_pile	23.4	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550dia piles 1.8m deep		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	19		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.5	m	
Pile Area	0.20	m^2	
Depth to a (La)	0.65	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	0.85		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	4.0		
ULS Pile Load = P + 1.2xW_pile	25.9	kN	
SLS Pile Load = P_s+W_pile	17.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	29.5		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	19.4		OK
Adopt	500 dia piles 0.85m deep		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	20&21		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.4	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.6		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	9.1		
ULS Pile Load = P + 1.2xW_pile	32.1	kN	
SLS Pile Load = P_s+W_pile	22.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550 dia piles 1.6m deep		

Gravity Piles Summary

Pile Gravity Design Summary

Lot	Pile Diameter mm	Pile Depth m
16	700	1.3
17	500	1.3
18	550	1.8
19	500	0.85
20	550	1.6
21	550	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles

<u>For Simplicity of Design – Consider typical piles to be Ø550 for Lot 17-21 & Ø700 for Lot 16 with depth as per the table</u>

6.3 Cantilever Anchor Pile

From the Engineering Basis of NZS 3604 the following tables are provided

3.4.2 Design for safety (ultimate limit state - ULS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	Deflection (mm)
Anchor pile	120	6.0	30	160	8.0	30
Braced pile	120	6.0	50	160	8.0	50
Cantilever pile	30	1.5	25	70	3.5	45

3.4.3 Design for serviceability (serviceability limit state - SLS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	rating Deflection (mm)
Anchor pile	20	1.0	3	120	6.0	10
Braced pile	20	1.0	3	120	6.0	13
Cantilever pile	5	0.4	1	45	2.25	4

1) Consider capacity design actions on the piles

Components – timber pile; bolted connection, soil.

Assuming the ductile demand = 120BU = 6kN (Typical anchor pile capacity)

Consider the pile design to be nominally ductile

From NZS3604 design basis – the design ductility is 3.5; Sp = 0.7; k_mew = 2.4

For Nominally ductile loads T=0.4, mew = 1.25, Sp=0.925, k_mew= 1.14

Elastic load factor = k_mew(3.5) /Sp = 2.4/0.7 = 3.43

Reduce by nominally ductile factor = 3.43 x (0.925/1.14) = 2.78

6kN x 2.78 = 16.6kN

Notes – EZI brace design is about 132% over strength for EQ

Hence reduce by demands 32% (for capacity just meeting demand)

Revised demand = 16.6/1.32 = 12.5 kN (Minimum demand on each pile)

Height above ground = height to FFL – Joist Depth – floor boards = 710-240-20 = 450mm

Wind is not critical due to the scaling factor applied to the loads.

Design philosophy of piles.

- If good ground is very deep (>1.5df)– consider the using lower bound soil capacity (Q_ult = 204kPa→ Su=40kPa) with eo=1.5df (All cases except Lot 19)
- If good ground found is relatively shallow <1.5df (~ 0.6-0.8m) use the higher values for good ground. (Lot 19)
- Consider the max bending moment to be at the location in the ground as per the Broms formula ignoring strength of concrete.
- Use the same pile diameter as the gravity piles for simplicity.

6.3.1 Anchor Pile Design 16-21

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Capacity of 200x200 SG6 Square pole Wet Condition

Fb(SG6) = 7.5 MPa

Notes – Phi = 1.0 for capacity designed elements.

Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x200x200^2/6 = 10.0 kNm

For 250x250 SG6

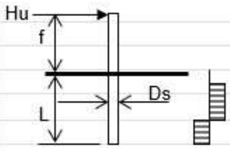
Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x250x250^2/6 = 19.5 kNm (Governs most designs)

Notes – Phi factor = 0.8 for seismic overstrength loads applied to the shear strength of soils

<u>Lot 16</u>

Use Ø700 Pile as per the gravity piles for this lot.

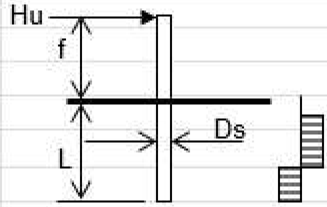
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.9718	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.12426	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.0136	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	12.732	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11315	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 12.7 kN > 12.5 kN accept

Recheck for the max allowable height (600mm is typically OK for all other sites – hence try 600mm)

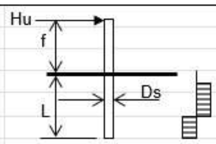


NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	13.882	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11886	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.3832	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	11.6154	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.10762	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

11.6kN < 12.5kN (92% capacity – within 10% Acceptable) but limit to 450mm.

<u>Adopt 250x250 SG6 Pile in 1.8m deep xØ700 pile for Lot 16(max height 450mm to GL-CL of fixing)</u>

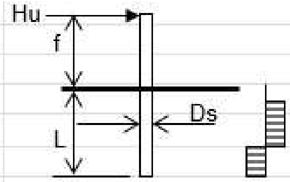
<u>Lot 17,18,20,21</u>



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	14.7551	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91815	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 14 kN > 12.5 kN accept

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	12.976	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90692	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	19.0223	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	13.2928	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90892	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.0kN>12.5kN (OK)

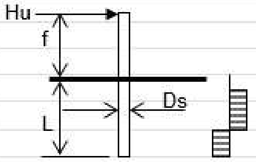
<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 17,18,20,21(max height 600mm to GL-CL of fixing)</u>

<u>Notes – adopt 1.8m for Lot 18 as gravity piles are deeper.</u>

<u>Lot 19</u>

300kPa strength found @ 0.65m on this lot

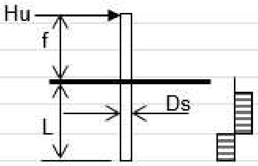
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	15.9122	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89488	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	20.8441	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	14.9112	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89049	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Try 600mm height

NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.5832	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88905	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	21.2481	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	13.4072	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88388	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.4kN > 12.5kN (OK)

<u>Hence 1.5m depth required. hence keep to 1.6m as per typical lots for simplicity (max height 600mm to GL-CL of fixing)</u>

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 19</u>

6.3.1.1 Deck Piles

Check typical deck anchor piles if design can be reduced

Demand from NZS3604 from before per pile = 37 BUs

Scaled up demands = 37/20BU x 2.78 = 5.14 kN

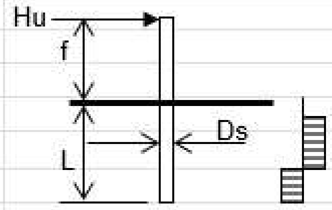
Based on other lots – check the design using the lower bound values.

Bending Capacity of 125x125 post = 0.8 x 10 x 125x125^2/6 = 2.6kNm

Bending Capacity of 150x150 post = 0.8 x 10 x 150x150^2/6 = 4.5kNm

Pile depths are typically minimum 1.6m for anchor piles

NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	3.4	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	2.64929	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.84173	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		



<u>2.6kN < 5.1 kN demand (N.G – hence requires greater pile 200SQ min size – since there are only two deck piles – keep the same size throughout – i.e. 250 SQ.</u>

Note – since the house demands are overall just meeting <u>– adopt one additional pile along line of house</u>

(deck demand = 74BU/20 x 2.78 = 10.3kN < 12.5kN for one pile OK.

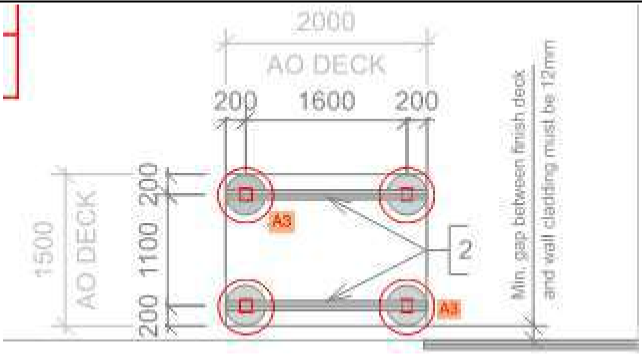
<u>Check min required for uplift of deck post.</u>

Volume of concrete = 0.4m^3 (To Arch.)

Lreq = 0.4 / (pi x 0.55^2/4 – 0.25^2) = 2.3m > 1.6m (hence increase depth to 2.3 meters for deck piles with Ø550 dia piles and post above.

Lreq(700dia) = 0.4 / (pi x 0.7^2/4 – 0.25^2) = 1.24m < 1.8m (hence 1.8 m OK for 700 dia piles)

6.3.1.2 Small Deck Piles



A_Deck = 1.5x2 = 3m^2

A_pile = 0.75m^2

For gravity – simply adopt the typical pile depths and diameter for simplicity.

Bracing demand – typically standard anchor piles to NZS3604 will be OK by inspection of 900mm depth or greater if required by the typical gravity piles.

6.3.1.3 Pile Design Summary Overall

Pile Design Summary Final Lot 16-21

Lot	Pile Diameter mm	Pile Depth m	Anchor Pile
16	700	1.3	1.8
17	550	1.3	1.6
18	550	1.8	1.8
19	550	0.9	1.6
20	550	1.6	1.6
21	550	1.6	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles & 250SQ H5 for Anchor Piles
Min strength SG6

<u>Deck piles sized for uplift min 2.3m deep for 550 piles and 1.8m for 700piles</u>

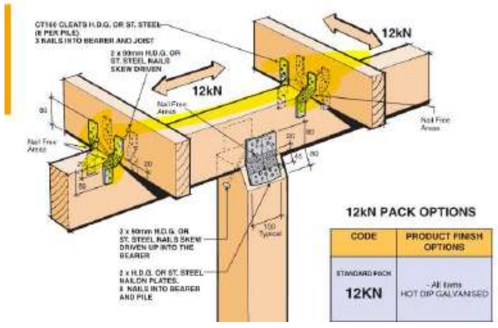
6.3.2 Connection Design

The overstrength seismic demand is 12.5 kN

This is comparable to 12kN NZS3604 connection (96%) Capacity

Hence typical connections may be substituted.

For joists to bearer connection use standard CT160 connections or similar.



However, for completeness provide the bolted connection design to the pile due to the larger size.

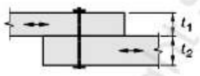
Since the loads are nominally ductile – consider the simplified method for design of bolted connections to AS/NZS1720.

<u>Case 1</u>

Load direction parallel to grain

TABLE 4.9(A)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SYSTEM CAPACITY

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skl})
(1) Two member 	b_{eff} equals smaller of t_1 and t_2	Q_{kl}

Member = 2/190x45 SG8

Be = 90mm

Try 2/M16 Bolts

TABLE 4.9(C)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kl}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
JD5	25	2 100	2 800	3 500	4 200	5 600	7 000	8 400	10 500	12 60
	35	2 200	3 900	4 900	5 900	7 800	9 800	11 800	14 700	17 60
	40	2 200	3 900	5 600	6 700	9 000	11 200	13 400	16 800	20 20
	45	2 200	3 900	6 200	7 600	10 100	12 600	15 100	18 900	22 70
	70	2 200	3 900	6 200	8 900	15 700	19 600	23 500	29 400	35 30
	90	2 200	3 900	6 200	8 900	15 800	24 600	30 200	37 800	45 40
	105	2 200	3 900	6 200	8 900	15 800	24 600	35 300	44 100	52 90
	120	2 200	3 900	6 200	8 900	15 800	24 600	35 500	50 400	60 50

Qskl=Qkl=15.8kN /bolt

$$N_{d,j} = \phi\, k_1\, k_{16}\, k_{17}\, n\, Q_{sk} \qquad \ldots 4.4(3)$$

and

N^* = design action effect in shear

ϕ = capacity factor (see Clause 2.3)

k_1 = factor for duration of load for fasteners (see Clause 2.4.1.1)

k_{16} = 1.2 for bolts that transfer load through metal side plates (see Figure 4.7) of adequate strength, and the bolts are a close fit to the holes in these plates provided that $b_{eff}/D > 5$ for loads acting parallel to the grain and $b_{eff}/D > 10$ for loads acting perpendicular to the grain (where b_{eff} denotes the effective timber thickness and D is the bolt diameter)
= 1.0 otherwise

k_{17} = factor for multiple bolted joint given in Table 4.12

n = number of bolts resisting design action effect in shear

Q_{sk} = characteristic capacities as derived in Clause 4.4.2.4. See also Clauses 4.4.4 and 4.4.5

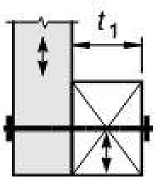
(e) For connections designed using the simplified method set out in ZZ4.1 to ZZ4.5: ϕ = 0.8.

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 15.8 = 25.3 kN > 12.5kN (OK)

<u>Case 2</u>

Check strength of pile connection.

Member = 250x160 (recessed) SG6, Unseasoned J5

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skp})
(1) Two member 	b_{eff} equals $2t_1$	Q_{kp}

Be = 160x2=320mm

Qskp=Qkp

Try 2/M16 Bolts

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.7 = 9.12 kN < 12.5kN (N.G)

Try use 4/M16

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.72 = 18.3 kN > 12.5kN (OK)

Hence Adopt 4-M16 Bolts for the pile bearer connection.

Minimum edge distances

To the loaded side of timber = 5xD = 5 x 16 = 80mm

C-C spacing = 5D = 80mm

Timber width required = 80+80+80 = 260mm > 250mm (Close – Accept as the bolts are not fully loaded & greater than elastic capacity can be achieved).

Case 3

For anchor piles loaded perp to direction of the bearers – check washer capacity

3.2.6 Bearing capacity

3.2.6.1 *Design capacity in bearing perpendicular to the grain*

The design capacity in bearing perpendicular to the grain ($N_{d,p}$) of a structural element (see Figure 3.8), for strength limit state, shall satisfy the following:

$$N_{d,p} \geq N_p^* \qquad \ldots 3.2(15)$$

where

$$N_{d,p} = \phi\, k_1\, k_4\, k_6\, k_7\, f'_p\, A_p \qquad \ldots 3.2(16)$$

and

ϕ = capacity factor (see Clause 2.3)

N_p^* = design load effect in bearing (see Figure 3.8 and Clause 1.4.2.2)

k_1 to k_7 = modification factors given in Section 2

f'_p = characteristic value in bearing perpendicular to grain

A_p = bearing area for loading perpendicular to grain.

For SG6/No. 1 Framing fp = 5.3MPa

Using 4 No. 60mm Square washers

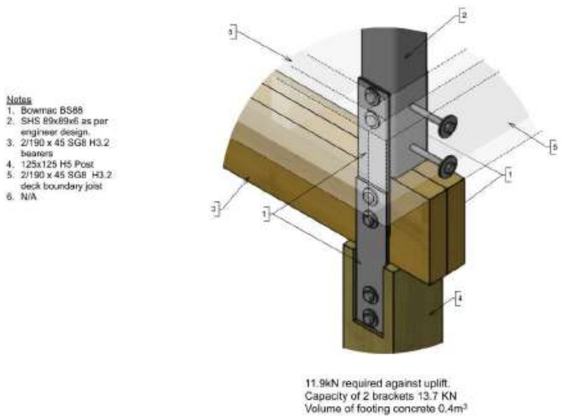
Phi_Nd,p = 0.8 x 1.0 x 1.0 x 1.0 x 1.0 x 5.3 x 4 x 60^2= 61 kN >>12.5 kN (OK)

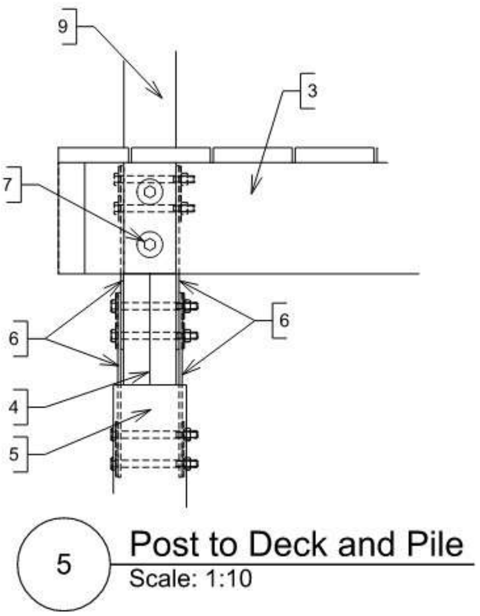
Using minimum 4mm Thk washer as per code (OK by inspection).

Adopt minimum 60mm x 4mm Square washers to M16 Bolts.

6.3.2.1 Connection at Deck Post

The architect has provided a connection detail for the external post. Check for compatibility with anchor pile design (note uplift requirements check by other engineer)





The connection in the square post is critical.

Slot cut the post to achieve double shear

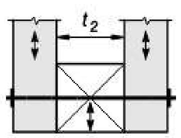
(2) Three member, Type A 	b_{eff} equals t_2	$2Q_{kp}$

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N — Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Be = 90mm

Qskp = 2 x 2.11kN = 4.22kN/12mm bolt

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 4.22 = 6.7 kN > 5.14kN (OK)

Hence OK to adopt the architect detail for the anchor piles of the deck. (i.e. 2/M12 bolts slot cut in timber pile)

Structus Consulting Limited
Victoria Park Market, Unit 69, 210 Victoria Street West, Auckland 1142
PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 M 021 059 5683 E info@structus.co.nz

2 Te Paia Lane, Kaitaia
Phone (09) 408 0979
PO Box 62, Awanui 0451
GST No: 107-240-918

19th November 2024
Att: Parson Architecture & PanelLock

To Whom it may Concern

Good Ground Report for Proposed New Dwelling at Lot 20 Te Paki Stream Road, Cape Reinga.

FNR Consulting have been engaged by Ngati Kuri to carry out geotechnical testing for a proposed new dwelling with an approximate floor area of 82m^2. A total of four scala penetrometer tests and one hand auger were conducted.

Testing was carried out in general accordance with the requirements of NZS 3604 and NZS 4402.

The test locations are shown in the attached plans and photographs, with the test results also attached to this document.

The NZLI Soils Map describes the soils in this area as: **Rangiuru Clay**.

Observations

The site soils appeared to be consistent with the NZLI Soils Map description, with clay observed in the hand auger testing across the subdivision. Based on the soil samples, the clay appeared to have a high plasticity and was moderately sensitive. In general, the clay was also loose to dense and had a firm to stiff consistency. The soil appeared to be either dry or moist, while the ground water level (GWL) was not reached over the 2.0m depth tested. Refer to the attached hand auger results for a full soil profile of the hand auger conducted in the centre of the building.

The site has not been levelled, and the tests were performed in the undisturbed natural ground (not fill material).

There are no visual signs of slope instability in the vicinity of the building site and the proposed position of the building relative to the adjacent slope is appropriate and does not pose a risk in terms of slope stability.

The site classification based on site reactivity in accordance with AS2870-2011 Table 2.1 is **Class S – Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.**

Liquefaction Risk

A desk-top study of liquefaction risk for this site has been undertaken.

"The area of Northland is identified to be at low risk of seismic hazard. There are no active faults known in the Far North. Small earthquakes will give short duration shaking that may not have enough cycles to cause liquefaction. Microzoning studies are probably not required as the hazard is low (GNS 2004)" - Regional Liquefaction Vulnerability Assessment – Far North District, prepared by Vision Consulting for FNDC 20/01/2023.

According to the above referenced report, and associated mapping, the Liquefaction Vulnerability Category for this site is "unlikely". This indicates that "there is a probability of more than 85% that liquefaction-induced ground damage will be None to Minor for 500-year shaking".

Based on the above it is considered that the liquefaction vulnerability for this site is low and that the expected degree of liquefaction induced ground damage is none to minor.

Scala Results

The penetrometer testing (attached below) indicated that the in-situ soils achieve "Good Ground" (as per the NZS 3604 definition) criteria between 1.10m and 1.25m below the original ground surface.

Yours Sincerely

Manu Burkhardt Macrae
BE, CMEngNZ, 253797
Attachments:

- *Site Plan and Test Locations; Photos; Scala Test Reports, Hand Auger Test Results, FNDC Liquefaction Risk Map.*

Site Plan

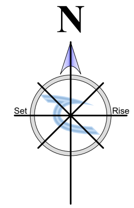
Notes

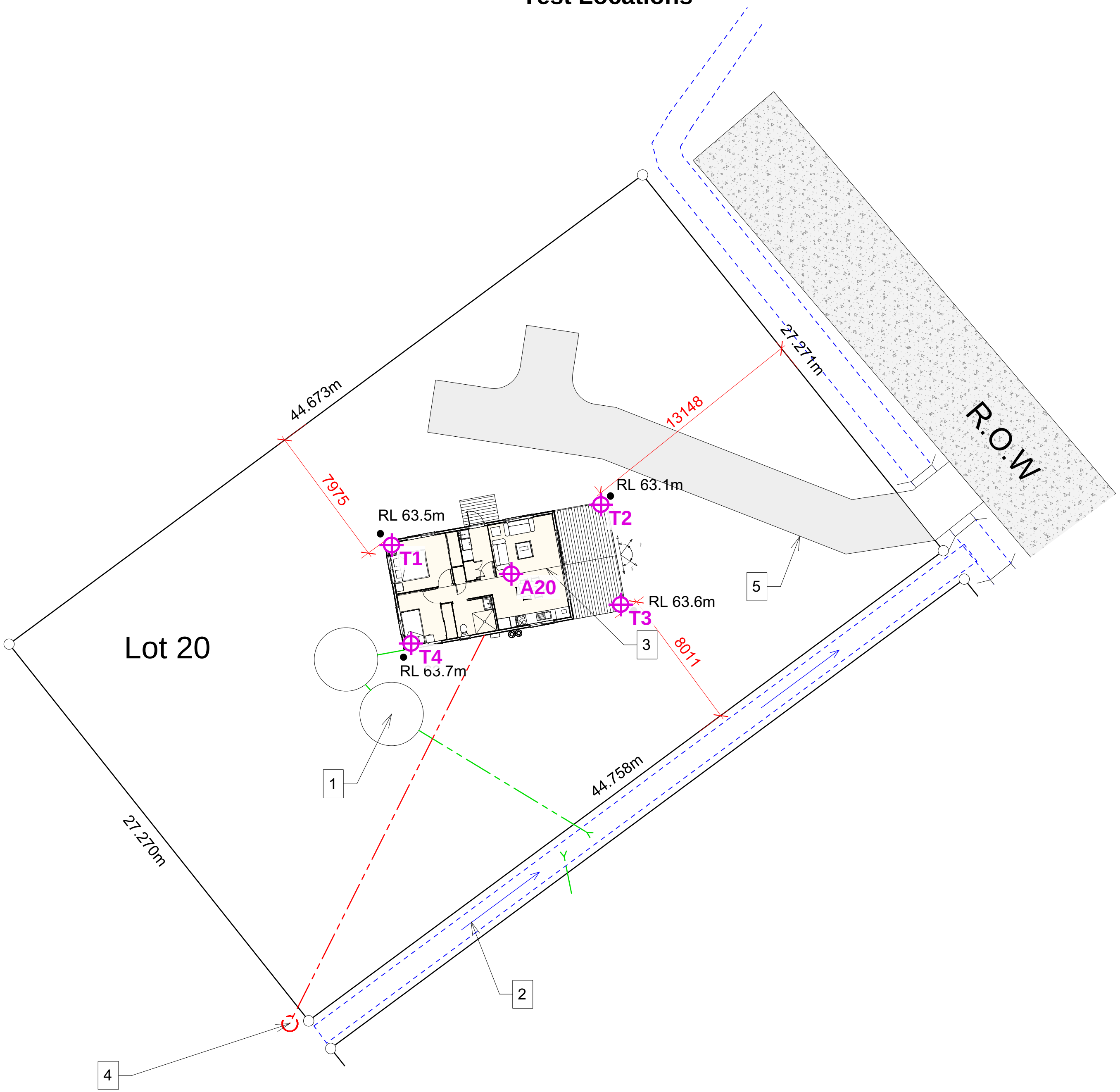
126524
Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:1000	DWG # A01
DWG	Te Paki Dunes Locality Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

Test Locations





Notes
1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain between lots
3. Proposed New Dwelling FFL 64.410
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1219m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	98m2
Impermeable Surfaces	=	180m2
Total Site Coverage	=	15%

126524

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

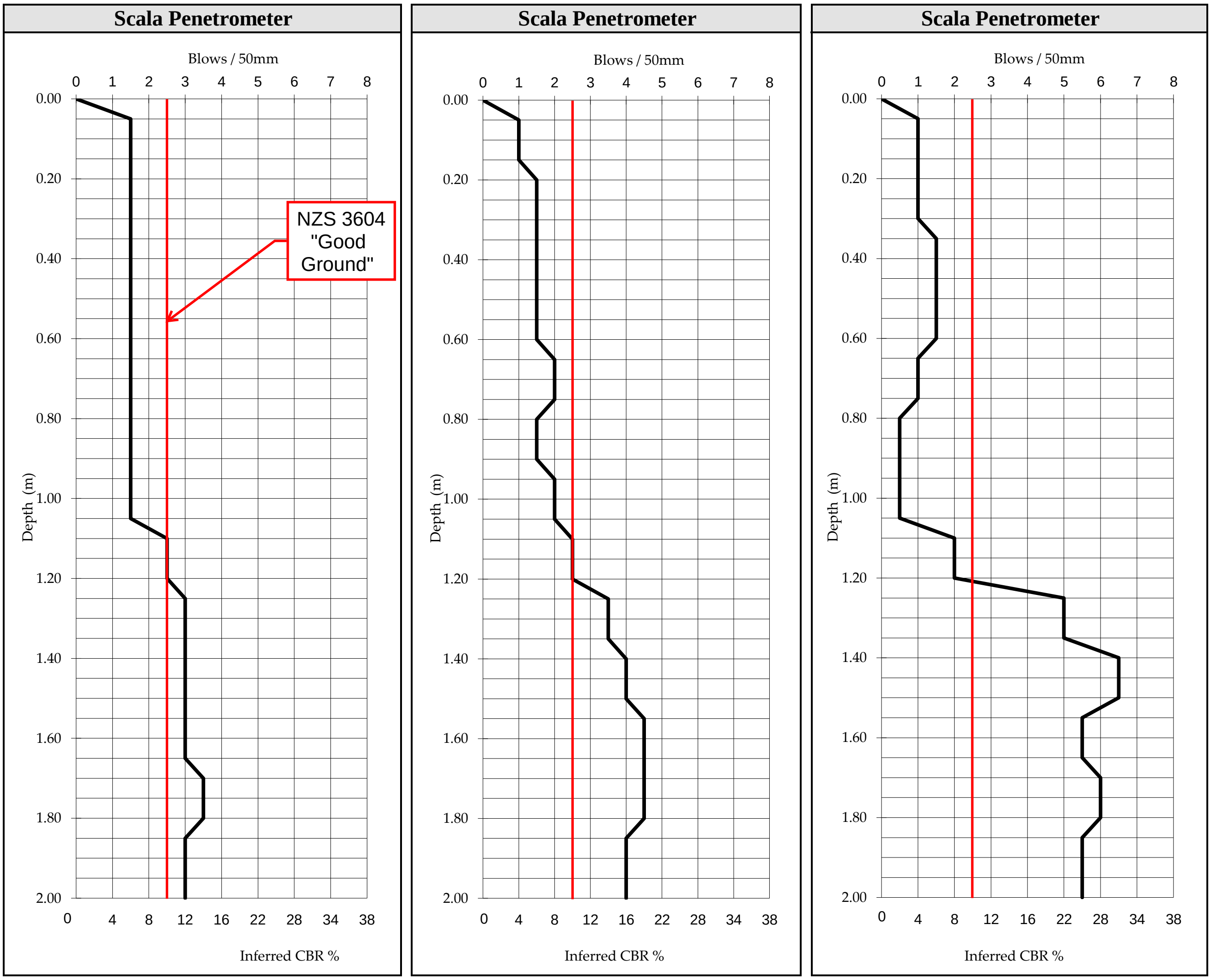
540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development		PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE # / SCALE @ A3 1:250	DWG # A03
DWG	Te Paki Dunes Site 2 Plan	DRAWN JP / CHKD	REVISION
STATUS	CONSENT ISSUE 31-10-2024		

Scala Test Location's 1 - 4

SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 20 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	1	Test number :	2	Test number :	3
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	Ex. GL	Reduced level :	Ex. GL



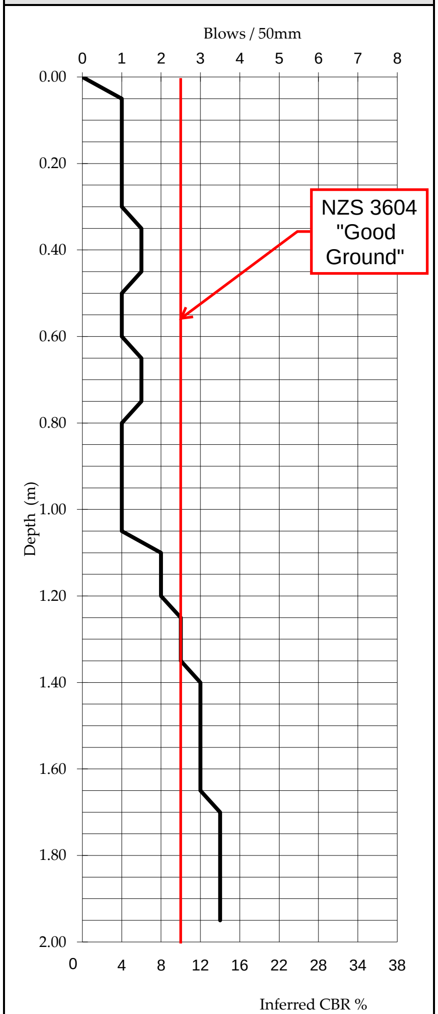
Test Methods
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

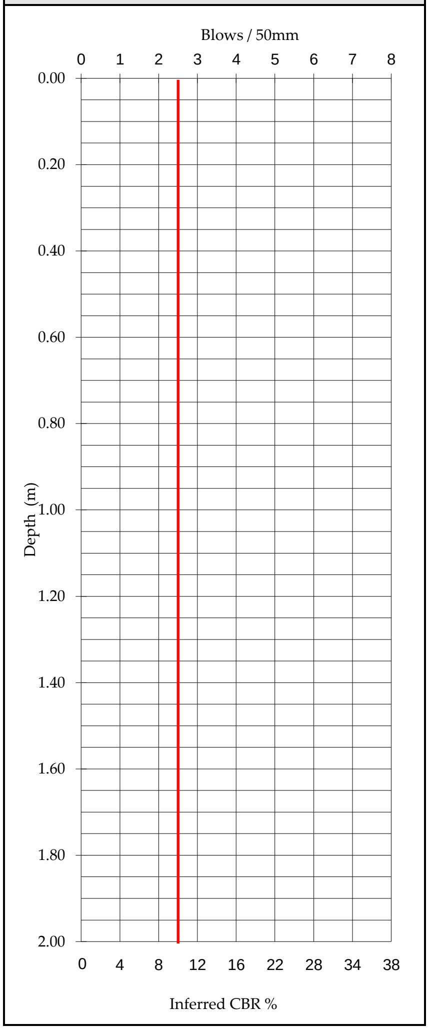
SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 20 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	4	Test number :	N/A	Test number :	N/A
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	N/A	Reduced level :	N/A

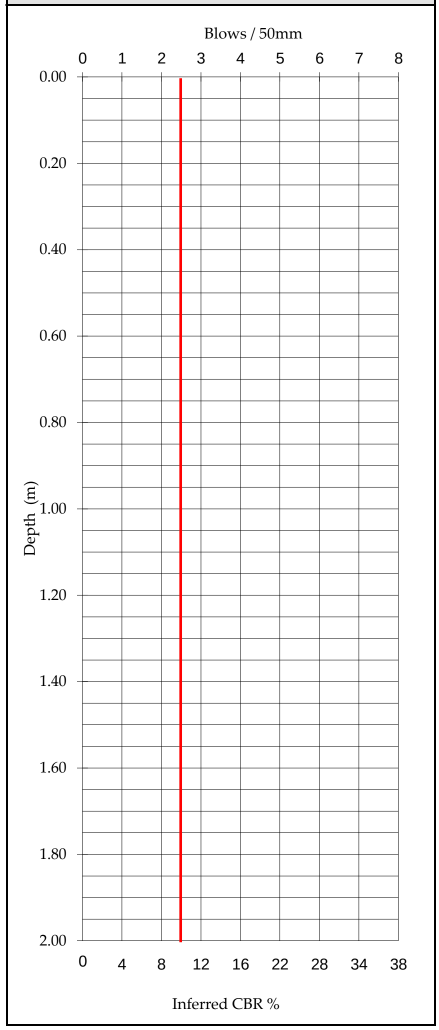
Scala Penetrometer



Scala Penetrometer



Scala Penetrometer



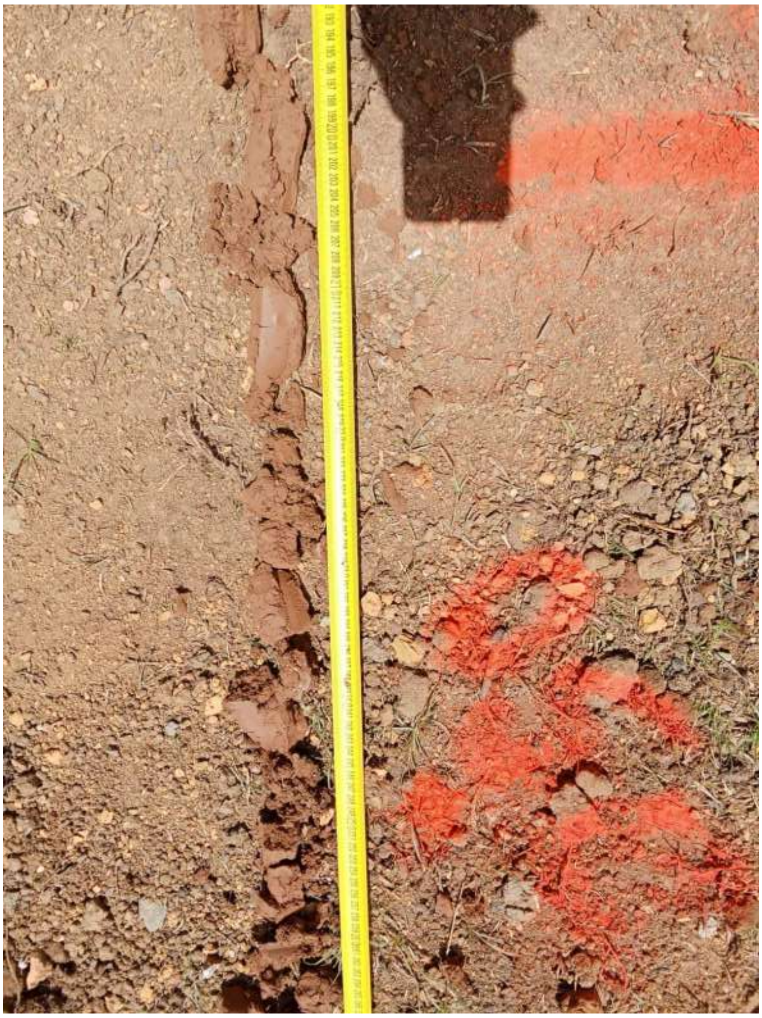
Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2

Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	18/11/24	Tested by:	HS
Date reported :	19/11/24	Reported by:	AVDL

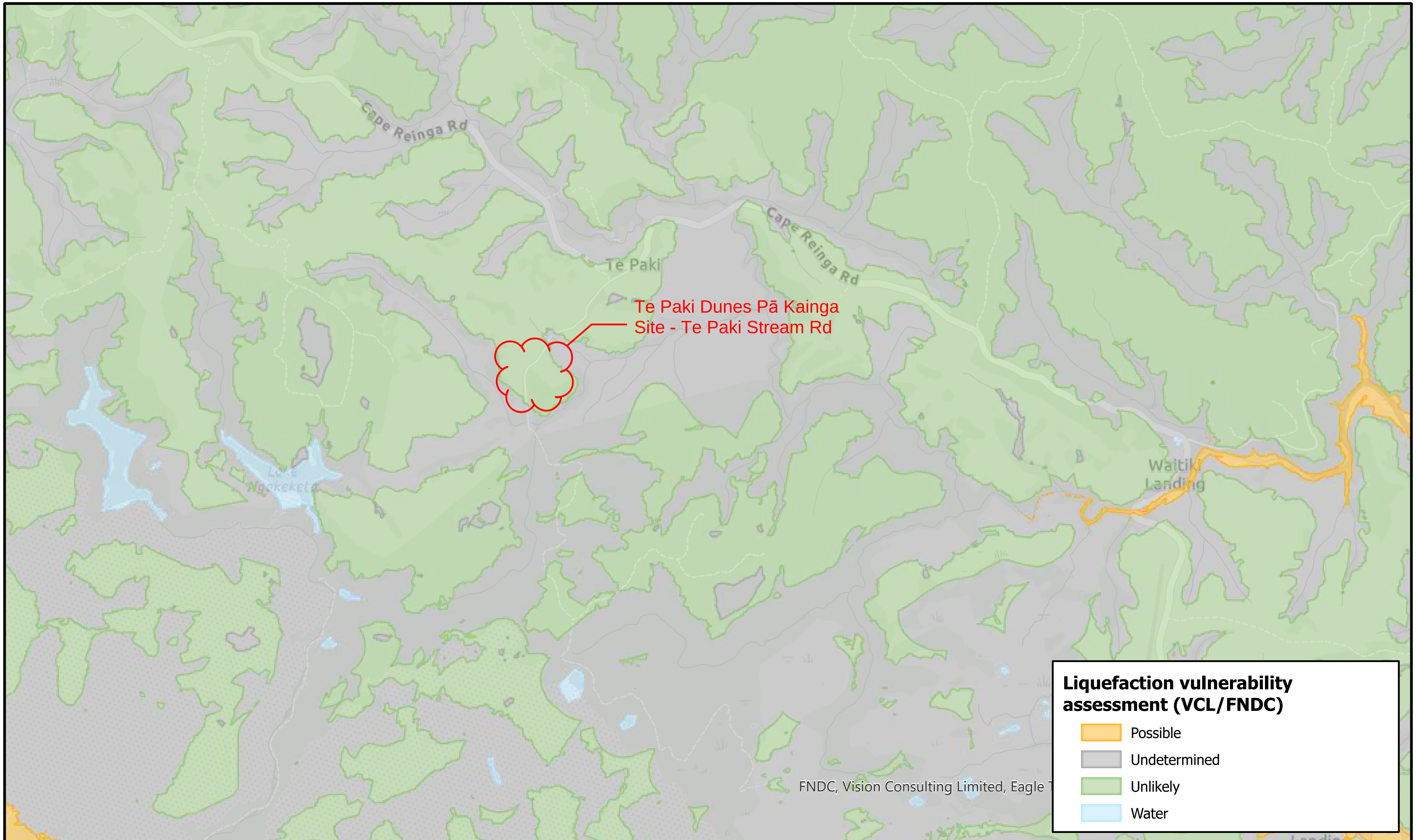
Hand Auger Samples to 2.0m for Lot 20



Soil Profile for the Hand Auger in Lot 20

Test Location	Depth of Sample / Test [m]	Corrected Shear Vane Results		Soil Description / Classification
		Undisturbed [kPa]	Disturbed [kPa]	
A20	Existing Ground Level			
	0.0 - 0.5	95	63	**0.0 – 0.2m:** Topsoil, Dark brown, Well graded, Dry. **0.2 – 0.5m:** CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Dry.
	0.5 - 1.0	116	74	CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Moist.
	1.0 - 1.5	125	95	CLAY, Reddish brown, Medium Dense, Stiff, High plasticity, Moderately sensitive, Moist.
	1.5 - 2.0	122	92	CLAY Loam, Reddish brown, Dense, Firm, High plasticity, Moist, Moderately sensitive, GWL not reached.

FNDC Liquefaction Risk Map



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

Far North Maps

Projection NZTM2000. Datum NZGD2000. Scale:1:36,112

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: 22/11/2024

PRODUCER STATEMENT – PS1
DESIGN

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** J000595

ISSUED BY: Structus Consulting Limited
(Engineering Design Firm)

TO: Ngati Kuri
(Owner/Developer)

TO BE SUPPLIED TO: Far North District Council
(Building Consent Authority)

IN RESPECT OF: Proposed relocatable dwelling pile foundations
(Description of Building Work)

AT: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland
(Address, Town/City)

LEGAL DESCRIPTION: **N/A** ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*:
Refer attached particulars dated 10 December 2024 for scope of works
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only , as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment *(Verification method/acceptable solution)* B1/VM1, B1/VM4 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to attached particulars dated 10 December 2024 .
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 2 level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Darren Andew Mitchell , am:

- ☑ CPEng number 1007610

and hold the following qualifications BEng (Hons), CPEng, CMEngNZ

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Darren Andew Mitchell
(Signature below):

ON BEHALF OF *(Engineering Design Firm)*: Structus Consulting Limited Date: 10/12/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer attached particulars dated 10 December 2024

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1. Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2. NZIA Standard Conditions of Contract SCC 2011
3. Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4. PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

Structus Consulting Limited
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T 09 869 2073 E info@structus.co.nz
www.structus.co.nz

Far North District Council

10 December 2024

Lots 16-21, Te Paki Stream Road, Cape Reinga – PS1 Producer Statement Attached Particulars

Structus have been commissioned to provide structural engineering design services for the relocatable dwelling foundation piles at Lots 16-21, Te Paki Stream Road, Cape Reinga, Northland for Ngati Kuri.

The structural design covered by this producer statement comprises the following only:

- Pile foundations
- SED Anchor pile to bearer connections.

Refer the following schedule listing the structural drawings and calculation report covered by this producer statement.

Drawing Title	No.	Rev	Structus Stamp Dated
Papakainga Development 16-21 Te Paki Dunes (Lot 16 Foundation Plan)	SK01	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 17 Foundation Plan)	SK02	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 18 Foundation Plan)	SK03	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 19 Foundation Plan)	SK04	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lots 20 & 21 Foundation Plan)	SK05	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes Structural Calculation Report		A	10/12/2024

Exclusions

The following items have not been included in this producer statement:

- Geotechnical engineering, including design parameters for pile foundations structural design
- Temporary propping, shoring or other temporary structures
- Waterproofing and cladding
- Any proprietary structures are to be designed by the supplier
- Civil engineering, such as earthworks, external pavement and drainage
- All structures above the pile foundations.

Assumptions

The design is based on the following assumptions:

- The design has been undertaken, and the ground conditions are, in accordance with the advice provided in the following FNR Geotechnical Investigation Reports:
    - Lot 16 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 17 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 18 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 19 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 20 Te Paki Stream Road, Cape Reinga – 19 November 2024
    - Lot 21 Te Paki Stream Road, Cape Reinga – 21 November 2024
- The proposed building structure is in accordance with the architectural drawings by PanelLock dated 2/9/2024
- Seismic subsoil class E is assumed
- The Lots 16-21, Te Paki Stream Road structural works are designed for Importance Level 2 with a 50 year design life.

Alternative Solutions
The following alternative solutions to the NZ Building Code have been used on this project:

- None

B2 Compliance
A Producer Statement for Clause B2 – Structural Durability of the Building Code has been requested. We are not able to provide this because there is no verification method for B2 contained within the Building Code.

The purpose of this compliance clarification is to confirm that direct construction monitoring by Structus Consulting Limited in relation to Clause B2 (Durability) of the Building Code for the above project, has been limited in that material protection or treatment is typically carried out by specialist suppliers and requires specific quality assurance by the suppliers. However, we can confirm the specifically designed structural elements that were included in the design documentation prepared by the Structus Consulting Limited comply with the applicable verification methods.

Timber (means of compliance B1/VM1)
The timber has been specified in accordance with NZS3640:2004. The quality of timber treatment is dependent on the QA systems of manufacturers, suppliers and the onsite contractors and sub-contractors. Refer to the contractor's PS3 and QA records where available.

Concrete (means of compliance B1/VM1)
Compliance with cover and concrete quality requirements for B1/VM1 are in accordance with NZS3101:2006.

Mild Steel (means of compliance B1/VM1)
Protective coatings have been specified in accordance with AS/NZS 2312:2014 and SNZ TS 3404:2018.

The corrosion category and the years to first major maintenance have been identified for the structural steel work in accordance with SNZ TS 3404:2018. This allows the contractor to procure the suitable corrosion protections systems to meet AS/NZS 2312:2014 and SNZ TS 3404:2018 requirements. The quality of mild steel protective coatings is dependent on:

- Paint supplier confirming that the paint can perform to the standard as required by AS/NZS 2312:2014 and SNZ TS 3404:2018 based on the stipulated corrosion category and years to first maintenance
- Steel preparation
- Quality and production consistency of the coating products
- QA of the application and curing
- QA of the handling, protection and repair

Refer to:

- Contractor's and sub-contractor's PS3s and QA records where available
- Third party inspection and test results
- On-going maintenance plan (attached)

Applicability

The advice covered by this producer statement has been prepared by Structus at the request of its client, for the particular brief and on the terms and conditions agreed with our client and is exclusively for use and reliance by Structus' client. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of, or reliance by any third party, on the advice (in whole or in part) covered by this producer statement.

No express or implied warranty is made as to the advice contained in the information covered by this producer statement. To the extent that any information provided to Structus is inaccurate, incomplete, or inadequate, Structus takes no responsibility and disclaims all liability for any loss or damage that results from any conclusions based on information that has been provided to Structus.

Yours Sincerely
Structus Consulting Limited

Darren Mitchell
Director

Lots 16-21, Te Paki Dunes – Structural Maintenance Schedule

This schedule of ongoing inspection and maintenance of structural elements shall be included with the O&M manuals and provided to the Owner/Body Corporate and building managers.

Inspection/Maintenance timeframe and item	
(a) Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Sub-ground floor mild-steel structures such as beams.
(b) 5-yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings.
(c) 10-yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. **Note that 10 years is the expected useful life for many sealants.**
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
(d) 25-yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above.

STRUCTURAL CALCULATION REPORT

PAPAKAINGA DEVLOPMENT
TE PAKI DUNES

Prepared for: **NGATI KURI**

Date: **10 DECEMBER 2024** Reference: **J000595** Revision: **A**

STRUCTUS

DOCUMENT CONTROL RECORD

Document prepared by:

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W structus.co.nz

Report Title	Structural Engineering Calculation Report		
Client	NGATI KURI	**Job Number**	J000595

Rev	Date	Revision Details	Author	Verifier	Approver
A	10 December 2024	Building Consent	A. Motara	C. Bell	D. Mitchell

Current Revision	A

Approval			
Author Signature		Approver Signature	
Name	A. Motara	Name	D. Mitchell
Title	Structural Engineer	Title	Director

A person using Structus documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Structus.

Job: Papakainga Development	**Job No:**	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	**Author:**	A. Motara
	Pages:	2

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		Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report		**Author:**	A. Motara
		Pages:	4

1 Design Overview & Philosophy

Structus was engaged by Ngati Kuri to undertake structural design and detailing for the proposed Subfloor Piles/Foundation Design at Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland. The proposed project is in the figure below. This is a calculation report in support of a building consent submission. This report is to be read in conjunction with:

- Structus marked up Architectural Drawings A1-A13 dated 06/12/24Parsonson Architecture Te Paki Dunes and Ngataki consent issue drawings A01 to A13 dated 15 /11/24
- PanelLock transportable dwelling drawings A1 to A13 dated 02 September 2024
- FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

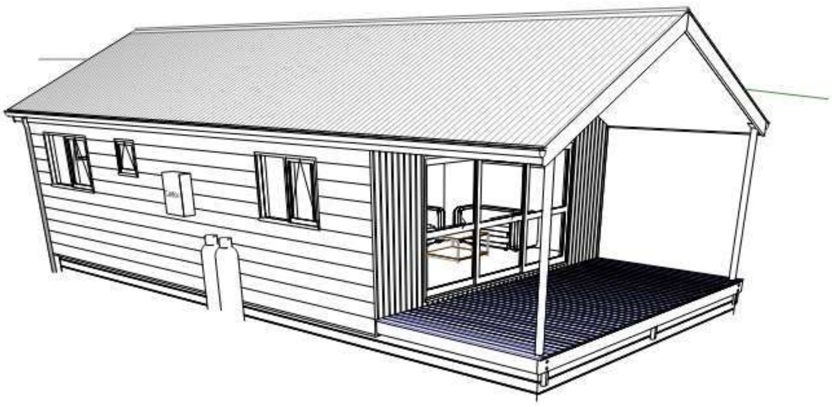


Figure 1-1: Building Overview

1.1 Location of building

Address: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland

Figure 1-2: Map View

1.2 Description of Buildings

The proposed buildings are transportable single storey dwellings of 82m² floor area. The dwellings at each lot are of similar floor plans and construction. The cladding is of lightweight construction supported by timber roof trusses and timber wall framing. The subfloor construction is of timber joists and timber piles encased in concrete.

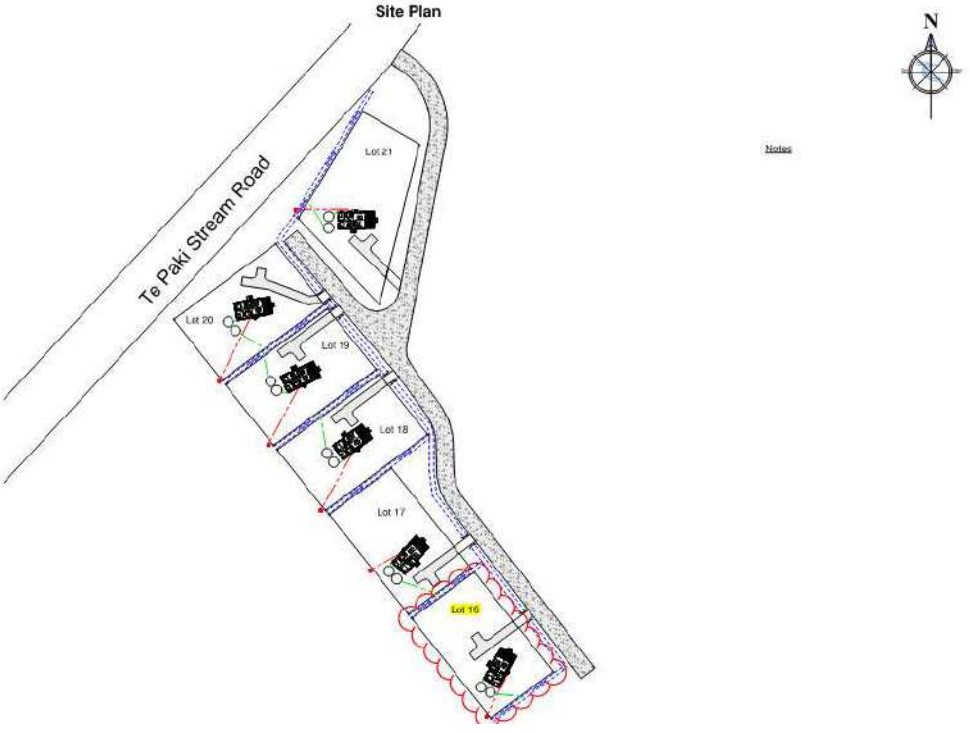


Figure 1-3: Site Plan

1.2.1 Gravity System

The gravity system is typically timber roof trusses supported by load bearing walls supported by conventional timber subfloor joists, bearers and bored timber piles.

1.2.2 Lateral Stability

Lateral stability is provided typically by roof, wall and subfloor bracing. The subfloor bracing is provided by specifically designed cantilever piles based on NZS3604 methodology for bracing demands.

1.2.3 Seismic Design

Seismic bracing demand is obtained based on NZS3604

1.2.4 Foundation

Foundations are timber piles encased in concrete. The foundations are typically embedded to a level that achieves good ground to NZS3604 or as required to achieve a suitable bracing capacity.

1.2.5 Geotechnical Investigation

- Geotechnical report reference - FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

Existing Soil Parameters	*Description*
y = 18kN/m^3	Soil density (Assumed)
s_u = 40-60kPa	Based on B1/VM4 Varies each lot - Refer to Foundation Calculations
Soil Class D or E	(Assumed/No information available)
Expansive Soil Class S	To AS:2870
Allowable end bearing = 204-300kPa	Capacity and depth varies at each Lot
Reduction factor = 0.5	Gravity case reduction factor
Reduction factor = 0.8	Seismic case reduction factor
Ground water – N/A	Ground water level not encountered

Further key points

- Liquefaction risk (Low)

2 Safety in Design

Safety in Design is required under the Health and Safety at Work Act 2015 (HSWA) and integrates risk management into the design process to identify, assess and treat Health and Safety risks to people over the life of an asset.

The HSWA requires designers to ensure, so far as is reasonably practicable, that any structure they design is without risks to the health and safety of persons who:

- Use the structure at a workplace (end users/customers);
- Construct the structure at a workplace;
- Carry out the manufacture, assembly, use, maintenance, proper demolition and disposal of the structure at a workplace; or
- Are in the vicinity of a workplace and are exposed to the structure, or whose health and safety may be affected by an activity related to the structure.

Structus has considered Safety in Design throughout the design process. Some risks have been designed out throughout the design process and therefore have been eliminated, however, other residual risks do exist. The residual risks are as follows:

- Open excavations/pile holes during construction.

The Safe Design report has identified hazards relating to the design of the structural works shown on the documents that would not normally be expected in other designs of the same type of structure.

The method of construction and maintaining safety during construction are the responsibility of the builder. If any of the structure in our designs is considered to present an unreasonable risk in respect to construction safety, the matter shall be referred to Structus for resolution before proceeding with the work.

This report is prepared solely for the purposes of the person conducting the business or undertaking who commissioned the design and is not prepared for the benefit of any other party or for any other purpose.

3 Loading and Material Properties

3.1 Importance Level

*The Importance Level is determined using Table 3.2 of AS/NZS 1170.0 and will be used to determine the required return periods of wind and seismic loading.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2

Figure 3-1: Importance Levels for Building Types

The residence is a (normal structure) and is classified as an Importance Level 2 building for design.

Design life of the building is 50 years therefore. From Table 3.3 of AS/NZS1170.0, the required Annual Probabilities of Exceedance are as follows:

Load	Importance Level	Annual probability of exceedance
Wu – Wind Loading Ultimate	2	1/500
Eu – Earthquake Loading Ultimate		1/500
Eu – Earthquake Loading Ultimate (Parts & Components)		1/500
All SLS loads		1/25

TABLE 3.3

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1	1/25	1/25	1/25	—	
	2	1/100	1/50	1/100	1/25	
	3	1/250	1/100	1/250	1/25	
	4	1/1000	1/250	1/1000	1/25	
5 years	1	1/25	1/25	1/25	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
25 years	1	1/50	1/25	1/50	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
50 years	1	1/100	1/50	1/100	—	—
	2	1/500	1/150	1/500	1/25	—
	3	1/1000	1/250	1/1000	1/25	—
	4	1/2500	1/500	1/2500	1/25	1/500

Figure 3-2: Annual Probability of Exceedance

3.2 Loadings

3.2.1 Self-Weight of Elements (SW):

- Concrete piles = 24kN/m3
- Perimeter cladding = 0.2kPa

Elements with self-weight (G)	*Description*
G_{roof} = 0.33 kPa	Roof build-up Metalcraft T-Rib roofing (assuming 0.55mm) 0.065kPa, Timber Trusses @900crs 0.07kPa, 0.04kPa Purlins, 0.05kPa Insulation blanket, 0.11kPa 18mm Triboard Ceiling.
G_{floor}= 0.30 kPa	Floor Build-up (0.14kPa 240x45 joists @ 400 crs + 0.1kPa 20mm particle boardT&G + 0.05kPa Insulation, misc 0.01kPa.
G_{int_wall} = 0.22kPa	36mm Triboard Wall panel.
G_{ext_wall} = 0.44 kPa	0.13kPa 7.5mm Hardi plank Weatherboards, 0.04kPa 90x45 framing, 0.05kPa insulation, 0.22kPa 36mm Triboard Wall panel

3.2.2 Superimposed Dead Loads (SDL)

SDL (G)	*Description*
G_{SDL}= 0.35 kPa	Nominal (Residential floor incl. floor coverings).

3.2.3 Imposed Loads (Q)

The following imposed / live loads are as per T3.1 of AS/NZS1170.1

Live Load (Q)	*Description*
Q_{RF} = 0.25 kPa	Roof life load
Q_{Floor} = 1.5kPa or 1.8kN	Residential Floor
Q_{Deck} = 2.0kPa	Residential balcony

3.2.4 Wind Loading

Wind Loading to be worked out using NZS3604 as per GIB spreadsheet – See Later Sections.

3.2.5 Seismic Loading

Seismic Load to be determined using NZS3604 and modified as required for the anchor pile design.

3.2.6 Load Combinations

The ultimate limit state combinations are considered as per AS/NZS 1170.0 section 4.2.

ULS Load Combinations	*Commentary*
[1.35G]	Permanent action
[1.2G, 1.5Q]	Permanent and imposed
[1.2G, W_u, ψ_cQ]	Downward wind ULS case
[0.9G, W_u]	Upward wind ULS case
[G, ψ_EQ, E_u]	Earthquake case

3.3 Material Properties

3.3.1 Concrete Strengths

- Foundations: 30 MPa

3.3.2 Reinforcing Steel

- Reinforcing Steel (High Yield) 500 MPa Micro Alloy Grade E
- Reinforcing Steel (Mild Steel) 300 MPa Micro Alloy Grade E

3.3.3 Structural Steel

3.3.3.1 Steel Grade

- Rolled Steel Sections: 300 MPa – Grade 300 to AS/NZS 3679
- Steel Plate General 250 MPa – Grade 250 to AS1594
- Steel Plate (special) 300 MPa – Grade 300 AS/NZS 3678
- StelTech Beams 300MPa – Grade 300 AS/NZS 3679
- CHS Hollow Sections 350MPa – Grade C350 AS 1163
- RHS Hollow Sections: AS 1163 - Grade C350 AS 1163
- Bolt Grades: Grade 4.6 mild steel and grade 8.8 high strength
- Tensioning requirements for 8.8 bolts S, TB, TF as required

3.3.3.2 Steel Corrosion Category

Durability Zone D (Far North) to NZS3604

3.3.4 Structural Timber

All timber shall be Pinus Radiata SG8 or SG6 grade and meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber.

4 Structural Load Path

Below is the typical structure for a single storey dwelling supported by trusses, load bearing walls, floor joists and shallow gravity piles with anchor piles for bracing.

Figure 4-1: Typical Roof Plan

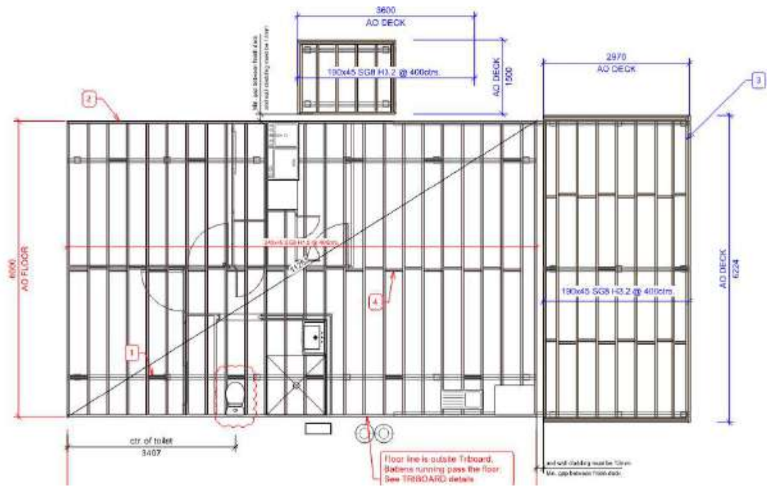


Figure 4-2: Typical Floor Plan

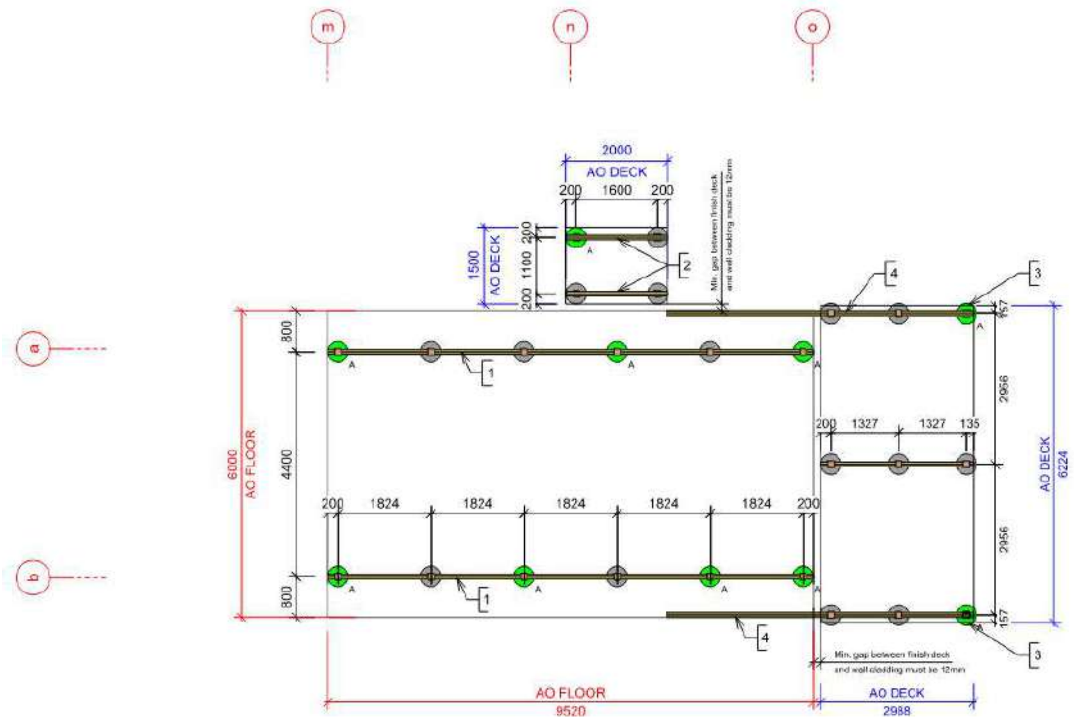
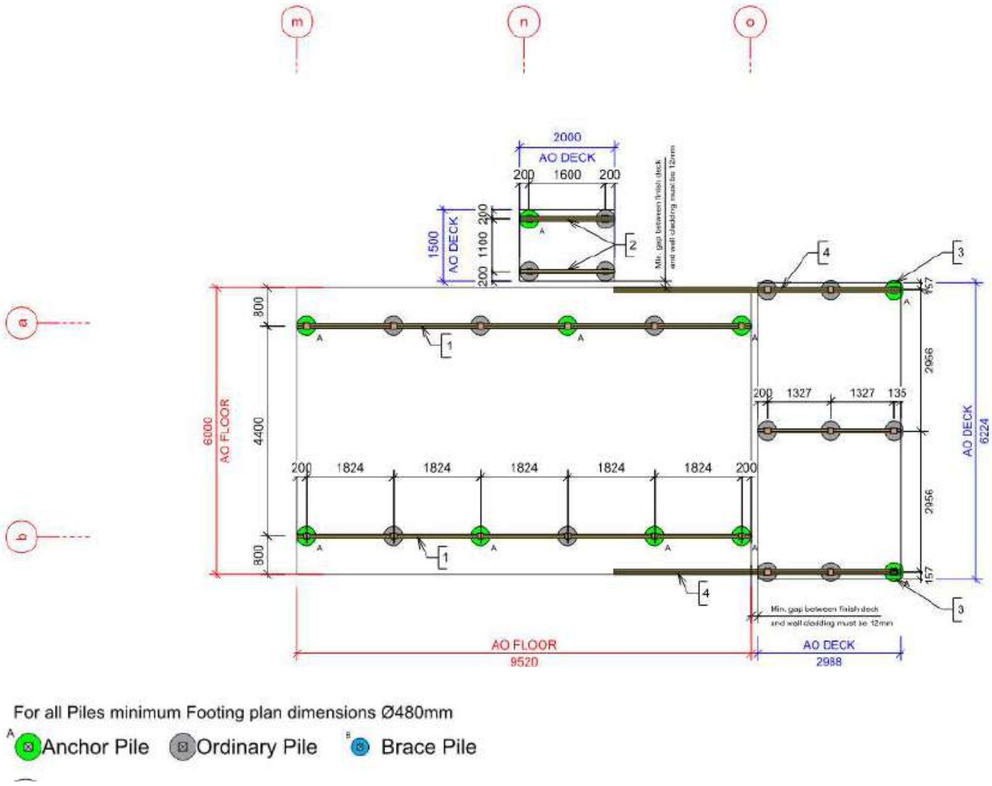


Figure 4-3: **Typical Lateral System Plan**

5 Subfloor Bracing Design

5.1 Bracing Design

Verification of the bracing plan below based on NZS3604 design loads.



Building Specification

Number of Storeys	Single
Floor Loading	2 kPa
Foundation Type	Subfloor
Sub Floor Cladding	Light

Single

Cladding Weight ?	Light
Roof Weight ?	Light
Room in Roof Space	No
Roof Pitch (degrees) ?	25
Roof Height above Eaves (m)	1.4
Building Height to Apex (m)	4.05
Ground to Lower Floor (m)	0.71
Stud Height (m)	2.4
Building Length (m)	10
Building Width (m)	6

Building Location

Wind Zone = High

Wind Zone or Consent Authority	Not Available
Wind Region ?	A
Lee Zone	No
Ground Roughness ?	Open
Site Exposure ?	Exposed
Topography ?	T1

? Earthquake Zone	1
Soil Type	D & E (Deep to Very Soft)
Annual Prob. of Exceedance	1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	224	304
Subfloor Level	401	600

Bracing Units required for Earthquake

	Along and Across
Single	395
Subfloor Level	547

SubFloor Along

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)
A		1	3		Anchor Pile	NZS3604	480	360
B		1	3		Anchor Pile	NZS3604	480	360

Wind	Earthquake
Demand	
401	**547**
Resistance	
960 239%	**720 132%**
480 OK	360 OK
480 OK	360 OK

SubFloor Across

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)
M		1	2		Anchor Pile	NZS3604	320	240
N		2	2		Anchor Pile	NZS3604	320	240
O		3	2		Anchor Pile	NZS3604	320	240

Wind	Earthquake
Demand	
600	**547**
Resistance	
960 160%	**720 132%**
320 OK	240 OK
320 OK	240 OK
320 OK	240 OK

Hence across direction is critical

Note re-check line O for additional demand from the deck.

7.4.2.2

Decks which project more than 2 m from the building shall have *subfloor bracing* provided by anchor and/or *braced piles*, at half the *bracing demand* required by table 5.8 for "light/light/light" *cladding*, for 0° *roof* slope and for "subfloor structures".

Anchor piles rating per pile	120 BUs for earthquake 160 BUs for wind

Table 5.8 – Bracing demand for various combinations of cladding on single-storey buildings on subfloor framing (2 kPa floor load, soil type D/E, earthquake zone 3) (see 5.3.1)

Roof cladding	Single-storey cladding	Subfloor cladding	Roof pitch degrees	Subfloor structure	Single-storey walls
				BU/m²	
Light roof	Light	Light and Medium	0-25 25-45 45-60	15 16 17	11 11 13
		Heavy	0-25 25-45 45-60	17 18 19	11 12 13
		Medium	0-25 25-45 45-60	18 18 19	12 13 14

Multiplication factors		EQ zone			
Soil class		1	2	3	4
A & B	Rock	0.3	0.5	0.6	0.9
C	Shallow	0.4	0.6	0.7	1.1
D & E	Deep to Very soft	0.5	0.8	1.0	1.5
NOTE – See 5.3.4 for additional bracing demand.					

Area of deck = 6.2x3=18.6m^2

Demand = ½ (0.5 x 16 x 18.6) = 74 BU (Total)

Demand/line = 74/2 = 37 BUs

From the bracing spreadsheet in the critical across direction

Capacity of Line O = 240 Bus

Demand based on tributary width = 547/3 lines = 182 BUS

Reserve capacity = 240-182 = 58 BUS > 37 BUs Hence OK

No additional piles required for the deck along the house line

For other lines

Nominal 1 AP at corner locations providing 120BUs > 37 BUs OK

Refer to the Anchor Pile specific design for pile design.

6 Foundation Design

6.1 Ground Conditions Summary

The following has been summarised from the geotechnical report.

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Notes –

Bearing capacity based on geotechnical engineer/soil report

Undrained shear strength derived from on B1/VM4 bearing capacity equations Qult =Nc x Su (based on ultimate bearing capacity)

6.2 Gravity Piles

6.2.1 Loading

Typical Pile (Central) — Pile Spacing (s) 1.82 m

		Dist Load		line Load		Pile Point Load w x s		
Element	Trib Width	G	Q	G	Q	G	Q	
Roof	3	0.35		1.05		1.911		
Ext. Wall	2.4	0.44		1.056		1.92192		
Floor	3	0.3	1.5	0.9	4.5	1.638	8.19	
Floor SDL	3	0.35		1.05		1.911		
					Totals	7.4	8.19	kN
		Factored Loads		ULS	1.2G+1.5Q	**21.1**	kN	
					1.35G	**10.0**	kN	
				SLS	G+0.7Q	**13**	kN	

6.2.2 Gravity Pile Design Lots 16-21

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**16**		
Ultimate Pile Capacity Q_ult	**204**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.7**	m	
Pile Area	0.38	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	12.0		
ULS Pile Load = P + 1.2xW_pile	35.6	kN	
SLS Pile Load = P_s+W_pile	25.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**39.3**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**25.9**		**OK**
Adopt	**700 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**17**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	6.1		
ULS Pile Load = P + 1.2xW_pile	28.5	kN	
SLS Pile Load = P_s+W_pile	19.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 1.3m deep**		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	18		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.6	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.8		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	10.3		
ULS Pile Load = P + 1.2xW_pile	33.5	kN	
SLS Pile Load = P_s+W_pile	23.4	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550dia piles 1.8m deep		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	19		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.5	m	
Pile Area	0.20	m^2	
Depth to a (La)	0.65	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	0.85		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	4.0		
ULS Pile Load = P + 1.2xW_pile	25.9	kN	
SLS Pile Load = P_s+W_pile	17.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	29.5		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	19.4		OK
Adopt	500 dia piles 0.85m deep		

Pile Design			
Base on shallow foundations and end bearing only			
Lot Number	20&21		
Ultimate Pile Capacity Q_ult	300		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	0.55	m	
Pile Area	0.24	m^2	
Depth to a (La)	1.4	m	
Nominal Additonal depth (Lb)	0.2		
Total Pile Length (La+Lb)	1.6		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	9.1		
ULS Pile Load = P + 1.2xW_pile	32.1	kN	
SLS Pile Load = P_s+W_pile	22.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	35.6		OK
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	23.5		OK
Adopt	550 dia piles 1.6m deep		

Gravity Piles Summary

Pile Gravity Design Summary

Lot	Pile Diameter mm	Pile Depth m
16	700	1.3
17	500	1.3
18	550	1.8
19	500	0.85
20	550	1.6
21	550	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles

For Simplicity of Design – Consider typical piles to be Ø550 for Lot 17-21 & Ø700 for Lot 16 with depth as per the table

6.3 Cantilever Anchor Pile

From the Engineering Basis of NZS 3604 the following tables are provided

3.4.2 Design for safety (ultimate limit state - ULS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	Deflection (mm)
Anchor pile	120	6.0	30	160	8.0	30
Braced pile	120	6.0	50	160	8.0	50
Cantilever pile	30	1.5	25	70	3.5	45

3.4.3 Design for serviceability (serviceability limit state - SLS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	rating Deflection (mm)
Anchor pile	20	1.0	3	120	6.0	10
Braced pile	20	1.0	3	120	6.0	13
Cantilever pile	5	0.4	1	45	2.25	4

1) Consider capacity design actions on the piles

Components – timber pile; bolted connection, soil.

Assuming the ductile demand = 120BU = 6kN (Typical anchor pile capacity)

Consider the pile design to be nominally ductile

From NZS3604 design basis – the design ductility is 3.5; Sp = 0.7; k_mew = 2.4

For Nominally ductile loads T=0.4, mew = 1.25, Sp=0.925, k_mew= 1.14

Elastic load factor = k_mew(3.5) /Sp = 2.4/0.7 = 3.43

Reduce by nominally ductile factor = 3.43 x (0.925/1.14) = 2.78

6kN x 2.78 = 16.6kN

Notes – EZI brace design is about 132% over strength for EQ

Hence reduce by demands 32% (for capacity just meeting demand)

Revised demand = 16.6/1.32 = 12.5 kN (Minimum demand on each pile)

Height above ground = height to FFL – Joist Depth – floor boards = 710-240-20 = 450mm

Wind is not critical due to the scaling factor applied to the loads.

Design philosophy of piles.

- If good ground is very deep (>1.5df)– consider the using lower bound soil capacity (Q_ult = 204kPa→ Su=40kPa) with eo=1.5df (All cases except Lot 19)
- If good ground found is relatively shallow <1.5df (~ 0.6-0.8m) use the higher values for good ground. (Lot 19)
- Consider the max bending moment to be at the location in the ground as per the Broms formula ignoring strength of concrete.
- Use the same pile diameter as the gravity piles for simplicity.

6.3.1 Anchor Pile Design 16-21

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Capacity of 200x200 SG6 Square pole Wet Condition

Fb(SG6) = 7.5 MPa

Notes – Phi = 1.0 for capacity designed elements.

Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x200x200^2/6 = 10.0 kNm

For 250x250 SG6

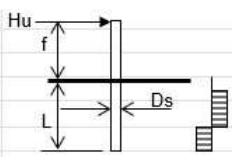
Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x250x250^2/6 = 19.5 kNm (Governs most designs)

Notes – Phi factor = 0.8 for seismic overstrength loads applied to the shear strength of soils

<u>Lot 16</u>

Use Ø700 Pile as per the gravity piles for this lot.

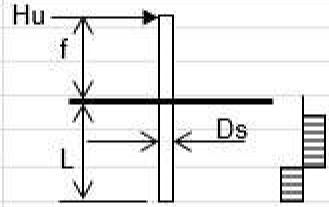
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.9718	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.12426	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.0136	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	12.732	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11315	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 12.7 kN > 12.5 kN accept

Recheck for the max allowable height (600mm is typically OK for all other sites – hence try 600mm)

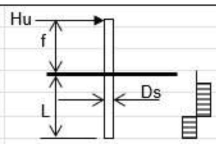


NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	13.882	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11886	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.3832	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	11.6154	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.10762	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

11.6kN < 12.5kN (92% capacity – within 10% Acceptable) but limit to 450mm.

<u>Adopt 250x250 SG6 Pile in 1.8m deep xØ700 pile for Lot 16(max height 450mm to GL-CL of fixing)</u>

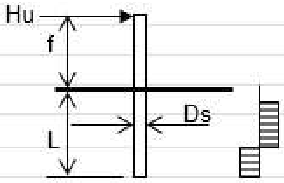
<u>Lot 17,18,20,21</u>



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	14.7551	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91815	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 14 kN > 12.5 kN accept

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	12.976	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90692	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	19.0223	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	13.2928	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90892	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

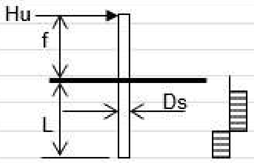
13.0kN>12.5kN (OK)

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 17,18,20,21(max height 600mm to GL-CL of fixing)</u>

<u>Notes – adopt 1.8m for Lot 18 as gravity piles are deeper.</u>

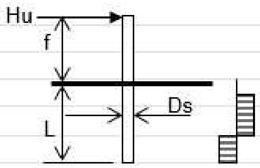
<u>Lot 19</u>

300kPa strength found @ 0.65m on this lot



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	15.9122	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89488	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	20.8441	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	14.9112	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89049	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.5832	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88905	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	21.2481	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	13.4072	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88388	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.4kN > 12.5kN (OK)

<u>Hence 1.5m depth required. hence keep to 1.6m as per typical lots for simplicity (max height 600mm to GL-CL of fixing)</u>

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 19</u>

6.3.1.1 Deck Piles

Check typical deck anchor piles if design can be reduced

Demand from NZS3604 from before per pile = 37 BUs

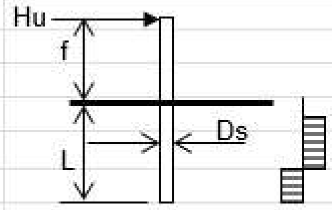
Scaled up demands = 37/20BU x 2.78 = 5.14 kN

Based on other lots – check the design using the lower bound values.

Bending Capacity of 125x125 post = 0.8 x 10 x 125x125^2/6 = 2.6kNm

Bending Capacity of 150x150 post = 0.8 x 10 x 150x150^2/6 = 4.5kNm

Pile depths are typically minimum 1.6m for anchor piles



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	3.4	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	2.64929	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.84173	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

<u>2.6kN < 5.1 kN demand (N.G – hence requires greater pile 200SQ min size – since there are only two deck piles – keep the same size throughout – i.e. 250 SQ.</u>

Note – since the house demands are overall just meeting <u>– adopt one additional pile along line of house</u>

(deck demand = 74BU/20 x 2.78 = 10.3kN < 12.5kN for one pile OK.

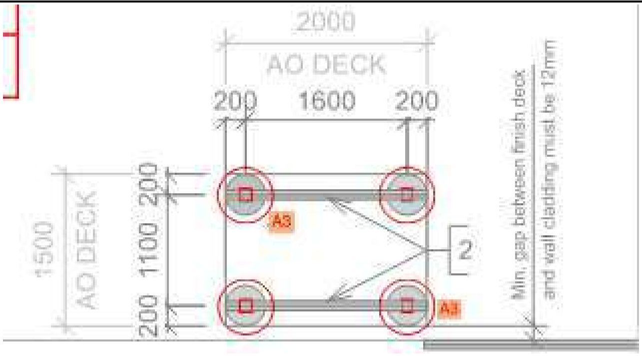
<u>Check min required for uplift of deck post.</u>

Volume of concrete = 0.4m^3 (To Arch.)

Lreq = 0.4 / (pi x 0.55^2/4 – 0.25^2) = 2.3m > 1.6m (hence increase depth to 2.3 meters for deck piles with Ø550 dia piles and post above.

Lreq(700dia) = 0.4 / (pi x 0.7^2/4 – 0.25^2) = 1.24m < 1.8m (hence 1.8 m OK for 700 dia piles)

6.3.1.2 Small Deck Piles



A_Deck = 1.5x2 = 3m^2

A_pile = 0.75m^2

For gravity – simply adopt the typical pile depths and diameter for simplicity.

Bracing demand – typically standard anchor piles to NZS3604 will be OK by inspection of 900mm depth or greater if required by the typical gravity piles.

6.3.1.3 Pile Design Summary Overall

Pile Design Summary Final Lot 16-21

Lot	Pile Diameter mm	Pile Depth m	Anchor Pile
16	700	1.3	1.8
17	550	1.3	1.6
18	550	1.8	1.8
19	550	0.9	1.6
20	550	1.6	1.6
21	550	1.6	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles & 250SQ H5 for Anchor Piles
Min strength SG6

<u>Deck piles sized for uplift min 2.3m deep for 550 piles and 1.8m for 700piles</u>

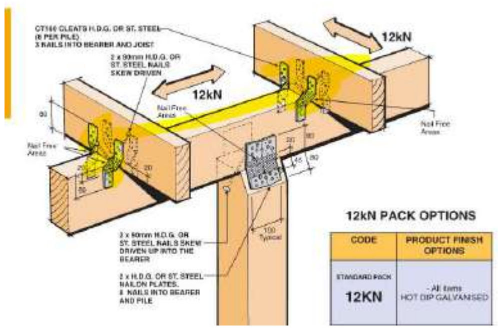
6.3.2 Connection Design

The overstrength seismic demand is 12.5 kN

This is comparable to 12kN NZS3604 connection (96%) Capacity

Hence typical connections may be substituted.

For joists to bearer connection use standard CT160 connections or similar.



However, for completeness provide the bolted connection design to the pile due to the larger size.

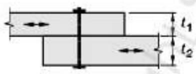
Since the loads are nominally ductile – consider the simplified method for design of bolted connections to AS/NZS1720.

<u>Case 1</u>

Load direction parallel to grain

TABLE 4.9(A)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SYSTEM CAPACITY

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skl})
(1) Two member 	b_{eff} equals smaller of t_1 and t_2	Q_{kl}

Member = 2/190x45 SG8

Be = 90mm

Try 2/M16 Bolts

TABLE 4.9(C)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kl}), N Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
JD5	25	2 100	2 800	3 500	4 200	5 600	7 000	8 400	10 500	12 60
	35	2 200	3 900	4 900	5 900	7 800	9 800	11 800	14 700	17 60
	40	2 200	3 900	5 600	6 700	9 000	11 200	13 400	16 800	20 20
	45	2 200	3 900	6 200	7 600	10 100	12 600	15 100	18 900	22 70
	70	2 200	3 900	6 200	8 900	15 700	19 600	23 500	29 400	35 30
	90	2 200	3 900	6 200	8 900	15 800	24 600	30 200	37 800	45 40
	105	2 200	3 900	6 200	8 900	15 800	24 600	35 300	44 100	52 90
	120	2 200	3 900	6 200	8 900	15 800	24 600	35 500	50 400	60 50

Qskl=Qkl=15.8kN /bolt

$$N_{d,j} = \phi\, k_1\, k_{16}\, k_{17}\, n\, Q_{sk} \qquad \ldots 4.4(3)$$

and

N^* = design action effect in shear

ϕ = capacity factor (see Clause 2.3)

k_1 = factor for duration of load for fasteners (see Clause 2.4.1.1)

k_{16} = 1.2 for bolts that transfer load through metal side plates (see Figure 4.7) of adequate strength, and the bolts are a close fit to the holes in these plates provided that $b_{eff}/D > 5$ for loads acting parallel to the grain and $b_{eff}/D > 10$ for loads acting perpendicular to the grain (where b_{eff} denotes the effective timber thickness and D is the bolt diameter)
= 1.0 otherwise

k_{17} = factor for multiple bolted joint given in Table 4.12

n = number of bolts resisting design action effect in shear

Q_{sk} = characteristic capacities as derived in Clause 4.4.2.4. See also Clauses 4.4.4 and 4.4.5

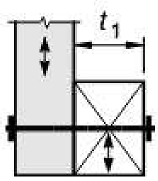
(e) For connections designed using the simplified method set out in ZZ4.1 to ZZ4.5: ϕ = 0.8.

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 15.8 = 25.3 kN > 12.5kN (OK)

<u>Case 2</u>

Check strength of pile connection.

Member = 250x160 (recessed) SG6, Unseasoned J5

Joint configuration	**Effective timber thickness (b_{eff})**	**System capacity (Q_{skp})**
(1) Two member 	b_{eff} equals $2t_1$	Q_{kp}

Be = 160x2=320mm

Qskp=Qkp

Try 2/M16 Bolts

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.7 = 9.12 kN < 12.5kN (N.G)

Try use 4/M16

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.72 = 18.3 kN > 12.5kN (OK)

Hence Adopt 4-M16 Bolts for the pile bearer connection.

Minimum edge distances

To the loaded side of timber = 5xD = 5 x 16 = 80mm

C-C spacing = 5D = 80mm

Timber width required = 80+80+80 = 260mm > 250mm (Close – Accept as the bolts are not fully loaded & greater than elastic capacity can be achieved).

Case 3

For anchor piles loaded perp to direction of the bearers – check washer capacity

3.2.6 Bearing capacity

3.2.6.1 *Design capacity in bearing perpendicular to the grain*

The design capacity in bearing perpendicular to the grain ($N_{d,p}$) of a structural element (see Figure 3.8), for strength limit state, shall satisfy the following:

$$N_{d,p} \geq N_p^* \qquad \text{. . . 3.2(15)}$$

where

$$N_{d,p} = \phi\, k_1\, k_4\, k_6\, k_7\, f'_p\, A_p \qquad \text{. . . 3.2(16)}$$

and

ϕ = capacity factor (see Clause 2.3)

N_p^* = design load effect in bearing (see Figure 3.8 and Clause 1.4.2.2)

k_1 to k_7 = modification factors given in Section 2

f'_p = characteristic value in bearing perpendicular to grain

A_p = bearing area for loading perpendicular to grain.

For SG6/No. 1 Framing fp = 5.3MPa

Using 4 No. 60mm Square washers

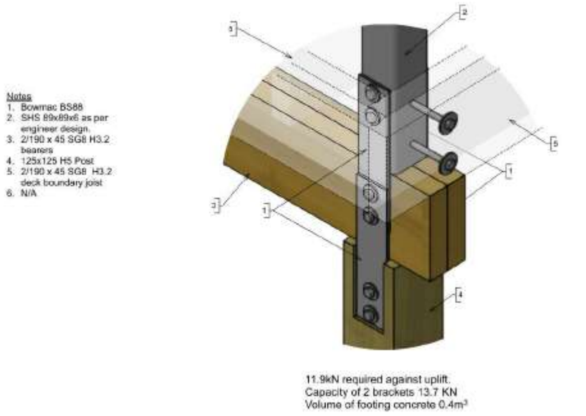
Phi_Nd,p = 0.8 x 1.0 x 1.0 x 1.0 x 1.0 x 5.3 x 4 x 60^2= 61 kN >>12.5 kN (OK)

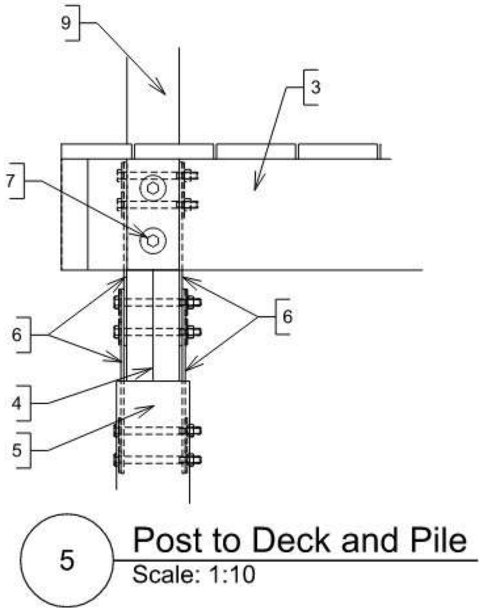
Using minimum 4mm Thk washer as per code (OK by inspection).

Adopt minimum 60mm x 4mm Square washers to M16 Bolts.

6.3.2.1 Connection at Deck Post

The architect has provided a connection detail for the external post. Check for compatibility with anchor pile design (note uplift requirements check by other engineer)





The connection in the square post is critical.

Slot cut the post to achieve double shear

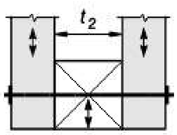
(2) Three member, Type A 	b_{eff} equals t_2	$2Q_{kp}$

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N — Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Be = 90mm

Qskp = 2 x 2.11kN = 4.22kN/12mm bolt

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 4.22 = 6.7 kN > 5.14kN (OK)

Hence OK to adopt the architect detail for the anchor piles of the deck. (i.e. 2/M12 bolts slot cut in timber pile)

Structus Consulting Limited
Victoria Park Market, Unit 69, 210 Victoria Street West, Auckland 1142
PO Box 911-111, Victoria Street West, Auckland 1142
T 09 869 2073 M 021 059 5683 E info@structus.co.nz

2 Te Paia Lane, Kaitaia
Phone (09) 408 0979
PO Box 62, Awanui 0451
GST No: 107-240-918

22nd November 2024
Att: Parson Architecture & PanelLock

To Whom it may Concern

Good Ground Report for Proposed New Dwelling at Lot 21 Te Paki Stream Road, Cape Reinga.

FNR Consulting have been engaged by Ngati Kuri to carry out geotechnical testing for a proposed new dwelling with an approximate floor area of 82m^2. A total of four scala penetrometer tests were conducted for Lot 21, while one hand auger was conducted at the centre of the neighboring building in Lot 20.

Testing was carried out in general accordance with the requirements of NZS 3604 and NZS 4402.

The test locations are shown in the attached plans and photographs, with the test results also attached to this document.

The NZLI Soils Map describes the soils in this area as: **Rangiuru Clay**.

Observations

The site soils appeared to be consistent with the NZLI Soils Map description, with clay observed in the hand auger testing across the subdivision. Based on the soil samples, the clay appeared to have a high plasticity and was moderately sensitive. In general, the clay was also loose to dense and had a firm to stiff consistency. The soil appeared to be either dry or moist, while the ground water level (GWL) was not reached over the 2.0m depth tested. Refer to the attached hand auger results for a full soil profile of the hand auger conducted in the centre of the neighboring building in Lot 20.

The site has not been levelled, and the tests were performed in the undisturbed natural ground (not fill material).

There are no visual signs of slope instability in the vicinity of the building site and the proposed position of the building relative to the adjacent slope is appropriate and does not pose a risk in terms of slope stability.

The site classification based on site reactivity in accordance with AS2870-2011 Table 2.1 is **Class S – Slightly reactive clay sites, which may experience only slight ground movement from moisture changes.**

Liquefaction Risk

A desk-top study of liquefaction risk for this site has been undertaken.

"The area of Northland is identified to be at low risk of seismic hazard. There are no active faults known in the Far North. Small earthquakes will give short duration shaking that may not have enough cycles to cause liquefaction. Microzoning studies are probably not required as the hazard is low (GNS 2004)" - Regional Liquefaction Vulnerability Assessment – Far North District, prepared by Vision Consulting for FNDC 20/01/2023.

According to the above referenced report, and associated mapping, the Liquefaction Vulnerability Category for this site is "unlikely". This indicates that "there is a probability of more than 85% that liquefaction-induced ground damage will be None to Minor for 500-year shaking".

Based on the above it is considered that the liquefaction vulnerability for this site is low and that the expected degree of liquefaction induced ground damage is none to minor.

Scala Results

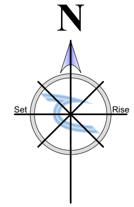
The penetrometer testing (attached below) indicated that the in-situ soils achieve "Good Ground" (as per the NZS 3604 definition) criteria between approximately 1.25m and 1.40m below the original ground surface.

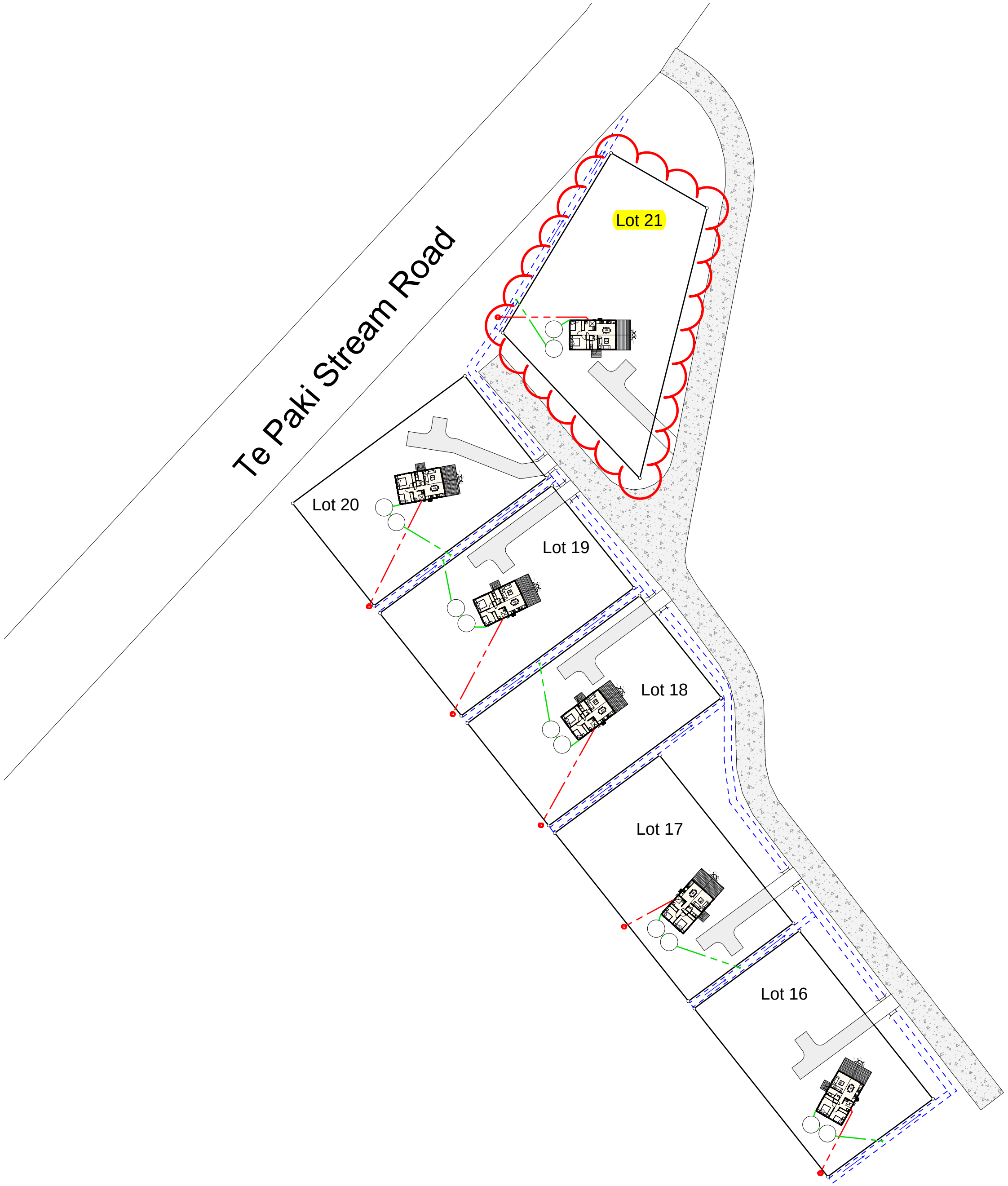
Yours Sincerely

Manu Burkhardt Macrae
BE, CMEngNZ, 253797
Attachments:

- *Site Plan and Test Locations; Photos; Scala Test Reports, Hand Auger Test Results, FNDC Liquefaction Risk Map.*

Site Plan





Notes

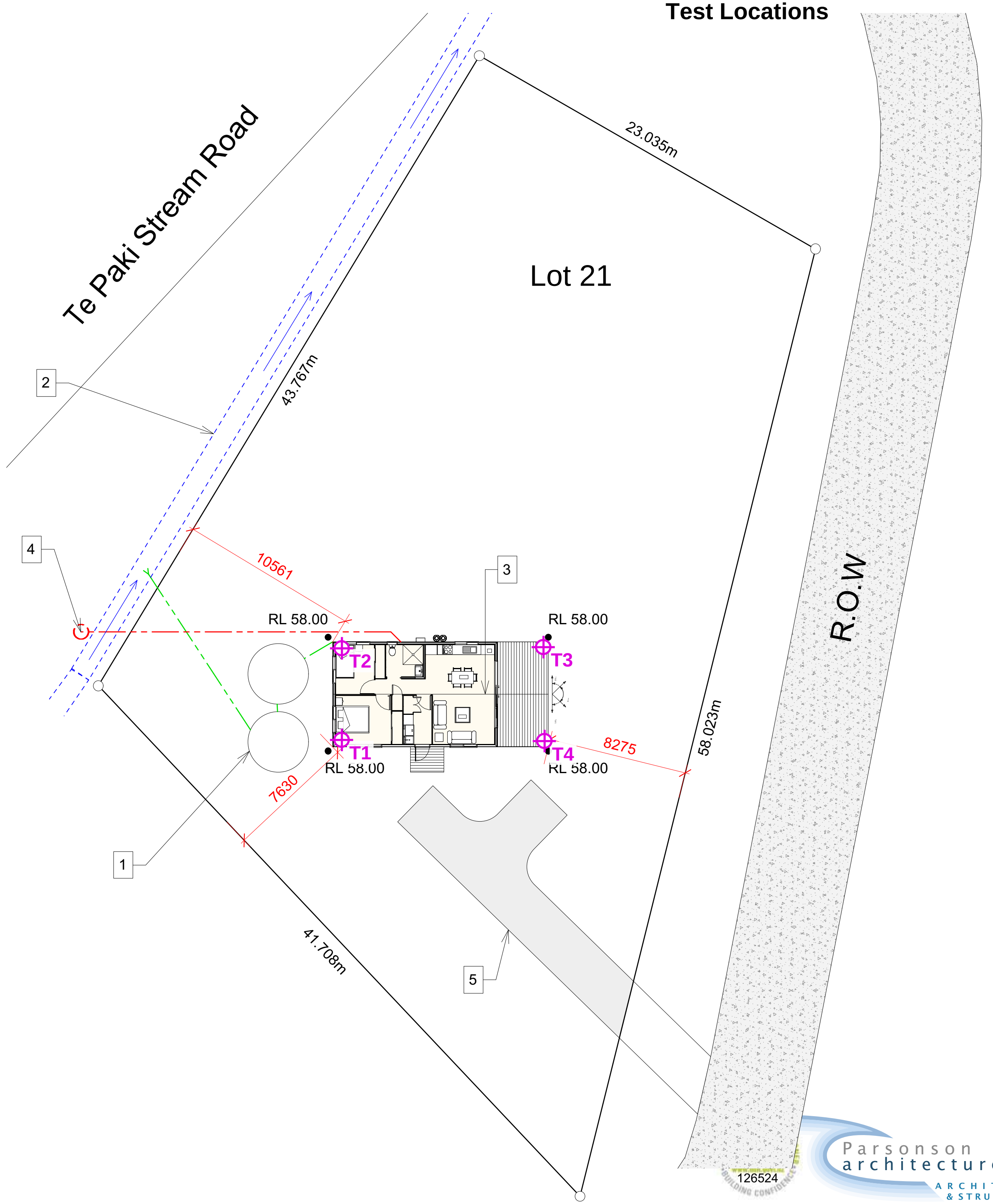
126524

Parsonson
architecture
ARCHITECTURAL
& STRUCTURAL DESIGN

540 Kimberley Road, Ngataki
R.D.4 Kaitaia, Northland
Joey Parsonson 021 204 6974
joeyparsonson@slingshot.co.nz

ISSUE	DATE	REVISION		
PROJECT	Proposed New Papakainga Development			PROJECT # NK-1024
CLIENT	Ngati Kuri	DATE #		DWG # A01
		SCALE @ A3	1:1000	
DWG	Te Paki Dunes Locality Plan	DRAWN	JP	
		CHKD		REVISION
STATUS	CONSENT ISSUE 31-10-2024			

Test Locations



N

Notes
1. All roof catchment water to 2 x 22500L water tanks. Overflow to be directed to open swale drain
2. Open swale drain
3. Proposed New Dwelling FFL 58.710
4. All household waste to sewer connection point
5. Proposed Driveway

Impermeable Surfaces Calculation		
Site Area	=	1522m2
Proposed Dwelling Area	=	82m2
Driveway Area	=	66m2
Impermeable Surfaces	=	148m2
Total Site Coverage	=	10%

126524

Parsonson architecture
ARCHITECTURAL & STRUCTURAL DESIGN

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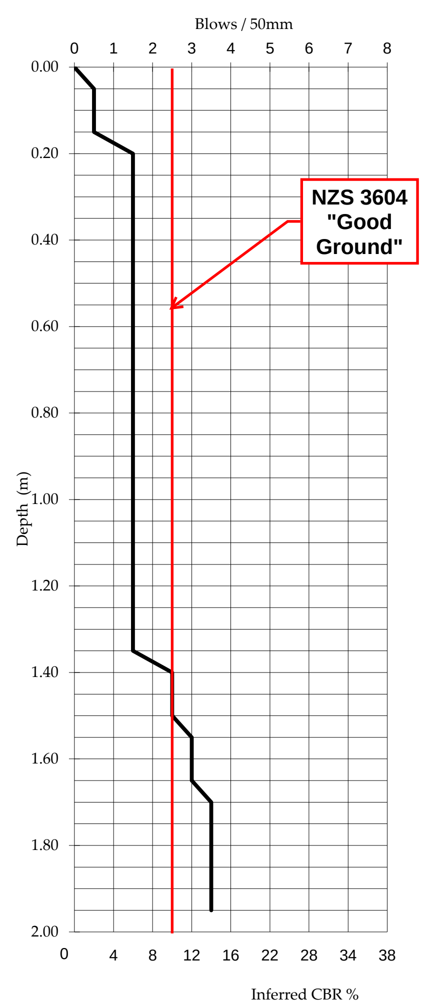
ISSUE	DATE	REVISION	
PROJECT	Proposed New Papakainga Development	PROJECT #	NK-1024
CLIENT	Ngati Kuri	DWG #	A02
DWG	Te Paki Dunes Site 1 Plan	SCALE @ A3 1:250; DRAWN JP	
STATUS	CONSENT ISSUE 31-10-2024		

Scala Test Locations

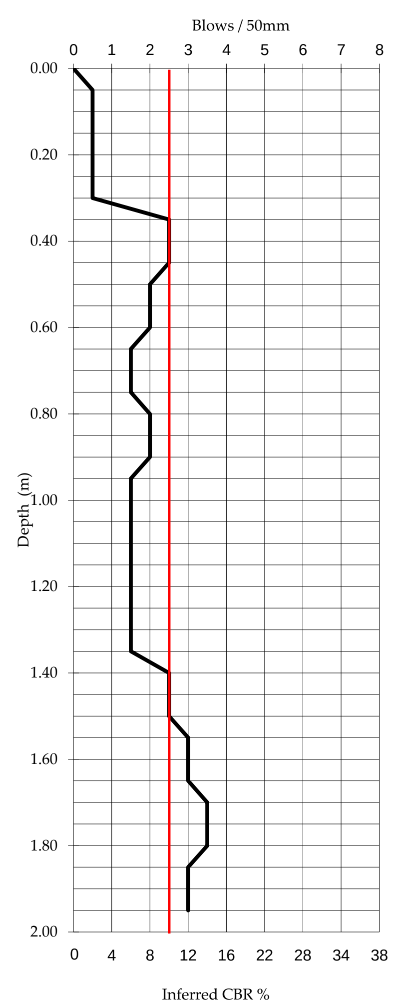
SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 21 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	1	Test number :	2	Test number :	3
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	Ex. GL	Reduced level :	Ex. GL

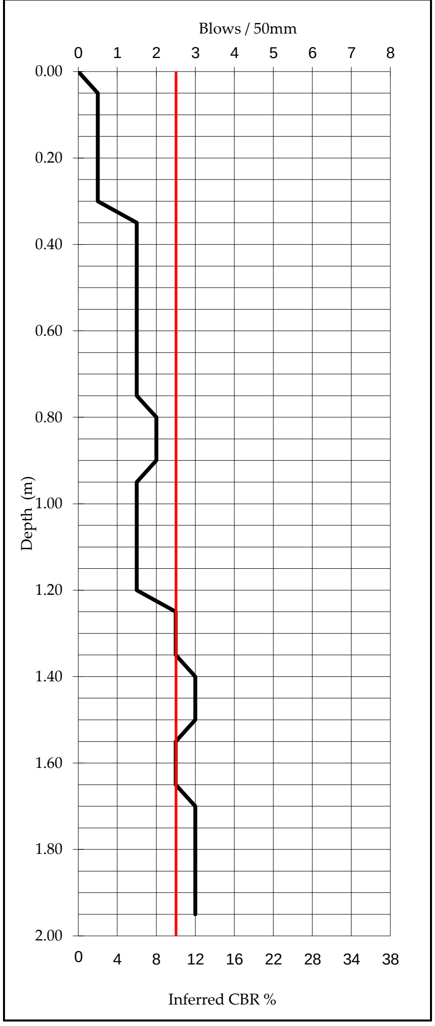
Scala Penetrometer



Scala Penetrometer



Scala Penetrometer



Test Methods

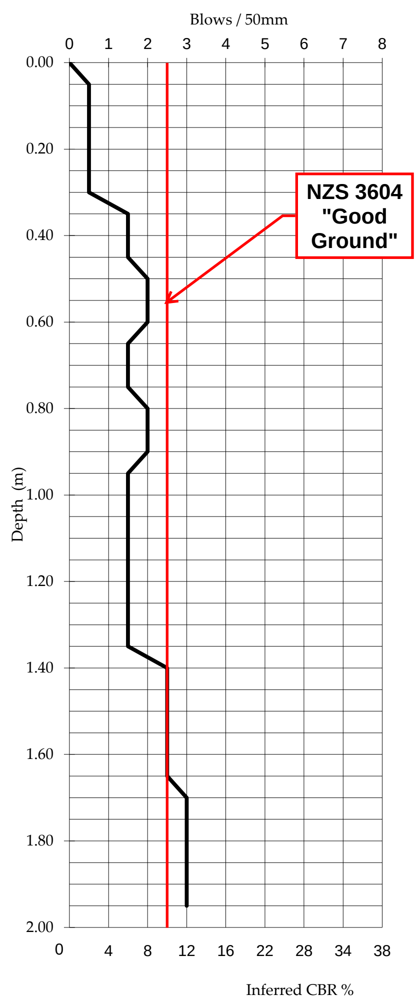
Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	20/11/24	Tested by:	HS
Date reported :	21/11/24	Reported by:	AVDL

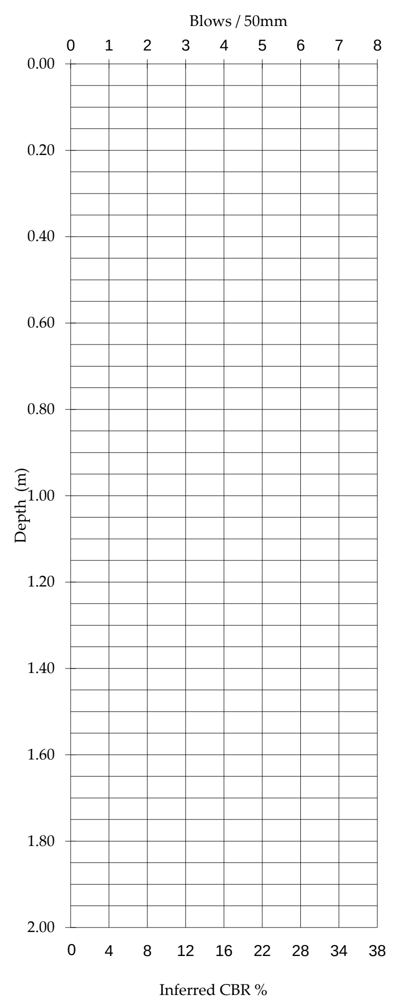
SCALA PENETROMETER
TEST REPORT

Project :	Proposed new dwelling				
Location :	Lot 21 Te Paki Stream Rd, Cape Reinga				
Client :	Ngati Kuri				
Contractor :	N/A				
Test number :	4	Test number :	N/A	Test number :	N/A
Water level :	N/A	Water level :	N/A	Water level :	N/A
Reduced level :	Ex. GL	Reduced level :	N/A	Reduced level :	N/A

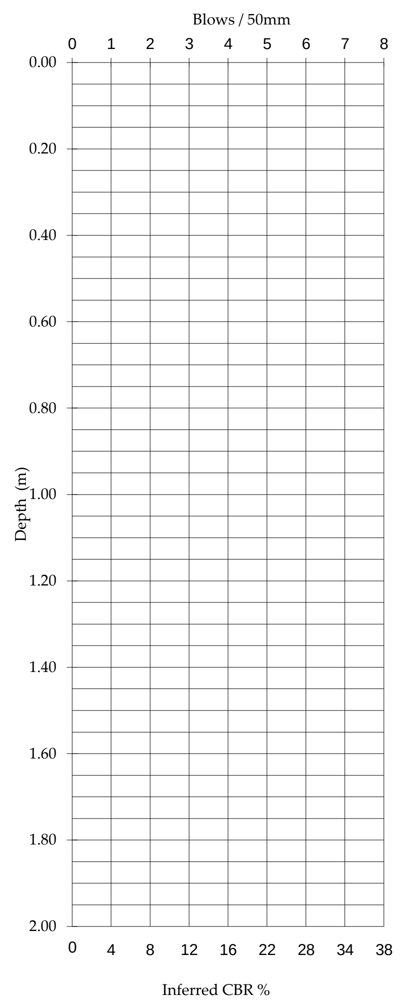
Scala Penetrometer



Scala Penetrometer



Scala Penetrometer

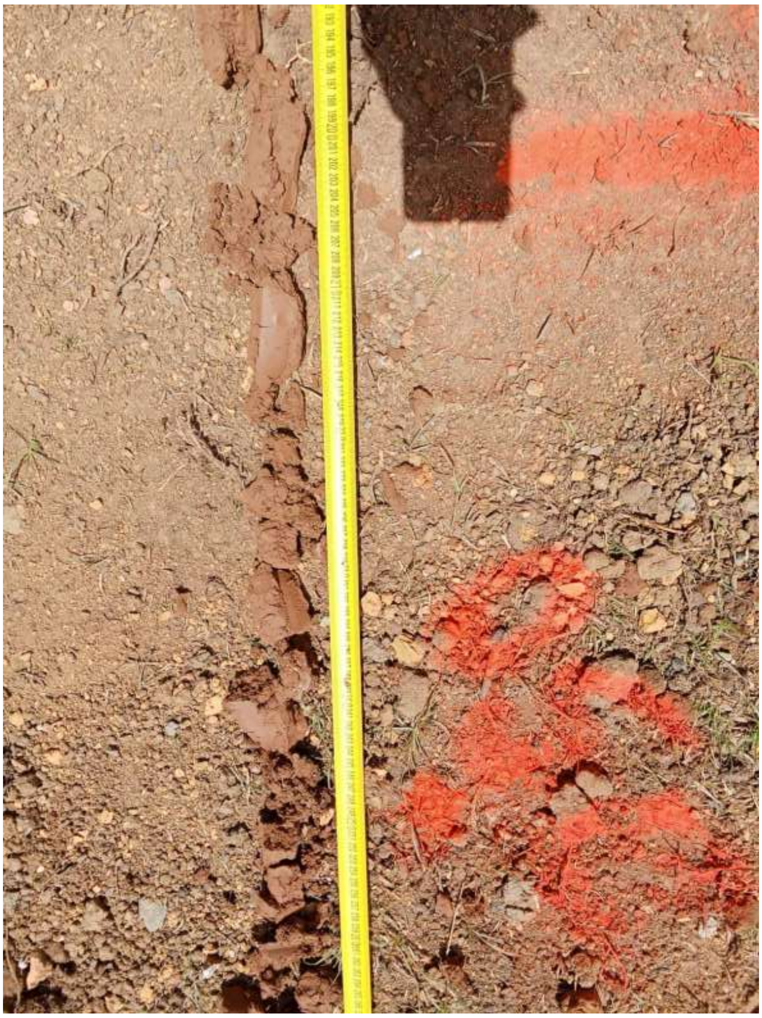


Test Methods

Determination of Penetration Resistance of a Soil, NZS 4402 : 1988, Test 6.5.2
Inferred CBR values taken from Austroads Pavement Design Manual 2004

Date tested :	20/11/24	Tested by:	HS
Date reported :	21/11/24	Reported by:	AVDL

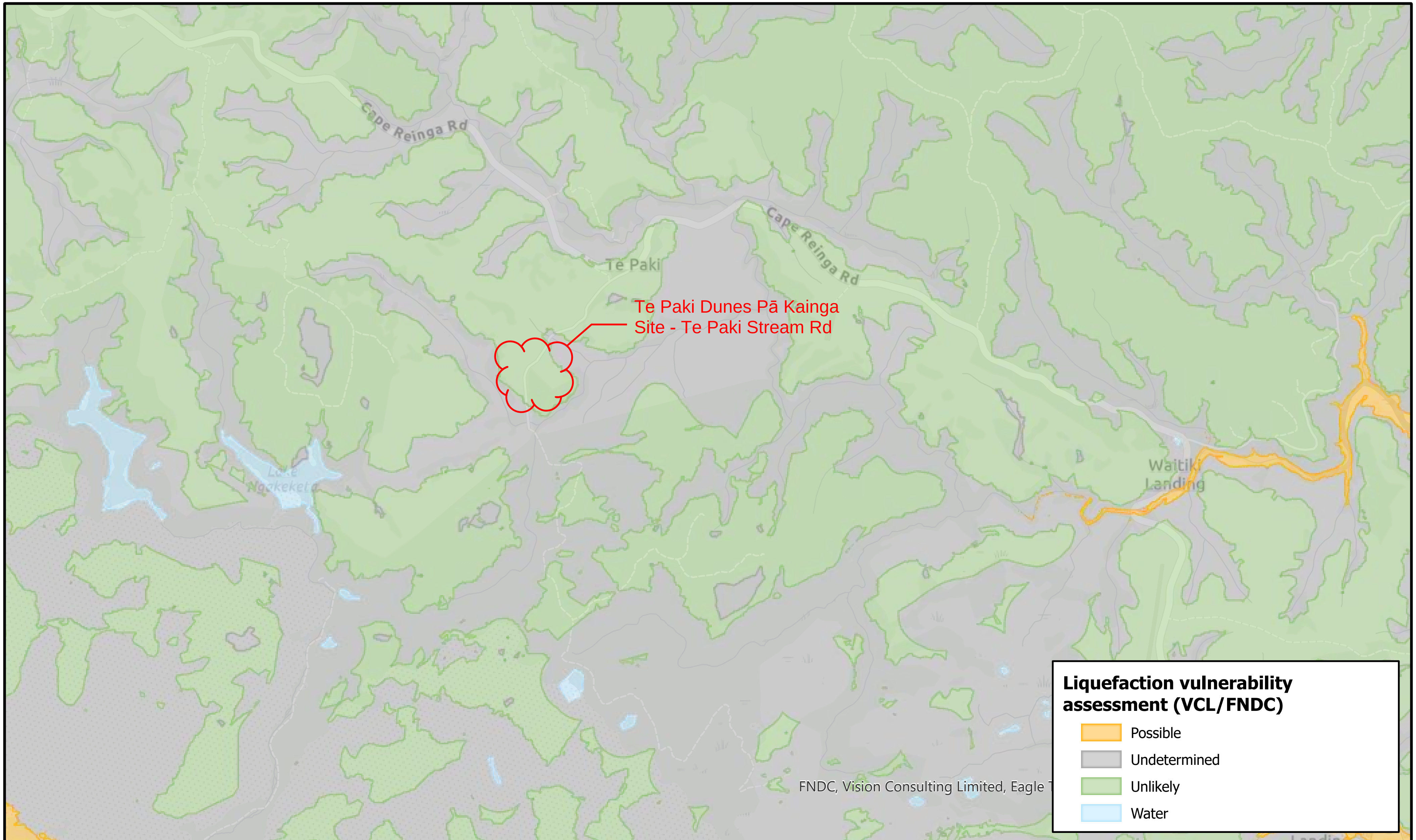
Hand Auger Samples to 2.0m for Lot 20



Soil Profile for Hand Auger in Lot 20

Test Location	Depth of Sample / Test [m]	Corrected Shear Vane Results		Soil Description / Classification
		Undisturbed [kPa]	Disturbed [kPa]	
A20	Existing Ground Level			
	0.0 - 0.5	95	63	**0.0 – 0.2m:** Topsoil, Dark brown, Well graded, Dry. **0.2 – 0.5m:** CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Dry.
	0.5 - 1.0	116	74	CLAY, Reddish brown, Loose, Firm, High plasticity, Moderately sensitive, Moist.
	1.0 - 1.5	125	95	CLAY, Reddish brown, Medium Dense, Stiff, High plasticity, Moderately sensitive, Moist.
	1.5 - 2.0	122	92	CLAY Loam, Reddish brown, Dense, Firm, High plasticity, Moist, Moderately sensitive, GWL not reached.

FNDC Liquefaction Risk Map



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

Far North Maps

0 1 2 3 km

Projection NZTM2000. Datum NZGD2000. Scale:1:36,112

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: 22/11/2024

PRODUCER STATEMENT – PS1
DESIGN

BUILDING CODE CLAUSE(S): B1 **JOB NUMBER:** J000595
ISSUED BY: Structus Consulting Limited
(Engineering Design Firm)
TO: Ngati Kuri
(Owner/Developer)
TO BE SUPPLIED TO: Far North District Council
(Building Consent Authority)
IN RESPECT OF: Proposed relocatable dwelling pile foundations
(Description of Building Work)
AT: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland
(Address, Town/City)
LEGAL DESCRIPTION: **N/A** ☑

We have been engaged by the owner/developer referred to above to provide *(Extent of Engagement)*:
Refer attached particulars dated 10 December 2024 for scope of works
in respect of the requirements of the Clause(s) of the Building Code specified above for Part only , as specified in the Schedule, of the proposed building work.

The design carried out by us has been prepared in accordance with:

- ☑ Compliance documents issued by the Ministry of Business, Innovation & Employment *(Verification method/acceptable solution)* B1/VM1, B1/VM4 and/or;
- ☐ Alternative solution as per the attached Schedule.

The proposed building work covered by this producer statement is described on the drawings specified in the Schedule, together with the specification, and other documents set out in the Schedule.

On behalf of the Engineering Design Firm, and subject to:

- Site verification of the following design assumptions: Refer to attached particulars dated 10 December 2024 .
- All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds that:

- the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the Schedule, will comply with the relevant provisions of the Building Code and that;
- the persons who have undertaken the design have the necessary competency to do so.

I recommend the CM 2 level of **construction monitoring**.

I, *(Name of Engineering Design Professional)* Darren Andew Mitchell , am:

- ☑ CPEng number 1007610

and hold the following qualifications BEng (Hons), CPEng, CMEngNZ

The Engineering Design Firm holds a current policy of Professional Indemnity Insurance no less than $200,000
The Engineering Design Firm is a member of ACE New Zealand.

SIGNED BY *(Name of Engineering Design Professional)*: Darren Andew Mitchell
(Signature below):

ON BEHALF OF *(Engineering Design Firm)*: Structus Consulting Limited Date: 10/12/2024

Note: This statement has been prepared solely for the Building Consent Authority named above and shall not be relied upon by any other person or entity. Any liability in relation to this statement accrues to the Engineering Design Firm only. As a condition of reliance on this statement, the Building Consent Authority accepts that the total maximum amount of liability of any kind arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in tort or otherwise, is limited to the sum of $200,000.

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

SCHEDULE to PS1

Please include an itemised list of all referenced documents, drawings, or other supporting materials in relation to this producer statement below:

Refer attached particulars dated 10 December 2024

GUIDANCE ON USE OF PRODUCER STATEMENTS

Information on the use of Producer Statements and Construction Monitoring Guidelines can be found on the Engineering New Zealand website
https://www.engineeringnz.org/engineer-tools/engineering-documents/producer-statements/

Producer statements were first introduced with the Building Act 1991. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects (NZIA), Institution of Professional Engineers New Zealand (now Engineering New Zealand), Association of Consulting and Engineering New Zealand (ACE NZ) in consultation with the Building Officials Institute of New Zealand (BOINZ). The original suite of producer statements has been revised at the date of this form to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with part of the reasonable grounds necessary for the issue of a Building Consent or a Code Compliance Certificate, without necessarily having to duplicate review of design or construction monitoring undertaken by others.

PS1 DESIGN Intended for use by a suitably qualified independent engineering design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;

PS2 DESIGN REVIEW Intended for use by a suitably qualified independent engineering design review professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;

PS3 CONSTRUCTION Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2013 or Schedules E1/E2 of NZIA's SCC 2011[2]

PS4 CONSTRUCTION REVIEW Intended for use by a suitably qualified independent engineering construction monitoring professional who either undertakes or supervises construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate.

This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACE New Zealand and Engineering New Zealand to interpret the Producer Statement.

Competence of Engineering Professional
This statement is made by an engineering firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its personnel.

The person signing the Producer Statement on behalf of the engineering firm will have a professional qualification and proven current competence through registration on a national competence-based register such as a Chartered Professional Engineer (CPEng).

Membership of a professional body, such as Engineering New Zealand provides additional assurance of the designer's standing within the profession. If the engineering firm is a member of ACE New Zealand, this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent engineering professional".

Professional Indemnity Insurance
As part of membership requirements, ACE New Zealand requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI Insurance minimum stated on the front of this form reflects standard practice for the relationship between the BCA and the engineering firm.

Professional Services during Construction Phase
There are several levels of service that an engineering firm may provide during the construction phase of a project (CM1-CM5 for engineers[3]). The building Consent Authority is encouraged to require that the service to be provided by the engineering firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4
Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Refer Also:

1 Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2013
2 NZIA Standard Conditions of Contract SCC 2011
3 Guideline on the Briefing & Engagement for Consulting Engineering Services (ACE New Zealand/Engineering New Zealand 2004)
4 PN01 Guidelines on Producer Statements

www.acenz.org.nz
www.engineeringnz.org

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T 09 869 2073 E info@structus.co.nz
www.structus.co.nz

Far North District Council

10 December 2024

Lots 16-21, Te Paki Stream Road, Cape Reinga – PS1 Producer Statement Attached Particulars

Structus have been commissioned to provide structural engineering design services for the relocatable dwelling foundation piles at Lots 16-21, Te Paki Stream Road, Cape Reinga, Northland for Ngati Kuri.

The structural design covered by this producer statement comprises the following only:

- Pile foundations
- SED Anchor pile to bearer connections.

Refer the following schedule listing the structural drawings and calculation report covered by this producer statement.

Drawing Title	No.	Rev	Structus Stamp Dated
Papakainga Development 16-21 Te Paki Dunes (Lot 16 Foundation Plan)	SK01	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 17 Foundation Plan)	SK02	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 18 Foundation Plan)	SK03	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lot 19 Foundation Plan)	SK04	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes (Lots 20 & 21 Foundation Plan)	SK05	A	10/12/2024
Papakainga Development 16-21 Te Paki Dunes Structural Calculation Report		A	10/12/2024

Exclusions

The following items have not been included in this producer statement:

- Geotechnical engineering, including design parameters for pile foundations structural design
- Temporary propping, shoring or other temporary structures
- Waterproofing and cladding
- Any proprietary structures are to be designed by the supplier
- Civil engineering, such as earthworks, external pavement and drainage
- All structures above the pile foundations.

Assumptions

The design is based on the following assumptions:

- The design has been undertaken, and the ground conditions are, in accordance with the advice provided in the following FNR Geotechnical Investigation Reports:
  - Lot 16 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 17 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 18 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 19 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 20 Te Paki Stream Road, Cape Reinga – 19 November 2024
  - Lot 21 Te Paki Stream Road, Cape Reinga – 21 November 2024
- The proposed building structure is in accordance with the architectural drawings by PanelLock dated 2/9/2024
- Seismic subsoil class E is assumed
- The Lots 16-21, Te Paki Stream Road structural works are designed for Importance Level 2 with a 50 year design life.

Alternative Solutions
The following alternative solutions to the NZ Building Code have been used on this project:

- None

B2 Compliance
A Producer Statement for Clause B2 – Structural Durability of the Building Code has been requested. We are not able to provide this because there is no verification method for B2 contained within the Building Code.

The purpose of this compliance clarification is to confirm that direct construction monitoring by Structus Consulting Limited in relation to Clause B2 (Durability) of the Building Code for the above project, has been limited in that material protection or treatment is typically carried out by specialist suppliers and requires specific quality assurance by the suppliers. However, we can confirm the specifically designed structural elements that were included in the design documentation prepared by the Structus Consulting Limited comply with the applicable verification methods.

Timber (means of compliance B1/VM1)
The timber has been specified in accordance with NZS3640:2004. The quality of timber treatment is dependent on the QA systems of manufacturers, suppliers and the onsite contractors and sub-contractors. Refer to the contractor's PS3 and QA records where available.

Concrete (means of compliance B1/VM1)
Compliance with cover and concrete quality requirements for B1/VM1 are in accordance with NZS3101:2006.

Mild Steel (means of compliance B1/VM1)
Protective coatings have been specified in accordance with AS/NZS 2312:2014 and SNZ TS 3404:2018.

The corrosion category and the years to first major maintenance have been identified for the structural steel work in accordance with SNZ TS 3404:2018. This allows the contractor to procure the suitable corrosion protections systems to meet AS/NZS 2312:2014 and SNZ TS 3404:2018 requirements. The quality of mild steel protective coatings is dependent on:

- Paint supplier confirming that the paint can perform to the standard as required by AS/NZS 2312:2014 and SNZ TS 3404:2018 based on the stipulated corrosion category and years to first maintenance
- Steel preparation
- Quality and production consistency of the coating products
- QA of the application and curing
- QA of the handling, protection and repair

Refer to:

- Contractor's and sub-contractor's PS3s and QA records where available
- Third party inspection and test results
- On-going maintenance plan (attached)

Applicability

The advice covered by this producer statement has been prepared by Structus at the request of its client, for the particular brief and on the terms and conditions agreed with our client and is exclusively for use and reliance by Structus' client. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of, or reliance by any third party, on the advice (in whole or in part) covered by this producer statement.

No express or implied warranty is made as to the advice contained in the information covered by this producer statement. To the extent that any information provided to Structus is inaccurate, incomplete, or inadequate, Structus takes no responsibility and disclaims all liability for any loss or damage that results from any conclusions based on information that has been provided to Structus.

Yours Sincerely
Structus Consulting Limited

Darren Mitchell
Director

Lots 16-21, Te Paki Dunes – Structural Maintenance Schedule

This schedule of ongoing inspection and maintenance of structural elements shall be included with the O&M manuals and provided to the Owner/Body Corporate and building managers.

Inspection/Maintenance timeframe and item	
(a) Half-yearly	Wash down all exposed steelwork that is not in a fully interior environment including: • Veranda steelwork • Steel carpark structure (beams, columns, braces etc) • Deck and balcony steelwork • Exposed façade steelwork, both primary and secondary structure • Sub-ground floor mild-steel structures such as beams.
(b) 5-yearly	Inspect and repair sealant that encloses structural mild-steel components and/or timber with mild-steel fixings.
(c) 10-yearly	Check exposed timber fixings for corrosion, repair as required.
	Inspect/replace sealant that encloses structural mild-steel components and/or timber with mild-steel fixings. This will typically include sealants around the perimeter of precast panels. **Note that 10 years is the expected useful life for many sealants.**
	Check all exposed steelwork that is not in a fully interior environment for signs of corrosion. Repair protective coatings as required.
(d) 25-yearly	Inspect samples of structural steel that is hidden from view but not enclosed within a vapour barrier, and repair protective coatings as necessary. A typical example is a veranda with built-in steelwork. (Such steelwork should typically have duplex protective coatings). Inspection may typically require removal of claddings and/or the drilling of holes for borescope access. Repair as required.
	Inspect all exposed, external timber. Repair as required.
	Inspect all exposed, external reinforced concrete for signs of spalling. Repair as required.
Following seismic shaking > SLS1 event	Inspections and repair as per b), c) and d) above.

STRUCTURAL CALCULATION REPORT

PAPAKAINGA DEVLOPMENT
TE PAKI DUNES

Prepared for: **NGATI KURI**

Date: **10 DECEMBER 2024** Reference: **J000595** Revision: **A**

STRUCTUS

DOCUMENT CONTROL RECORD

Document prepared by:

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Report Title	Structural Engineering Calculation Report		
Client	NGATI KURI	Job Number	J000595

Rev	Date	Revision Details	Author	Verifier	Approver
A	10 December 2024	Building Consent	A. Motara	C. Bell	D. Mitchell

Current Revision	A

Approval			
Author Signature		Approver Signature	
Name	A. Motara	Name	D. Mitchell
Title	Structural Engineer	Title	Director

A person using Structus documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by Structus.

Job: Papakainga Development	**Job No:**	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	**Author:**	A. Motara
	Pages:	2

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	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	**Author:**	A. Motara
	Pages:	4

1 Design Overview & Philosophy

Structus was engaged by Ngati Kuri to undertake structural design and detailing for the proposed Subfloor Piles/Foundation Design at Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland. The proposed project is in the figure below. This is a calculation report in support of a building consent submission. This report is to be read in conjunction with:

- Structus marked up Architectural Drawings A1-A13 dated 06/12/24Parsonson Architecture Te Paki Dunes and Ngataki consent issue drawings A01 to A13 dated 15 /11/24
- PanelLock transportable dwelling drawings A1 to A13 dated 02 September 2024
- FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

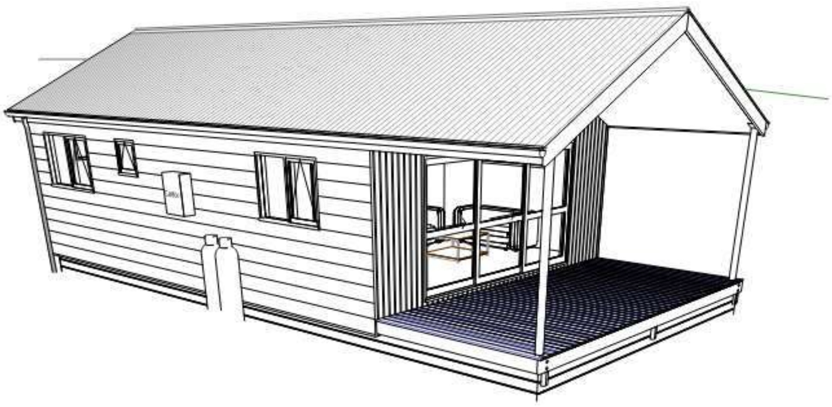

Figure 1-1: Building Overview

1.1 Location of building

Address: Lot 16-21, Te Paki Stream Road, Cape Reinga, Northland

Figure 1-2: Map View

Job: Papakainga Development	Job No:	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	Author:	A. Motara
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1.2 Description of Buildings

The proposed buildings are transportable single storey dwellings of 82m^2 floor area. The dwellings at each lot are of similar floor plans and construction. The cladding is of lightweight construction supported by timber roof trusses and timber wall framing. The subfloor construction is of timber joists and timber piles encased in concrete.

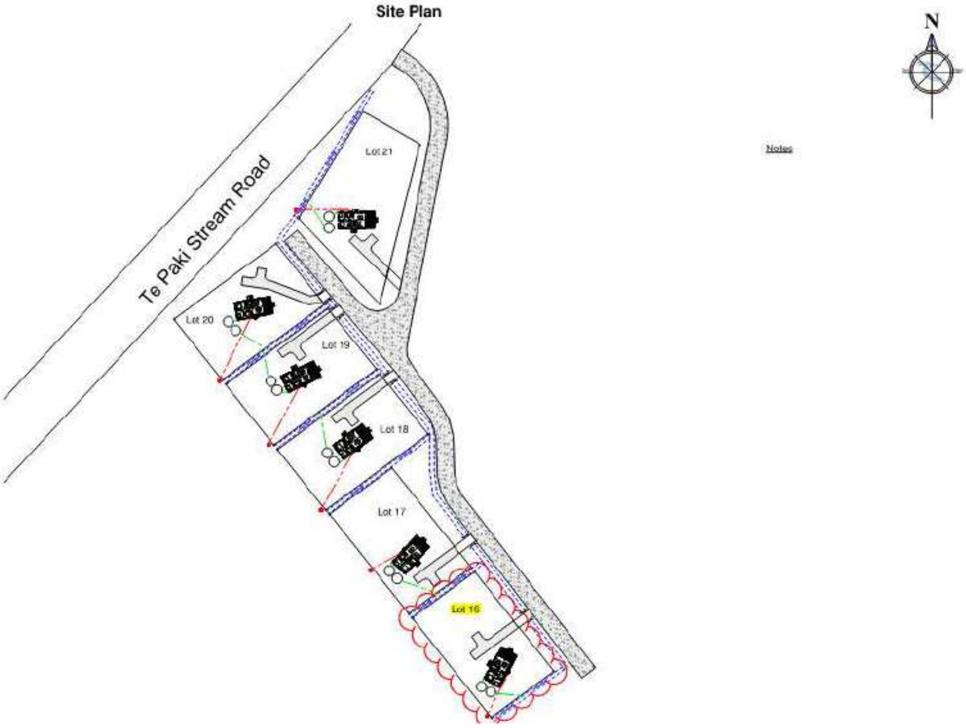


Figure 1-3: Site Plan

1.2.1 Gravity System

The gravity system is typically timber roof trusses supported by load bearing walls supported by conventional timber subfloor joists, bearers and bored timber piles.

1.2.2 Lateral Stability

Lateral stability is provided typically by roof, wall and subfloor bracing. The subfloor bracing is provided by specifically designed cantilever piles based on NZS3604 methodology for bracing demands.

1.2.3 Seismic Design

Seismic bracing demand is obtained based on NZS3604

1.2.4 Foundation

Foundations are timber piles encased in concrete. The foundations are typically embedded to a level that achieves good ground to NZS3604 or as required to achieve a suitable bracing capacity.

1.2.5 Geotechnical Investigation

- Geotechnical report reference - FNR Consulting Ngataki and Te Paki Dunes ground reports dated 19 and 20 November 2024

Existing Soil Parameters	*Description*
y = 18kN/m^3	Soil density (Assumed)
s_u = 40-60kPa	Based on B1/VM4 Varies each lot - Refer to Foundation Calculations
Soil Class D or E	(Assumed/No information available)
Expansive Soil Class S	To AS:2870
Allowable end bearing = 204-300kPa	Capacity and depth varies at each Lot
Reduction factor = 0.5	Gravity case reduction factor
Reduction factor = 0.8	Seismic case reduction factor
Ground water – N/A	Ground water level not encountered

Further key points

- Liquefaction risk (Low)

2 Safety in Design

Safety in Design is required under the Health and Safety at Work Act 2015 (HSWA) and integrates risk management into the design process to identify, assess and treat Health and Safety risks to people over the life of an asset.

The HSWA requires designers to ensure, so far as is reasonably practicable, that any structure they design is without risks to the health and safety of persons who:

- Use the structure at a workplace (end users/customers);
- Construct the structure at a workplace;
- Carry out the manufacture, assembly, use, maintenance, proper demolition and disposal of the structure at a workplace; or
- Are in the vicinity of a workplace and are exposed to the structure, or whose health and safety may be affected by an activity related to the structure.

Structus has considered Safety in Design throughout the design process. Some risks have been designed out throughout the design process and therefore have been eliminated, however, other residual risks do exist. The residual risks are as follows:

- Open excavations/pile holes during construction.

The Safe Design report has identified hazards relating to the design of the structural works shown on the documents that would not normally be expected in other designs of the same type of structure.

The method of construction and maintaining safety during construction are the responsibility of the builder. If any of the structure in our designs is considered to present an unreasonable risk in respect to construction safety, the matter shall be referred to Structus for resolution before proceeding with the work.

This report is prepared solely for the purposes of the person conducting the business or undertaking who commissioned the design and is not prepared for the benefit of any other party or for any other purpose.

3 Loading and Material Properties

3.1 Importance Level

*The Importance Level is determined using Table 3.2 of AS/NZS 1170.0 and will be used to determine the required return periods of wind and seismic loading.

TABLE 3.2

IMPORTANCE LEVELS FOR BUILDING TYPES—NEW ZEALAND STRUCTURES

Importance level	Comment	Examples
1	Structures presenting a low degree of hazard to life and other property	Structures with a total floor area of <30 m^2 Farm buildings, isolated structures, towers in rural situations Fences, masts, walls, in-ground swimming pools
2	Normal structures and structures not in other importance levels	Buildings not included in Importance Levels 1, 3 or 4 Single family dwellings Car parking buildings
3	Structures that as a whole may contain people in crowds or contents of high value to the community or pose risks to people in crowds	Buildings and facilities as follows: (a) Where more than 300 people can congregate in one area (b) Day care facilities with a capacity greater than 150 (c) Primary school or secondary school facilities with a capacity greater than 250 (d) Colleges or adult education facilities with a capacity greater than 500 (e) Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities (f) Airport terminals, principal railway stations with a capacity greater than 250 (g) Correctional institutions (h) Multi-occupancy residential, commercial (including shops), industrial, office and retailing buildings designed to accommodate more than 5000 people and with a gross area greater than 10 000 m^2 (i) Public assembly buildings, theatres and cinemas of greater than 1000 m^2

Figure 3-1: Importance Levels for Building Types

The residence is a (normal structure) and is classified as an Importance Level 2 building for design.

Design life of the building is 50 years therefore. From Table 3.3 of AS/NZS1170.0, the required Annual Probabilities of Exceedance are as follows:

Load	Importance Level	Annual probability of exceedance
Wu – Wind Loading Ultimate	2	1/500
Eu – Earthquake Loading Ultimate		1/500
Eu – Earthquake Loading Ultimate (Parts & Components)		1/500
All SLS loads		1/25

TABLE 3.3

ANNUAL PROBABILITY OF EXCEEDANCE

Design working life	Importance level	Annual probability of exceedance for ultimate limit states			Annual probability of exceedance for serviceability limit states	
		Wind	Snow	Earthquake	SLS1	SLS2 Importance level 4 only
Construction equipment, e.g., props, scaffolding, braces and similar	2	1/100	1/50	1/100	1/25	
Less than 6 months	1	1/25	1/25	1/25	—	
	2	1/100	1/50	1/100	1/25	
	3	1/250	1/100	1/250	1/25	
	4	1/1000	1/250	1/1000	1/25	
5 years	1	1/25	1/25	1/25	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
25 years	1	1/50	1/25	1/50	—	—
	2	1/250	1/50	1/250	1/25	—
	3	1/500	1/100	1/500	1/25	—
	4	1/1000	1/250	1/1000	1/25	1/250
50 years	1	1/100	1/50	1/100	—	—
	2	1/500	1/150	1/500	1/25	—
	3	1/1000	1/250	1/1000	1/25	—
	4	1/2500	1/500	1/2500	1/25	1/500

Figure 3-2: Annual Probability of Exceedance

3.2 Loadings

3.2.1 Self-Weight of Elements (SW):

- Concrete piles = 24kN/m3
- Perimeter cladding = 0.2kPa

Elements with self-weight (G)	*Description*
G_{roof} = 0.33 kPa	Roof build-up Metalcraft T-Rib roofing (assuming 0.55mm) 0.065kPa, Timber Trusses @900crs 0.07kPa, 0.04kPa Purlins, 0.05kPa Insulation blanket, 0.11kPa 18mm Triboard Ceiling.
G_{floor}= 0.30 kPa	Floor Build-up (0.14kPa 240x45 joists @ 400 crs + 0.1kPa 20mm particle boardT&G + 0.05kPa Insulation, misc 0.01kPa.
G_{int_wall} = 0.22kPa	36mm Triboard Wall panel.
G_{ext_wall} = 0.44 kPa	0.13kPa 7.5mm Hardi plank Weatherboards, 0.04kPa 90x45 framing, 0.05kPa insulation, 0.22kPa 36mm Triboard Wall panel

3.2.2 Superimposed Dead Loads (SDL)

SDL (G)	*Description*
G_{SDL}= 0.35 kPa	Nominal (Residential floor incl. floor coverings).

3.2.3 Imposed Loads (Q)

The following imposed / live loads are as per T3.1 of AS/NZS1170.1

Live Load (Q)	*Description*
Q_{RF} = 0.25 kPa	Roof life load
Q_{Floor} = 1.5kPa or 1.8kN	Residential Floor
Q_{Deck} = 2.0kPa	Residential balcony

3.2.4 Wind Loading

Wind Loading to be worked out using NZS3604 as per GIB spreadsheet – See Later Sections.

3.2.5 Seismic Loading

Seismic Load to be determined using NZS3604 and modified as required for the anchor pile design.

3.2.6 Load Combinations

The ultimate limit state combinations are considered as per AS/NZS 1170.0 section 4.2.

ULS Load Combinations	*Commentary*
[1.35G]	Permanent action
[1.2G, 1.5Q]	Permanent and imposed
[1.2G, W_u, $\psi_c Q$]	Downward wind ULS case
[0.9G, W_u]	Upward wind ULS case
[G, $\psi_E Q$, E_u]	Earthquake case

3.3 Material Properties

3.3.1 Concrete Strengths

- Foundations: 30 MPa

3.3.2 Reinforcing Steel

- Reinforcing Steel (High Yield) 500 MPa Micro Alloy Grade E
- Reinforcing Steel (Mild Steel) 300 MPa Micro Alloy Grade E

3.3.3 Structural Steel

3.3.3.1 Steel Grade

- Rolled Steel Sections: 300 MPa – Grade 300 to AS/NZS 3679
- Steel Plate General 250 MPa – Grade 250 to AS1594
- Steel Plate (special) 300 MPa – Grade 300 AS/NZS 3678
- StelTech Beams 300MPa – Grade 300 AS/NZS 3679
- CHS Hollow Sections 350MPa – Grade C350 AS 1163
- RHS Hollow Sections: AS 1163 - Grade C350 AS 1163
- Bolt Grades: Grade 4.6 mild steel and grade 8.8 high strength
- Tensioning requirements for 8.8 bolts S, TB, TF as required

3.3.3.2 Steel Corrosion Category

Durability Zone D (Far North) to NZS3604

3.3.4 Structural Timber

All timber shall be Pinus Radiata SG8 or SG6 grade and meet the requirements of Table 2.3 of NZS 3603 for mechanically graded timber.

4 Structural Load Path

Below is the typical structure for a single storey dwelling supported by trusses, load bearing walls, floor joists and shallow gravity piles with anchor piles for bracing.

Figure 4-1: Typical Roof Plan

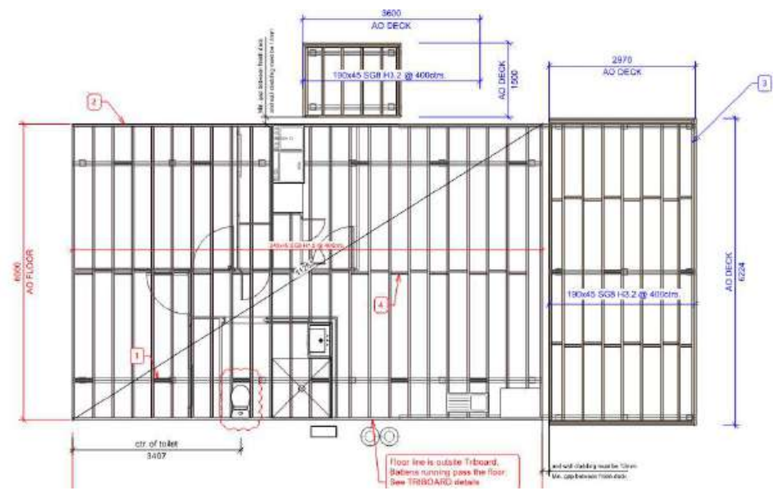


Figure 4-2: Typical Floor Plan

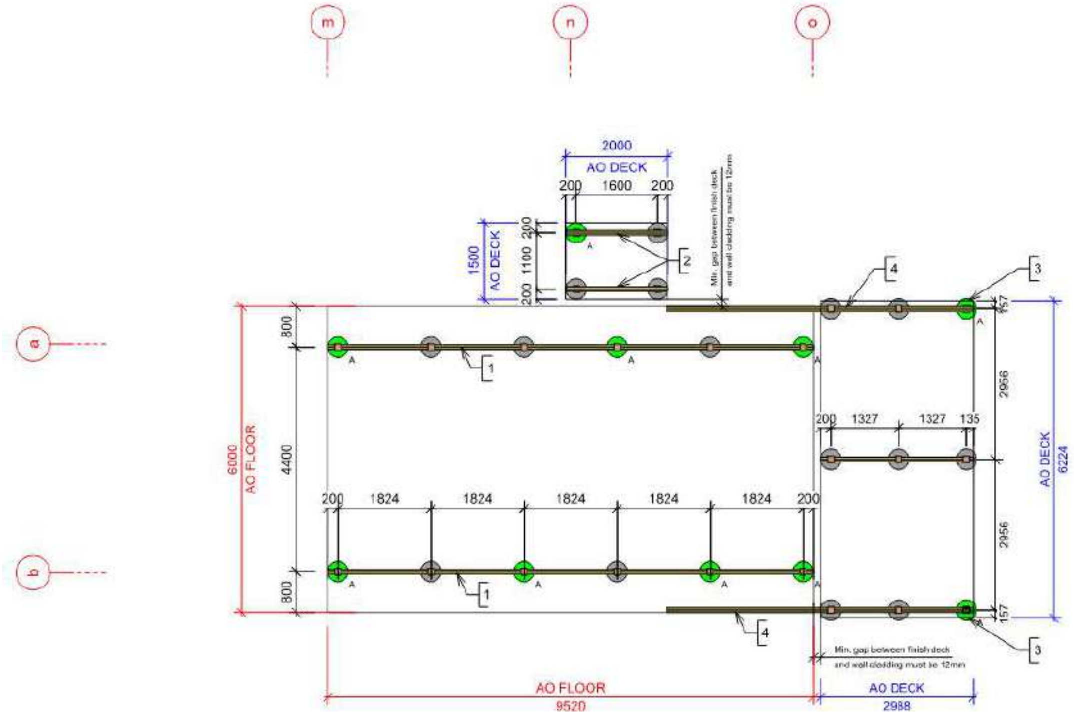
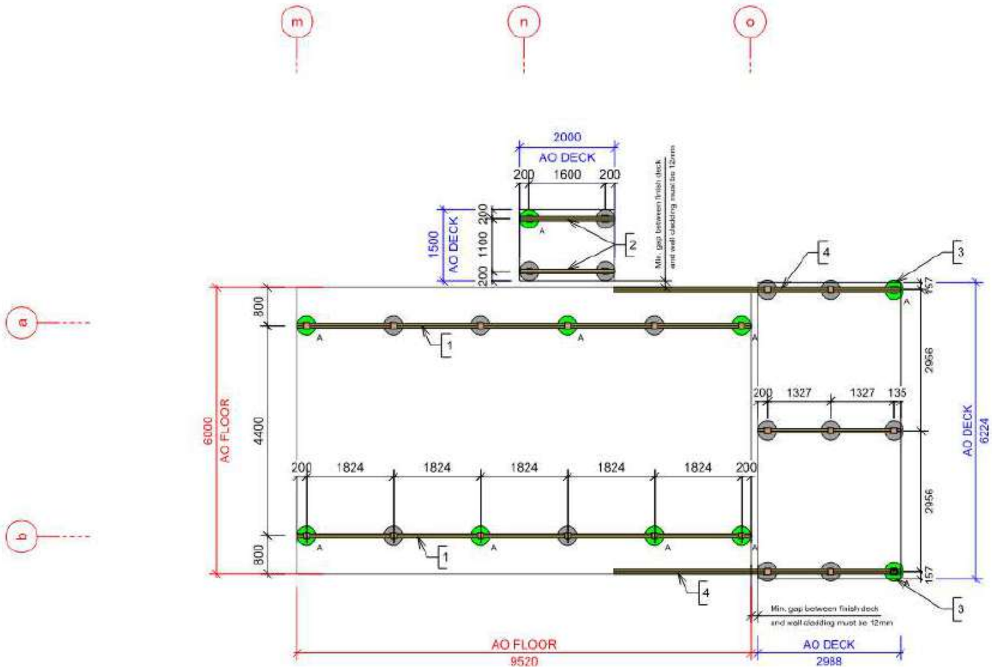


Figure 4-3: **Typical Lateral System Plan**

5 Subfloor Bracing Design

5.1 Bracing Design

Verification of the bracing plan below based on NZS3604 design loads.



For all Piles minimum Footing plan dimensions Ø480mm

Anchor Pile Ordinary Pile Brace Pile

Job: Papakainga Development	**Job No:**	J000595
	Date:	10-Dec-24
Subject: Papakainga Development Te Paki Dunes Foundations – Structural Calculation Report	**Author:**	A. Motara
	Pages:	17

Building Specification

Number of Storeys	Single
Floor Loading	2 kPa
Foundation Type	Subfloor
Sub Floor Cladding	Light

	Single
Cladding Weight ?	Light
Roof Weight ?	Light
Room in Roof Space	No
Roof Pitch (degrees) ?	25
Roof Height above Eaves (m)	1.4
Building Height to Apex (m)	4.05
Ground to Lower Floor (m)	0.71
Stud Height (m)	2.4
Building Length (m)	10
Building Width (m)	6

Building Location

Wind Zone = High

Wind Zone or Consent Authority	Not Available
Wind Region ?	A
Lee Zone	No
Ground Roughness ?	Open
Site Exposure ?	Exposed
Topography ?	T1

? Earthquake Zone	1
Soil Type	D & E (Deep to Very Soft)
Annual Prob. of Exceedance	1 in 500 (Default)

Bracing Units required for Wind

	Along	Across
Single Level	224	304
Subfloor Level	401	600

Bracing Units required for Earthquake

	Along and Across
Single	395
Subfloor Level	547

SubFloor Along

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)	Wind	Earthquake
									Demand	
									401	547
									Resistance	
									960 239%	720 132%
A		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK
B		1	3		Anchor Pile	NZS3604	480	360	480 OK	360 OK

SubFloor Across

To Add Elements, right click when on the Element above which you want to insert the Element.

To Add Lines, right click when on the Line above which you want to insert the Line.

Import

Line	Ext. Len. (m)	Element	Length(m) or No.	Angle (degrees)	Type	Supplier	Wind (BU)	Earthquake (BU)	Wind	Earthquake
									Demand	
									600	547
									Resistance	
									960 160%	720 132%
M		1	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
N		2	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK
O		3	2		Anchor Pile	NZS3604	320	240	320 OK	240 OK

Hence across direction is critical

Note re-check line O for additional demand from the deck.

7.4.2.2

Decks which project more than 2 m from the building shall have *subfloor bracing* provided by anchor and/or *braced piles*, at half the *bracing demand* required by table 5.8 for "light/light/light" *cladding*, for 0° *roof* slope and for "subfloor structures".

Anchor piles rating per pile	120 BUs for earthquake 160 BUs for wind

Table 5.8 – Bracing demand for various combinations of cladding on single-storey buildings on subfloor framing (2 kPa floor load, soil type D/E, earthquake zone 3) (see 5.3.1)

Roof cladding	Single-storey cladding	Subfloor cladding	Roof pitch degrees	Subfloor structure	Single-storey walls
				BU/m²	
Light roof	Light	Light and Medium	0-25 25-45 45-60	15 16 17	11 11 13
		Heavy	0-25 25-45 45-60	17 18 19	11 12 13
		Medium	0-25 25-45 45-60	18 18 19	12 13 14

Multiplication factors		EQ zone			
Soil class		1	2	3	4
A & B	Rock	0.3	0.5	0.6	0.9
C	Shallow	0.4	0.6	0.7	1.1
D & E	Deep to Very soft	0.5	0.8	1.0	1.5

NOTE – See 5.3.4 for additional bracing demand.

Area of deck = 6.2x3=18.6m^2

Demand = ½ (0.5 x 16 x 18.6) = 74 BU (Total)

Demand/line = 74/2 = 37 BUs

From the bracing spreadsheet in the critical across direction

Capacity of Line O = 240 Bus

Demand based on tributary width = 547/3 lines = 182 BUS

Reserve capacity = 240-182 = 58 BUS > 37 BUs Hence OK

No additional piles required for the deck along the house line

For other lines

Nominal 1 AP at corner locations providing 120BUs > 37 BUs OK

Refer to the Anchor Pile specific design for pile design.

6 Foundation Design

6.1 Ground Conditions Summary

The following has been summarised from the geotechnical report.

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Notes –

Bearing capacity based on geotechnical engineer/soil report

Undrained shear strength derived from on B1/VM4 bearing capacity equations Qult =Nc x Su (based on ultimate bearing capacity)

6.2 Gravity Piles

6.2.1 Loading

Typical Pile (Central) — Pile Spacing (s) 1.82 m

		Dist Load		line Load		Pile Point Load w x s		
Element	Trib Width	G	Q	G	Q	G	Q	
Roof	3	0.35		1.05		1.911		
Ext. Wall	2.4	0.44		1.056		1.92192		
Floor	3	0.3	1.5	0.9	4.5	1.638	8.19	
Floor SDL	3	0.35		1.05		1.911		
					Totals	7.4	8.19	kN
		Factored Loads		ULS	1.2G+1.5Q	**21.1**	kN	
					1.35G	**10.0**	kN	
				SLS	G+0.7Q	**13**	kN	

6.2.2 Gravity Pile Design Lots 16-21

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**16**		
Ultimate Pile Capacity Q_ult	**204**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.7**	m	
Pile Area	0.38	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	12.0		
ULS Pile Load - P + 1.2xW_pile	35.6	kN	
SLS Pile Load - P_s+W_pile	25.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**39.3**		**OK**
SLS Pile Capacity - phi_allow. x Q_ult x A_pile	**25.9**		**OK**
Adopt	**700 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**17**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**1.1**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.3		
Concrete Density	24	kN/m3	
W_pile - A x L x (gamma_conc)	6.1		
ULS Pile Load - P + 1.2xW_pile	28.5	kN	
SLS Pile Load = P_s+W_pile	19.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity - phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 1.3m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**18**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.55**	m	
Pile Area	0.24	m^2	
Depth to a (La)	**1.6**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.8		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	10.3		
ULS Pile Load = P + 1.2xW_pile	33.5	kN	
SLS Pile Load = P_s+W_pile	23.4	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**35.6**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**23.5**		**OK**
Adopt	**550dia piles 1.8m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**19**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.5**	m	
Pile Area	0.20	m^2	
Depth to a (La)	**0.65**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	0.85		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	4.0		
ULS Pile Load = P + 1.2xW_pile	25.9	kN	
SLS Pile Load = P_s+W_pile	17.1	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**29.5**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**19.4**		**OK**
Adopt	**500 dia piles 0.85m deep**		

Pile Design

Base on shallow foundations and end bearing only

Lot Number	**20&21**		
Ultimate Pile Capacity Q_ult	**300**		
Phi_dependable	0.5		ULS reduction factor
Phi_allowable	0.33		SLS reduction factor
Pile Diameter	**0.55**	m	
Pile Area	0.24	m^2	
Depth to a (La)	**1.4**	m	
Nominal Additonal depth (Lb)	**0.2**		
Total Pile Length (La+Lb)	1.6		
Concrete Density	24	kN/m3	
W_pile = A x L x (gamma_conc)	9.1		
ULS Pile Load = P + 1.2xW_pile	32.1	kN	
SLS Pile Load = P_s+W_pile	22.2	kN	
ULS Pile Capacity = phi_dep. x Q_ult x A_pile	**35.6**		**OK**
SLS Pile Capacity = phi_allow. x Q_ult x A_pile	**23.5**		**OK**
Adopt	**550 dia piles 1.6m deep**		

Gravity Piles Summary

Pile Gravity Design Summary

Lot	Pile Diameter mm	Pile Depth m
16	700	1.3
17	500	1.3
18	550	1.8
19	500	0.85
20	550	1.6
21	550	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles

<u>For Simplicity of Design – Consider typical piles to be Ø550 for Lot 17-21 & Ø700 for Lot 16 with depth as per the table</u>

6.3 Cantilever Anchor Pile

From the Engineering Basis of NZS 3604 the following tables are provided

3.4.2 Design for safety (ultimate limit state - ULS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	Deflection (mm)
Anchor pile	120	6.0	30	160	8.0	30
Braced pile	120	6.0	50	160	8.0	50
Cantilever pile	30	1.5	25	70	3.5	45

3.4.3 Design for serviceability (serviceability limit state - SLS)

Element	Earthquake rating (BU)	(kN)	Deflection (mm)	Wind rating (BU)	(kN)	rating Deflection (mm)
Anchor pile	20	1.0	3	120	6.0	10
Braced pile	20	1.0	3	120	6.0	13
Cantilever pile	5	0.4	1	45	2.25	4

1) Consider capacity design actions on the piles

Components – timber pile; bolted connection, soil.

Assuming the ductile demand = 120BU = 6kN (Typical anchor pile capacity)

Consider the pile design to be <u>nominally ductile</u>

From NZS3604 design basis – the design ductility is 3.5; Sp = 0.7; k_mew = 2.4

For Nominally ductile loads T=0.4, mew = 1.25, Sp=0.925, k_mew= 1.14

Elastic load factor = k_mew(3.5) /Sp = 2.4/0.7 = 3.43

Reduce by nominally ductile factor = 3.43 x (0.925/1.14) = 2.78

6kN x 2.78 = 16.6kN

Notes – EZI brace design is about 132% over strength for EQ

Hence reduce by demands 32% (for capacity just meeting demand)

Revised demand = 16.6/1.32 = 12.5 kN (Minimum demand on each pile)

Height above ground = height to FFL – Joist Depth – floor boards = 710-240-20 = 450mm

Wind is not critical due to the scaling factor applied to the loads.

Design philosophy of piles.

- If good ground is very deep (>1.5df)– consider the using lower bound soil capacity (Q_ult = 204kPa→ Su=40kPa) with eo=1.5df (All cases except Lot 19)
- If good ground found is relatively shallow <1.5df (~ 0.6-0.8m) use the higher values for good ground. (Lot 19)
- Consider the max bending moment to be at the location in the ground as per the Broms formula ignoring strength of concrete.
- Use the same pile diameter as the gravity piles for simplicity.

6.3.1 Anchor Pile Design 16-21

Ground Condition Summary (Lot 16-21)

Nc = 5.14 (undrained condition)

Ø=0.5 (ULS bearing) & Ø=0.8(ULS EQ)

Lot	Depth Good Ground Achieved (m-bgl)	Ultimate Bearing Capacity	Dependable Capacity Ø=0.5 (Gravity Case)	Dependable Capacity (Ø=0.8) EQ overstrength (B1/VM4)	Unfactored Undrained Shear Strength q_u/Nc (B1/VM4)	Notes
16	1.1	204	102	163.2	40	Bearing capacity as per MJ Stockwell Paper/Geotech
17	1.1	300	150	240	58	
18	1.6	300	150	240	58	
19	0.65	300	150	240	58	Refusal at 1.25m on western side
20	1.3	300	150	240	58	
21	1.4	300	150	240	58	

Capacity of 200x200 SG6 Square pole Wet Condition

Fb(SG6) = 7.5 MPa

Notes – Phi = 1.0 for capacity designed elements.

Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x200x200^2/6 = 10.0 kNm

For 250x250 SG6

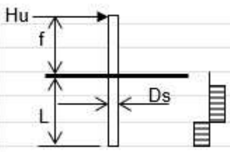
Phi_Mn = Phi x K1 x fb x Z = 1.0x1.0x7.5x250x250^2/6 = 19.5 kNm (Governs most designs)

Notes – Phi factor = 0.8 for seismic overstrength loads applied to the shear strength of soils

<u>Lot 16</u>

Use Ø700 Pile as per the gravity piles for this lot.

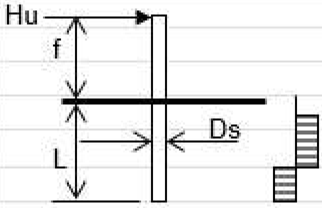
NZBC Method Section 4.3.2a



<u>Pile with Lateral Load in Cohesive Soil:</u>				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
<u>Short Free Head Pile:</u>	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.9718	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.12426	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.0136	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
<u>Long Free Head Pile:</u>				
Ultimate Lateral Load	Hul	12.732	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11315	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Capacity = 12.7 kN > 12.5 kN accept

Recheck for the max allowable height (600mm is typically OK for all other sites – hence try 600mm)

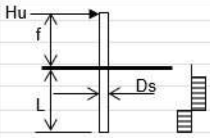


NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.7	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.8	m	
Unsupported Length of Pile Shaft	fo	1.05	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	13.882	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	1.11886	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	23.3832	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	11.6154	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	1.10762	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

11.6kN < 12.5kN (92% capacity – within 10% Acceptable) but limit to 450mm.

<u>Adopt 250x250 SG6 Pile in 1.8m deep xØ700 pile for Lot 16(max height 450mm to GL-CL of fixing)</u>

<u>Lot 17,18,20,21</u>



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	14.7551	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91815	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

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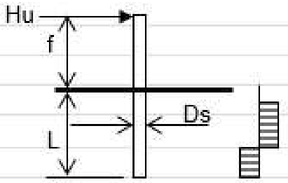
Capacity = 14 kN > 12.5 kN accept

Try 600mm height



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	1.5Ds
Short Free Head Pile:				
Ultimate Lateral Load	Hu	12.976	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90692	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	19.0223	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
		Therefore OK		
Long Free Head Pile:	N/A, MUST EVALUATE AS SHORT PILE			
Ultimate Lateral Load	Hul	13.2928	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.90892	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.0kN>12.5kN (OK)

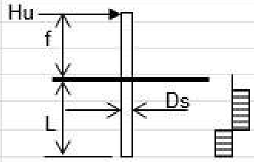
<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 17,18,20,21(max height 600mm to GL-CL of fixing)</u>

<u>Notes – adopt 1.8m for Lot 18 as gravity piles are deeper.</u>

<u>Lot 19</u>

300kPa strength found @ 0.65m on this lot

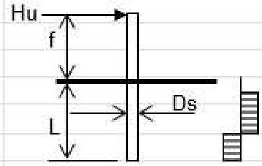
NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	15.9122	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89488	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	20.8441	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	14.9112	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.89049	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

Try 600mm height

NZBC Method Section 4.3.2a



Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	19.5	kNm	
Soil Shear Strength	s_u	46	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.6	m	
Length of Pile Shaft	L	1.5	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.5832	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88905	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	21.2481	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	13.4072	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.88388	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

13.4kN > 12.5kN (OK)

<u>Hence 1.5m depth required. hence keep to 1.6m as per typical lots for simplicity (max height 600mm to GL-CL of fixing)</u>

<u>Adopt 250x250 SG6 Pile in 1.6m deep (minimum) xØ550 pile for Lot 19</u>

6.3.1.1 Deck Piles

Check typical deck anchor piles if design can be reduced

Demand from NZS3604 from before per pile = 37 BUs

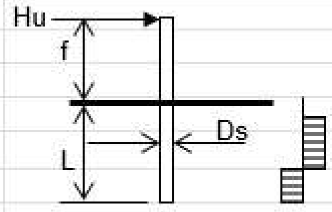
Scaled up demands = 37/20BU x 2.78 = 5.14 kN

Based on other lots – check the design using the lower bound values.

Bending Capacity of 125x125 post = 0.8 x 10 x 125x125^2/6 = 2.6kNm

Bending Capacity of 150x150 post = 0.8 x 10 x 150x150^2/6 = 4.5kNm

Pile depths are typically minimum 1.6m for anchor piles



NZBC Method Section 4.3.2a				
Pile with Lateral Load in Cohesive Soil:				
Ultimate strength of Pile Shaft	Mult	3.4	kNm	
Soil Shear Strength	s_u	32	kPa	
Diameter of Pile Shaft	Ds	0.55	m	
Height of Load above Ground	f	0.45	m	
Length of Pile Shaft	L	1.6	m	
Unsupported Length of Pile Shaft	fo	0.825	m	=1.5*Ds
Short Free Head Pile:	N/A, MUST EVALUATE AS LONG PILE			
Ultimate Lateral Load	Hu	14.1174	kN	=9*su*Ds*(SQRT(2*((f+L)^2+(f+fo)^2))-(L+2*f+fo))
Depth to Max Pile Shaft Moment	g_c	0.91413	m	=Hu/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	18.6288	kNm	=Hu*(f+fo+Hu/(18*su*Ds))
Long Free Head Pile:				
Ultimate Lateral Load	Hul	2.64929	kN	=3*su*Ds*(SQRT(9*(f+fo)^2+2*Mult/(su*Ds))-3*(f+fo))
Depth to Max Pile Shaft Moment	g_c	0.84173	m	=Hul/(9*su*Ds)+fo
Maximum Pile Moment	M_{max}	=Mult		

<u>2.6kN < 5.1 kN demand (N.G – hence requires greater pile 200SQ min size – since there are only two deck piles – keep the same size throughout – i.e. 250 SQ.</u>

Note – since the house demands are overall just meeting <u>– adopt one additional pile along line of house</u>

(deck demand = 74BU/20 x 2.78 = 10.3kN < 12.5kN for one pile OK.

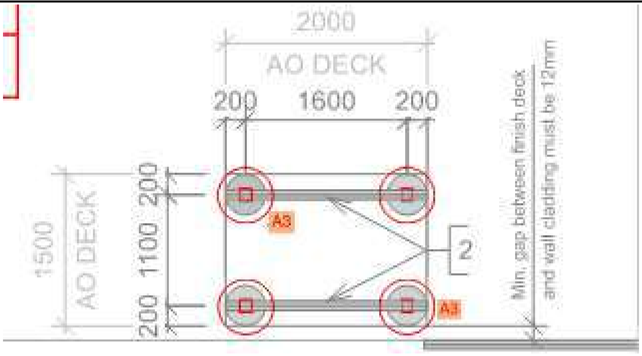
<u>Check min required for uplift of deck post.</u>

Volume of concrete = 0.4m^3 (To Arch.)

Lreq = 0.4 / (pi x 0.55^2/4 – 0.25^2) = 2.3m > 1.6m (hence increase depth to 2.3 meters for deck piles with Ø550 dia piles and post above.

Lreq(700dia) = 0.4 / (pi x 0.7^2/4 – 0.25^2) = 1.24m < 1.8m (hence 1.8 m OK for 700 dia piles)

6.3.1.2 Small Deck Piles



A_Deck = 1.5x2 = 3m^2

A_pile = 0.75m^2

For gravity – simply adopt the typical pile depths and diameter for simplicity.

Bracing demand – typically standard anchor piles to NZS3604 will be OK by inspection of 900mm depth or greater if required by the typical gravity piles.

6.3.1.3 Pile Design Summary Overall

Pile Design Summary Final Lot 16-21

Lot	Pile Diameter mm	Pile Depth m	Anchor Pile
16	700	1.3	1.8
17	550	1.3	1.6
18	550	1.8	1.8
19	550	0.9	1.6
20	550	1.6	1.6
21	550	1.6	1.6

Posts to be typical 125 H5 Senton Posts for gravity piles & 250SQ H5 for Anchor Piles

Min strength SG6

<u>Deck piles sized for uplift min 2.3m deep for 550 piles and 1.8m for 700piles</u>

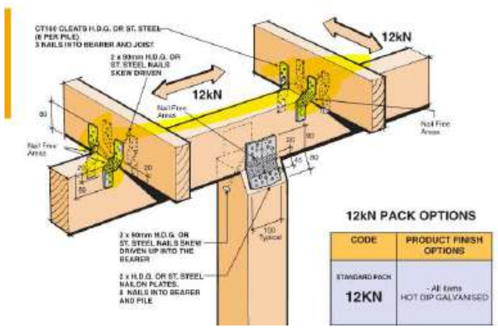
6.3.2 Connection Design

The overstrength seismic demand is 12.5 kN

This is comparable to 12kN NZS3604 connection (96%) Capacity

Hence typical connections may be substituted.

For joists to bearer connection use standard CT160 connections or similar.



However, for completeness provide the bolted connection design to the pile due to the larger size.

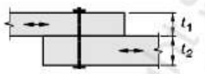
Since the loads are nominally ductile – consider the simplified method for design of bolted connections to AS/NZS1720.

<u>Case 1</u>

Load direction parallel to grain

TABLE 4.9(A)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SYSTEM CAPACITY

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skl})
(1) Two member 	b_{eff} equals smaller of t_1 and t_2	Q_{k1}

Member = 2/190x45 SG8

Be = 90mm

Try 2/M16 Bolts

TABLE 4.9(C)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PARALLEL TO GRAIN—SEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kl}), N — Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
JD5	25	2 100	2 800	3 500	4 200	5 600	7 000	8 400	10 500	12 60
	35	2 200	3 900	4 900	5 900	7 800	9 800	11 800	14 700	17 60
	40	2 200	3 900	5 600	6 700	9 000	11 200	13 400	16 800	20 20
	45	2 200	3 900	6 200	7 600	10 100	12 600	15 100	18 900	22 70
	70	2 200	3 900	6 200	8 900	15 700	19 600	23 500	29 400	35 30
	90	2 200	3 900	6 200	8 900	15 800	24 600	30 200	37 800	45 40
	105	2 200	3 900	6 200	8 900	15 800	24 600	35 300	44 100	52 90
	120	2 200	3 900	6 200	8 900	15 800	24 600	35 500	50 400	60 50

Qskl=Qkl=15.8kN /bolt

$$N_{d,j} = \phi\, k_1\, k_{16}\, k_{17}\, n\, Q_{sk} \qquad \ldots 4.4(3)$$

and

N^* = design action effect in shear

ϕ = capacity factor (see Clause 2.3)

k_1 = factor for duration of load for fasteners (see Clause 2.4.1.1)

k_{16} = 1.2 for bolts that transfer load through metal side plates (see Figure 4.7) of adequate strength, and the bolts are a close fit to the holes in these plates provided that $b_{eff}/D > 5$ for loads acting parallel to the grain and $b_{eff}/D > 10$ for loads acting perpendicular to the grain (where b_{eff} denotes the effective timber thickness and D is the bolt diameter)

= 1.0 otherwise

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k_{17} = factor for multiple bolted joint given in Table 4.12

n = number of bolts resisting design action effect in shear

Q_{sk} = characteristic capacities as derived in Clause 4.4.2.4. See also Clauses 4.4.4 and 4.4.5

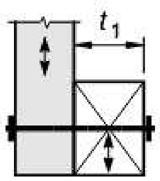
(e) For connections designed using the simplified method set out in ZZ4.1 to ZZ4.5: ϕ = 0.8.

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 15.8 = 25.3 kN > 12.5kN (OK)

Case 2

Check strength of pile connection.

Member = 250x160 (recessed) SG6, Unseasoned J5

Joint configuration	Effective timber thickness (b_{eff})	System capacity (Q_{skp})
(1) Two member 	b_{eff} equals $2t_1$	Q_{kp}

Be = 160x2=320mm

Qskp=Qkp

Try 2/M16 Bolts

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N								
		Bolt diameter (D)								
		M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.7 = 9.12 kN < 12.5kN (N.G)

Try use 4/M16

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 5.72 = 18.3 kN > 12.5kN (OK)

Hence Adopt 4-M16 Bolts for the pile bearer connection.

Minimum edge distances

To the loaded side of timber = 5xD = 5 x 16 = 80mm

C-C spacing = 5D = 80mm

Timber width required = 80+80+80 = 260mm > 250mm (Close – Accept as the bolts are not fully loaded & greater than elastic capacity can be achieved).

Case 3

For anchor piles loaded perp to direction of the bearers – check washer capacity

3.2.6 Bearing capacity

3.2.6.1 *Design capacity in bearing perpendicular to the grain*

The design capacity in bearing perpendicular to the grain ($N_{d,p}$) of a structural element (see Figure 3.8), for strength limit state, shall satisfy the following:

$$N_{d,p} \geq N_p^* \quad \ldots 3.2(15)$$

where

$$N_{d,p} = \phi\, k_1\, k_4\, k_6\, k_7\, f'_p\, A_p \quad \ldots 3.2(16)$$

and

ϕ = capacity factor (see Clause 2.3)

N_p^* = design load effect in bearing (see Figure 3.8 and Clause 1.4.2.2)

k_1 to k_7 = modification factors given in Section 2

f'_p = characteristic value in bearing perpendicular to grain

A_p = bearing area for loading perpendicular to grain.

For SG6/No. 1 Framing fp = 5.3MPa

Using 4 No. 60mm Square washers

Phi_Nd,p = 0.8 x 1.0 x 1.0 x 1.0 x 1.0 x 5.3 x 4 x 60^2= 61 kN >>12.5 kN (OK)

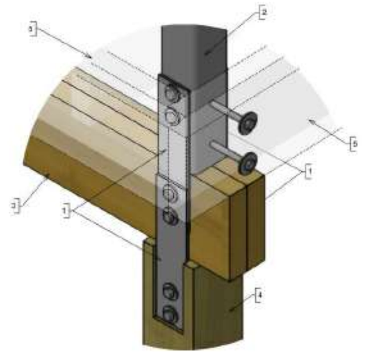
Using minimum 4mm Thk washer as per code (OK by inspection).

Adopt minimum 60mm x 4mm Square washers to M16 Bolts.

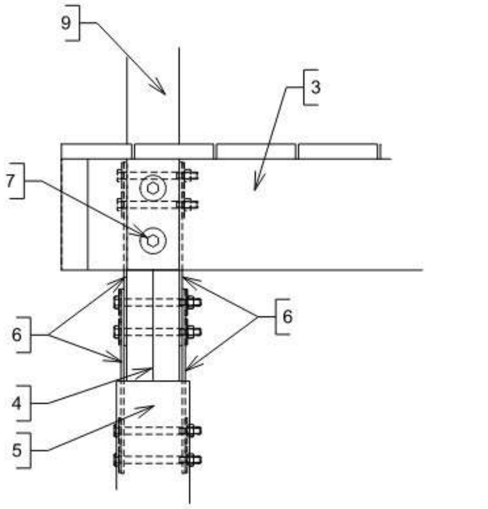
6.3.2.1 Connection at Deck Post

The architect has provided a connection detail for the external post. Check for compatibility with anchor pile design (note uplift requirements check by other engineer)

Notes
1. Bowmac BS88
2. SHS 89x89x6 as per engineer design.
3. 2/190 x 45 SG8 H3.2 bearers
4. 125x125 H5 Post
5. 2/190 x 45 SG8 H3.2 deck boundary joist
6. N/A



11.9kN required against uplift.
Capacity of 2 brackets 13.7 KN
Volume of footing concrete 0.4m³



5 Post to Deck and Pile
Scale: 1:10

The connection in the square post is critical.

Slot cut the post to achieve double shear

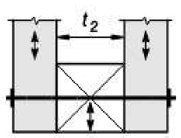
(2) Three member, Type A 	b_{eff} equals t_2	$2Q_{kp}$

TABLE 4.10(B)

CHARACTERISTIC CAPACITY FOR SINGLE BOLTS PERPENDICULAR TO THE GRAIN—UNSEASONED TIMBER

Joint group	Effect timber thickness (b_{eff}) mm	Characteristic capacity (Q_{kp}), N — Bolt diameter (D) M6	M8	M10	M12	M16	M20	M24	M30	M36
J5	25	350	470	590	710	940	1 180	1 410	1 760	2 120
	38	540	710	890	1 070	1 430	1 790	2 140	2 680	3 210
	50	710	940	1 180	1 410	1 880	2 350	2 820	3 530	4 230
	75	1 060	1 410	1 760	2 120	2 820	3 530	4 230	5 290	6 350
	100	1 310	1 880	2 350	2 820	3 760	4 700	5 640	7 050	8 460
	150	1 310	2 020	2 820	3 710	5 640	7 050	8 460	10 580	12 690
	200	1 310	2 020	2 820	3 710	5 720	7 990	10 500	14 100	16 920

Be = 90mm

Qskp = 2 x 2.11kN = 4.22kN/12mm bolt

Phi_Ndj = 0.8 x 1.0 x 1.0 x 1.0 x 2 x 4.22 = 6.7 kN > 5.14kN (OK)

Hence OK to adopt the architect detail for the anchor piles of the deck. (i.e. 2/M12 bolts slot cut in timber pile)

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