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

Office Use Only
Application Number:

Application for resource consent or fast-track resource consent

(Or Associated Consent Pursuant to the Resource Management Act 1991 (RMA)) (If applying for a Resource Consent pursuant to Section 87AAC or 88 of the RMA, this form can be used to satisfy the requirements of Form 9). Prior to, and during, completion of this application form, please refer to Resource Consent Guidance Notes and Schedule of Fees and Charges — both available on the Council's web page.

1. Pre-Lodgement Meeting

Have you met with a council Resource Consent representative to discuss this application prior to lodgement?

☑ **Yes** ☐ **No**

If yes, who have you spoken with? Eden Nathan, Nick Williamson

2. Type of consent being applied for

(more than one circle can be ticked):

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

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

3. Would you like to opt out of the fast track process?

☐ **Yes** ☐ **No**

4. Consultation

Have you consulted with Iwi/Hapū? ☑ **Yes** ☐ **No**

If yes, which groups have you consulted with? Te Runanga Nui o Te Aupōuri

Who else have you consulted with?

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

5. Applicant details

Name/s: Richard Jones at Tu Mai Ra Energy

Email:

Phone number:

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

Have you been the subject of abatement notices, enforcement orders, infringement notices and/or convictions under the Resource Management Act 1991? ◯ **Yes** ✔ **No**

If yes, please provide details.

6. Address for correspondence

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

Name/s: Sam Hurley

Email:

Phone number:

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

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

7. Details of property owner/s and occupier/s

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

Name/s: Te Runanga Nui O To Aupouri

Property address/
location: 24 Te Ahu Road, Te Kao

Postcode 0484

8. Application site details

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

Name/s:

Site address/ location: Potahi Road, Te Kao

Postcode 0484

Legal description: Pt Te Kao 71D Residue Block **Val Number:**

Certificate of title: 419221

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

Site visit requirements:

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

Is there a dog on the property? ○ **Yes** ○ **No**

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

To arrange access, please contact either Rosie Conrad -

9. Description of the proposal

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

Wind monitoring mast that exceeds height. Please see attached AEE

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

10. Would you like to request public notification?

○ **Yes** ☑ **No**

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

(more than one circle can be ticked):

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

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

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

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

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

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

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

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

◯ **Subdividing land**

☑ **Disturbing, removing or sampling soil**

◯ **Changing the use of a piece of land**

◯ **Removing or replacing a fuel storage system**

13. Assessment of environmental effects:

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

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

14. Draft conditions:

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

If yes, please be advised that the timeframe will be suspended for 5 working days as per s107G of the RMA to enable consideration for the draft conditions.

15. 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)	Richard Jones at Tu Mai Ra Energy
Email:	
Phone number:	
Postal address: (or alternative method of service under section 352 of the act)	Postco

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.

15. Billing details continued...

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) Sam Hurley

Signature: (signature of bill payer)

Date 15-Jan-2026

MANDATORY

16. Important Information:

Note to applicant

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

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

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

Fast-track application

Under the fast-track resource consent process, notice of the decision must be given within 10 working days after the date the application was first lodged with the authority, unless the applicant opts out of that process at the time of lodgement.

A fast-track application may cease to be a fast-track application under section 87AAC(2) of the RMA.

Privacy Information:

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

17. Declaration

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

Name (please write in full) Sam Hurley

Signature

Date 15-Jan-2026

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

See overleaf for a checklist of your information...

Checklist

Please tick if information is provided

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

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

Hurley Planning

PROPOSED LAND USE CONSENT FOR:

Wind Monitoring Mast Development at Potahi Road, Te Kao
Part Te Kao 71D Residue Block and Part Te Kao 71D Residue Block
15 January 2026

HURLEY PLANNING
LAND USE CONSENT APPLICATION

Project Wind Monitoring Mast within a site located on Potahi Road, Te Kao

Ref LUC25010

Report Type Land Use Consent Application

Report Date 15 January 2026

Author

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Director

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1.0 INTRODUCTION

Tū Mai Rā Energy ("The applicant") hereby applies to Far North District Council ("the Council") for a Land Use Consent, pursuant to the Resource Management Act ("The RMA") and as required under the Far North District Council's Operative District Plan ("The Plan"). The proposal is for the construction and operation of a wind monitoring mast, approximately 39.51m in height. The proposal is part of a larger project, that is being undertaken through a Memorandum of Understanding with the landowner, Te Rūnanga Nui O To Aūpouri and the eventual microgrid owner/operator, Pōtahi marae, to provide renewable energy. primarily to an existing papakāinga development within the site, a sports facility and the power network operated by Top Energy.

Applicant	Tū Mai Rā Energy
Site Address	1 Potahi Road, Te Kao
Address for Service	C/- Hurley Planning Attention: Sam Hurley
Zone	Rural Production (Operative District Plan) Māori Purpose (Proposed District Plan)

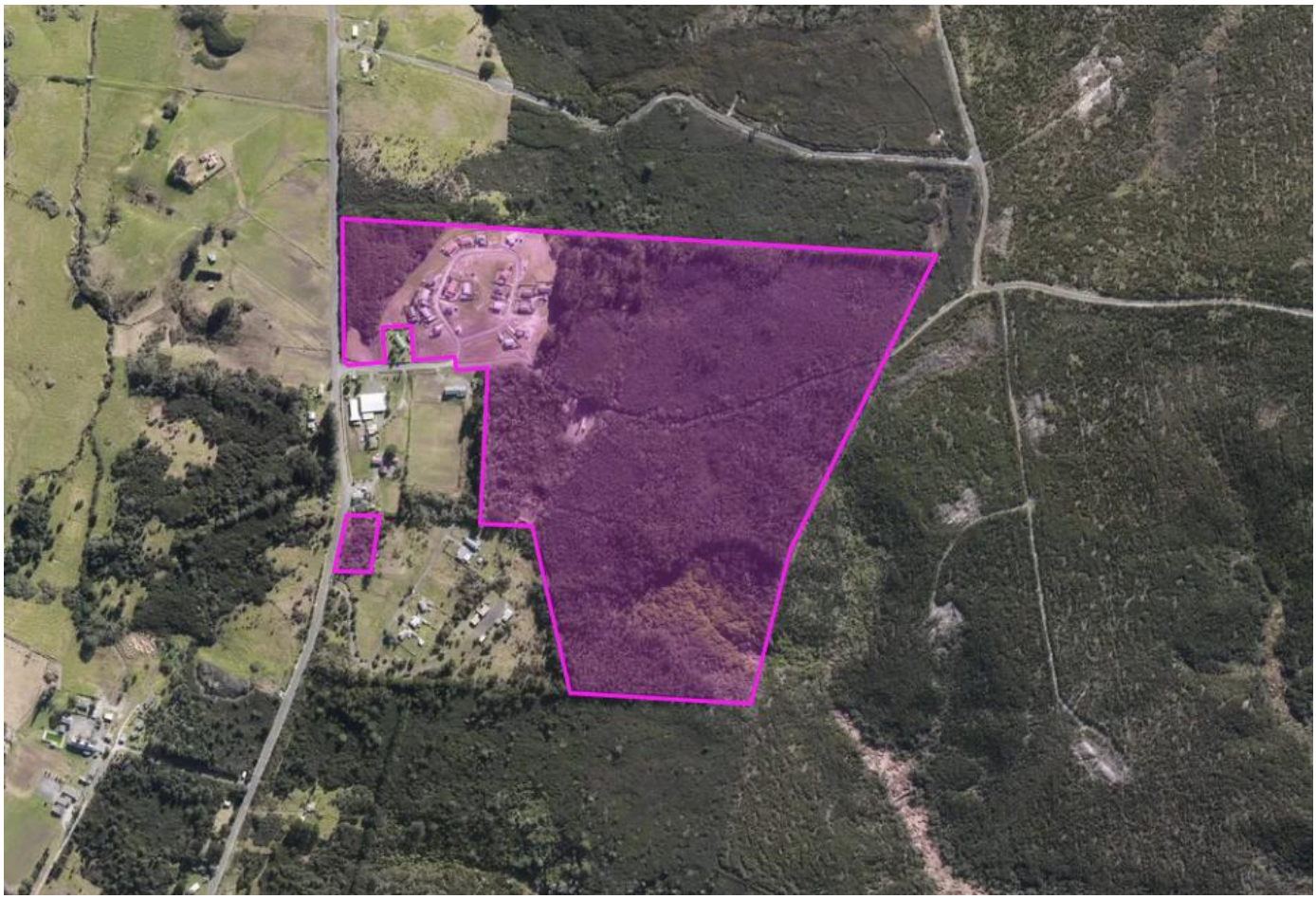


Figure 1: Aerial image of the site at Potahi Road, Te Kao

2.0 DESCRIPTION OF EXISTING SITE

2.1 Existing Land Use and Ownership

The legal description of the property is as follows,

TABLE 1: EXISTING PROPERTY DETAILS			
Address	**Legal Description**	**Owner**	**Area**
1 Potahi Road	Part Te Kao 71D Residue Block and Part Te Kao 71D Residue Block	Te Runanga Nui O To Aupouri	38.1184 hectares

2.2 Site Description & Surrounds

The site is located on the eastern side of State Highway 1 and is a large property that is 38.1181ha in size. The property is an undulating property, which forms on the northern and southern side of Potahi Road. The main development on the site is a papakāinga housing development, located within the north-western part of the site. This consists of multiple houses, which have access to a loop road that forms part of Potahi Road. Potahi Road continues east through the site and provides access to forestry in the east. The majority of the site is covered in vegetation. It is noted that this is primarily used for forestry.

In terms of the surrounding area, the Pōtahi (Te Kao) Marae is located to the southwest/west of the property. This also gains access from Potahi Road. The rest of the Te Kao township is further along the State Highway, to the south. The majority of the surrounding properties in the greater environs are rural in nature, with the primary use being forestry.

3.0 DESCRIPTION OF PROPOSED ACTIVITY

The applicant is seeking to construct a wind monitoring mast that is approximately 39.51m in height. The mast would be placed in a manner so that it is at a 90-degree angle with 0m RL. There would be a series of guy wires, approximately 4.8mm thick, and placed at different heights on the mast, being at 7.31m, 14.27m, 21.23m, 28.20m, and 36.68m. The lower three would extend to an anchor point 21.3m from the base of the structure. The higher two would extend to an anchor point 22.9m from the base of the mast. There would also be a gin pole, that is 9.14m in length, and extending from the base of the mast. Please also refer to the attached engineering plans for further information.

The mast would be located within the centre area of the property, in the approximate location shown on the attached scheme plan. The applicant seeks consent for the mast to be in place for approximately 6 months, so to gather enough information to accurately predict the nature of wind within the site. However, the applicant is also seeking a grace period of 12 months, in the form of a condition, that requires the mast to be decommissioned and removed from the site within 12 months of becoming operational. This would give adequate time to undertake suitable monitoring while also feasible time frames to arrange for a safe and suitable removal of the infrastructure from the site. Once the monitoring has been complete, the development would be removed from the site.

3.1 Earthworks

Any earthworks will consist solely of clearing a track through forestry debris for 4WD vehicle access, trenching for the aforementioned mast and the anchor points for the guy wires. It is envisioned that any

earthworks would be negligible, e.g., less than 2m³ in total. Once the development has been removed, the holes within which previously held the mast, and its supports, will be filled in with soil and grassed over.

3.2 Access

All access to the site will be retained through the existing accessway, which is off of Potahi Road. Given the existing nature of the road and its formation, no upgrades are deemed to be necessary. Further, it is noted that the construction part of the development would be temporary, and, aside from unexpected emergency works, no one will need to visit the site regularly until the mast is removed.

4.0 RELEVANT RULES

4.1 Operative District Plan Rules

The site is zoned "Rural Production" Zone. For clarity, the entirety of the rules of the District Plan will not be replicated here. However, following rules are considered relevant to the proposal.

FAR NORTH DISTRICT PLAN COMPLIANCE ASSESSMENT – OPERATIVE DISTRICT PLAN		
RULES	**ASSESSMENT**	**RULE STATUS**
8 RURAL ENVIRONMENT		
8.6 RURAL PRODUCTION ZONE		
8.6.5.1.4 SETBACK FROM BOUNDARIES No building shall be erected within 10m of any site boundary; with the following exceptions; (a) no accessory building shall be erected within 3m of boundaries other than road boundaries, on sites less than 5000m2 (b) no crop protection structures shall be located within 3m of boundaries; (c) no building shall be erected within 12m of any road boundary with Kerikeri Road on properties with a road frontage with Kerikeri Road between its intersection with SH10 and Cannon Drive; (d) no building for residential purposes shall be erected closer than 100m from any zone boundary with the Minerals Zone; (e) no building shall be erected within the building line restriction area as marked in Appendix 6C, located immediately north of the Te Waimate Heritage Precinct. Any proposed building to be erected within this building line restriction area shall be deemed a discretionary activity and the Heritage New Zealand Pouhere Taonga will be considered an affected party to any such application made under this rule. Note: This rule does not apply to the below ground components of wastewater disposal	The mast, by virtue of its height, would be considered to be a building. It is noted that, by virtue of its proposed location, it meets these requirements.	**Permitted**

systems. However, provisions in Chapter 12.7 – Lakes Rivers Wetlands and the Coastline still apply to below ground Components of wastewater treatment systems. Attention is also drawn to the TP58 On-site Wastewater Systems: Design and Management Manual and the Regional Water and Soil Plan for Northland, as consent may be required.		
8.6.5.1.7 NOISE (a) All activities except Temporary Military Training Activities shall be so conducted as to ensure that noise from the site shall not exceed the following noise limits as measured at or within the boundary of any other site in this zone, or at any site in the Residential, Coastal Residential or Russell Township Zones, or at or within the notional boundary of any dwelling in any other rural or coastal zone: 0700 to 2200 hours 65 dBA L10 2200 to 0700 hours 45 dBA L10 and 70 dBA Lmax Exemptions: The foregoing noise limits shall not apply to airport operations at Kaitaia, Kerikeri and Kaikohe including aircraft being operated during or immediately before or after flight. For the purposes of this exemption aircraft operations shall include all aircraft activity from start up to shut down of engines. The noise limits shall also not apply to activities periodically required by normal farming and plantation forestry activities and the use of aircraft, provided that the activity shall comply with the requirements of s.16 of the Act. Noise Measurement and Assessment: Sound levels shall be measured in accordance with NZS 6801:1991 "Measurement of Sound" and assessed in accordance with NZS 6802:1991 "Assessment of Environmental Sound". The notional boundary is defined in NZS 6802:1991 "Assessment of Environmental Sound" as a line 20m from any part of any dwelling, or the legal boundary where this is closer to the dwelling. **Construction Noise:** Construction noise shall meet the limits recommended in, and shall be measured and assessed in accordance with, NZS 6803P:1984 "The Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work". (b) Noise limits for Temporary Military Training	The development will comply with these noise requirements, both during construction and operation.	**Permitted**

Activities are as follows: Time Limits (dBA) (Any Day) L10 L95 Lmax 0630 to 0730 60 45 70 0730 to 1800 75 60 90 1800 to 2000 70 55 85 2000 to 0630 55 Impulse noise resulting from the use of explosives, explosives simulators or small arms shall not exceed 122 dBC. Temporary Military Training Activities shall be conducted so as to ensure the following noise limits are not exceeded at any point within the notional boundary of any dwelling, or residential institution, or educational facility within the district.		
8.6.5.1.8 BUILDING HEIGHT The maximum height of any building shall be 12m.	At approximately 39.51m in height, the proposed works exceed this requirement. It then needs to be assessed under the Restricted Discretionary Rule, 8.6.5.1.8, listed below	**See below**
8.6.5.1.10 BUILDING COVERAGE Any new building or alteration/addition to an existing building is a permitted activity if the total Building Coverage of a site does not exceed 12.5% of the gross site area.	The proposed development would not cause the site to exceed site coverage. It is noted that the maximum permitted coverage is 47,648m² (381184 x 0.125) and the level of development currently on the site is significantly below this.	**Permitted**
8.6.5.1.11 SCALE OF ACTIVITIES	There will be no persons permanently on the site during the operation of the mast.	**Permitted**
8.6.5.3.2 BUILDING HEIGHT The maximum height of any building shall be 15m. In assessing application under this provision the Council will restrict the exercise of its discretion to: (a) the extent to which adjacent properties will be adversely affected in terms of visual domination, overshadowing, loss of privacy and loss of access to sunlight and daylight; (b) the ability to mitigate any adverse effects by way of increased separation distances between buildings or the provision of landscaping and screening.	The proposed development also exceeds the 15m requirement. It then defaults to a Discretionary Activity, as noted below.	**See below**
8.6.5.4 DISCRETIONARY ACTIVITIES An activity is a discretionary activity in the Rural	As it does not comply with the height requirements above, the development	**Discretionary Activity**

Production Zone if: (a) it complies with Rules 8.6.5.4.1 Residential Intensity; 8.6.5.4.2 Integrated Development; 8.6.5.4.3 Helicopter Landing Area and/or 8.6.5.4.4 Scale of Activities below; and (b) it complies with the relevant standards for permitted, controlled, restricted discretionary or discretionary activities set out in Part 3 of the Plan - District Wide Provisions unless it is an Integrated Development pursuant to Rule 8.6.5.4.2 below; but (c) it does not comply with one or more of the other standards for permitted, controlled or restricted discretionary activities in this zone as set out under Rules 8.6.5.1; 8.6.5.2 and 8.6.5.3 above.	is a Discretionary Activity.	
17 DESIGNATIONS AND UTILITY SERVICES		
17.2 UTILITY SERVICES		
17.2.6.1.3 ABOVE GROUND UTILITY SERVICES FOR SUPPLY OF ELECTRICITY INCLUDING LINES, STRUCTURES, AND SUPPORT STRUCTURES FOR THE TRANSFORMATION, TRANSMISSION OR DISTRIBUTION OF ELECTRICITY IN THE RURAL ENVIRONMENT In the rural environment zones, including the Waimate North Zone, but excluding areas identified as Outstanding Landscapes, Outstanding Landscape Features or Outstanding Natural Features (as shown on the Resource Maps), new lines or additions to lines (being a lineal extension of the line) for conveying electricity at a voltage up to and including 110 kV, including all support structures for those lines, is a permitted activity, and is not required to comply with the rules in Part 2 – Environment Provisions. Note: In the urban environment zones, recreation and conservation zones and coastal environment zones, and in areas identified as Outstanding Landscapes, Outstanding Landscape Features or Outstanding Natural Features (as shown on the Resource Maps) new lines or additions to lines for conveying electricity at a voltage up to and including 110 kV, including all support structures for those lines, are subject to Rule 17.2.6.4(d) Discretionary Activities.	The mast would be a standalone structure which would monitor wind in the area to determine whether the area is suitable for a wind turbine development. Given that it is a unique structure, and not explicitly tied to a clearly defined proposed development, we do not consider these rules to be applicable to the proposed development.	**See below**
17.2.6.3 RESTRICTED DISCRETIONARY ACTIVITIES An activity is a restricted discretionary activity if: (a) it does not comply with one or more of the standards for permitted activities set out in Rules	The development would be considered to be a meteorological facility, given that it is used for the monitoring of wind. It complies with all other rules above.	**Restricted Discretionary**

17.2.6.1.1 to 17.2.6.1.7; and (b) it is a lighthouse, meteorological facility, navigation aid or a beacon; and (c) it is a new line or addition to lines for conveying electricity at a voltage up to and including 110 kV, including all support structures for those lines in the Coastal Living and South Kerikeri Inlet Zones; and (d) it complies with the relevant standards for permitted, controlled or restricted discretionary activities in the zone in which it is located, set out in Part 2 of the Plan – Environment Provisions; and (e) it complies with the relevant standards for permitted, controlled or restricted discretionary activities set out in Part 3 of the Plan – District Wide Provisions. In assessing an application for a restricted discretionary activity under Rule 17.2.6.3 the Council will restrict the exercise of its discretion to: (i) the visual impact of the proposed facility, (ii) the extent to which mitigation of any adverse visual effects is possible; and (iii) the potential for minimising effects by location and/or by grouping facilities.		

4.2 Proposed District Plan Rules

It is noted that the Council is currently working through the requirements to enact a new District Plan, which is currently known as the "Proposed District Plan". As per the RMA, consideration should also be given to this plan for the determination of the overall activity status.

The site is zoned "Māori Purpose" Zone. For clarity, the entirety of the rules of the Proposed District Plan will not be replicated here. However, following rules are considered relevant to the proposal.

FAR NORTH DISTRICT PLAN COMPLIANCE ASSESSMENT – OPERATIVE DISTRICT PLAN		
RULES	**ASSESSMENT**	**RULE STATUS**
ENERGY, INFRASTRUCTURE, AND TRANSPORT		
Renewable electricity generation		
REG-R4 Temporary monitoring masts (new and upgrading) Activity status: Permitted Where: PER-1 The height of the mast does not exceed 80m. PER-2 No more than three masts are installed at any one time within a site.	The mast would be a permitted activity. It would be less than 80m, there would be only one mast, it would be removed within 5 years, and it would be setback the correct distance from the boundary of the site. Notice could be provided.	**Permitted**

PER-3 A mast must be removed within 5 years of placement and the site remediated. PER-4 The building or structure is setback at least a distance equal to the height of the mast from the boundary of any other site. PER-5 Written notice is provided to Council at least 1 month prior to the installation of the building or structure, and any subsequent relocation of any mast. The written notice shall detail the location of the activity, details of ownership and management responsibilities.		

4.3 National Environmental Standards

Upon review of the relevant National Environmental Standards, we are of the opinion that the only relevant National Environmental Standard are the National Environmental Standards for Electricity Transmission ("NES:ET") and National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES:CS)

With regards to the NES:ET, none of the associated activities with the infrastructure will be considered to be an activity that triggers the need for a consent under any of the clauses.

With regards to the NES:CS, it is noted that the land is used for rural purposes, being forestry. We do not anticipate that any of those activities noted under the HAIL have occurred within the area that the development will be constructed, nor is there any HAIL activities occurring there currently. Furthermore, we do not anticipate that any HAIL activities may have migrated to the site in sufficient enough quantity to have caused the land to be contaminated. As we could not find any evidence of a HAIL activity, we do not consider the NES:CS to be further relevant to the proposal.

4.4 Activity Status

We consider this application can be assessed as a Discretionary Activity as per the Operative District Plan. The activity is a permitted activity under the Proposed District Plan, and all relevant National Environmental Standards. Therefore, its overall activity status is a Discretionary Activity.

5.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

As a Discretionary Activity, Council can take any issues into consideration. Given the nature of the application, we have assessed the application using the following aspects.

- Visual Impact
- Noise
- Highly Productive Land
- Cultural Effects
- Geotechnical Effects
- Engineering Effects

This discussion is set out below, following a discussion of the weighting of the two District Plans.

5.1 Operative District Plan versus the Proposed District Plan

A weighting assessment for a proposed district plan is required when there's a conflict between an operative and a proposed district plan, to determine which plan should be given more weight in a resource consent decision. The weight given to a proposed plan generally increases as it progresses through the plan-making process, and it becomes more certain. This assessment is a key part of the planning decision-maker's duty to consider both plans under Section 104(1)(b) of the Resource Management Act.

In this instance, it is noted that the development would be a permitted activity under the Proposed District Plan. The majority of the Proposed District Plan has been through the hearings process, but no determination on the rules has been made as of yet. It is anticipated that the decisions on the plan will be released at some point in 2026. Therefore, while it is considered possible that the proposal will be a permitted activity soon, the proposal is still considered to be contrary to a current operative rule. As such, while the Proposed District Plan should be given weighting and considered as part of the application, consent is still required.

5.2 Visual Impact

It is firstly noted that, due to the overall height of the structure, there is potential for the development to be noticeable within the greater surrounding area. In doing so there is also potential that the visual effects of the development could be considered to be noticeable, and written approval from persons deemed to be affected may be necessary.

As part of the application, comments have been sought from a Landscape Architect. These will not be repeated in full here, but they have undertaken a comprehensive assessment of the nature of the site, the proposed development, and any actual and potential visual impact effects that will arise on both the site and the surrounding environs.

The conclusion of this report is that any adverse effects can be mitigated to a level that is less than minor. I agree with this conclusion, and as they are less than minor, then I do not believe that any persons will be affected by the proposal, including both the residents within the papakāinga development, the neighbouring properties, or the public realm. In addition, as the mast is temporary, any visual effects from the development will effectively cease upon removal of the mast. For these reasons, all actual and potential effects will be less than minor.

5.3 Noise

The development consists of a mast, and a small amount of infrastructure to support the activity. The activity would be over 300m away from the nearest dwellings, being the papakāinga housing located to the northwest. With regards to the mast structure itself it is relatively quiet, and it is anticipated that any operational noise specifically from the mast will not be perceivable within the surrounding environs. Given the degree of separation between the development, and the nearby noise-sensitive activity of the papakāinga housing, we believe that any noise generated on the site will not be noticeable. As such, the proposed development would not create any reverse-sensitivity issues due to noise generated by the development.

The noise rules pertaining to construction noise have also been discussed with the applicant, and they will be able to comply with all District Plan’s noise provisions. As such, there not be a discernible level of noise at or beyond the site. This, coupled with the activity not creating any on-site effects, means that any actual and potential effects from noise will be less than minor. Furthermore, it is also noted that any noise effects would also be temporary. Once the mast itself is removed, any supporting infrastructure will also be removed, so the entirety of the activity will be removed from the site. Therefore, any actual and potential effects will be less than minor.

5.4 Traffic Effects

At the start of construction, being within the first two weeks, there will be approximately 2 movements of one light 4WD type vehicle that will drop off materials. Once the monitoring has finished, there would be approximately one standard 4WD vehicle to the site to remove the mast. There will be some irregular vehicle movements during the monitoring phase, as the mast will be monitored remotely, and the only movements will be for maintenance over a six month period.

In terms of the impacts of these traffic movements on the amenity of other users of Potahi Road, any adverse effects will be less than minor. In this instance, it is noted that these vehicle movements would be similar in nature to trucks visiting the site to undertake forestry works. Essentially, there would be an increase in vehicle movements over a short time period, and they would then cease.

Furthermore, it is noted that Potahi Road provides a suitable level of access for vehicles to the site. There is no need to upgrade either the road or create a new vehicle crossing for the proposed development. The nature of it will allow for vehicles to visit the site safely, while also providing a suitable level of access to all users, which will mean that there will not be any significant issue from congestion. As such, we do not envision that there will be any conditions set that pertain to traffic.

5.5 Cultural Effects

It is firstly noted that this development has been undertaken through a Memorandum of Understanding with the landowner, Te Rūnanga Nui O To Aūpouri, and the eventual microgrid owner/operator, the adjacent Pōtahi marae. Furthermore, a Cultural Values Assessment has been prepared through a collaborative approach between the applicant and the mana whenua. The purpose of this report is to thoroughly assess and address all cultural impacts. The report has been included in the appendix and will not be replicated in full in this section, but it is noted that the conclusion of this report is that all cultural effects will be less than minor, provided conditions set out through the report are met. This has been agreed to by the applicant. On this basis, we are of the opinion that the proposal would have less than minor effects with regards to cultural impacts.

5.6 Geotechnical Effects

A geotechnical report has been provided as part of the application. This report was prepared by Haigh Workman, dated November 2025, and is included in the appendix. This report covers both the wind mast site, which is identified as the wind turbine site in the report, as well as a solar panel development that is proposed as part of a separate consent. The conclusion of this report was that the development can be undertaken in a safe and effective manner, provided that it met a series of recommendations. It is anticipated that these will be set as conditions of consent, as well as a general accordance condition requiring that the development be undertaken in accordance with this report. Given the above, we are of the opinion that any geotechnical effects would be less than minor.

5.7 Conditions Summary

As noted throughout this report, the proposed development is a temporary wind monitoring mast, that will be removed after 6 months. We would anticipate that a condition be set that requires the mast to be decommissioned and removed from the site within 12 months of becoming operational. This would allow a grace period to remove the mast, should any issues be encountered.

There are no other conditions that we could envision being set as part of this consent, aside from requiring the development being undertaken in accordance with the supplied information.

5.8 Summary

Based on the assessment above, we are of the opinion that any adverse effects from the proposal will be less than minor. On this basis, there are no potential parties which are deemed to be affected by the proposal.

6.0 DISTRICT PLAN OBJECTIVES AND POLICIES

As a Discretionary activity, consideration needs to be given to the relevant objectives and policies under the District Plan. The following are considered pertinent to this application, with a comment under each.

6.1 Chapter 8

The following are considered pertinent to this application, with a comment under each.

8.6.3.3 To promote the maintenance and enhancement of the amenity values of the Rural Production Zone to a level that is consistent with the productive intent of the zone.
8.6.3.6 To avoid, remedy or mitigate the actual and potential conflicts between new land use activities and existing lawfully established activities (reverse sensitivity) within the Rural Production Zone and on land use activities in neighbouring zones.
8.6.3.7 To avoid remedy or mitigate the adverse effects of incompatible use or development on natural and physical resources.
8.6.3.8 To enable the efficient establishment and operation of activities and services that have a functional need to be located in rural environments.
8.6.3.9 To enable rural production activities to be undertaken in the zone remedying or mitigating adverse environmental effects.

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

Comment
As discussed in the section above, which assesses the adverse effects of the proposal, it has been determined that the adverse effects would be less than minor. Consideration has been given to all environmental effects, including reverse sensitivity. Given the nature of the proposal, we do not envision that there would be any noticeable effects on the rural productivity of both the site, and the surrounding area.

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

Comment
As noted above in the District Plan assessment, the structure would exceed the maximum permitted heights, under both permitted activity criteria and the Restricted Discretionary activity criteria. These height rules are designed to ensure that any buildings on the site have been constructed in a manner that is anticipated for that area and would fit within the character and appearance of the zone. In this instance, the mast is significantly taller than what is expected for the area, but consideration should be given to the detailed design of the mast. It is a thin structure, which has been placed in a manner that is would not be noticeable within either the street scene or neighbouring properties. Aside from the mast, there will be guy wires as well that hold the structure in place, but these would be less notable than the mast itself. As such, we are of the opinion that the proposal is in accordance with this policy.

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

Comment
As discussed, the adverse effects of the proposal have been assessed in detail above. This includes on the maintenance and enhancement of the amenity values of the Rural Production Zone. Special consideration has been given to the surrounding environs, but also the papakāinga housing development on the site. We are of the opinion that any adverse effects will be negligible, and the site will continue to be consistent with the productive intent of the zone.

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

Comment
Based on the intended subsequent use of the mast area, which would be for providing renewable energy sources within an area that is better suited for this type of development when considered against rural production, then the development would be in accordance with this policy.

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

Comment
The wind monitoring mast would not be a conflicting land use activity. It would not generate a level or traffic, noise, or other general disturbance to the site, or the use of the surrounding properties. As such, it would be in accordance with this policy.

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

Comment
Given the negligible scale of effects from the proposal, as well as its proposed location, we do not envision any need to place the proposed infrastructure in a different location. As such, it is consistent with this policy.

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

Comment
The location of the mast has been firstly considered alongside the location of the existing papakāinga housing. It has been located far away so as to not be immediately noticeable by residents, in terms of visual outlook or noise. While the development has been sited further along Potahi Road, and there will be an increase in traffic movements while the development is being constructed, this would be temporary in nature, and would not cause any notable effects on the papakāinga housing. The same is considered applicable to the wider surrounding area as well. As such, the development would be in accordance with this policy.

6.2 Chapter 17

The following are considered pertinent to this application, with a comment under each.

Objectives

17.2.3.1 To provide for the efficient development, use, maintenance and upgrading of utility services to meet the reasonable needs of residents and businesses throughout the District while ensuring that significant adverse effects are avoided, remedied or mitigated.

17.1.3.2 To enable the operation, maintenance and upgrade of the existing National Grid while ensuring it is not compromised by incompatible activities.

17.1.3.3 To enable compatible land use activities, that can be managed to avoid compromising the operation, maintenance, and upgrading of the National Grid.

Policies

17.2.4.2 That any significant adverse effects of proposed utility services and radio communications on amenity values is avoided, remedied or mitigated.

This has been discussed in detail in the section above. The conclusion is that, due to the nature and location of the mast, any adverse effects will be negligible, subject to conditions. They can therefore be avoided, remedied and mitigated, and the development is in accordance with this policy.

17.2.4.3 That provision be made to enable new/upgraded utility services to meet growth demand

It is noted that there has been a recent impetus on providing renewable energy sources to meet the energy demands that have arisen from population growth. The mast is crucial in providing the applicant with the necessary scope to undertake a development in the future that provides power to the grid, with the onus on providing the papakāinga housing development with a much cheaper source of power. Given this, we believe that the development is in accordance with this policy.

7.0 STATUTORY MATTERS

7.1 Part 2 of the Resource Management Act 1991

Section 5 of the Act states the purpose of the Act is to "promote the sustainable management of natural and physical resources'". It goes further to state that sustainable management means "...managing the use, development and protection of natural and physical resources in a way or at a rate which enables people and communities to provide for the social, economic and cultural wellbeing…" The Act also provides for the appropriate protection of the environment by way of Section 5(2)(c) "…avoiding, remedying, or mitigating any adverse effects of activities on the environment".

It is considered that the proposed development promotes the concept of sustainable management, providing for the social and economic well-being of the community, without giving rise to any adverse effects that cannot be avoided, remedied or mitigated.

Of those matters prescribed under Section 6 of the RMA, I consider that, due to the nature of the Proposal and the characteristics of the Site, only clauses 'e' and 'f' are relevant to the determination of the Proposal. Any adverse effects relating to these clauses can be dealt with via consent conditions. For completeness, I do not consider that granting consent for the Proposal will have any influence on public access to the coastal marine area, lakes or rivers. In my opinion, the granting of the resource consent sought by the Applicant is consistent with Section 6 of the RMA. Of those matters contained within Section 7 to which particular regard must be had, it is our opinion the following are relevant to the consideration of this Proposal:

(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:
(f) maintenance and enhancement of the quality of the environment:
(i) the effects of climate change:
(j)the benefits to be derived from the use and development of renewable energy.

Our conclusion is that the proposal represents a type of development that is in accordance with the above. Consideration has been given to the principles of kaitiakitanga, as well as the ethic of stewardship. Through utilising an existing site that can easily accommodate the development without being detrimental to the overarching use of the site, then the overall impact on the land would be reduced. The proposal therefore represents an efficient use of a land resource whilst maintaining and enhancing the quality of the environment, including the amenity values of the site. The development has been determined to address the effects of climate change, by providing infrastructure that can potentially be utilised in the provision of renewable energy, and subsequently reducing demand on energy providers that create a higher carbon footprint. It follows that the granting consent for the Proposal is consistent with Section 7 of the RMA.

Furthermore, the proposal is not contrary to any of the relevant principles under the Treaty of Waitangi under section 8. In conclusion, the proposal is consistent with the RMA's sustainable management purpose. The actual effects of the proposal have been discussed in the report and overall, it is considered that the main purpose of the Resource Management Act 1991 will be met, and the effect of the proposal will be less than minor. The proposal will be consistent with the RMA's sustainable management purpose.

7.2 Section 88(2) of the Act

Section 88(2) of the Act requires an assessment of any actual and potential effects including, in accordance with the Fourth Schedule, an assessment of environmental effects in such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

An assessment of effects, corresponding to the scale and significance of the proposal has been included in the application.

7.3 Notification Assessment

There are two types of notification under the RMA, being Public Notification and Limited Notification. These are assed individually below.

7.3.1 Public Notification

Section 95A of the Act deals with requirements for the Local Authority to notify the application. Under (1) of Subsection 95A, it states that "*A consent authority must follow the steps set out in this section, in the order given, to determine whether to publicly notify an application for a resource consent*".

For Step 1, the application does not meet any of the criteria set out in subsection (3) of 95A. The applicant is not requesting that the application be publicly notified. At present, public notification is not required under Section 95C. Finally, the application has not been made jointly with an application to exchange recreation reserve land under section 15AA of the Reserves Act 1977. For Step 2, the proposal meets the criteria in subsection (5)(b)(iii). The proposal is for a Discretionary Activity, and the activity is for land use. Therefore, as per subsection 4a, Step 3 does not apply, but Step 4 is still applicable. An assessment of limited notification is below.

7.3.2 Limited Notification

Section 95B of the Act deals with an assessment as to whether limited notification of a consent application is required. This part of the Act also has several steps that a consent authority must determine the consent against. For Step 1, there are no affected protected customary rights groups or affected customary marine

title groups. The proposed activity is not on or adjacent to, nor will it affect, land that is the subject of a statutory acknowledgement made in accordance with an Act specified in Schedule 11. For Step 2, the proposal does not meet either of the criteria under subsection (6) of 95B.

For Step 3, a detailed assessment of the adverse effects of the proposal can be found in section 5. There are no persons that we consider affected by the proposal. For Step 4, there are no special circumstances that exist in relation to the application that warrant notification of the application to any other persons not already determined to be eligible for limited notification under this section.

8.0 SECTION 104 ASSESSMENT

Section 104(1) of the RMA provides that, when considering an application for resource consent, the consent authority must, subject to Part 2 of the RMA, have regard to:

- The actual and potential effects of the activity on the environment;
- Relevant plan and policy statement provisions; and
- Any other matter the consent authority considers relevant and reasonably necessary to determine the application.

This section assesses the proposal against these relevant matters. It also briefly addresses the other potentially relevant factors listed in the remainder of section 104 and concludes with an assessment considering the Purpose and Principles of the Act in Part 2 of the RMA.

8.1 Section 104(1)(a)

Section 104(1)(a) requires the consent authority to have regard to any actual and potential effects on the environment of allowing the activity. This has been discussed above.

8.2 Section 104(1)(b)

Section 104(1)(a) requires the consent authority to have regard to any actual and potential effects on the environment of allowing the activity. This has been discussed above.

Section 104(1)(b) requires the consent authority to have regard to any relevant provisions of:

- A national environmental standard;
- Other regulations;
- A national policy statement;
- A New Zealand Coastal Policy Statement;
- An operative or proposed regional policy statement; and
- Relevant operative or proposed plans.

The relevant statutory documents containing the relevant provisions are:

- National Policy Statement for Renewable Electricity Generation 2011 (NPSREG)
- Climate Change Climate Change Response (Zero Carbon) Amendment Act
- New Zealand's missions Reduction Plan
- National Environmental Standards for Electricity Transmission Activities
- National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health
- Northland Regional Plans;
- Far North District Plan

With regards to the national documents, we have mostly assessed the proposal against these documents throughout this report and determined that the development is in general accordance with the above.

Included below is an assessment with regards to the National Policy Statements for Renewable Electricity Generation, and the Electrical Transmission.

8.2.1 National Policy Statement for Renewable Electricity Generation

The National Policy Statement for Renewable Electricity Generation 2011 (NPS-REG) came into effect on 13th May 2011, and the primary intention of this document is promoting renewable energy developments. To do so, the NPS REG sets out an objective and policies to enable the sustainable management of renewable electricity generation as under the RMA.

Under this document, it is noted that the stated matters of national are:
a. the need to develop, operate, maintain and upgrade renewable electricity generation activities throughout New Zealand; and
b. the benefits of renewable electricity generation.

In this document, it is also noted that the single objective is:

To recognise the national significance of renewable electricity generation activities by providing for the development, operation, maintenance and upgrading of new and existing renewable electricity generation activities, such that the proportion of New Zealand's electricity generated from renewable energy sources increases to a level that meets or exceeds the New Zealand Government's national target for renewable electricity generation.

The NPS REG seeks to achieve the objective through a range of policies. The following are considered to be directly relevant to this proposal:

a. Recognising the benefits of renewable electricity generation activities.
b. Acknowledging the practical implications of achieving New Zealand's target for electricity generation from renewable resources.
c. Acknowledging the practical constraints associated with the development, operation, maintenance and upgrading of new and existing renewable electricity generation activities.

In general, the proposal is in general accordance with the NPS-REG. It is noted that Policy A states that *"decision-makers shall recognise and provide for the national significance of renewable electricity generation activities"*. By virtue of the mast essentially being the first step in the provision of a renewable energy source, his application therefore is considered to be providing benefits through positive effects which are of national significance. This policy states these positive effects include

- *"…maintaining or increasing electricity generation capacity while avoiding greenhouse gas emission",*
- *"…maintaining or increasing security of electricity supply at local, regional and national levels"*,
- *"…using renewable resources rather than finite resources"*,
- *"…the reversibility of adverse effects on the environment"*,
- *"…avoiding reliance on imported fuels for the purposes of generating electricity"*.

Given that the proposal would be providing all of the above, we are of the opinion that it is in accordance with this Policy.

Policy B recognises that there is an importance of retaining existing renewable electricity generation activities in order to achieve national targets for the generation of electricity from renewable sources. While

there are currently none within this part of the site, the NPS-REG also notes that there would need to be significant development of renewable electricity generation in order to meet those targets. The mast could create a renewable energy source development, while being designed in a way to be easily operated and maintained, and therefore in accordance with Policy B.

Policy C1 recognises the practical constraints of operating, maintaining and upgrading renewable electricity generation activities, as well as the need to locate the activity where the resource is readily available. It also identified that the development should be undertaken with the utilisation of existing infrastructure, and the need to connect renewable electricity generation activities to the national grid. The location of the proposed mast, and potential turbine, was determined based on the ideal combination of readily available land, located in close proximity to a development, and which would not create any form of noticeable effect on either the site or the surrounding environs. The site, located within the outskirts of Te Kao, but on a site that has been developed, would also have a relatively easy ability to connect to the existing infrastructure. Given the nature of the surrounding developments, it is located in an appropriate location for renewable energy activities, and, on balance, the positive effects would be substantially more than any adverse actual and potential effects that have been assessed through this application.

Finally, Policy C2 states *"When considering any residual environmental effects of renewable electricity generation activities that cannot be avoided, remedied or mitigated, decision-makers shall have regard to offsetting measures or environmental compensation including measures or compensation which benefit the local environment and community affected".* A comprehensive assessment of the adverse effects has been included through this report and supported by the attached documents. In general, there are no effects that require any substantial form of offsetting or compensation with respect to the proposed development.

Given the above, it is therefore concluded that the proposal is consistent with the objective and all relevant policies of the NPS-REG.

8.2.2 National Policy Statement for Electrical Transmission

The National Policy Statement on Electricity Transmission (NPS-ET) came into force on the 13th of March 2008. This document sets out the objective and policies for managing the electricity transmission network. This includes the provision of guidance across New Zealand for the ongoing management, as well as future planning, of the national grid.

There is one objective, which is as follows:

To recognise the national significance of the electricity transmission network by facilitating the operation, maintenance and upgrade of the existing transmission network and the establishment of new transmission resources to meet the needs of present and future
generations, while:

- *managing the adverse environmental effects of the network; and*
- *managing the adverse effects of other activities on the network.*

In terms of policies, the relevant ones are as follows, with a comment under each

Policy 1
In achieving the purpose of the Act, decision-makers must recognise and provide for the national, regional and local benefits of sustainable, secure and efficient electricity transmission. The benefits relevant to any particular project or development of the electricity transmission network may include:
i) maintained or improved security of supply of electricity; or
ii) efficient transfer of energy through a reduction of transmission losses; or

iii) the facilitation of the use and development of new electricity generation, including renewable generation which assists in the management of the effects of climate change; or
iv) enhanced supply of electricity through the removal of points of congestion.

The above list of benefits is not intended to be exhaustive and a particular policy, plan, project or development may have or recognise other benefits.

The proposal would potentially provide a secure increase in the supply of electricity. It would also include the development of new electricity generation, which is renewable and assists in the management of renewable generation.

Policy 2
In achieving the purpose of the Act, decision-makers must recognise and provide for the effective operation, maintenance, upgrading and development of the electricity transmission network.

Should the mast return favourable results, then any subsequent turbine proposal could be an effective development that aids the existing electricity transmission network.

Policy 3
When considering measures to avoid, remedy or mitigate adverse environmental effects of transmission activities, decision-makers must consider the constraints imposed on achieving those measures by the technical and operational requirements of the network.

This has been considered through the report.

Policy 4
When considering the environmental effects of new transmission infrastructure or major upgrades of existing transmission infrastructure, decision-makers must have regard to the extent to which any adverse effects have been avoided, remedied or mitigated by the route, site and method selection.

The site has been chosen on the basis that it is located within close proximity to development, but still in a location that would not create any noticeable adverse effects on the area. Regardless, it is also noted that any future development would still need to be assessed against this policy.

Policy 7
Planning and development of the transmission system should minimise adverse effects on urban amenity and avoid adverse effects on town centres and areas of high recreational value or amenity and existing sensitive activities.

The development has been designed to reduce any effects on the surrounding area to a level that is less than minor. As such, it is in accordance with this policy.

Policy 8
In rural environments, planning and development of the transmission system should seek to avoid adverse effects on outstanding natural landscapes, areas of high natural character and areas of high recreation value and amenity and existing sensitive activities.

The development, with particular regards to the landscape report, has been designed to reduce any effects on the surrounding area to a level that is less than minor. As such, it is in accordance with this policy.

Policy 9

Provisions dealing with electric and magnetic fields associated with the electricity transmission network must be based on the International Commission on Non-ioninsing Radiation Protection Guidelines for limiting exposure to time varying electric magnetic fields (up to 300 GHz) (Health Physics, 1998, 74(4): 494-522) and recommendations from the World Health Organisation monograph Environment Health Criteria (No 238, June 2007) or revisions thereof and any applicable New Zealand standards or national environmental standards.

This is noted.

In summary, the proposed development is in accordance with the NPS-ET.

8.2.3 Other Documents

In terms of the Northland Regional Plans, including the Proposed Regional Plan, we have determined that the proposal will be a permitted activity under this document. Specifically, it will not exceed the maximum permitted earthworks volume, nor will it involve the discharge of stormwater or contamination to anywhere else. All stormwater will be retained on-site. As such, consent is not being sought from the regional authority alongside this application.

The only document which triggers the need for a resource consent is the Far North Operative District Plan, which has been assessed throughout this document.

8.3 Section 104B

The following is found under Section 104B of the RMA.

After considering an application for a resource consent for a discretionary activity or non-complying activity, a consent authority—
(a) may grant or refuse the application; and
(b) if it grants the application, may impose conditions under section 108.

In this instance, we have demonstrated how the positive effects significantly outweigh the adverse effects of the development. As such, we are of the opinion that, on balance, the proposal will be acceptable. Therefore, for the purposes of the substantial planning assessment, we are of the opinion that the application can be deemed to be suitable and can be granted by the Council under delegated authority.

9.0 CONCLUSION

The proposed works will generate a level of adverse effects that will be less than minor. In terms of positive effects, it will be providing a structure that may lead to a permanent renewable and sustainable power supply, which will benefit developments within the larger site, as well as the surrounding power network. For these reasons, we believe that Far North District Council can process the consent without notification, and issue a decision that permits the development, subject to conditions.

Report prepared by

Sam Hurley
Director

APPENDIX 1: SCHEME PLANS

APPENDIX 2: CERTIFCATE OF TITLE

APPENDIX 3: LANDSCAPE REPORT

APPENDIX 4: CULTURAL VALUES ASSESSMENT

APPENDIX 5: ENGINEERING DOCUMENTATION

RECORD OF TITLE
UNDER LAND TRANSFER ACT 2017
FREEHOLD

Search Copy

R.W. Muir
Registrar-General
of Land

Identifier **419221**

Land Registration District **North Auckland**

Date Issued 15 April 2008

Prior References
NA108D/387

Estate Fee Simple

Area 38.1184 hectares more or less

Legal Description Part Te Kao 71D Residue Block and Part Te Kao 71D Residue Block

Registered Owners

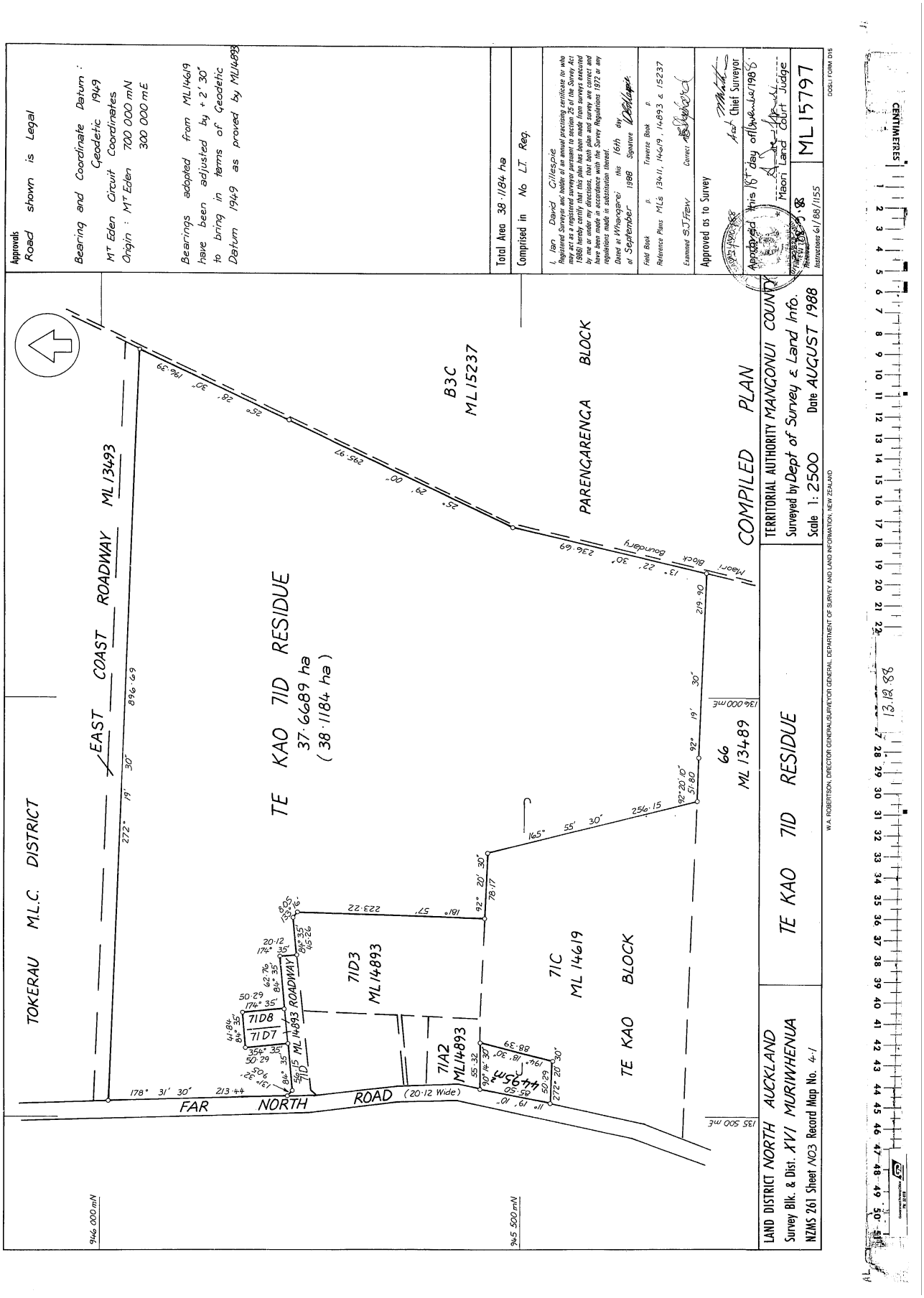
Te Runanga Nui O To Aupouri

Interests

7784050.1 Status Order determining the status of the within land to be Maori Freehold Land - 15.4.2008 at 9:00 am

9097390.1 Notice pursuant to Section 195(2) Climate Change Response Act 2002 - 15.6.2012 at 10:50 am (affects Part Te Kao 71D Residue Block)

10007261.1 Forestry Right pursuant to the Forestry Rights Registration Act 1983 to Summit Forests New Zealand Limited - 3.8.2015 at 2:50 pm


Approvals
Road shown is Legal
Bearing and Coordinate Datum : Geodetic 1949
MT Eden Circuit Coordinates
Origin : MT Eden 700 000 mN
300 000 mE
Bearings adopted from ML14619 have been adjusted by + 2' 30" to bring in terms of Geodetic Datum 1949 as proved by ML14893
Total Area 38·1184 ha
Comprised in No LT Req.
I, Ian David Gillespie
Registered Surveyor and holder of an annual practising certificate (or who may act as a registered surveyor pursuant to section 25 of the Survey Act 1986) hereby certify that this plan has been made from surveys executed by me or under my directions, that both plan and survey are correct and have been made in accordance with the Survey Regulations 1972 or any regulations made in substitution thereof.
Dated at Whangarei this 16th day of September 1988 Signature
Field Book P. Traverse Book P.
Reference Plans MLs 13411, 14619, 14893 & 15237
Examined S.J.Frew Correct
Approved as to Survey
Approved this 16th day of June 1988
Chief Surveyor
Maori Land Court Judge
Deposited 16.6.88
Instruments 61/88/1155
ML 15797
DOSLI FORM D15
TOKERAU M.L.C. DISTRICT
EAST COAST ROADWAY ML 13493
TE KAO 71D RESIDUE
37·6689 ha
(38·1184 ha)
B3C ML15237
PARENGARENGA BLOCK
COMPILED PLAN
Maori Block Boundary
66 ML 13489
71D8
71D7
71D5
ML 14893 ROADWAY
71D3 ML14893
71A2 ML14893
71C ML 14619
TE KAO BLOCK
FAR NORTH ROAD (20·12 Wide)
TE KAO 71D RESIDUE
TERRITORIAL AUTHORITY MANGONUI COUNTY
Surveyed by Dept of Survey & Land Info.
Scale 1: 2500 Date AUGUST 1988
W.A. ROBERTSON, DIRECTOR GENERAL/SURVEYOR GENERAL, DEPARTMENT OF SURVEY AND LAND INFORMATION, NEW ZEALAND
LAND DISTRICT NORTH AUCKLAND
Survey Blk. & Dist. XVI MURIWHENUA
NZMS 261 Sheet NO3 Record Map No. 4-1
946 000 mN
945 500 mN
136 000 mE
135 500 mE
CENTIMETRES

Report on Maori Land details for the following Record(s) of Title

Record(s) of Title

419221	Identified as potentially Maori Freehold Land

***** End of Report *****


Papakainga
Transformer
Cable to transformer
Draft microgrid layout
DP
DP
DP
Battery site
Possible wind turbine site
Wind monitoring site

Cultural Values Assessment – Te Kao Microgrid Renewable Energy Project

1. Introduction / Kupu Whakataki

This Cultural Values Assessment (CVA) has been prepared to support the assessment of the Te Kao Microgrid Renewable Energy Project, a community-centred initiative designed to improve energy resilience, sustainability, and autonomy for Te Kao. The project integrates solar generation, a small wind turbine, battery energy storage, and associated underground cabling. A temporary wind mast has been included as enabling infrastructure to confirm wind characteristics and inform long-term renewable planning.

This CVA acknowledges the central role of Te Rūnanga Nui o Te Aupōuri as a key protector of Te Aupōuri's mana whenua for the Te Kao landscape and across the Aupōuri peninsula. This document's intent is to provide cultural analysis, narrative foundations, and planning context. Expressions of mātauranga ā-iwi, cultural narratives, values, concerns, aspirations, and tikanga-based guidance have been undertaken in consultation with Te Aupōuri direct input.

The purpose of this CVA is twofold:

- To ensure cultural values are recognised and given effect within the resource consent process.
- To work with Te Rūnanga Nui o Te Aupōuri on shaping the CVA through kōrero, wānanga, and lived experience.

In undertaking this assessment, we acknowledge that the whenua, moana, repo, ngahere, and hau of Te Kao form part of a living cultural landscape shaped by generations of Te Aupōuri. This CVA reflects an intention to uphold mana whenua, give weight to tikanga, and recognise the cultural, environmental, and intergenerational considerations essential to evaluating the microgrid proposal.

1.5: TMRE's Approach / Te Ahurea o TMRE

This Cultural Values Assessment has been prepared by Tū Mai Rā Energy (TMRE), a boutique renewable energy provider that operates from a Te Ao Māori foundation. We believe it is important for Te Aupōuri to understand who we are and how we approach our work before engaging with this assessment.

Tū Mai Rā - Stand Before the Sun

Our name, Tū Mai Rā, means "stand before the sun" and reflects our foundational belief that renewable energy development is about partnership with natural forces, not extraction from them. We draw inspiration from the story of Māui taming the sun for the benefit of all people, and we seek to honour that tradition through our work.

Working in Partnership with Atua

TMRE recognises and works alongside three atua whose domains intersect with renewable energy:

Tama-nui-te-rā - Atua associated with the sun

- We approach solar energy as a gift from Tama-nui-te-rā, not a resource to exploit
- Our design decisions consider how to honour this gift while serving community needs
- We acknowledge that the sun's energy is not ours to take, but to receive respectfully

Tāwhirimātea - Atua of winds and storms

- Our wind energy work recognises Tāwhirimātea's authority over weather and wind patterns
- We design systems that work with natural variability, not against it
- We acknowledge that wind energy is subject to Tāwhirimātea's moods and conditions

Rūaumoko - Atua of earthquakes, volcanoes, and the rumblings of the earth

- During earthworks, we acknowledge Rūaumoko's domain
- We approach land disturbance with humility and respect for the earth's power
- We recognise our responsibility to minimise harm to the mauri of the land

Cultural Practices in Our Work

These are not just poetic references - they guide our actual practice:

Karakia - We endeavour to conduct karakia at key moments in every project:

- Upon first arriving at a site, to announce our presence to the mauri of the place
- Before beginning earthworks or construction
- At project commissioning
- When work is complete

Tikanga-guided decision-making - When faced with design or operational decisions, we ask:

- Does this honour the mauri of this place?
- What does this installation give back?
- Are we being guided by manaakitanga (care) or just efficiency?
- How will this affect future generations?

Ongoing relationship with place - We view projects as long-term relationships (25+ years), not one-time transactions. This means:

- Monitoring for environmental and cultural impacts, not just system performance
- Commitment to proper decommissioning and site restoration
- Accountability to both technical and cultural outcomes

Our Role in This Assessment

TMRE approaches this Cultural Values Assessment with clear understanding of our role and our limits:

What we bring:

- Technical expertise in renewable energy design and installation
- Experience working respectfully on culturally significant sites
- Commitment to genuine partnership and co-governance
- Our own cultural framework and practices

What we cannot and do not claim:

- To speak for Te Aupōuri or define their cultural values
- To determine what is culturally appropriate on their whenua
- To assess cultural effects without iwi guidance
- To know the mātauranga, tikanga, or stories of this place

Our intention: This document provides a structural framework and technical/planning context. However, **only Te Aupōuri can provide the cultural substance, assessment, and direction.** We have prepared this draft to support their process, not to predetermine their conclusions.

We acknowledge Te Rūnanga Nui o Te Aupōuri as mana whenua and commit to operating under their tikanga guidance throughout this project. If the project does not align with Te Aupōuri's values and aspirations, we will not proceed.

2. Methodology / Tikanga Arotake

This CVA draws from a multi-layered methodology combining cultural narrative development, planning assessment, environmental analysis, and a tikanga-aligned approach informed by Te Ao Māori.

Key methodological components include:

- Review of foundational information, including Te Aupōuri Iwi – History, Tradition and Culture; the Te Kao site plan; the draft Hurley Planning land use consent application (LUC25003 – Wind Mast); and available policy documents relevant to renewable energy activities in Te Hiku.
- Adaptation of a proven CVA structure, modelled on the detailed approach used in the Rangitāne o Tamaki nui-ā-Rua CVA, but tailored to the identity, tikanga, and landscape of Te Aupōuri.
- Cultural landscape analysis, considering the physical and intangible attributes of Te Kao — including papakāinga, Pōtahi Marae, repo/wetlands, historical pathways, and ecological features.
- Statutory and planning review, including relevant provisions of the Resource Management Act 1991, Te Tiriti o Waitangi principles, National Policy Statements, and the Far North District Plan and Proposed District Plan.
- Recognition of limitations, noting that Te Aupōuri has not yet provided project-specific cultural feedback. All cultural interpretations in this draft are provisional placeholders based on publicly available information and general Te Ao Māori principles. They are NOT statements of Te Aupōuri's actual cultural position and can be replaced entirely by iwi-led content.

The methodology aligns with principles of partnership, protection, and participation, recognising that the assessment of cultural effects is most robust when co-authored with iwi. This draft provides a foundation onto which the rūnanga can add context-rich knowledge, mātauranga tuku iho, and cultural interpretation.

3. Project Description / Whakamārama Kaupapa

The Te Kao Microgrid Renewable Energy Project represents a strategic investment in community resilience, sustainability, and energy sovereignty. TMRE approaches this project as an expression of working alongside Tāwhirimātea (atua of winds) and Tama-nui-te-rā (atua of the sun) to support the community's energy sovereignty and resilience. The project proposes a hybrid renewable energy system designed to reduce dependence on the national grid, improve reliability during outages, and support the long-term aspirations of Te Aupōuri and the Te Kao

community.

Overall System Components:

- Solar generation - installed on a prepared platform area, providing year-round daytime energy supply.
- Wind generation - enabled through both a temporary wind mast and proposed long-term turbine, offering complementary energy production particularly in winter months.
- Battery energy storage system (BESS) - enabling local load balancing, outage resilience, and improved energy autonomy.
- Underground cabling - connecting the renewable energy system to the existing transformer and papakāinga infrastructure.

Site Context:
The project area sits inland from Pōtahi Road, approximately 300–400 metres west of the Te Kao papakāinga. The site features regenerating shrublands, historical forestry clearance areas, patches of wetland, and gentle sand-based topography typical of Te Hiku landscapes. The proposed platform areas are located to avoid significant ecological features where possible.

Construction Requirements:
Earthworks will be modest and primarily involve levelling, minor cut-and-fill, and installation of poles, batteries, and solar arrays. All construction timing, methods, and protocols will be determined in partnership with Te Aupōuri cultural monitors, respecting seasons, weather patterns, and tikanga.

This integrated renewable system is intended to serve as a model for community-based energy systems across Māori communities, aligning with long-term aspirations for environmental care, economic resilience, and sustainable development.

4. Te Aupōuri History, Identity and Rohe / Te Hītori me te Tuakiri o Te Aupōuri [This section to be completed by Te Aupōuri]

Te Aupōuri's history, identity, and connection to this rohe can only be properly articulated by the iwi themselves. This section is reserved for Te Rūnanga Nui o Te Aupōuri to provide their own narrative, including:

Historical narrative:

Te Aupōuri are one of the five iwi of Muriwhenua, also known as Te Hiku o te Ika a Māui, the Far North of Aotearoa.

The people of Te Aupōuri share a number of well known ancestors with wider Muriwhenua including:

Kupe of the Mata-whao-rua canoe and Te Ngaki of the Tāwhiri-rangi canoe;
Nukutawhiti of the Ngā-toki-mata-whao-rua canoe;
Ruanui-a-Tāne of the Māmari canoe and his wife Manawa-a-rangi;
Whakatau of the Mahuhu-ki-te-rangi canoe;
Pō-hurihanga of the Kurahaupō canoe and his wife Maieke;
Tū-moana of the Tinana canoe and his wives Pare-waha-ariki and Kahukura-ariki;
Te Parata of the Māmaru canoe and his wife Kahu-tia-nui;
Tōhē and Te Kura-a-rangi;
Tū-mata-hina and Tangi-rere;
Rāhiri, Āhua-iti and Whakaruru;
Ue-oneone and Rei-tū;
Kai-rewa and Wai-miri-rangi;
Toa-kai, Tū-kotia and Tara-whati;
Hāiti-tai-marangai and Puna;
Tū-whakatere,Tū-te-rangi-a-tohia and Tū-poia; and
Moko-hōrea and Uru-te-kawa.

From these ancestors descend two families from which Te Aupōuri as an independent iwi trace our descent.

Firstly, the family of Mōre Te Korohunga and Te Awa. Mōre Te Korohunga was from Ngāti Ruanui and his wife Te Awa was from Muriwhenua. Their family were originally known as Ngāti Te Awa (the descendants of Te Awa).

Secondly, the family of Te Ihupango and Te Amongaariki II, who had two daughters - Tihe and Kohine. Te Amongaariki II is especially important to Te Aupōuri being the principal ancestress of the Te Kao lands and the southern Pārengarenga Harbour.

The name 'Te Aupōuri' came about from an event in the time of Mōre Te Korohunga and Te Awa's children - Kupe, Whēru, Te Ikanui, Te Kakati and Te Uruhāpainga. One day, following the murder of Kupe, and her brother’s revenge, Ngāti Te Awa were besieged in Makora Pā. Finally, Ngāti Te Awa lit a huge fire covering the Whangapē Harbour with thick dark smoke. They managed to escape north across the harbour in the midst of the dense smoke to their mother’s lands further north. Hence the name Te Aupōuri (au = smoke or current, pōuri = dark).

Contemporary identity:

Te Aupōuritanga today means all descendants of More Te Korohunga and Te Awa. Mainly the descendants of their two sons, Wheeru and Te Ikanui.

Te Aupōuri in Te Kao connect mainly to Te Ikanui but it is also common to have connections to both tupuna.

For the descendants of Te Ikanui, Te Kao is our haukāinga. Our total area of interest spans from Waipapakauri to Te Rerenga Wairua, around to the Murimotu and then down to Houhora on the East Coast. This also includes the outer islands of Manawatāwhi (Three Kings) and Rangitahua (Kermadecs).

We invest actively in the cultural vitality, transmitting our reo and tikanga through wānanga and creating resources for our people.

Our aspiration is for Te Kao to be a resilient and safe place for all our haukāinga, where they can live in a state of cultural wealth and sovereignty.

Power security and power sovereignty is a key part to unlocking this aspiration, hence the crucial value of this project. It is not practical nor effective for us to rely on centralized grid systems for power and water, creating our own community system is key to ensuring we are safe and secure.

Connection to Te Kao:

Te Kao is the center of our kāinga. The whenua on both sides of Te Awapoka was once covered in kūmara cultivations. Our tupuna would preserve the kūmara by steaming and drying it in the sun. This kai was called ‘kao’ and was once a staple of the Aupōuri diet, hence the name Te Kao given to our home.

Te Kao is also seen as a final bastion of Te Aupōuri, having lost a considerable amount of our land rights to the south of the Aupōuri Peninsula (Rarawa, Ōtaipango, Houhora) through fraudulent land transactions with the settlers. And then also losing a considerable amount to the very Far North through Crown-led land grabs, resulting in most of our whenua to the North being locked in the conservation estate.

Pōtahi marae is the sole marae of Te Aupōuri ki Te Kao. All descendants connect to the tupuna within the whare hui, Waimirirangi and her daughter Haerekiterā both being honoured as the face of the whare. Although most of them have passed on, the walls hold the mana and tapu of our kuia and kaumātua, our mātua tupuna.

The land at and surrounding Pōtahi now acts as a hub for our whānau and for the wider iwi as it includes our marae, our papakāinga, our sports club, and access to a significant portion of our coastline to the East, Tokerau.

Relationship to this project:

Creating, utilising and maintaining renewable and sustainable sources of energy, water, and kai for our iwi is a critical part of our strategic objectives. To speak of kaitiakitanga and to practice it is vastly different. This project enables and empowers Te Aupōuri to actively practice our kaitiakitanga in the way we sustain our lives within our kāinga, by creating an environmentally

sustainable alternative to power generation, and a source that is and resilient and less susceptible to local and regional grid failures caused by extreme weather events. This means we look after our taiao, as well as providing power safety for our people.

For planning context only: Publicly available information describes Te Aupōuri as one of the iwi of Te Hiku o Te Ika, with rohe extending across the northernmost peninsula of Aotearoa. Te Kao and Pōtahi Marae are identified as significant cultural centers. A Treaty settlement was reached in 2012. However, TMRE defers entirely to Te Aupōuri to provide the historical and cultural narrative they consider appropriate for this assessment.

5. Cultural Landscape Context / Te Horopaki Ahurea o te Whenua

The cultural landscape of Te Kao can only be properly described and interpreted by Te Aupōuri as mana whenua. This section is reserved for Te Aupoūri description of:

Physical and spiritual landscape:

> The Aupōuri peninsula is surrounded by the moana. Te Moananui a Kiwa to the East, and Te Moana Tāpokopoko a Tāwhaki to the West. These two seas collide at our most spiritually significant headland, Te Rerenga Wairua, and the collision of these two seas is referred to as Te Tai-i-Whatia. Te Rerenga Wairua is also the extreme end of Te Ara Wairua which is the spiritual pathway our tupuna pursue from the South end of Te Oneroa a Tōhē, up to Te Rerenga Wairua, over to Manawatāwhi which we believe is the launch pad to Hawaiki.
>
> We have always been a coastal people. Our landscape is relatively flat and the narrowest part of our peninsula is only 6km from the East to the West. This means that we have access to miles of coastline, as well as the Pārengarrenga harbour, this is reflected in the Aupōuri diet which included mostly kaimoana. However, the landscape of our home is highly susceptible to wind from all directions, and the quality of the soil has very high contents of sand and clay. This provided challenges which our tupuna adapted to.

Cultural sites and features, historical land use:

The name Pōtahi holds many layers of history. Pōtahi was an ancestor, daughter of Te Makotahi, sister of Te Houtaewa, a renowned toa within Aupōuri history. She was known for holding and protecting Te Houtaewa's battle axe, Tūnuiārangi, before he made his last stand against Ngāpuhi warrior Kīroa at Houhora.

Pōtahi is also the name of one of our ancient urupā which sits on the bank of Te Awapoka.

The hill across from the marae where the papakāinga stands is also Pōtahi. One of the origins of the name came from our tupuna laying kōiwi up on that hill before they were either buried or taken to a sacred cave. The kōiwi would lay there for one night, Pō (night) Tahi (one) – hence the name Pōtahi.

We now know Pōtahi as the marae, including the papakāinga and the surrounding area to that side of SH1.

Contemporary relationships:

- How Te Aupōuri and Te Kao community interact with this landscape today
- Current land uses and activities
- Aspirations for the future of this whenua
- How this project site fits within the broader cultural landscape

The wider whenua is a hub for our community. The marae, the papakāinga, and the sports club. This place is populated and frequented by Te Aupōuri people, connecting and nurturing our Aupōuritanga.

The specific designated area for this project has had very minimal practical use in the last few decades. That part of the block has been an access-way from Pōtahi Rd out to the East Coast, either side of the road has been covered in scrub and slash with no valuable utilization. This project provides practical and valuable use of land that is otherwise marginal.

Cultural values specific to this place:

The designated area is culturally rated in a way that allows for projects of this nature to take place on the whenua, for the benefit of the community. For wider context, nearby we have our septic field for the papakāinga, the local refuse station is also on the other side. Pōtahi overall is a cultural keystone for us, however, we take the pragmatic view that the designated area for the project is low-risk from a cultural perspective, therefore this type of project is appropriate and can be managed safely, through our constant guidance.

Physical context for planning purposes: The proposed renewable energy site is located approximately 300-400m east of Te Kao papakāinga, inland from Pōtahi Road. The site features regenerating shrublands, wetland patches, areas of historical forestry activity, and gentle sand-based topography. The broader landscape includes coastal dune systems, Pārengarenga Harbour to the north, and Te Oneroa-a-Tōhē to the west. Site layout, structure placement, and design details will be guided by Te Aupōuri's cultural landscape knowledge and requirements.

6. Cultural Values Framework / Ngā Uara Māori

This framework sets out the cultural values relevant to assessing the microgrid project. These values are distilled from Te Ao Māori principles, environmental ethics, historic narratives, and contemporary iwi aspirations.

These values are offered as a starting framework based on common Te Ao Māori principles. Te Aupōuri may prioritise, expand, or reframe these values according to their specific tikanga and mātauranga.

- Whakapapa – genealogical connections among land, waters, people, and atua.
- Kaitiakitanga – responsibilities of guardianship, sustainable stewardship, and long-term care.

- Wairuatanga – spiritual dimensions of place, including connections to ancestors and metaphysical states.
- Mauri – the life force or intrinsic vitality of natural and cultural elements.
- Mana Whenua – authority derived from ancestral occupation and enduring relationships to place.
- Whanaungatanga – relationships between people, environment, and community networks.
- Rangatiratanga – rights to self-determination, decision-making, and governance over resources.
- Tikanga – customary practices that guide appropriate conduct.
- Noa and Tapu – balance between sacred and everyday states, particularly during land disturbance activities.
- Toiora – wellbeing across generations.

7. Statutory & Planning Context / Te Horopaki Ture

This section outlines the statutory and planning framework that guides assessment of the microgrid project. While planning frameworks guide the consent process, Te Aupōuri's cultural assessment carries equal or greater weight in determining appropriateness.

The Renewable Energy Project—comprised of solar, wind, battery, cabling, and wind mast components—must align with the Resource Management Act 1991, National Policy Statements, regional planning instruments, and district plan provisions.

Key frameworks include: RMA Part 2 (sustainable management and Treaty principles), NPS-REG (providing for renewable energy development), NPS-ETC (electricity transmission considerations), NES-CS (contaminated land), and the Northland Regional Plan. The Far North District Plan and Proposed District Plan provide rules concerning renewable generation, land use, earthworks, noise, indigenous vegetation, and cultural/heritage overlays.

The LUC25003 draft land use consent application offers technical verification of activity statuses, rule compliance, and assessment criteria for the wind mast component. This CVA integrates those assessments to ensure cultural effects are considered alongside environmental and planning requirements.

7.1 Planning Rules Summary Table

Instrument	Relevant Provisions	Relevance to Project
RMA 1991	Part 2, Sections 6–8	Sets overarching framework including Treaty principles.
NPS-REG	Objective & Policies	Supports renewable energy development with cultural considerations.

FNDC District Plan	Energy, Earthworks, Indigenous Vegetation Rules	Controls land disturbance and structures.
FNDC Proposed Plan	Cultural Landscapes, Renewable Energy Rules	Recognises Māori cultural landscapes explicitly.

8. Assessment of Cultural Effects / Arotake Pānga Ahurea

The following categories of potential cultural effects have been identified for Te Aupōuri's consideration and assessment. For each category, TMRE has described potential impacts from a technical perspective, but only Te Aupōuri can assess the cultural significance and severity of these effects.

8.1 Effects on Mauri

Potential impacts identified:

- Land disturbance through earthworks (cut and fill, pole installation)
- Installation of structures (solar arrays, wind turbine, battery storage, underground cables)
- Potential changes to water flow or drainage patterns in repo areas
- Introduction of non-natural materials and structures into the landscape
- Construction activities including machinery, vehicles, and human presence

Questions for Te Aupōuri:

- How would you assess the potential effects on the mauri of this whenua?
- Are there specific areas where mauri is particularly sensitive or vulnerable?
- What measures would protect or restore mauri during and after construction?
- Are there times when the mauri is more vulnerable (seasonal, weather-related)?
- What would indicate that mauri has been harmed, and how would we know if restoration is successful?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = low

Overall risk = low

Proposed mitigation measures:

- Work closely with developers in project planning and delivery to ensure all developments are culturally aware, necessary and practically implemented.
- Constant monitoring of development, timely communication between parties and timely responses from the Rūnanga to any unforeseen cultural events

Effect rating: Negligible

8.2 Effects on Wairuatanga

Potential impacts identified:

- Visual changes to the landscape when viewed from papakāinga, marae, or other significant viewpoints
- Presence of modern structures in what may be a spiritually significant area
- Potential disturbance of spiritual connections between people and place
- Changes to how the landscape is experienced and felt
- Night-time changes (lighting if any, visual presence)

Questions for Te Aupōuri:

- Does this area have particular wairua significance?
- Are there specific viewsheds or sightlines that are culturally important?
- How might the presence of renewable energy infrastructure affect spiritual connections?
- Are there design modifications (placement, height, color, screening) that would reduce wairua impacts?
- Are there places where structures should definitely not be located?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = low

Overall risk = low

Slight risk here of the community perceiving the new structure, and any potential disturbance it may bring (view, noise etc.)

Proposed mitigation measures:

- Complete thorough assessment of visual and sound impact of the new structures and ensure that decision-making aligns with tolerable and satisfactory levels of change
- Communication strategy to be led out by TRNOTA and Pōtahi marae to mitigate risks within our whānau

Effect rating: less than minor, provided conditions are adhered to

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8.3 Effects on Whakapapa

Potential impacts identified:

- Potential removal or disturbance of indigenous vegetation
- Changes to ecological relationships and habitat networks
- Potential impacts on native species (flora and fauna)
- Disruption of relationships between land, water, and living things
- Introduction of structures that may affect how whakapapa is understood or expressed

Questions for Te Aupōuri:

- How does Te Aupōuri understand whakapapa relationships in this landscape?
- Are there specific species or ecological features that are particularly significant?
- How important is the existing vegetation and habitat?
- What role does biodiversity play in maintaining whakapapa connections?
- What restoration or enhancement work would strengthen whakapapa?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = low

Overall risk = low

Proposed mitigation measures:

- Te Aupōuri taiao lead Niki Conrad to assess the steps and developments of the project in alignment with the taiao goals of Te Aupōuri

Effect rating: negligible

8.4 Effects on Kaitiakitanga

Potential impacts identified:

- Changes to how Te Aupōuri can exercise kaitiakitanga over this whenua
- Potential for renewable infrastructure to support or undermine stewardship goals
- Questions about who makes decisions during operation and maintenance
- Long-term responsibilities for monitoring and care
- Decommissioning and restoration at end-of-life

Questions for Te Aupōuri:

- How does this project support or challenge Te Aupōuri's role as kaitiaki?
- What governance or decision-making structure would enable proper kaitiakitanga?
- What monitoring and reporting would Te Aupōuri need to fulfill stewardship responsibilities?
- How should decisions about operation, modification, or decommissioning be made?
- What does good kaitiakitanga look like for a renewable energy project?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = moderate

Overall risk = low

Social and economic value of use of land = high

Employment and education benefits provided = high

Environmental sustainability = high

Overall this project had a positive effect on Te Aupōuri's role as kaitiaki

Proposed mitigation measures:

- All parties to reach a satisfactory and clear Memorandum of Understanding and Management Agreement over the lifetime of the project which sets clear expectations and responsibilities for the Rūnanga, Pōtahi, and TMRE

Effect rating: less than minor, provided conditions are adhered to

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8.5 Effects on Cultural Landscapes and Viewsheds

Potential impacts identified:

- Visual changes from residential areas, marae, and other key viewpoints
- Changes to skyline and horizon
- Introduction of modern/industrial aesthetic into cultural landscape
- Potential impacts on how place is experienced emotionally and culturally
- Changes to photographs, memories, and future experiences of place

Questions for Te Aupōuri:

- What viewpoints are most culturally significant?
- How important is maintaining the current visual character?
- Are there acceptable vs. unacceptable visual changes?
- Would landscaping, screening, or color choices make a difference?
- How do you want visitors and future generations to experience this landscape?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = moderate

Overall risk = low

Proposed mitigation measures:

- Te Aupōuri to lead adding our own cultural features to the project – i.e pou whakairo, signage, design.

Effect rating: less than minor, provided conditions are adhered to

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8.6 Effects on Taonga Species and Mahinga Kai

Potential impacts identified:

- Potential disturbance to bird species (particularly from wind turbine)
- Impacts on wetland ecology and species
- Changes to habitat that may affect taonga species
- Potential impacts on traditional resource gathering areas
- Effects on species that have cultural, ecological, or practical significance

Questions for Te Aupōuri:

- Are there taonga species in or near the project area?
- Are there mahinga kai or traditional gathering areas affected?
- What monitoring would detect impacts on culturally significant species?
- What would constitute unacceptable harm to taonga species?
- How can the project enhance habitat for culturally important species?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = moderate

Overall risk = low

Proposed mitigation measures:

- To ensure access to the east coast is undisturbed as this is a significant pātaka kai for our people

Effect rating: less than minor, provided conditions are adhered to

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8.7 Risk of Disturbing Unrecorded Cultural Sites

Potential impacts identified:

- Earthworks may encounter unrecorded archaeological sites
- Potential discovery of koiwi tangata (human remains)
- Risk of disturbing taonga or culturally significant materials
- Potential impacts on sites not recorded in formal databases
- Changes to areas that Te Aupōuri knows to be sensitive but may not have disclosed publicly

Questions for Te Aupōuri:

- Are there areas where earthworks should definitely be avoided?
- Are there known sensitivities that should guide site design?
- What protocols should govern any discoveries?
- Who should be notified immediately if discoveries are made?
- What would constitute appropriate response and remediation?

Te Aupōuri assessment:

Cultural and conservation value = low

Likelihood of degradation = low

Impact = moderate

Overall risk = low

Proposed mitigation measures:

- Timely communication from developers of any unforeseen cultural events or discovery of taonga, kōiwi etc.
- A timely response plan from Te Aupōuri to manage these unforeseen events

Effect rating: less than minor, provided conditions are adhered to

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8.8 Cumulative and Long-term Effects

Potential impacts identified:

- This project in combination with other development in the area
- Long-term presence (25+ years) of structures and infrastructure
- Precedent-setting for future renewable or other development
- Intergenerational impacts on how future Te Aupōuri experience their whenua
- Climate and environmental benefits vs. local cultural impacts

Questions for Te Aupōuri:

- How does this project fit with other changes happening in Te Kao?
- What cumulative effects concern you?
- How do you weigh climate benefits against local cultural impacts?
- What does this mean for the next generation's relationship with whenua?
- What would make this a positive or negative precedent?

Te Aupōuri assessment:

This project creates positive value for the community by reducing the cost of living for our whānau, increasing power security, reducing our harm to the environment, and enabling future development of kāinga for our people. This aligns with the path of development we envision for Te Kao.

Proposed mitigation measures: NA

Effect rating: less than minor, provided conditions are adhered to

8.9 Overall Cultural Effects Assessment

For Te Aupōuri to complete:

Taking into account all of the above categories, how would you characterise the overall cultural effects of this project?

□ Acceptable with no mitigation required □ Acceptable with minor mitigation □ Acceptable with significant mitigation □ Acceptable only with major design changes □ Not acceptable in current form □ Not acceptable in any form

What are the key factors in your overall assessment?

- Clear expectations from all three parties
- Clear development plans and timelines
- Constant and timely communication
- Constant presence and support from all parties
- Effective stakeholder communication

What would need to change for effects to be acceptable (if currently not acceptable)?

NA

What positive cultural outcomes could this project deliver?

- Renewable energy source which is less harmful to our taiao
- Power security and resilience
- Reduced cost of living
- Employment, education, and procurement opportunities for local people

9. Mitigation and Partnership Opportunities / Ngā Ara Whakaiti me te Mahi Tahi

This section sets out an approach to mitigation and partnership, bringing together:

- Practical cultural protection tools
- Tikanga-based site protocols
- Partnership and co-governance pathways
- Long-term stewardship measures aligned with kaitiakitanga

9.1 Cultural Monitoring and Tikanga Protocols

- Appointment of Te Aupōuri cultural monitors during all earthworks.
- TMRE will conduct karakia before site work begins, acknowledging the whenua and our atua (Tama-nui-te-rā, Tāwhirimātea, Rūaumoko)
- On-site tikanga procedures for any discovery of koiwi tangata or taonga.
    - Specific steps if koiwi tangata discovered
    - Who gets called (names, contact info)
    - Work stoppage protocols
    - Site blessing/cleansing requirements
    - Reburial or relocation processes

- Development of a Cultural Monitoring Plan jointly with Te Rūnanga Nui o Te Aupōuri.

9.2 Environmental Stewardship and Mauri Enhancement

- Wetland restoration opportunities in repo areas - Te Aupōuri to identify priority areas and appropriate native species.
- Indigenous planting programmes using species identified by Te Aupoūri as culturally significant.
- Long-term ecological monitoring incorporating Te Aupoūri mātauranga and western science approaches.

9.3 Establish Microgrid Kaitiaki Working Group with representatives from

- Te Rūnanga Nui o Te Aupoūri
- Pōtahi marae
- Independent technical adviser
- Other?

Define decision making protocols and authority, and establish regular hui schedule (quarterly during construction, annually during operation)

9.4 Data Sovereignty and Information Sharing

- Ensure monitoring data is available to Te Aupōuri in a mutually agreed format.
- Develop a data-sharing agreement respecting iwi data sovereignty principles.

9.5 Capacity Building and Employment Pathways

- Prioritise local Te Kao/Te Aupōuri employment opportunities.
- Support training in renewable energy systems, operations, and maintenance.

9.6 Cultural Legacy

- Document the partnership approach and tikanga practices as a model for future projects
- Create opportunities for Te Aupōuri to share their experience with other iwi considering similar projects
- Consider how the microgrid itself becomes a teaching tool about renewable energy and kaitiakitanga for future generations

10. Recommendations / Ngā Tūtohunga

TMRE commits to operating under tikanga guidance from Te Aupōuri throughout project delivery.

The following recommendations draw together findings from the cultural landscape assessment, statutory framework, and Te Ao Māori values:

- Consent conditions should reflect Te Aupōuri's cultural requirements, not generic cultural conditions
- Project success metrics should include cultural outcomes alongside technical/financial measures
- Implement a Cultural Monitoring Plan co-designed with Te Aupōuri.
- Formalise a Kaitiaki Working Group to guide project delivery and long-term stewardship.
- Incorporate iwi feedback into final site layout and design refinements.
- Use indigenous planting and wetland enhancement as mitigation tools.
- Embed tikanga-based discovery protocols into consent conditions.
- Engage Te Aupōuri early in any future project stages or upgrades.

11. Conclusion / Whakakapi

This Cultural Values Assessment provides a foundation focused on recognising, protecting, and integrating the cultural values of Te Aupōuri within the Te Kao Microgrid Renewable Energy Project. While some analysis has been provided across cultural landscape, planning frameworks, and effects assessments, input from Te Rūnanga Nui o Te Aupōuri has been essential for finalisation.

The project represents a meaningful opportunity to advance community resilience, energy sovereignty, and sustainable development under a partnership model grounded in Te Aupōuritanga and TMRE's commitment to working in partnership with mana whenua. Continued collaboration will ensure that the project aligns with iwi aspirations, protects the mauri of the whenua and cultural identity, and benefits future generations through genuine co-governance and shared kaitiakitanga.

12. Appendices / Ngā Āpitihanga

The following appendices are recommended for inclusion in the final CVA, once consultation with Te Aupōuri has occurred:

- Appendix A – Site plans, maps, and design drawings
- Appendix B – Far North District Plan and Proposed District Plan rule summaries
- Appendix C – Cultural effects matrix
- Appendix D – Extracts from relevant National Policy Statements and NES
- Appendix E – Te Aupōuri historical and cultural reference materials
- Appendix F – Technical reports and environmental assessments
- Appendix G – Engagement record with Te Aupōuri (to be completed following consultation)
- Appendix H – Accidental Discovery Protocols
- Appendix I – Cultural Monitoring Plan

MARSHALL DAY Acoustics

TE KAO MICROGRID ASSESSMENT OF NOISE

Rp 001 20250840 | 5 Dec 2025

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Report No.: **Rp 001 20250840**

Document Control

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SUMMARY

Marshall Day Acoustics has been engaged by Tū Mai Rā to undertake a noise assessment for a proposed microgrid project near Te Kao, in the Far North.

The key operational noise sources would be from the following plant.

- **A 100kW wind turbine** with a likely hub height of 30 to 40m with a rotor diameter of around 25m.
- **A solar array** comprising fixed photovoltaic cells.
- **Around 12 inverters**. An inverter turns Direct Current (DC) as stored by the battery to alternating current (AC) current used by dwellings. The inverters would likely be a string type inverter for this project, rather than a large central inverter (as would be used on a commercial scale solar farm). The inverters will be located and associated with the battery cabinets.
- **Battery Energy Storage System BESS**. The battery storage is likely to be a modular system cabinet comprising 200 x 5 kWh battery cells (housed in approximately 20 BESS cabinets, connected to the BESS). The cabinet systems may have a packaged air conditioning system in the cabinet (if outdoors), or alternatively a large split system unit will be used to cool the building in which the BESS is located (if a building or container is used to provide weather protection of the units).

The proposed microgrid would be well removed from the nearest rural dwelling receivers by approximately 375 metres. Our overall conclusions are given below.

BESS + INVERTER

- The noise level from the BESS system can readily comply with the Operative and Proposed District Plan daytime and night-time noise limits.
- The noise level from the BESS system is calculated to be below 16 dB L_{Aeq} at the nearest dwelling (other than dwellings on the subject site). This is a very low level of noise which would be readily acceptable to all residents.

WIND TURBINE

- The noise level from the wind turbine is calculated to be below 25 dB L_{A90} at the nearest dwelling (other than dwellings on the subject site) even when wind speeds are around 10 m/s. At lower wind speeds noise levels will be appreciably lower.
- The noise level from the wind turbine can readily comply with the Proposed District Plan daytime and night-time noise limits at the site boundaries (55 dB L_{Aeq} daytime / 40 dB L_{Aeq} night-time). Noise levels would comply with the Operative District Plan noise limits at the site boundary.
- The wind turbine can also comply with the *NZS 6808: 2010 Acoustics – Wind Farm Noise* minimum noise limit of 40 dB L_{A90}[1]. It is not proposed to apply the NZS6808 noise limits to this consent.

CUMULATIVE NOISE

- It is unlikely for the BESS and wind turbine to operate at maximum noise output at the same time. However, even if this did occasionally occur, noise levels would remain low. Ready compliance with the District Plan noise limit and 40 dB L_{A90} noise guidelines are calculated to occur.

Construction activity can readily comply with the permitted District Plan construction noise rules and New Zealand Standard guidelines. Overall, the location of the microgrid is well chosen with respect to noise. Significant distances between the noise sources and the nearest receivers will result in low overall noise levels and compliance with the District Plan noise limits which will result in reasonable noise effects in terms of the RMA.

[1] Note that no regression analysis has been carried out at this site, as wind speed data is not available.

TABLE OF CONTENTS

1.0 INTRODUCTION

Marshall Day Acoustics has been engaged by Tū Mai Rā to undertake a noise assessment for a proposed microgrid project near Te Kao, in the Far North.

The microgrid would comprise of a fixed array of solar panels connected to a battery electric storage system. A 100 kW wind turbine is also proposed. The BESS would comprise 200 x 5.1 kWh modular battery units which would potentially be housed in around 20 BESS cabinets (of c. 51.2 kWh each). Inverter units and DC-DC converters will be associated with the BESS cabinets. There would be medium voltage transformers associated with the system, as well as ancillary control and switchboard systems.

The microgrid is intended to provide electricity to the dwellings that are located on the subject site. The microgrid would operate by generating and storing electrical power from the solar and wind generators for use at other times.

This report sets out an assessment of noise against the Far North District Council noise rules and zoning provision. The report discusses:

- the existing District Plan noise rules
- New Zealand Standard guidelines for wind turbine noise
- noise emissions from the expected operation of the project
- an assessment of noise levels

This report is intended to form part of an application for resource consent to the Far North District Council.

A glossary of terminology is included in Appendix A.

2.0 APPLICATION SITE

2.1 Site description

Te Kao is one of the most northern settlements in New Zealand, located some 28 kilometres south of Cape Reinga. The settlement contains schools, a general store, marae and areas of rural and residential development.

The project would sit on a large site on Potahi Rd. The site contains many dwellings on the same title. The site is located adjacent to State Highway.

The majority of the site is used for forest, or as cleared forest land. The site is relatively flat, with small undulations falling towards the state highway and to the south-east.

The proposed BESS and wind turbine are fairly well removed from the nearest dwelling receivers. The receivers on the subject site are located 300 metres to the west. The nearest dwelling on a separate site is 375m to the west (5 Potahi Road) and around 400 metres to the south-west (Te Rawhitiroa Road dwellings).

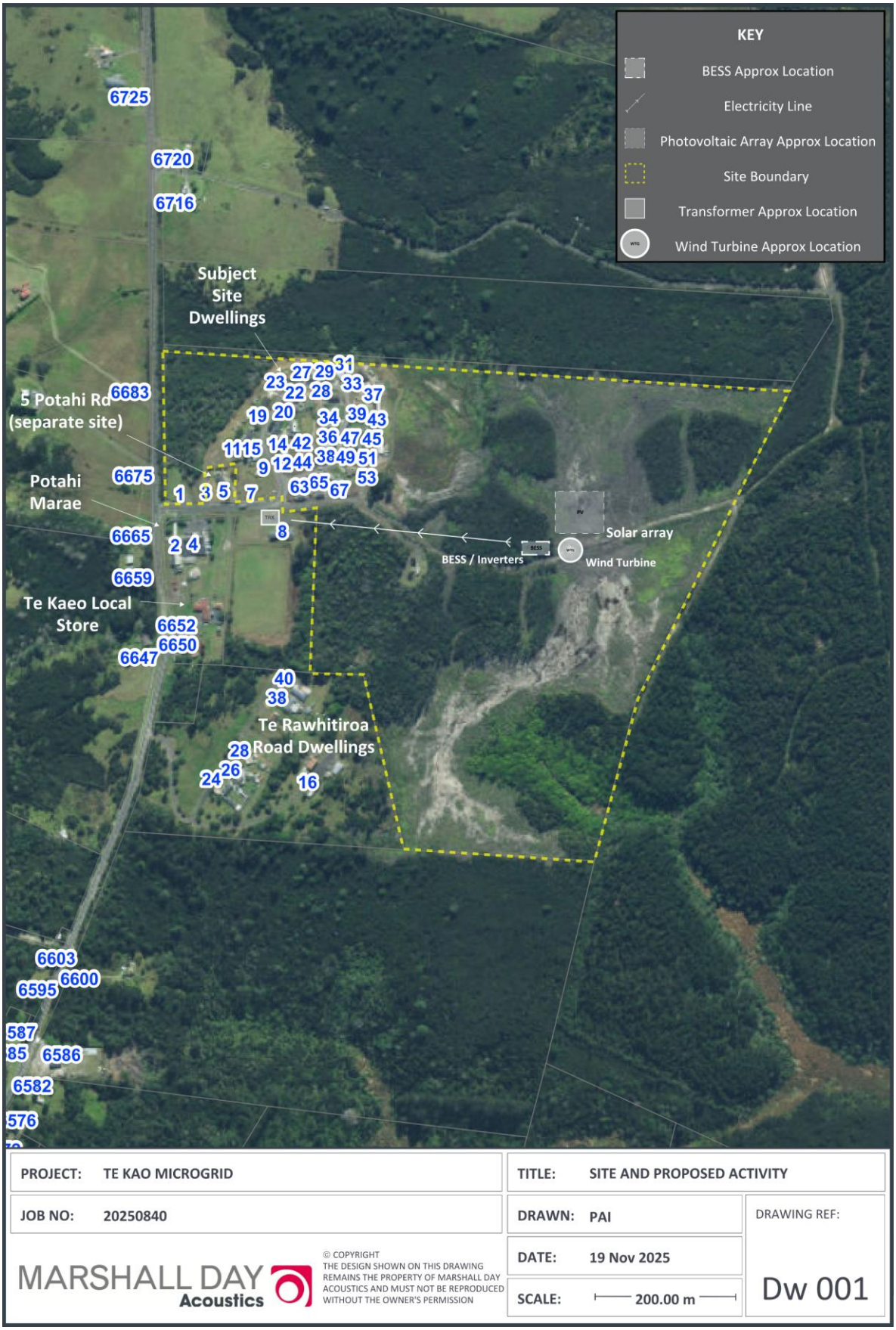
Surrounding receivers are listed in Table 1 and depicted in Figure 1.

Table 1: Surrounding Receivers

Receiver Location	Address	Zone[1]	Approx distance of closest dwelling (m) To nearest BESS inverter wind turbine
A	5 Potahi Road	Rural Production	375m
B	Potahi Marae	Rural Production	500m
C	Te Kao Local Store	Rural Production	480m
D	Te Rawhitiroa Road Dwellings	Rural Production	400m
E	6665 State Highway 1	Rural Production	570m
F	6659 State Highway 1	Rural Production	590m
G	6675 State Highway 1	Rural Production	770m
H	6647 State Highway 1	Rural Production	570m
J	Te Kura o Te Kao (School)	Rural Production	1000m
K	Potahi Road dwellings (on subject site)	Rural Production	300m to 460m

Note 1: Existing land use and distances have predominantly been determined from aerial photography and are indicative. The noise model uses specific distances between source and receiver.
Note 2: Around 30 dwellings are located on the Potahi Road subject site at a distance of between 300 to 460m from the turbine, BESS and inverter.

Figure 1: Site (shown in yellow outline) and surroundings



3.0 PROPOSAL

The microgrid would comprise a fixed solar array[2] and potential wind turbine. These would be connected to 200 x 5.1 kWh modular battery units (BESS units) which would potentially be housed in around 20 BESS cabinets (of c. 51.2 kWh each).

The BESS cabinets would either be Ingress Protection (IP) rated with their own cooling system (and be located outdoors). Alternatively they may be or located within a shipping container sized structure which is cooled by a third-party cooling system (e.g. a split system air conditioner).

Inverter units will be associated with the BESS cabinets. There would be MV transformers associated with the system, as well as ancillary control and switchboard systems.

The proposed site location in relation to the surrounding area is shown in Figure 1.

3.1 Facility Description

The microgrid would be located some 375m from the nearest dwellings that are not on the subject site.

The key operational noise sources would be from the following plant.

- **A 100kW wind turbine**. The wind turbine would likely have a hub height of 30 to 40m with a rotor diameter of around 25m.
- **A solar array** comprising fixed photovoltaic cells.
- **Around 12 inverters**. An inverter turns Direct Current (DC) as stored by the battery to alternating current (AC) current used by dwellings[3]. The inverters would likely be a string type inverter for this project, rather than a large central inverter (as would be used on a commercial scale solar farm). The inverters will be located and associated with the battery cabinets. A preliminary selection of an inverter unit has been used in this assessment
- **Battery Energy Storage System BESS**. The battery storage is likely to be a modular system cabinet comprising 200 x 5 kWh battery cells (housed in approximately 20 BESS cabinets). A preliminary selection of the BESS units has been used in this assessment.
- **A connection point.** Energy would be conveyed to and from the power generation to a residential sized transformer located across the road from the subject site.

Battery storage may operate during the night period (as well as during the daytime). Typically the BESS will be charged by solar (during the daytime) and wind (when wind is above a certain windspeed), and will discharge at peak periods of power use within the residential dwellings.

3.2 Written Approvals

Refer to the planning assessment for any written approvals. The microgrid is serving dwellings on the same site and is not required to comply with any District Plan noise limits at those dwellings. An assessment of noise levels at these dwellings has been provided nonetheless.

3.3 Acoustic Mitigation

No specific acoustic mitigation is expected to be applied to the microgrid.

[2] No solar tracker motors are proposed. Solar panels do not make any noise.

[3] No specific inverter supplier has been selected at this stage of the project.

4.0 EXISTING NOISE ENVIRONMENT

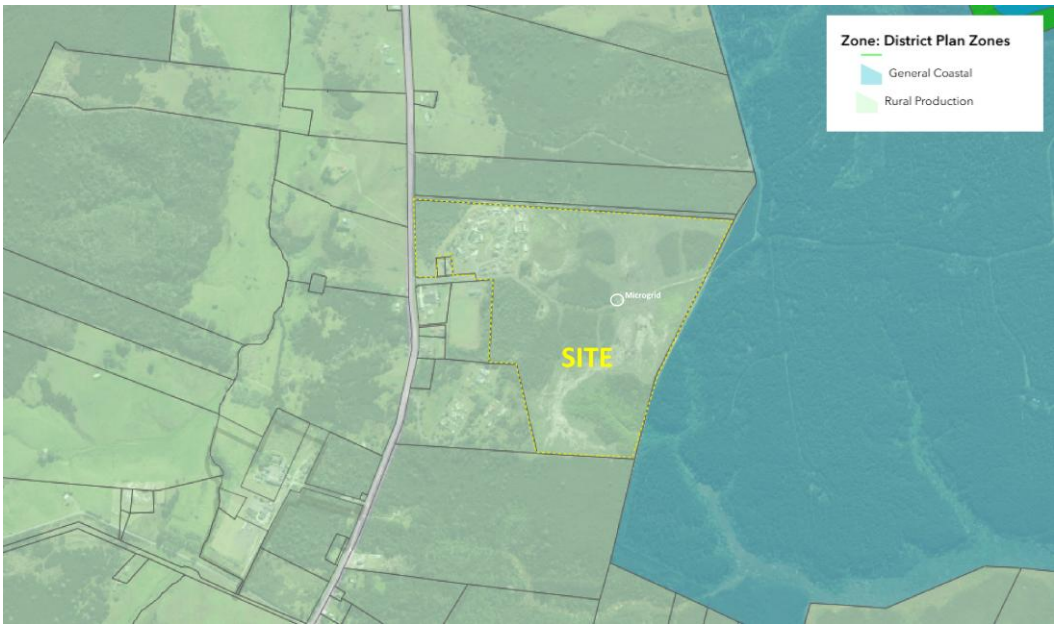
Noise measurements have not been carried out on this site. It is likely that the surrounding residents will experience some noise from intermittent traffic on the state highway during the daytime along with intermittent rural activity. However, at night ambient noise levels will be relatively low. The existing ambient noise environment is expected to be typical of most remote rural environments with a nearby state highway.

5.0 NOISE PERFORMANCE STANDARDS

5.1 Zoning

The application site is situated on land zoned *Rural Production* in the Far North District Plan – Operative Version (District Plan), as are all surrounding sites. Figure 2 shows the zoning at the application and neighbouring sites.

Figure 2: Far North District Plan



(Source: Far North District Council)

5.2 Operative Plan Noise Standards

Permitted activity noise standards and policies for the *Rural Production Zone* are set out in the District Plan in Chapter 8.6.

Standard 8.6.5.1.7 states that noise emitted from a site in the *Rural Production* zone must meet the following limits, at or within the boundary of any other site within the *Rural Production* zone:

- 65 dB L_{A10} between 0700 and 2200 hours;
- 45 dB L_{A10} and 70 dB L_{AFmax} between 2200 and 0700 hours

The Far North District Plan noise limits are unusual in that they apply a 'site boundary' noise limit in a rural zone. In many situations, this can result in a noise limit that does not result in a suitable control of environmental noise. In the case of the subject site, the location of the noise source in relation to the site boundaries is likely to result in a noise limit that broadly accords with national environmental guidelines for environmental noise at night. However, in our opinion, the daytime noise limit of 65 dB L_{A10} is higher than what is reasonable for a typical rural noise environment. The specified measurement parameter L_{A10} is also out of date and not used in the current New Zealand Standards. The Proposed District Plan has updated this rule (as discussed below).

5.3 Proposed District Plan Noise Standards

The application site would be zoned *Māori Purpose zone – Rural* under the proposed District Plan. The proposed District Plan has been through the hearings stage and does not yet have legal effect. However, a consideration of the proposed noise limits is useful as an indication of the type of amenity that could be expected in this zone in the future.

Noise rules as recommended post-hearing for the *Māori Purpose zone – Rural* in the Proposed District Plan are set out in NOISE-S1. These limits are:

> *NOISE S1 d) Noise generated in all zones, other than the zones and sites in e) and f) below:*
>
> 1. *Noise shall not exceed the following rating noise levels within the notional boundary of any noise sensitive activity within the receiving property:*
>
> | | |
> |---|---|
> | *7.00 am to 10.00 pm – (daytime):* | *55 dB L_{Aeq}* |
> | *10.00 pm to 7.00 am – (night-time):* | *40 dB L_{Aeq} and 70 dB L_{AFmax}* |

The proposed plan states that:

> *Noise shall be measured in accordance with NZS 6801:2008: - Acoustics Measurement of Environmental Sound, and assessed in accordance with NZS 6802:2008: Acoustics - Environmental Noise, unless otherwise specified elsewhere in the District Plan.*

We consider that these limits are much more appropriate for a rural environment than the operative rules. We have included them in the proposed conditions in Section 10.0.

5.4 Construction Noise

Standard 8.6.5.1.7 also sets noise limits on construction noise. This section states that *Construction noise shall meet the limits recommended in, and shall be measured and assessed in accordance with, NZS 6803P:1984 "The Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work"* .

However, the 1984 version of the New Zealand Standard NZS 6803 (a provisional release) has been replaced by version NZS 6803:1999 'Acoustics – Construction Noise'. The 1999 Standard is similar in effect to the previous version. It is recommended that the criteria of the 1999 version be substituted and applied to this project. Note, however, that compliance with the NZS6803:1999 standard will typically result in compliance with NZS6803:1984P.

A copy of the construction noise guidelines are set out in Appendix E.

5.5 Wind Turbine Noise Standard

The District Plan does not reference *NZS 6808: 2010 Acoustics – Wind Farm Noise* directly. The NZS 6808: 2010 standard includes methods for setting noise limits for wind turbine noise. These are generally applied to wind farms. Details of this standard are discussed in Appendix D[4].

The New Zealand Standard *NZS 6808: 2010 Acoustics – Wind Farm Noise* provides a very detailed and complex procedure to determine noise limits for large wind farms. In summary, it says that 40 dB L_{A90}[5] is a reasonable noise limit at lower wind speeds, but that this limit can be increased in high wind speeds (as there is masking noise from wind in the trees or other sources when wind speed increases). If the NZS6808:2010 standard was used to set noise limits for the site, the resulting

[4] A wind regression analysis to establish a noise limit in accordance with *NZS 6808: 2010* has not been carried out for this site, as wind monitoring data is not available at the wind turbine hub height. This wind monitoring is proposed by the applicant in the next stage of the site development, after consent is granted for the activity.

[5] Note that NZS6808 states: "The resultant predicted time-average (L_{EQ}) wind farm sound levels occurring at receiver locations shall be taken as the predicted L_{90} wind farm sound level." The LAeq can be considered to be the same as the LA90.

recommended noise limit would be 40 dB $L_{A90,}$ or the background sound level plus 5 decibels, whichever is the greater.

Our recommendation is that because this proposal consists of only one turbine (it is not a wind farm) and some other noises (inverters, cooling fans etc) that the application of NZS6808 creates complexity. We consider that the normal NZS 6802 approach (referencing the Proposed District Plan rule) should be used for assessment and compliance. This results in a simple consent assessment procedure which provides a good level of protection to the Te Kao community over the Microgrid noise emission.

5.6 Resource Management Act

Under the provisions of the Resource Management Act (RMA) there is a duty to adopt the best practicable option to ensure that noise (including vibration[6]) from any development does not exceed a reasonable level. Specifically, Sections 16 and 17 reference noise effects as follows.

Section 16 states that "every occupier of land (including any premises and any coastal marine area), and every person carrying out an activity in, on, or under a water body or the coastal marine area, shall adopt the best practicable option to ensure that the emission of noise from that land or water does not exceed a reasonable level".

Section 17 states that "every person has a duty to avoid, remedy, or mitigate any adverse effect on the environment arising from an activity carried on by or on behalf of the person, whether or not the activity is in accordance with –

(a) Any of sections 10, 10A, 10B and 20A; or

(b) A national environmental standard, a rule, a resource consent, or a designation"

6.0 OPERATIONAL NOISE LEVELS

6.1 Noise Sources and Modelling Methodology

The main noise sources from the proposed BESS operation would be the cooling fan noise from the battery storage units and the inverters. Sound power levels of the string inverters used for this assessment have been determined based on manufacturers data for the BESS + inverter packages.

Noise from the wind turbine is generated in proportion to the wind speed, with noise levels typically being highest at wind speeds of around 7 to 10m/s. We have obtained indicative sound power data for the wind turbine from a provisional selection from a wind turbine manufacturer.

We prepared a noise model using SoundPLAN® environmental noise modelling which considers factors such as the terrain, screening by buildings, and ground effect. Calculations have been carried out using ISO 9613-2:1996 "*Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation*". Noise levels have been calculated under meteorological conditions that are favourable to sound propagation[7] and represent the 'worst case' propagation situation.

Table 4 sets out the sound power levels used in this assessment. Data is based on an indicative selection of possible BESS and inverter units and wind turbines.

Manufacturers data can show that inverters and battery energy storage systems (BESS) can have tonal characteristics at various frequencies. The assessment of environmental noise effects for resource consent allows for tonal character from the BESS and inverters[8].

[6] RMA 1991 Part 1 Section 2 Interpretation: Noise includes vibration

[7] These are set out in ISO9613-2 and represent downwind or temperature inversion conditions.

[8] Tonality (from inverters or the BESS) is expected to occur at higher frequencies. Higher frequencies are attenuated with distance due to air and ground absorption, as well as topographical screening. Given the distances involved, tonality may not be audibly present at

Table 4: Sound Power Levels

Noise Source	Sound Power Level dBA re 10^{-12} Watts	Number of Units	Directivity	Operation time
Energy Storage				
Modular Battery Storage	73 dB L_{WA} per cabinet (based on a 61.4 kWh cabinet configuration + 30 kW inverter) Total sound power level = 86 dB L_{WA}	20 cabinets + Inverter at 55 kWh each	None allowed for	Any time, likely for blocks of a few hours
MV Transformer	64 dB L_{WA}	1	None allowed for	Any time, likely for blocks of a few hours
Solar array	Fixed array (no trackers) – no noise	n/a	n/a	Daytime
Wind Turbine				
100 kW turbine	90 dB L_{WA} at wind speed of 10m/s at 28m above ground level As claimed by example manufacturer in accordance with BS EN61400-11:2003. Note that wind turbines at 100 kW show variation in noise level. Spectrum not available – noise levels calculated using example wind turbine spectrum from other projects	1	None	During wind speeds of above 3m/s or so.

6.2 Calculation Methodology

Noise levels have been calculated at the notional boundaries of all nearby dwellings and at the boundaries of the site (for comparison against the District Plan noise rules).

The calculations have been carried out based on the following assumptions.

BESS + Inverter

- BESS systems in IP rated outdoor cabinets under roofed enclosure with open sides
- Inverter fan cooling (packaged insitu air-conditioning) noise sources at around 1.0 metres above ground (ass attached to the BESS)
- Constant output noise level from all units. No duration correction has been applied in the night period, as per NZS6802:2008
- Inverter units will likely have directivity, however this has conservatively not been included in our calculations
- We have applied special audible characteristics (SAC) corrections of +5 dBA to all calculated BESS noise levels on the assumption that noise generation could generate noise that is subjectively or objectively tonal in accordance with the simplified method of NZS6802:2008.

Wind turbine

- Noise levels calculated at constant 10m/s wind speed (in reality, noise levels will vary with wind speed).

the receivers as any tones may be below the background level. Nonetheless, we have conservatively allowed for tonality to be present at low levels at the receiver locations.

- Wind turbine hub height representative of the expected hub height
- It is assumed the wind turbine is free of tonality or other characteristics that would result in a special audible characteristics penalty.

7.0 CALCULATED NOISE LEVELS

The following Table 5 summarises the results of our calculations.

Table 5: Calculated Noise levels

Receiver Location	**Calculated Rating Noise Level (dB L_{Aeq} BESS / dB L_{A90} Wind Turbine)** **Note that NZS6808 states:** ***"The resultant predicted time-average (L_{EQ}) wind farm sound levels occurring at receiver locations shall be taken as the predicted L_{90} wind farm sound level."*** The L_{Aeq} can be considered to be the same as the L_{A90}.		
	BESS	**Wind Turbine**	**Cumulative Noise**
5 Potahi Road	12	22	22
Potahi Marae (4 Potahi Road)	10	22	22
Health Clinic (6652 Far North Road)	12	21	22
Te Kao Local Store (6650 Far North Road)	5	21	21
Te Rawhitiroa Road Dwellings	16	24	25
6665 State Highway 1	8	20	20
6659 State Highway 1	3	18	18
6675 State Highway 1	1	15	15
6647 State Highway 1	11	20	21
Te Kura o Te Kao (School)	2	14	14
West boundary	17	24	25
North boundary	23	28	29
East Boundary	22	30	31
South Boundary	15	21	22
Potahi Road dwellings (on subject site)	22	27	28

8.0 RESULTS SUMMARY

Our calculations show that:

8.1 BESS

- The BESS system is calculated to be below 16 dB L_{Aeq} at the notional boundary of the nearest dwelling (other than dwellings on the subject site). This is a very low level of noise which would be readily acceptable to all residents.
- Noise levels from the BESS system would be below 23 dB L_{Aeq} at any site boundary[9].
- The BESS system would readily comply with the Operative District Plan night-time noise limit of 45 dB L_{A10} at the site boundaries. A margin of compliance of over 20 decibels is expected at night, based on the source emission data provided[10].
- Noise from the BESS would readily comply with the Proposed District Plan night-time noise limit of 40 dB L_{Aeq} at the nearest notional boundaries. A margin of compliance of over 20 decibels is expected at night, based on the source emission data provided[11].

8.2 WIND TURBINE

- The noise from the wind turbine is calculated to be 24 dB L_{A90} at the notional boundary of the nearest dwelling even at 10m/s wind speed. This is a low level of environmental noise.
- Noise levels from the BESS system would be below 30 dB L_{A90} at any site boundary
- The wind turbine would readily comply with the Operated District Plan night-time noise limit of 45 dB L_{A10} at the site boundaries. A margin of compliance of 15 decibels is expected at night, based on the source emission data provided[12].
- The wind turbine would readily comply with the Proposed District Plan night-time noise limit of 40 dB L_{Aeq} at the notional boundaries. A margin of compliance of over 15 decibels is expected during the night, based on the source emission data provided[13].

8.3 Assessment of Noise Effects

- It is unlikely for the BESS and wind turbine to operate at maximum noise output at the same time. However, even if this did occur, the cumulative noise levels would remain low as shown in Table 5 above. Ready compliance with the proposed 40 dB L_{Aeq} night-time noise guideline is expected to occur.
- On this basis we are of the opinion that noise effects from the proposed microgrid would reasonable, and consistent with the expected level of amenity of the zone and area.

[9] L_{A10} noise levels will likely be very similar to the L_{Aeq} noise levels as the source of noise is constant.

[10] A margin of compliance of over 40 decibels is expected during the daytime based on the site boundary noise rule of 65 dB L_{A10}.

[11] A margin of compliance of over 35 decibels is expected during the daytime based on the notional boundary noise rule of 55 dB L_{Aeq}

[12] A margin of compliance of 35 decibels is expected during the daytime based on the site boundary noise rule of 65 dB L_{A10}.

[13] A margin of compliance of over 30 decibels is expected during the daytime based on the notional boundary noise rule of 55 dB L_{Aeq}

9.0 CONSTRUCTION NOISE LEVELS

Construction noise is not expected to be significant as the construction project is of a relatively small scale. It is likely that construction will require the preparation of suitable platforms by cut and fill, the delivery of BESS, turbine, mast and transformer units, the establishment of cabling and the installation of all ancillary power reticulation plant. Works may also involve preparation of the foundation (concrete truck slumping and pumping), transportation, craning structure into place and connection works. Solar piling may be required to establish the fixed solar array. These activities will readily comply with the relevant limits during typical work hours.

9.1 Calculated typical construction noise levels

Construction works associated with the project is expected to consist of

- Earthworks for the BESS platform and wind turbine foundation using cut-and-fill
- Concrete pours to establish any required foundations or perimeter beams
- Delivery of BESS, wind turbine, support structure and transformer plant to site
- Driving of piles to support solar arrays

We anticipate the plant and activities shown in the following table could be used during construction, recognising that construction may be on a smaller scale. The table includes the per unit sound power level, calculated level at the closest receiver from the main works, and the minimum distance required to comply with the construction noise limit (refer Section 4.3)

Table 2: Calculated NZS6803:1999 construction noise levels

Activity	Equipment	Sound Power dB L_{WA}	Noise level at Nearest Receiver dB L_{Aeq} 425m
Site enabling works	30T excavator	103	37
	Truck and trailer	105	39
Strip topsoil and excavation to form BESS and Tind Turbine platform	30T excavator	103	37
	5-axle dump truck	106	40
	Bulldozer	113	47
	Compactor / roller	103	37
Foundations and delivery of BESS, transformer and turbine	Concrete pump and truck	106	40
	20T Excavator	103	37
	Truck	97	31
	Generator (150 kVA)	93	27
	Crawler crane	98	32
Solar pile driving	Vermeer type piling rig	123	57
Site landscaping and access roads	7T excavator	102	36
	20T excavator	103	37
	3-axle dump trucks	106	40
	7t vibratory roller	102	36
	Bitumen truck	103	37

Notes to table:

(1) Appendix A provides an explanation of technical terms
(2) In accordance with Section C.2 of NZS 6803: 1999 results include of 3 dB facade reflection
(3) The maximum noise level limit (85 dB L_{AFmax}) will be readily complied with at all receivers
(4) No acoustic screening is assumed. Generalise spectrum has been used

Based on the above, noise from construction activities is calculated to readily comply with the relevant daytime construction noise limits with a significant margin. No adverse effects will occur. Most works could also potentially comply with the Sunday daytime noise limit of 55 dB L_{Aeq}, with the exclusion of solar pile driving.

Construction vibration from vibrating rollers is expected to be low (well below 1mm/s PPV) at the distances to the nearest receivers.

9.2 Construction noise and vibration management

A Construction Noise and Vibration Management Plan (CNVMP) is often recommended as a condition where activity cannot comply with the guidelines in NZS 6803:1999 or to manage effects even when compliance with the standard is expected to be achieved. In this case, compliance will readily occur and due to substantial separation distances, effects on nearby properties from construction activities on site are not anticipated. Therefore, a CNVMP is not recommended as necessary.

10.0 RECOMMENDED NOISE CONDITIONS

The following noise conditions are proposed to apply to any consent granted.

Operational Noise

1. Noise produced by all operational activities on the microgrid site shall not exceed the following noise rating levels when measured in accordance with New Zealand Standard NZS 6801:2008 *Acoustics – Measurement of environmental sound* and assessed in accordance with New Zealand Standard NZS 6802:2008 *Acoustics - Environmental Noise* at the notional boundary of any dwelling lawfully established outside the subject site as at the date of the microgrid consent.

Daytime	(0700 to 2200 hours)	55 dB L_{Aeq}
Night-time	(2200 to 0700 hours)	40 dB L_{Aeq}

2. For the avoidance of doubt, compliance in accordance with NZS6801 and 6802:2008 means that compliance measurements will not be carried out in wind speeds greater than 5m/s.

3. Prior to the commencement of construction, predicted noise contours from the microgrid shall be provided to the Council by a suitably qualified and experienced acoustician. The calculations shall be carried out using:

   - Calculation methods in accordance with NZS 6808: 2010 Acoustics – Wind Farm Noise
   - Sound power levels at rated power of the wind turbine as based on *IEC 61400-11:2012 Wind turbines - Part 11: Acoustic noise measurement techniques.*

   A report of the predicted sound levels shall be provided to the Council. This shall include the following information.

   a. A map showing the noise contour lines in the vicinity of the noise sensitive receivers;
   b. Noise sensitive locations for which wind turbine noise is calculated
   c. Wind turbine sound power levels;
   d. The make and model of the wind turbines;
   e. The hub-height of the wind turbines;
   f. Calculation procedure used;
   g. Meteorological conditions assumed;
   h. Air absorption parameters used;
   i. Ground attenuation parameters used;

j. Topography/screening assumed; and
k. Predicted far-field wind farm sound levels

The report shall demonstrate that the final wind turbine will comply with the noise limit in condition 1 at 95% of the rated power of the turbine

Construction Noise

4. Construction noise shall be measured and assessed in accordance with NZS 6803:1999. The assessment position shall be at 1 metre from any building that is a noise sensitive location

5. The consent holder shall ensure that noise from construction work on the site does not exceed the noise limits in the following table:

Time of week	Time period	Duration of work					
		More than 14 calendar days but less than 20 weeks (dBA)		Up to 14 calendar days (dBA)		More than 20 weeks (dBA)	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
Sundays and public holidays	0630-0730	45	75	45	75	45	75
	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

Variation to Noise Limits

6. If compliance with the noise limit in Condition 1 cannot be demonstrated at 95% rated power, the consent holder may, at their discretion, seek a S127 variation to augment Condition 1 to align the recommended conditions in NZS6808.

Advice note: *The following condition is drawn from NZS6808 as an example*

The consent holder shall ensure that, at the specified assessment positions, at any wind speed, wind farm sound levels do not exceed:

(a) A noise limit of 40 dB $L_{A90(10\,min)}$, provided that the following noise limit shall apply in the circumstances stated in (b);

(b) When the background sound level is greater than 35 dB $L_{A90(10\,min)}$, the noise limit shall be the background sound level $L_{A90(10\,min)}$ plus 5 dB.

7. Any application to vary the consent condition shall be supported by preconstruction noise monitoring to establish existing background noise levels relative to wind speed. These measurements and reporting shall be in accordance with *NZS 6808: 2010 Acoustics – Wind Farm Noise* and shall be carried out by a recognised acoustician. A report shall be provided

to Far North District Council showing the measured noise levels and the calculated noise limits. A report shall be provided to Far North District Council showing:

a. Description of the sound monitoring equipment including ancillary equipment;
b. The location of sound monitoring positions;
c. Description of the anemometry equipment including the height AGL of the anemometer;
d. Position of wind speed measurements;
e. Time and duration of the monitoring period;
f. Averaging period for both sound and wind speed measurements;
g. Atmospheric conditions: the wind speed and direction at the wind farm position and rainfall;
h. Number of data pairs measured (wind speed in m/s, background sound in L_{90});
i. Description of the regression analysis; and
j. Graphical plots showing the data scatter and the regression curves

8. The report shall also provide updated calculations of wind turbine noise that demonstrate compliance with the derived background noise limit across the range of wind speeds.

APPENDIX A GLOSSARY OF TERMINOLOGY

Background sound	The sound that is continuously present in a room or outdoor location. Often expressed as the A-weighted sound level exceeded for 90 % of a given time period i.e. L_{A90}.
Emission	Sound that is generated by, and propagates away from a source.
Frequency	Sound occurs over a range of frequencies, extending from the very low (e.g. thunder) to the very high (e.g. mosquito buzz). Measured in units of Hertz (Hz). Humans typically hear sounds between 20 Hz and 20 kHz. High frequency acuity naturally reduces with age: most adults can hear up to 15 kHz.
Hertz (Hz)	The unit of frequency, named after Gustav Hertz (1887-1975). One hertz is one pressure cycle of sound per second. One thousand hertz – 1000 cycles per second – is a kilohertz (kHz).
Immission	Sound received at one location from a source(s) at another location(s).
Initial sound	Total sound present in an initial situation before a change to the existing situation occurs. This definition is from ISO 1996.
Noise	A subjective term used to describe sound that is unwanted by, or distracting to, the receiver.
Notional boundary	A line 20 metres from any side of a dwelling, or the legal boundary where this is closer to the dwelling. This definition is from NZS 6802:2008.
Octave band	The interval between one frequency and its double. Sound is divided into octave bands for analysis. The typical octave band centre frequencies are 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz and 4 kHz.
Prescribed time frame	'Daytime', 'night-time', 'evening', or any other relevant period specified in any rule or national environmental standard. This definition is from NZS 6802:2008.
Rating level	A derived level used for comparison with a noise limit. Takes into account any and all corrections described in NZS 6801 and NZS 6802, e.g. duration, special audible character, residual sound etc. This definition is from NZS 6802:2008.
Reference time interval	The time interval over which the time average A-weighted sound pressure levels is determined. Typically 15 minutes. This definition is from NZS 6802:2008.
Residual sound	The total sound remaining at a given position in a given situation when the specific sounds under consideration are suppressed or are an insignificant part of the total sound. This definition is from NZS 6802:2008.
Special audible characteristics	Distinctive characteristics of a sound that make it more likely to cause annoyance or disturbance. A penalty of up to 5 decibels can be applied when

	assessing sounds with SAC Examples are tonality – a hum or a whine) and impulsiveness – bangs or thumps.
Specific sound	A component of total sound that can be identified as associated with a specific source. Specific sound is the 'sound of interest' in an assessment. This definition is from NZS 6802:2008.
A-weighting	A set of frequency-dependent sound level adjustments that are used to better represent how humans hear sounds. Humans are less sensitive to low and very high frequency sounds. Sound levels using an "A" frequency weighting are expressed as dB L_A. Alternative ways of expressing A-weighted decibels are dBA or dB(A).
C-weighting	A frequency weighting used to approximate the response of the human ear to sounds with strong low frequency components (typically between 25 and 125 Hz) at high noise levels (typically greater than 85 decibels).
dB	Decibel. The unit of sound level.
L_{A10}	The A-weighted sound level exceeded for 10% of the measurement period, measured in dB. Commonly referred to as the average maximum noise level.
L_{A90}	The A-weighted sound level exceeded for 90 % of the measurement period, measured in dB. Commonly referred to as the background noise level.
L_{A95}	The A-weighted sound level exceeded for 95 % of the measurement period, measured in dB. Commonly referred to as the background noise level.
L_{Aeq}	The equivalent continuous A-weighted sound level. Commonly referred to as the average sound level and is measured in dB.
L_{Amax}	The A-weighted maximum sound level. The highest sound level which occurs during the measurement period. Usually measured with a fast time–weighting i.e. L_{AFmax}

APPENDIX B SITE LAYOUT PLAN (REFERENCE ONLY, NOT TO SCALE)

PV (SOLAR) SITE INFORMATION

Scan me for System Manual

TŪ MAI RĀ ENERGY

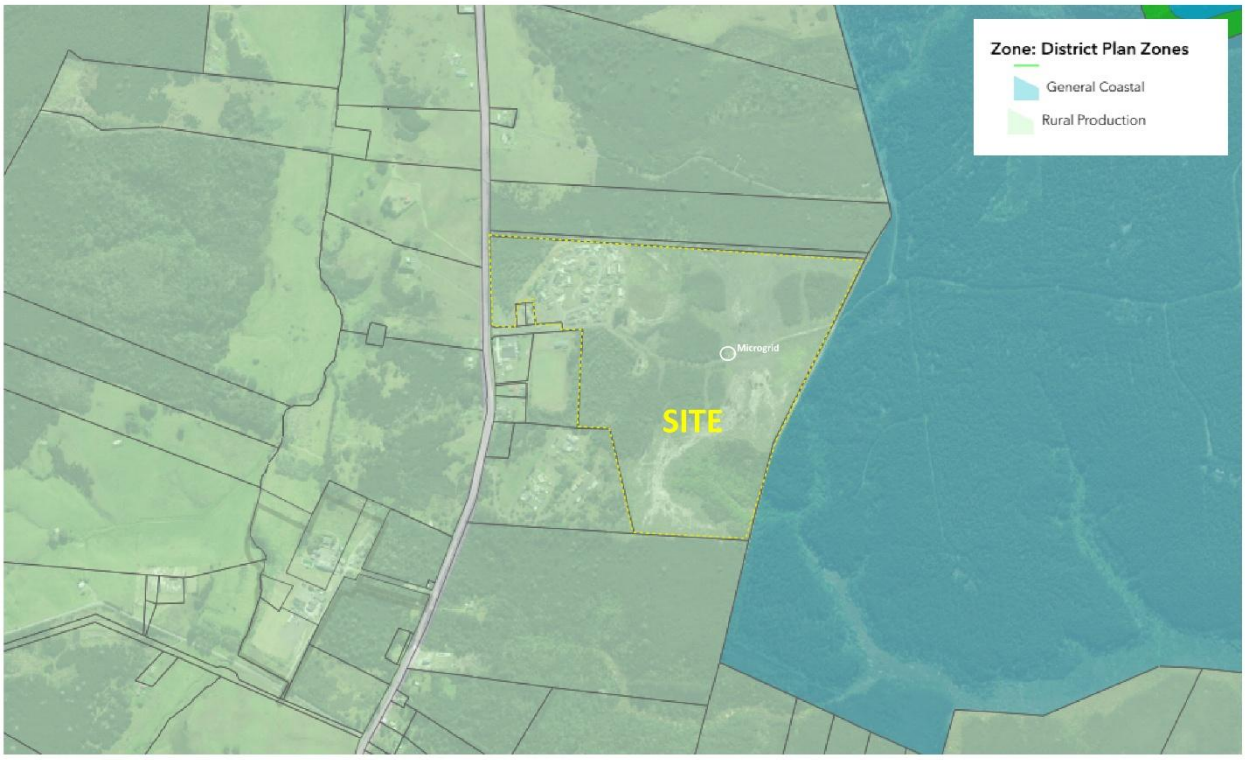
Install Address: 20 Potahi Road, Te Kao, New Zealand

Legend: Disconnection Point; Load Break Disconnector; DC Cabling Path; Inverter; Switchboard; You Are Here; Mainstreet Connection; Connection Point; Sub-Board; Battery

PV Array Size: 558 kW **Max. DC Voltage:** 908 V **Installed By:** Tū Mai Rā Energy **Phone:** 0800867369 **Install Date:** 3 July 2025

WARNING DC Disconnection Points may only be operated by suitably qualified personnel.

APPENDIX C DISTRICT PLAN ZONE MAP



APPENDIX D DISCUSSION OF NZS6808:2010 WIND FARM NOISE

NZS6808:2010 requires that the L_{90} noise level at any residential site caused by a wind turbine generator should not exceed a limit of the **existing background level (L_{90}) plus 5 dB, or 40 dBA**, whichever is the greater.

This level of 40 dBA has been based on an internationally accepted indoor noise limit of 30 – 35 dB L_{Aeq} designed to protect against sleep disturbance. It assumes a reduction from outdoors to indoors of 10 decibels with partly open windows. It is noted that this is a conservative approach, as up to a 15-decibel reduction is actually achieved by a typical dwelling, with windows open approximately 200-300 mm.

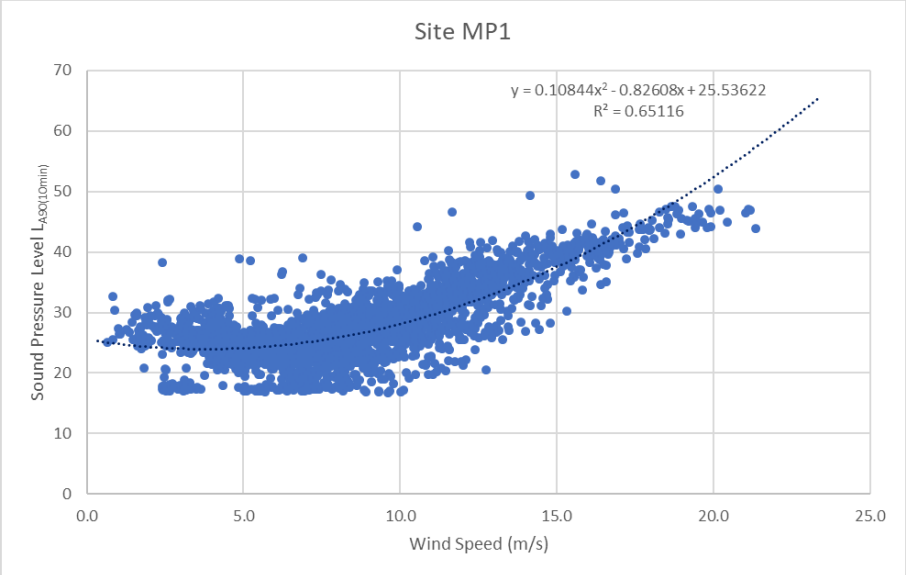
The portion of the limit which depends on the existing background sound level recognises that in the presence of wind, noise levels increase due to vegetation and other objects with which wind interacts, which typically results in a natural increase in noise levels.

Wind turbine noise is usually most noticeable during lower wind speeds of 6–8 m/s (22–29 km/hr) when the sound level produced by the turbine(s) can be comparable to, or greater than, the background noise generated by the wind. At higher wind speeds, the background noise due to the wind itself can partially mask the turbine noise, and this forms the basis for the increasing noise limit at higher windspeeds.

For a large commercial wind farm, measurements of pre-installation background noise level would be plotted against measured wind speed. A regression line through these measurement points would be used to represent the pre-installation noise level, and the corresponding noise limit would be derived from this noise limit. The calculated wind farm noise level would then be compared against this noise limit line, and if the limit is exceeded, redesign of the wind farm or other mitigation measures would be considered.

An example of a measurement of background noise and wind speed is given in Figure D1. Note that this is not for the microgrid subject site - it is an example only. In this example note that the background sound level appears to be controlled by steady noise sources below 8 m/s, and begins to rise along with increased wind speed above 8 m/s.

Figure D1—Example of Measured Noise level vs Wind Speed



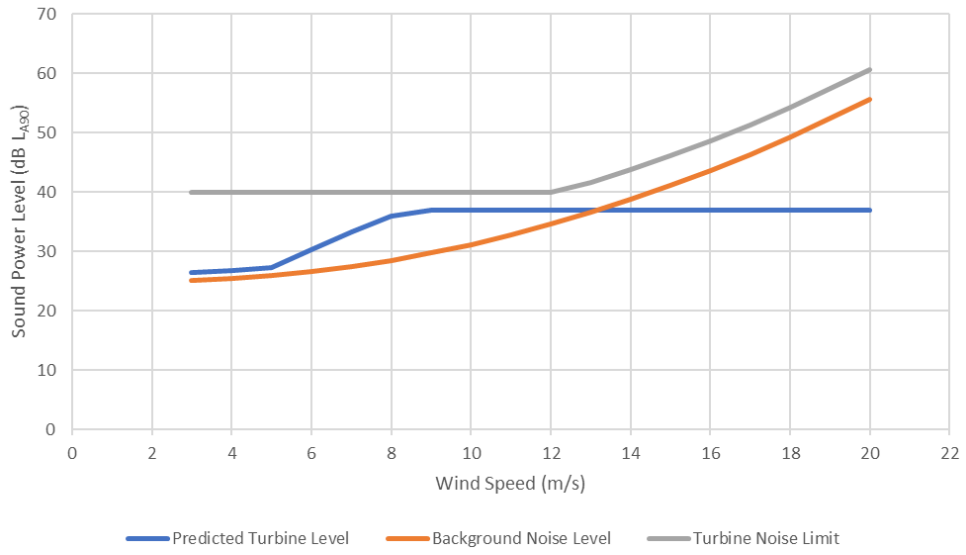
For the same example given previously, an example comparison of calculated wind farm noise against the background sound regression line is shown in Figure D2. This figure also shows the derived "wind farm noise limit".

Figure D2 compares several relationships:

- The orange line would be the background sound regression line determined from measurements.

- The grey line would be the noise limit derived from the background noise curve. The "fixed" 40 dBA portion of the noise limit is also shown.
- The blue line is the calculated noise level, on the conservative assumption that the receiver lies downwind of all turbines simultaneously.

Figure D2—Typical Turbine Noise Assessment



In this example the noise limit is determined by the "40 dB L_{A90}" part of the rule below windspeeds of 12 m/s, and by the "background + 5 dB" part of the rule above windspeed of 12 m/s. The blue line takes the shape of the particular wind turbine's noise level / wind speed relationship (this is not necessarily the same as the turbine that could be used for the Microgrid) . The peak turbine noise level (which occurs around 9 m/s in this case, but maybe around 10m/s in the microgrid turbine case)) is the level used to describe the sound level of the wind farm when presented numerically.

In the above example it can be seen that the calculated noise level from the wind farm at the example site is less than the noise limit at all wind speeds. If the blue line lies **above** the grey line at any point, it would indicate potential non-compliance at the wind speeds where this occurs.

It should be noted that compliance with NZS6808:2010 noise limits does not indicate inaudibility of the wind turbines. Under some circumstances the wind turbines may become the dominant noise source in the environment. In other circumstances the wind turbines may not be dominant but would still be audible. In other circumstances the wind turbines may in fact be inaudible. However whether dominant or simply audible, the noise levels produced by wind turbines which comply with this limit are determined by NZS6808:2010 to be acceptable, and of sufficiently low level to avoid sleep disturbance, intrusion on normal activities, or to cause any adverse health effects, and to maintain reasonable amenity.

It is important to remember that an assessment of wind turbine noise using NZS6808:2010 is using this worst case 'downwind in all directions' prediction model. However, in most cases the actual noise level experienced from the operational wind turbines will very rarely (if ever) reach these levels.

The above analysis has not been complied for the subject site, as wind monitoring data is not available at the wind turbine hub height. This monitoring is proposed in the next stage of the site development, after consent is granted for the activity. For this reason, noise levels for resource consent have been calculated and compared against a 40 dB L_{A90} noise limit at all wind speeds where data is available. Data is also compared against the District Plan zone noise limit of 45 dB L_{A10} at the site boundary.

APPENDIX E CONSTRUCTION NOISE RULES (NZS6803:1999)

NZS6803:1999 sets out the following noise limits:

"Residential zones and dwellings in rural areas:

Table 2 – Recommended upper limits for construction noise received in residential zones and dwellings in rural areas

Time of week	Time period	Duration of work					
		Typical duration (dBA)		Short-term duration (dBA)		Long-term duration (dBA)	
		L_{eq}	L_{max}	L_{eq}	L_{max}	L_{eq}	L_{max}
Weekdays	0630-0730	60	75	65	75	55	75
	0730-1800	75	90	80	95	70	85
	1800-2000	70	85	75	90	65	80
	2000-0630	45	75	45	75	45	75
Saturdays	0630-0730	45	75	45	75	45	75
	0730-1800	75	90	80	95	70	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75
Sundays and public holidays	0630-0730	45	75	45	75	45	75
	0730-1800	55	85	55	85	55	85
	1800-2000	45	75	45	75	45	75
	2000-0630	45	75	45	75	45	75

"Industrial or commercial areas:

Table 3 – Recommended upper limits for construction noise received in industrial or commercial areas for all days of the year

Time period	*Duration of work*		
	Typical duration	***Short-term duration***	***Long-term duration***
	L_{eq} (dBA)	*L_{eq} (dBA)*	*L_{eq} (dBA)*
0730-1800	*75*	*80*	*70*
1800-0730	*80*	*85*	*75*

Notes in the standards to the tables above:

7.2.5

The night time limits in Table 2 shall apply to activities carried out in industrial or commercial areas where it is necessary to prevent sleep interference, specifically where there are residential activities, hospitals, hotels, hostels, or other accommodation facilities located within commercial areas. The limits in Table 2 may also be used to protect other specific noise sensitive activities at certain hours of the day.

7.2.6

One major factor which should be considered is whether there is a relatively high background sound level (L_{90}) due to noise from sources other than construction work at the location under investigation. In such cases limits should be based on a determination of the existing level of noise in the area (a "background plus" approach).

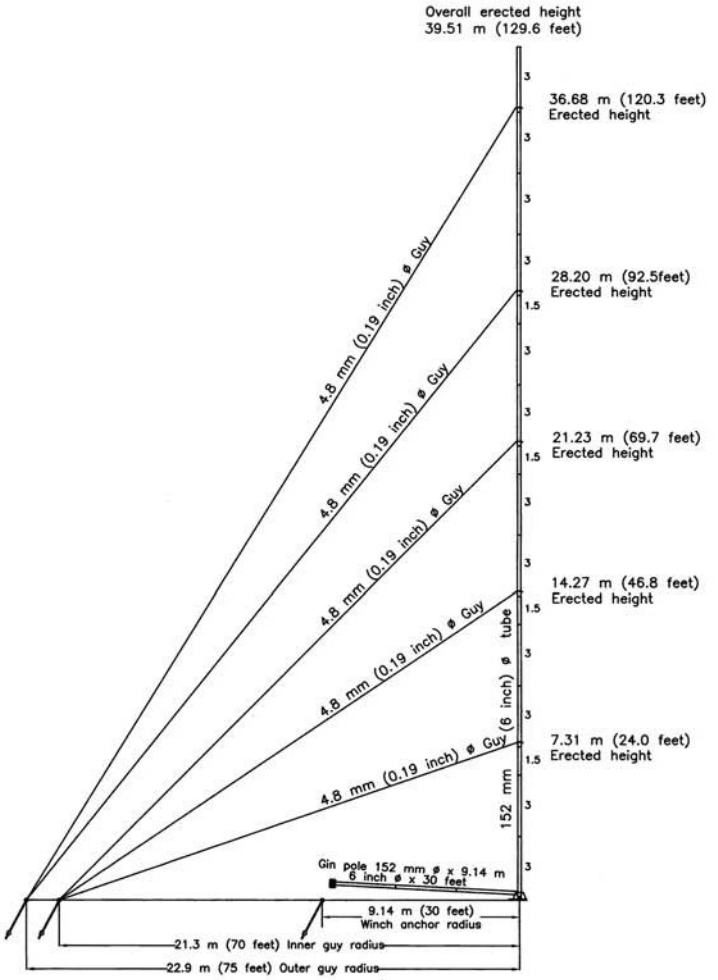
7.2.7

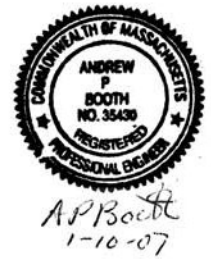
Where there is no practicable method of measuring noise outside a building, the upper limits for noise measured inside the building shall be the levels stated in tables 2 and 3 minus 20 dBA. This is considered to be a typical value for the sound reduction normally achieved in New Zealand buildings with doors and windows closed."

Materials						
	Outer Diameter	Wall Thickness	Description	Yield Strength	Breaking Strength	Corrosion Protection
1	8 inch	0.109 inch	MT 1020	50.0 ksi	N/A	Hot Dipped
	203 mm	2.8 mm		345 mPa		Galvanized
2	8-6 inch taper	0.109 inch	MT 1020	50.0 ksi	N/A	ASTM 653
	203-152 mm	2.8 mm		345 mPa		
3	6 inch	0.109 inch	MT 1015	50.0 ksi	N/A	
	152 mm	2.8 mm		345 mPa		
4	6-4.5 inch taper	0.109 inch	MT 1015	50.0 ksi	N/A	
	152-114 mm	2.8 mm		345 mPa		
5	4.5 inch	0.083 inch	MT 1010	50.0 ksi	N/A	
	114 mm	2.1 mm		345 mPa		
6	0.187 inch		7x7 Galv.	N/A	3.7 kLb	Galvanized
	4.76 mm		Aircraft		15.2 kN	

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	Units, notes update	17Jul03	APB
B	Changed reaction format	17Aug03	APB
C	Revised SI forces	13Dec06	APB

Reactions and member forces		
	Imperial	SI
10 m (33 feet) wind velocity (Fastest mile)	70 mph	31.3 m/s
Top of tower wind velocity (Fastest mile)	85 mph	38 m/s
Radial ice thickness	0.0 inch	0 mm
Inner guy anchor force	0.6 kLb	2.7 kN
Inner guy anchor force (angle from horizontal)	27°	27°
Outer guy anchor force	1.9 kLb	8.5 kN
Outer guy anchor force (angle from horizontal)	51°	51°
Tower base force (horizontal- during erection)	2.0 kLb	8.9 kN
Tower base force (vertical)	4.3 kLb	19.1 kN
Erection anchor force	2.8 kLb	12.5 kN
Erection anchor force (angle from horizontal)	45°	45°
Maximum guy tension	0.8 kLb	3.6 kN
Maximum tower tube stress (compression)	5.2 ksi	35.9 mPa
Maximum tower tube stress (tension)	2.5 ksi	17.1 mPa
Maximum top deflection	10 inch	247 mm
Initial guy tension	0.2 kLb	0.9 kN





Notes
A) Wind forces and allowable member loads are calculated using ANSI TIA/EIA-222-F, (1996), "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures".
B) Wind speeds are fastest mile wind velocity per EIA-222-F. EIA-222-F wind loading coefficients: Gf=1.69, Cf=1.0, α =2/7.
C) Fastest mile (fm) wind speed can be approximately converted to three second (3sec) wind speed using the equation:
V(3sec) =1.22 V(fm) for V(fm) <= 100 mph
D) Guy joint efficiency = 0.9 and the guy safety factor is greater than or equal to 2.0.
E) An ANSYS large deflection FEA model using beam (Pipe16) and tension (Link10) elements with distributed wind load was used to calculate member forces and reactions.
F) Tower allowable stress design per American Institute of Steel Construction (AISC) "Allowable Stress Design", 9th Ed. 1989. Chapter H, equations H1-1, H1-2
G) This tower design meets the structural requirements of EIA-222-F, sections 1,2,3,6,8 for the given loading condition. This analysis does not apply to EIA-222-F sections 7,11,12,13.
H) Foundation design must be considered separately and is not a part of this analysis. Specific foundation details must be approved for the specific application and site by a qualified professional.
I) A locally qualified professional must determine the applicability of this analysis for the expected site conditions. Due to the lack of involvement in the siting or construction phase of this product at a specific location, liability is strictly limited to issues arising from negligence, willful misconduct by NRG or the professional engineer completing this analysis. No warranty, expressed or implied, is made concerning the suitability of this product for a given application or location.

Units notation

mm - Millimeters
m - Meters
m/s - Meters per second
kN - 1,000 Newtons
mPa - 1,000,000 Pascals
kLb - 1,000 US pounds
ksi - 1,000 US pounds per inch²
mph - Miles per hour
Ø - Diameter

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
± 1/64 .XX ± .015 ± 1°
.XXX ± .005
DO NOT SCALE DRAWING
MATERIAL :
FINISH :

APPROVALS	DATE
DRAWN A Booth	26Apr03
CHECKED	
ISSUED	

NRG SYSTEMS INC
110 RIGGS ROAD, HINESBURG, VT., 05461

TITLE: 40 Meter TallTower
152 mm (6.0 inch) diameter tube

SIZE B | DWG.NO. TT1989 | REV C
SCALE NTS | SHEET 1

Figure 45: 40 m TallTower

Geotechnical Investigation Report

Proposed Wind Turbine

Potahi Road, Te Kao

For

Tū Mai Rā Energy

Haigh Workman reference 25 140

November 2025

Phone: +64 9 407 8327 • info@haighworkman.co.nz • www.haighworkman.co.nz

PO Box 89 • 6 Fairway Drive • Kerikeri 0245 • New Zealand

Revision History

Revision Nº	Issued By	Description	Date
A	Josh Curreen	First Issue	November 2025

Prepared By:

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MEngNZ

Reviewed and Approved By:

Wayne Thorburn

Senior Geotechnical Engineer
CPEng, CMEngNZ

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TABLES

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1 Introduction

1.1 Project Brief and Scope

Haigh Workman Limited (Haigh Workman) were engaged by Tū Mai Rā Energy (the Client) to undertake a geotechnical investigation for a proposed wind turbine at Potahi Road, Te Kao (Pt Te Kao 71D). This report presents the information gathered during the site investigation, interpretation of the data obtained, and site-specific geotechnical recommendations relevant to the site.

The scope of this report encompasses the geotechnical suitability in the context of the proposed development as defined in the Short Form Agreement (dated 8th October 2025). This appraisal has been designed to assess the subsoil conditions for the wind turbine foundation design.

This report provides the following:

- A summary of the published geology with reference to the geotechnical investigations undertaken.
- Analysis of the data obtained from site investigations, providing a geotechnical ground model.
- Development recommendations.

1.2 Proposed Development

We understand that the client intends to construct a sustainable energy system to power approximately 100 homes in the Te Kao community. Stage 1 involves a solar microgrid situated off Potahi Road, approximately 600 m east of State Highway 1. A geotechnical investigation report* was prepared by Haigh Workman in August 2025 for Stage 1. This report covers Stage 2 of the development which is for the construction of a wind turbine situated to the south-west of the solar microgrid. Indicative location of the proposed development is shown in Figure 1.

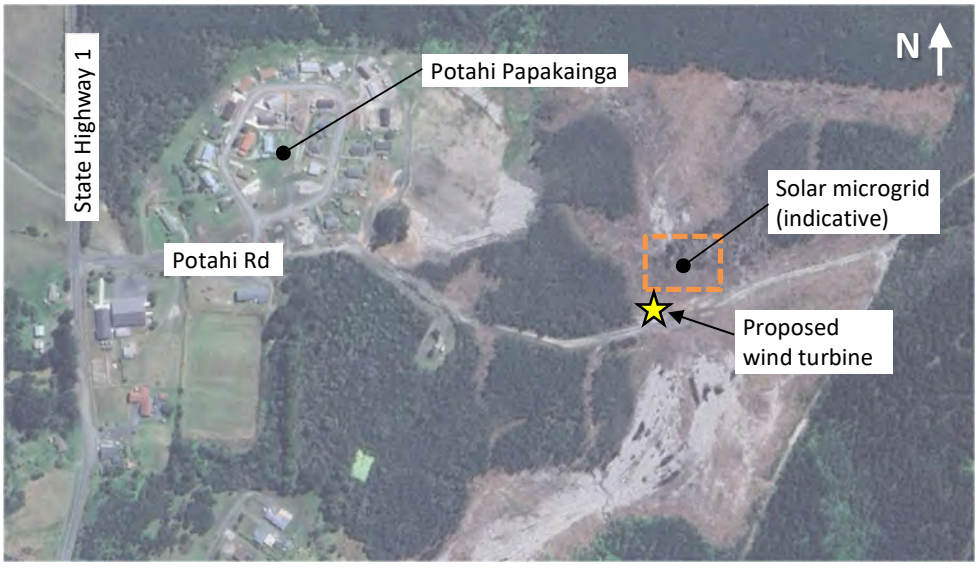

Figure 1: Proposed Development (Google Earth)

* *Geotechnical Investigation Report, Haigh Workman Limited, Ref. 25 140, dated August 2025*

This geotechnical investigation and report considers the geotechnical aspects of the proposed development, with particular reference to the proposed development location, (refer to drawings in Appendix A).

Should the proposed development vary from the proposal described above and/or be relocated outside of the investigated area, further investigation and/or amendments to the recommendations made in this report may be required.

1.3 Site Description

The property is legally described as Pt Te Kao 71D with a total land area of 37.7 ha. The subject site is located off the end of Potahi Road, approximately 600 m east of State Highway 1. Access to the site is provided by a gravel track, inferred to have been created for forestry purposes.

The solar site is located on the northern side of the existing gravel track, on a plateau which slopes very gently down towards the north-west. At the time of investigation, the site had been logged with logs and slash covering the majority of the platform. Small Manuka trees and other scrubs have also started growing between the slash.

The wind turbine site is located at the south-western corner of the solar site, directly off the gravel track, and is cleared with sparse vegetation across the platform.

Ponding water was observed in numerous areas across the solar farm site; however the turbine site was generally well drained.

2 Published Geology

The site is within the bounds of the GNS Geological Map 1 "Geology of the Kaitaia area[†] 1:250,000 scale[‡]. The published geological map indicates that the site is underlain by Awhitu Group (Pad) cemented dune sand of Pliocene age. The Awhitu Group deposits are underlain by Paratoetoe Formation materials (Parengarenga Group) comprising muddy fine-grained sandstone, and conglomerate.

Geological units presented in Table 1 below, with an extract from the geological map shown in Figure 2.

Table 1: Geological Legend

Symbol	Unit Name	Description
Pad	Awhitu Group	Cemented dune sand and associated facies (Pliocene age). Sub rocks include lignite mudstone.
Mpp	Paratoetoe Formation (Parengarenga Group)	Muddy fine-grained sandstone with pebble to boulder conglomerate, pebbly sandstone and pebbly mudstone derived from the Mount Camel terrane, the Northland Allochthon, and Coromandel Group volcanoes.

[†] Isaac, M.J. (compiler) 1996. Geology of the Kaitaia area. Institute of Geological and Nuclear Sciences 1:250 000 geological Map 1. 1 sheet + 44 p. Lower Hutt, New Zealand: Institute of Geological and Nuclear Sciences Limited.

Figure 2: Geological Map (Kaitaia area, 1:250,000)

3 Ground Investigations

3.1 Subsurface Investigations

3.1.1 *Solar Microgrid Investigations*

Haigh Workman undertook geotechnical investigations on 17th of July 2025 for the solar microgrid. The investigations comprised the drilling of 6 hand auger boreholes (HA01 to HA06) and 7 Scala penetrometer tests located across the proposed development location. In addition to the hand auger investigations, a total of 5 Cone Penetrometers Tests (CPT01 to CPT05) were completed at the site.

The results of this investigation are summarised in the August 2025 geotechnical investigation report[§] and are not repeated in this report.

3.1.2 *Machine Borehole (Wind Turbine Site)*

Haigh Workman visited the site on 4 November 2025 to carry out one machine-drilled borehole investigation. DCN Drilling Limited was engaged to drill the borehole to a depth of 18.45 m below ground level (mbgl). Triple tube drilling techniques were utilised to recover core samples in the soil and rock. In-situ testing included Standard Penetration Tests (SPT) at 1.5 m intervals using a split spoon sampler in the soil (testing in accordance with NZS 4402:1988 Test 6.5.1). Retrieved core samples were subsequently labelled, photographed, and stored in core boxes.

[§] *Geotechnical Investigation Report, Haigh Workman Limited, Ref. 25 140, dated August 2025*

Investigations were logged in accordance with The New Zealand Geotechnical Society, "Guidelines for the Field Classification and Description of Soil and Rock for Engineering Purposes" (2005). The test location is shown on the drawings in Appendix A and investigation log is included within Appendix B.

3.2 Ground Conditions

Based on the results of the geotechnical investigation conducted by Haigh Workman for the solar microgrid, it is considered that the soils directly underlying the site comprise natural soils of the Awhitu Group. All hand auger boreholes and CPTs terminated on a very dense cemented sand layer between 1.0 and 1.3 mbgl. The surface soils comprise a thin layer of topsoil, overlying very loose to loose sand and sandy silt, overlying a dense organic carbonaceous silty sand (lignite rich soils).

Machine drilling was undertaken to penetrate the cemented sand layer and obtain data from a deeper soil profile to inform the wind turbine foundation design.

The table below summarises the materials encountered in the machine borehole. A detailed borehole log is given in Appendix B.

Table 2: Summary of Machine Borehole Results

Geological Unit		MH01
AWHITU GROUP	**Very Loose to Loose SAND** *No SPT undertaken*	0.0 – 0.8 m
	Very Dense Cemented SAND *(SPT'N' value 30)*	0.8 – 2.0 m
	Loose to Medium Dense SAND (slightly cemented) *No SPT undertaken*	2.0 – 3.1 m
KARIOITAHI GROUP	**Stiff CLAY** *(SPT'N' value 8 to 16)*	3.1 – 6.2 m
	Firm CLAY and Silty CLAY *(SPT'N' value 4 to 6)*	6.2 – 8.6 m
PARATOETOE FORMATION	**Stiff to Very Stiff SILT, clayey SILT and silty CLAY** *(SPT'N' values 9 to 23)*	8.6 – 16.1 m
	Hard SILT (Completely weathered Mudstone) *(SPT'N' values 33 to 52)*	16.1 – 18.45 m (E.O.B)

Note: Depths (metres) measured below existing ground level.

3.3 Groundwater

Groundwater was measured at 4.3 mbgl in borehole MH01 upon completion of drilling. Given the low permeability of the underlying clay soils and presence of drilling fluid, the static groundwater level will likely vary from this measured depth. A standpipe was installed in the machine drilled borehole following completion of drilling to monitor groundwater levels in the future if required. The standpipe was constructed with a 32mm diameter blank PVC pipe slotted over the screened depth (1.0 to 12.0 mbgl), then backfilled with K2 gravel and sealed with Bentonite clay. The standpipe was finished with a lockable metal cover, set flush with the ground surface. Piezometer construction and screening details are given on the borehole log.

4 Geotechnical Assessment

4.1 Geotechnical Design Parameters

Geotechnical design parameters recommended in this report are based on in-situ test results and empirical relationships. Refer to Table 3 below for soil parameters to be adopted for foundation design.

Table 3: Geotechnical Design Parameters

Geological Unit	Bulk Unit Weight, γ (kN/m³)	Effective Cohesion c' (kPa)	Effective Friction Angle ϕ' (degrees)	Undrained Shear Strength Su (kPa)	Young's Modulus E (MPa)
Very Loose SAND [AWHITU GROUP]	*N/A – Foundations to be embedded below loose surface sands*				
Very Dense Cemented SAND [AWHITU GROUP]	18	0	38	N/A	20 – 50
Loose to Med. Dense SAND [AWHITU GROUP]	18	0	34	N/A	50 – 100
Stiff CLAY [KARIOITAHI GROUP]	18	5	30	50 – 100	12 – 25
Firm CLAY and Silty CLAY [KARIOITAHI GROUP]	18	3	26	50	6 – 12
Stiff to Very Stiff Residual [PARATOETOE FORMATION]	18	5	32	50 – 100	25 – 50
Hard Completely Weathered Mudstone [PARATOETOE FORMATION]	18	10	34	> 200	50

**Refer to Table 2 for depths of geological layers.*

4.2 Seismic Hazard and Liquefaction Potential

The site conditions have been assessed to be consistent with seismic subsoil Class C (shallow soil site) in accordance with NZS1170.5.

Liquefaction potential has been assessed as negligible given the density of the soils and age of the deposits. No further assessment is necessary.

5 Development Recommendations

5.1 Foundations

At the time of writing this report, structural load information for the proposed wind turbine foundation was not available. Therefore, detailed foundation design parameters cannot be provided. Foundation design can adopt the geotechnical design parameters outlined Table 3.

These parameters have been estimated to account for the anticipated soil stratigraphy beneath the proposed wind turbine site. They are suitable for use in the design of shallow or deep piled foundations, subject to confirmation of actual loads and structural requirements during detailed design.

Bearing capacity calculations will require a comprehensive load breakdown from the structural engineer, including axial loads, lateral forces, and moment actions, to appropriately size the foundation system.

Further geotechnical input, in close coordination with the structural engineer, will be required once turbine loads and foundation geometry are confirmed to verify bearing capacity and settlement performance. Any changes in site conditions or design assumptions should be reviewed by a geotechnical engineer prior to finalising the foundation design.

5.2 Earthworks

No widespread earthworks or specifically designed retaining walls are anticipated for the proposed wind turbine site. If any significant earthwork or retaining walls requiring engineering design are proposed, the matter should be referred back to Haigh Workman for further recommendations.

5.3 Geotechnical Review

We recommend that the consent drawings are submitted for review to either ourselves, or another professional geotechnical engineer who is familiar with the contents of this report, once they are ready for submission to Council for approval. We recommend this review is carried out to check the compatibility of the design with the recommendations given within this report.

5.4 Construction Observations

We consider the following specific items, but not limited to will need to be addressed prior to and at the time of construction to ensure the foundation soils are consistent with the assumptions made in this geotechnical report:

1. Geotechnical drawing review prior to undertaking construction observations;
2. Observe all foundation excavations for the building prior to foundations being poured.

Provision should be allowed for modifying the foundation solution at this time should unforeseen ground conditions be encountered.

6 Limitations

This report has been prepared for the use of Tū Mai Rā Energy with respect to the particular brief outlined to us. This report is to be used by our Client and their Consultants and may be relied upon when considering geotechnical advice.

Furthermore, this report may be utilised in the preparation of building and/or resource consent applications with local authorities. The information and opinions contained within this report shall not be used in other context for any other purpose without prior review and agreement by Haigh Workman Ltd.

The recommendations given in this report are based on site data from discrete locations. Inferences about the subsoil conditions away from the test locations have been made, but cannot be guaranteed. We have inferred an appropriate geotechnical model that can be applied for our analyses. However, variations in ground conditions from those described in this report could exist across the site. Should conditions encountered differ to those outlined in this report we ask that we be given the opportunity to review the continued applicability of our recommendations. Furthermore, should any changes be made, we must be allowed to review the new development proposal to ensure that the recommendations of this report remain valid.

Appendix A – Drawings

Drawing No.	Title
WT01	Site Investigation Plan

NOTES:

1. LOT BOUNDARIES AND AERIAL PHOTO INFORMATION TAKEN FROM LAND INFORMATION NEW ZEALAND (LINZ).
2. LOCATIONS HAVE NOT BEEN SURVEYED AND ARE INDICATIVE ONLY.

Issue	Date	Revision
A	20/11/2025	FIRST ISSUE

DWG: SITE INVESTIGATION PLAN

Scale 1:1000 @A3 | Date NOV 2025

Drawn JMC | Checked WT | Approved WT

File T:\CLIENTS\TU MAI RA ENERGY\25 140 POTAHI ROAD, TE KAO\ENGINEERING\DRAWINGS\25 140 GEO PLANS_TURBINE.DWG

HAIGH WORKMAN LTD Civil & Structural Engineers

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Project: GEOTECHNICAL INVESTIGATION
POTAHI ROAD, TE KAO (Pt Te Kao 71D)

Client: TU MAI RA ENERGY

Project No. 25 140 | RC no. N/A

DWG No. **WT01**

Sheet No. **1** of **1**

Plotted By Josh Curreen at 24/11/2025 4:55:08 pm

Appendix B – Machine Borehole Log

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New Zealand

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Borehole Log - MH01

Hole Location: Refer to Site Plan

JOB No. 25 140

CLIENT:	Tu Mai Ra Energy	**SITE:**	Potahi Road, Te Kao Sustainable Energy Project			Sheet 1 of 4
Date Started:	04/11/2025	**DRILLING METHOD:**	Rotary Cored (HQTT)	**LOGGED BY:**	JP	
Date Completed:	04/11/2025	**CORE DIAMETER (mm)**	63mm	**CHECKED BY:**	WT	

Soil Description

Based on NZGS Logging Guidelines 2005

SAND; light grey to light greyish brown. Medium dense, dry to moist, no plasticity. Sand: fine. [AWHITU GROUP]

From 0.25m: Becomes dark brown to dark brownish orange. Dense, dry. Trace fibrous organics. (Organic Stained).

From 0.35m: Becomes dark brown.

SAND; dark brown to black, speckled reddish brown (organic stained). Dense to very dense. Sand: fine.

From 0.8m: Becomes cemented, banded dark brown and black

From 1.25m: Becomes orangish brown to dark brown. Medium dense.

From 1.7m: Becomes brown to light brownish orange, banded dark brown.

SAND; brownish orange. Loose to medium dense. Sand: fine.

From 2.2m: Becomes medium dense (slightly cemented).

At 2.5m: Band (<5mm) of cemented sand; dark brown to black.

From 2.7m: Becomes loose to medium dense.

CLAY; light brown, rare dark brown streaks. Very stiff, moist, high plasticity. [KARIOITAHI GROUP]

CLAY, trace silt; light brown, trace dark brown streaks. Very stiff, moist, high plasticity.

From 4.95m: Becomes light brown, streaked light greyish brown.

Depth (m)	Geology	Method	Standard Penetration Test	Vane Shear Strength Test	Sample Type	TCR (%)	RQD (%)
0.0	AWHITU GROUP	OPEN BARREL				100	
0.5		Rotary Cored - HQTT				100	
1.0							
1.5		Split Spoon SPT	1.5m to 1.95m 4/8//7/7/8/8 N=30			89	
2.0		Rotary Cored - HQTT				76	
2.5							
3.0		Split Spoon SPT	3.0m to 3.45m 2/1//3/4/4/5 N=16			100	
3.5	KARIOITAHI GROUP	Rotary Cored - HQTT		87/15*		24	
4.0							
4.5		Split Spoon SPT	4.5m - 4.95m 1/1//1/2/2/3 N=8			100	
5.0							

Groundwater Level Measured at 4.3mbgl.

Installation: Flush Toby Box; Bentonite; Screen with Filter Sand

LEGEND

CLAY, SILT, SAND, SANDSTONE, MUDSTONE, TOPSOIL, FILL, GRAVEL, SILTSTONE

Corrected shear vane reading
Remoulded shear vane reading

Note: Groundwater measured at 4.3mbgl on completion of drilling.
Hand Held Shear Vane S/N: 2220.

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Borehole Log - MH01

Hole Location: Refer to Site Plan

JOB No. 25 140

CLIENT:	Tu Mai Ra Energy	**SITE:**	Potahi Road, Te Kao Sustainable Energy Project			
Date Started:	04/11/2025	**DRILLING METHOD:**	Rotary Cored (HQTT)	**LOGGED BY:**	JP	Sheet 2 of 4
Date Completed:	04/11/2025	**CORE DIAMETER (mm)**	63mm	**CHECKED BY:**	WT	

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Method	Standard Penetration Test	Vane Shear Strength Test	Sample Type	TCR (%)	RQD (%)	Installation
From 4.95m: Becomes light brown, streaked light greyish brown, trace dark brown streaks.	5.0				Rotary Cored - HQTT				100		Screen with Filter Sand
	5.5										
	6.0				Split Spoon SPT	6.0m to 6.45m 0/1//1/1/2/2 N=6			100		
CLAY, some silt; light brown, streaked light greyish brown. Stiff to very stiff, moist, medium to high plasticity.											
Silty **CLAY**; light brown, speckled light grey to black. Stiff, moist, medium to high plasticity.	6.5	KARIOITAHI GROUP			Rotary Cored - HQTT				100		
	7.0						85/26				
From 7.7m: Becomes light bluish grey. Firm to stiff.	7.5				Split Spoon SPT	7.5m to 7.95m 0/1//1/1/1/1 N=4			90		
Clayey **SILT**; light brown, streaked light grey, speckled black. Stiff, moist to wet, medium plasticity.	8.0				Rotary Cored - HQTT				100		
Silty **CLAY**; dark grey. Very stiff, moist, medium plasticity. [PARATOETOE FORMATION]	8.5										
From 8.7m: Becomes dark grey, speckled light grey. Trace remnant rock fabric.	9.0	PARATOETOE FORMATION			Split Spoon SPT	9.0m to 9.45m 1/2//4/5/6/7 N=22			100		Screen with Filter Sand
	9.5				Rotary Cored - HQTT				86		
Clayey **SILT**; dark grey and light grey. Very stiff, moist, medium plasticity. [Completely weathered, dark grey, banded light grey MUDSTONE].	10.0										

LEGEND

CLAY | SILT | SAND | SANDSTONE | MUDSTONE
TOPSOIL | FILL | GRAVEL | SILTSTONE

Corrected shear vane reading
Remoulded shear vane reading

Note:

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Borehole Log - MH01

Hole Location: Refer to Site Plan

JOB No. 25 140

CLIENT:	Tu Mai Ra Energy	**SITE:**	Potahi Road, Te Kao Sustainable Energy Project			Sheet 3 of 4
Date Started:	04/11/2025	**DRILLING METHOD:**	Rotary Cored (HQTT)	**LOGGED BY:**	JP	
Date Completed:	04/11/2025	**CORE DIAMETER (mm)**	63mm	**CHECKED BY:**	WT	

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Method	Standard Penetration Test	Vane Shear Strength Test	Sample Type	TCR (%)	RQD (%)	Installation
From 10.2m: Becomes light grey to grey. Trace remnant rock fabric. Minor weakly cemented gravel.	10.0	PARATOETOE FORMATION			HQTT				86		Screen with Filter Sand
CLAY, some silt; light grey to grey. Very stiff, moist, medium to high plasticity.	10.5				Split Spoon SPT	10.5m to 10.95m 2/2//3/3/4/3 N=13			33		
From 11.0m: Becomes grey to dark grey. Very stiff, moist, medium to high plasticity. *From 10.95m to 12.0m: Poor sample recovery.*	11.0				Rotary Cored - HQTT				24		
	11.5										
Silty **CLAY**; light grey to grey, streaked dark grey and light brownish yellow. Very stiff, moist, medium plasticity.	12.0				Split Spoon SPT	12.0m to 12.45m 0/1//1/3/4/4 N=12			100		
SILT, some clay; light greenish grey. Very stiff, moist, low plasticity. (Recovered as Clayey silt and fine gravel. Gravel: weakly cemented, angular.)	12.5				Rotary Cored - HQTT				33		
Clayey **SILT**; light greenish grey to light green, mottled grey and dark grey. Very stiff, moist, medium plasticity.	13.0										
From 13.25m: Minor fine gravel. Clayey **SILT**; light green to light greenish grey and grey. Very stiff, moist, low to medium plasticity [Completely weathered MUDSTONE].	13.5				Split Spoon SPT	13.5m to 13.95m 1/1//5/5/6/7 N=23			100		Bentonite
Clayey **SILT**, minor fine gravel; light green to greenish grey, mottled light grey. Very stiff, moist, medium plasticity. Gravel: weakly cemented.	14.0				Rotary Cored - HQTT				48		
From 14.3m: Minor black bands. *From 14.5m: Becomes grey with black and light brown streaks.* *From 14.9m: Some fine to medium gravel (weakly cemented).*	14.5										
	15.0										

LEGEND

CLAY · SILT · SAND · SANDSTONE · MUDSTONE
TOPSOIL · FILL · GRAVEL · SILTSTONE

Corrected shear vane reading
Remoulded shear vane reading

Note:

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Borehole Log - MH01

Hole Location: Refer to Site Plan

JOB No. 25 140

CLIENT: Tu Mai Ra Energy
Date Started: 04/11/2025
Date Completed: 04/11/2025
SITE: Potahi Road, Te Kao Sustainable Energy Project
DRILLING METHOD: Rotary Cored (HQTT)
CORE DIAMETER (mm) 63mm
LOGGED BY: JP
CHECKED BY: WT

Soil Description (Based on NZGS Logging Guidelines 2005)	Depth (m)	Geology	Graphic Log	Water Level	Method	Standard Penetration Test	Vane Shear Strength Test	Sample Type	TCR (%)	RQD (%)	Installation
Clayey **SILT**, trace fine gravel; light green and light greenish grey, mottled light grey. Very stiff, moist, low to medium plasticity. [Completely weathered MUDSTONE].	15.0	PARATOETOE FORMATION			Split Spoon SPT	15.0m to 15.45m 2/2//2/3/2/2 N=9			22		
SILT, some clay, trace fine gravel; light greenish grey and light grey, mottled greyish green. Very stiff, moist, low plasticity.	15.5				Rotary Cored - HQTT				100		Bentonite
Clayey **SILT**; light green and light grey, mottled greenish grey. Very stiff, moist, medium plasticity.	16.0										
SILT, some clay, trace fine gravel; light green and light grey, mottled greenish grey, speckled dark grey. Very stiff, moist, low to medium plasticity. [Completely weathered MUDSTONE].	16.5				Split Spoon SPT	16.5m to 16.95m 2/4//7/7/9/10 N=33			90		
SILT, some clay; light green and light greyish green, streaked and banded light grey and green, mottled dark grey. Very stiff to hard, dry to moist, low plasticity [Completely weathered MUDSTONE].	17.0				Rotary Cored - HQTT				100		Bentonite
	17.5										
	18.0				Split Spoon SPT	18.0m to 18.45m 5/7//11/11/13/17 N=52			100		
End of Hole at 18.45m. (Target Depth)	18.5										
	19.0										
	19.5										
	20.0										

LEGEND

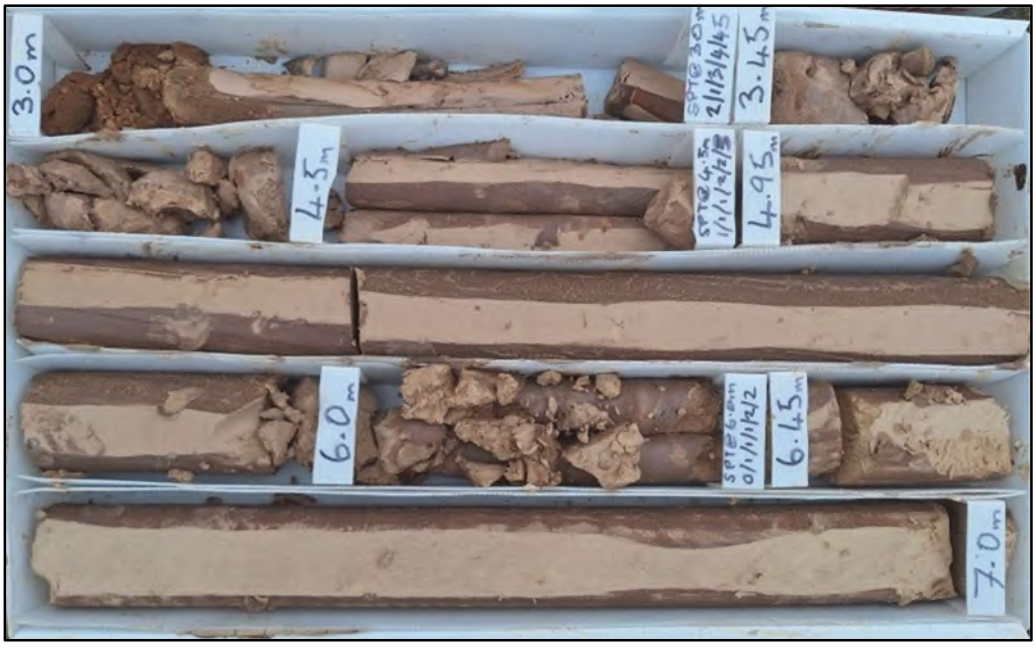
CLAY | SILT | SAND | SANDSTONE | MUDSTONE
TOPSOIL | FILL | GRAVEL | SILTSTONE

Corrected shear vane reading
Remoulded shear vane reading

Note:

MH01

Machine Borehole MH01 – 0.0m to 3.0m. Box 1 of 5.



Machine Borehole MH01 – 3.0m to 7.0m. Box 2 of 5.

Machine Borehole MH01 – 7.0m to 10.5m. Box 3 of 5.

Machine Borehole MH01 – 10.5m to 16.0m. Box 4 of 5.

Machine Borehole MH01 – 16.0m to 18.45m. Box 5 of 5.

LITTORALIS
LANDSCAPE ARCHITECTURE

Memorandum to:
Far North District Council – Resource Consents Division

TE KAO SOLAR ARRAY AND WIND MONITORING MAST – RESOURCE CONSENT APPLICATION

Landscape, Rural Character and Visual Amenity Effects

Introduction

We have been engaged by Tū Mai Rā Energy to provide an assessment of the potential landscape, rural character and visual amenity effects of a modest solar array and a mast for monitoring wind conditions at Te Kao, in the Far North. This assessment will inform resource consent applications being lodged on behalf of the applicants by Mr S Hurley, Resource Management Consultant, for each of these activities. Whilst this memorandum acknowledges those individual applications, it addresses them collectively for the sake of efficiency and coherence.

The broader proposal represents a commitment by Te Rūnanga Nui o Te Aupoūri to create a self-sufficiency in energy supply to the papakainga and other run Rūnanga-related properties at Te Kao. There has been considerable investment in the papakainga over the past decade and the resulting homes have seen the population of the settlement increase accordingly.

Context

Te Aupoūri peninsula reflects the considerable influence of past coastal processes as a substantial tombolo formed by sands carried north after being transported from the central north island. That process of deposition results in the landform being relatively low-lying, with more pronounced undulations to its western extent, where a higher energy wave environment and more consistent westerly winds have piled the dune sands into marked patterns of low hills, such as those immediately to the west of Te Kao. Similar, but more modest formations lie variably along the eastern coast, including the slopes rising to the east of Te Kao.

The central spine of the peninsula, which is traced by SH1, is largely lower lying and reasonably flat, often as a reflection of past or enduring wetlands that have formed atop the underlying sands. Large expanses of very simple, open grassland established upon slightly elevated but very gently undulating terrain are a feature of the portion of SH1 that runs from Ngataki to just south of Te Kao.

Te Kao represents something of a change point in the landform and landuse of the peninsula. The settlement lies in a broad valley, where the relic western dune fields almost reach the lower and apparently more recent sand deposits that define the eastern side of the village. SH1 runs down the divide between these landforms. The eastern dunes remain very active, as seen in Attachment One, with large areas of mobile sand, particularly on the spit enclosing Parengarenga Harbour. The intrusion of that harbour immediately to the north of Te Kao is another element that shapes this wider area.

From just south of, and including, Te Kao, the terrain traced by SH1 is considerably hillier than in the southern, central part of the peninsula. Whilst the Aupoūri Forest (an extensive pine plantation) occupies the western half of the landform from a short distance north of Ahipara, it is not until a little south of Te Kao that it displaces the pastoral farms that characterise the eastern belt of the peninsula to that point when heading north. That change in land-use is influential in the shift in character mentioned in the preceding paragraph, bringing a strong vertical element along with the clear distinctions between grassland and production forest.

When moving north of Te Kao, the landscape is shaped by areas of often steeply undulating pasture, pine forest and areas of land administered by the Department of Conservation. That combination of topography and shrubland or exotic forest considerably limits the visibility of Te Kao and the forestry areas to its east.

Site description

The Site (being the immediate area containing the activities) lies within a larger block is legally described as Te Kao 71D Residue that is managed by Te Rūnanga Nui o Te Aupoūri as part of a substantial pine plantation forest that stretches from the foot of the Parengarenga spit to just north of Everitt Road to the south. It lies approximately 600m from SH1 and 300m from the nearest homes in the papakainga.

The combined application Site lies within a larger extent that was harvested of pines in the past 24 months and lies as predominantly open ground, with scattered small logs and slash, pine stumps and areas of initial colonisation by manuka, kanuka and a range of allied native shrubland species, along with juvenile pine and Sydney wattle seedlings. Attachment One (C) shows how the Site is situated relative to the larger area of clearance undertaken during harvest and the way that remaining areas of vegetation of scale lie between it, the papakainga and surrounding terrain. Panoramas VP13 and VP14 in Attachment Three give a sense of the detailed characteristics of the Site and that way that it is contained by semi-mature vegetation on the outer fringe of all sides of the clearing.

The proposed solar array would lie to the north of a forestry access track that runs on from the public Potahi Road and secured by a heavy forestry gate that is kept locked. The wind monitoring mast would be positioned to the south of that road.

Proposal

Drawings that illustrate the proposal/s are found in Attachments Three and Four.

The mast proposed to support wind monitoring instruments at its head would be a slender, galvanized tubular steel structure that is supported by 5 tiers of slim cable guys. Tubing would be 203mm diameter near the ground and taper in steps to 114mm in the upper segment. By way of comparison, the mast would be roughly 2/3 the thickness of a standard concrete power pole at their respective bases. This structure would remain in place for approximately 12 months to gather a full annual cycle of wind data, before being dismantled.

A grouping of comparable masts exists near Waimanoni, a short distance north of Awanui, and usefully provides a "real-life" example of the visual presence of such a structure. Whilst there is an awareness of these masts when on the closest parts of SH1, they have a muted presence in the broadly horizontal, open, farmed landscape that they rise above. It is not until being within 1km of these four structures that the traveler becomes aware of their combined existence.

Photograph 1: a cluster of four masts of comparable scale to the single mast proposed by this application. These structures are located a short distance north of Awanui.

The second portion of the proposal involves a small "solar farm", with arrays covering up to 2 ha within the area marked on Attachments Three (C) and Four. Mounting racks would be low and see the apex of the panels being no more than 2m above ground. A small ancillary building/s nearby would house a

battery bank and control equipment. Vegetation in the immediate vicinity of the arrays would be managed to ensure optimal sunlight access to the panels. It is intended that a belt of vegetation that is higher than the panels would be maintained, in some form, to the western perimeter of the Site, or beyond, in perpetuity.

Visual amenity effects

The low-lying construction of the solar farm part of the proposal, coupled with the fact that it lies within a vegetative frame that will be maintained – in some form – for the duration of the arrays' existence, means that any visual amenity effects, landscape effects or rural character effects will be contained to being entirely within the production forestry context immediately related to the Site Accordingly, there will be no adverse visual amenity, landscape, or rural character effects imposed upon anywhere outside that immediate area. The visual effects of the solar part of the proposal are accordingly assessed as being less than minor.

A range of photographic panoramas found in Attachment Two (with their locations marked in Attachment One) illustrate views toward the Site from typical, largely publicly accessible, vantage points the exist within a 5km radius. As previously mentioned, the limited diameter of the mast will make it relatively inconspicuous from 1km and almost indistinguishable from that greater 5km distance.

The vegetation surrounding the mast location, combined with it being either elevated above or level with most potential viewing locations means that vegetation remaining around mast will screen the lower 30-50% of the structure, depending upon the viewing location. That means that it will be the lesser 150-114mm diameter sections of the mast that would potentially be witnessed. It is understood that there are no plans to harvest any parts of the wider production forest during the existence of the monitoring mast.

The vertical nature of the forest's composition and the fact that the forest represents a productive land-use that includes predictable sequences of harvest and replanting means that a structure like a mast is less contrasting than it would be amidst open grassland or indigenously vegetated settings.

The captions of the panoramas describe the relative presence of the mast within each view, with many demonstrating that it would not be seen from that area or that it would have only a very limited impact. In recognition of the very limited potential for the mast to impose heightened effects, those captions form the descriptive basis for establishing potential effects. Their distribution, as seen in the sheets of Attachment One, demonstrate that a detailed field assessment has underpinned this memorandum.

As a reflection of the preceding commentary and the descriptions associated with the panorama captions, the visual amenity effects of the proposed wind monitoring mast are less than minor.

Landscape and rural character effects

Earlier descriptions and attached photographs convey the character of the Site and its immediate setting as a production forest. There are no heightened landscape values or rural character amenity present.

As previously discussed, the solar farm portion of the proposal would have no effects upon what very limited landscape and rural character values exist on the Site and its wider setting.

Although it would rise well above the monoculture of conifers that surround it, the slender profile of the mast would not have a strong presence and it would share a common vertical line with that forest as a small measure of compatibility. Since the mast would only figure subtly in the experience of the broader Te Kao hinterland, the landscape and natural character effects of the mast are assessed as being less than minor.

Provisions of the Operative Far North District Plan (OFNDP) and Proposed Far North District Plan (PFNDP)

As it lies within the Rural Production Zone (RPZ), the thrust of policy 8.6 of providing for activities whilst managing adverse effects upon amenity values is particularly relevant. As this memorandum outlines, the adverse effects of the mast are very limited and so this policy direction is respected by the application.

Similarly, provisions applying to utility services seeks a similar balance between "providing for" and managing potential adverse effects upon amenity. Once again, the policy is not compromised by the proposal.

The PFNP continues the themes of the OFNDP through it provisions for Renewable Energy Generation and Special Purpose Zones – Maori Special Purpose. The policies that require amenity values to be appropriately managed whilst providing for the primary purpose of the chapter are satisfied by the solar and mast components of the proposal.

Conclusion

In summary, the solar component of the proposal will have no external effects in relation to the scope of this assessment. Potential adverse effects on landscape, natural character and visual amenity values of the wind monitoring mast will be less than minor.

Mike Farrow Principal Landscape Architect

LITTORALIS LANDSCAPE ARCHITECTURE
November 2025

Prepared for: Te Rūnanga Nui o Te Aupoūri.

ATTACHMENTS

PROPOSED SOLAR ARRAY AND WIND MONITORING MAST
TE KAO | FAR NORTH

LITTORALIS
LANDSCAPE ARCHITECTURE

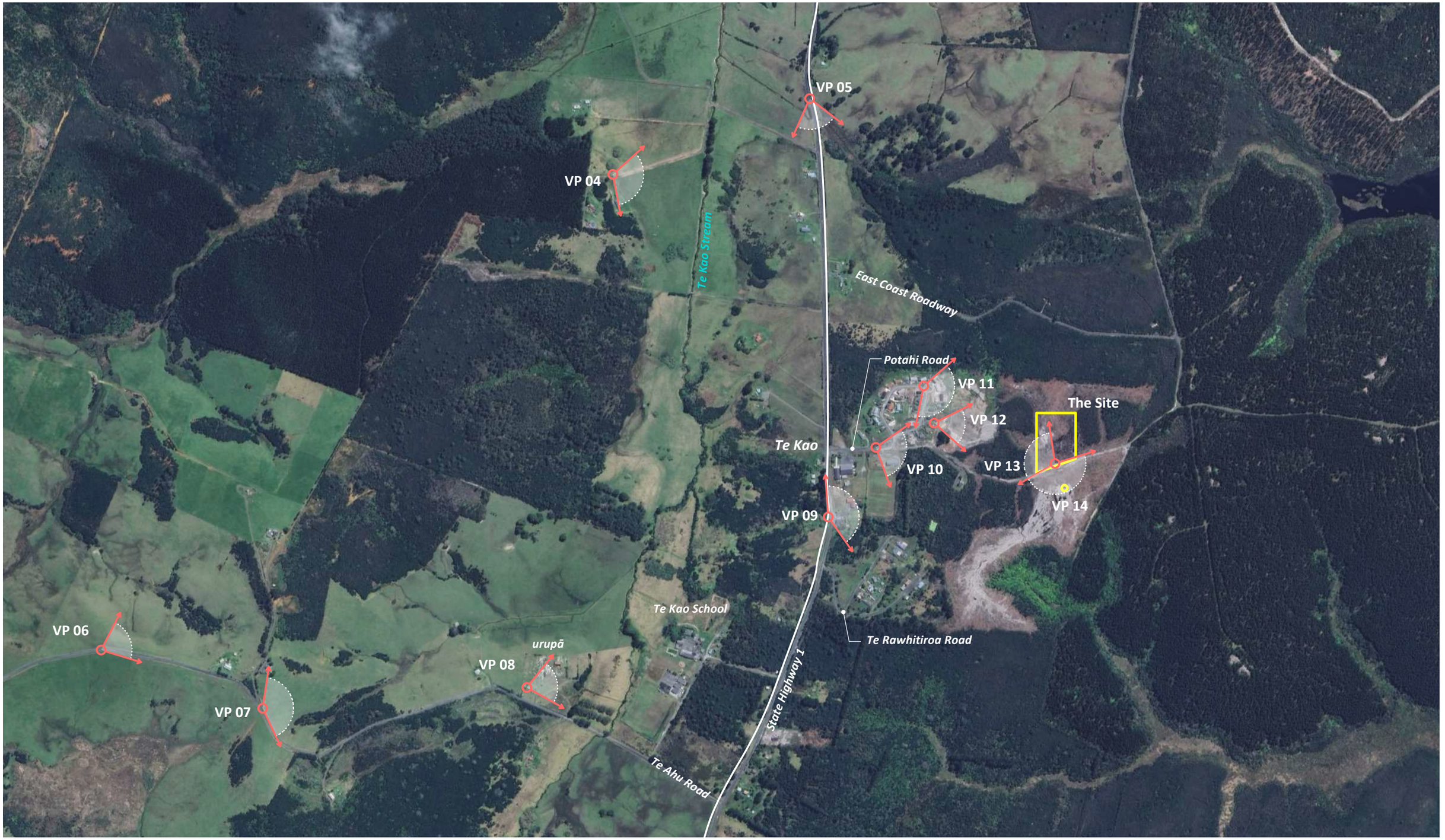
ATTACHMENT ONE
VANTAGE POINT LOCATIONS A

Image source: Google Earth

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT ONE
VANTAGE POINT LOCATIONS B

Image source: Google Earth



LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT ONE
VANTAGE POINT LOCATIONS C

Image source: Google Earth

LITTORALIS
LANDSCAPE ARCHITECTURE

Date of photography for panoramas
15/10/2025 08:15am to 02:30pm

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP01:
Near low water on Great Exhibition Bay, alongside the northern vehicle access point. The mast would not be visible from this location or elsewhere on the beach.

Panorama VP02:
A distant view toward Te Kao from Te Ahu Road some 4km to the west of the Site. Over this distance the mast would be a very slender and barely visible within the wider vista.

The panoramic photographs were digitally merged. Original photographs with Nikon Z5 with with approx. 33mm focal length lens setting, making the image magnification equivalent to a 50mm focal length lens on a full frame 35mm camera. The field of view for each panorama varies in response to the relevant field of view for each of the vantage points.

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP03:
A shot from approximately 1km along Everitt Road, looking north towards the Site. Intervening forestry would conceal the mast from view from this and other areas to the south.

Panorama VP04:
Taken from an access to a few houses to the west of SH1, approximately 1km from the Site. The mast would be visible as a fine vertical line above the pines seen on the skyline to upper right in the image.

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP05:
Looking south toward Te Kao from a dip in SH1 just north of the settlement. The upper portion of the mast would be visible as a slender vertical element on the skyline to the left of the road, almost directly ahead.

Panorama VP06:
The view east from a gently descending portion of lightly used Ta Ahu Road, approximately 2.6km from the Site. Even over this distance the tubular form of the mast would be relatively indistinct.

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP07:

Panorama VP08:
Looking over the urupa on Te Ahu Road, with the kura in the floor of the valley below, with Te Kao beyond.
The mast would be largely obscured by the trees on the hill to the east of the village centre.

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP09:
Set on the margin of SH1 alongside Te Kao store. The mast would lie beyond the trees forming the skyline and would be screened from this area.

Panorama VP10:
Looking up the straight of Poutahi Road as it climbs towards the papakainga and continues on as the forestry road. The mast would be positioned approximately in line with the large power pole seen to right of the road and would almost certainly be obscured by the intervening tree beyond.

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LANDSCAPE ARCHITECTURE

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP11:
Taken from the bend in the portion of Te Poutahi Road that loops within the papakainga.
The mast would be positioned above the nose of the blue utility vehicle.

Panorama VP12:
Viewing towards the microgrid site (obscured from this and all other locations outside the forestry area) and mast location from the eastern margin of the papakainga. The mast would be aligned approximately above the red letterbox seen in the foreground.

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT TWO
SITE PHOTOGRAPHS

Panorama VP13:
Looking across the microgrid site from the margin of the primary forest access road. The extent of the microgrid is marked approximately on the image. The papakainga lies some distance beyond the scrubby vegetation seen immediately to the right of the road.

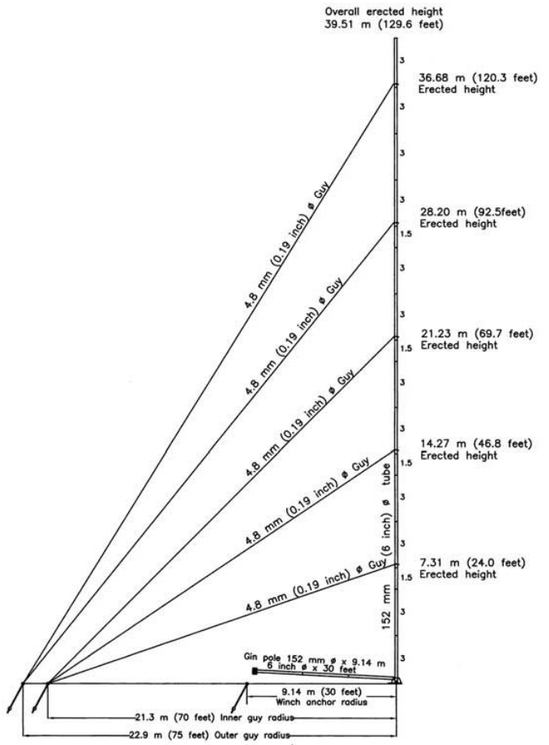
Panorama VP14:
The wind monitoring mast site on the southern side of the forestry access road, with the location of the mast approximately indicated.

LITTORALIS
LANDSCAPE ARCHITECTURE

Materials						
	Outer Diameter	Wall Thickness	Description	Yield Strength	Breaking Strength	Corrosion Protection
1	8 inch	0.109 inch	MT 1020	50.0 ksi	N/A	Hot Dipped Galvanized ASTM 653
	203 mm	2.8 mm		345 mPa		
2	8-6 inch taper	0.109 inch	MT 1020	50.0 ksi	N/A	
	203-152 mm	2.8 mm		345 mPa		
3	6 inch	0.109 inch	MT 1015	50.0 ksi	N/A	
	152 mm	2.8 mm		345 mPa		
4	6-4.5 inch taper	0.109 inch	MT 1015	50.0 ksi	N/A	
	152-114 mm	2.8 mm		345 mPa		
5	4.5 inch	0.083 inch	MT 1010	50.0 ksi	N/A	
	114 mm	2.1 mm		345 mPa		
6	0.187 inch		7x7 Galv.	N/A	3.7 kLb	Galvanized
	4.76 mm		Aircraft		15.2 kN	

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	Units, notes update	17Jul03	APB
B	Changed reaction format	17Aug03	APB
C	Revised SI forces	13Dec06	APB

Reactions and member forces		
	Imperial	SI
10 m (33 feet) wind velocity (Fastest mile)	70 mph	31.3 m/s
Top of tower wind velocity (Fastest mile)	85 mph	38 m/s
Radial ice thickness	0.0 inch	0 mm
Inner guy anchor force	0.6 kLb	2.7 kN
Inner guy anchor force (angle from horizontal)	27°	27°
Outer guy anchor force	1.9 kLb	8.5 kN
Outer guy anchor force (angle from horizontal)	51°	51°
Tower base force (horizontal- during erection)	2.0 kLb	8.9 kN
Tower base force (vertical)	4.3 kLb	19.1 kN
Erection anchor force	2.8 kLb	12.5 kN
Erection anchor force (angle from horizontal)	45°	45°
Maximum guy tension	0.8 kLb	3.6 kN
Maximum tower tube stress (compression)	5.2 ksi	35.9 mPa
Maximum tower tube stress (tension)	2.5 ksi	17.1 mPa
Maximum top deflection	10 inch	247 mm
Initial guy tension	0.2 kLb	0.9 kN



COMMONWEALTH OF MASSACHUSETTS
ANDREW P BOOTH
NO. 35439
REGISTERED PROFESSIONAL ENGINEER
APBooth 1-10-07

Notes
A) Wind forces and allowable member loads are calculated using ANSI TIA/EIA-222-F, (1996), "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures".
B) Wind speeds are fastest mile wind velocity per EIA-222-F. EIA-222-F wind loading coefficients: Gf=1.69, Cf=1.0, α =2/7.
C) Fastest mile (fm) wind speed can be approximately converted to three second (3sec) wind speed using the equation:
V(3sec) =1.22 V(fm) for V(fm) <= 100 mph
D) Guy joint efficiency = 0.9 and the guy safety factor is greater than or equal to 2.0.
E) An ANSYS large deflection FEA model using beam (Pipe16) and tension (Link10) elements with distributed wind load was used to calculate member forces and reactions.
F) Tower allowable stress design per American Institute of Steel Construction (AISC) "Allowable Stress Design", 9th Ed. 1989. Chapter H, equations H1-1, H1-2
G) This tower design meets the structural requirements of EIA-222-F, sections 1,2,3,6,8 for the given loading condition. This analysis does not apply to EIA-222-F sections 7,11,12,13.
H) Foundation design must be considered separately and is not a part of this analysis. Specific foundation details must be approved for the specific application and site by a qualified professional.
I) A locally qualified professional must determine the applicability of this analysis for the expected site conditions. Due to the lack of involvement in the siting or construction phase of this product at a specific location, liability is strictly limited to issues arising from negligence, willful misconduct by NRG or the professional engineer completing this analysis. No warranty, expressed or implied, is made concerning the suitability of this product for a given application or location.

Units notation

mm - Millimeters
m - Meters
m/s - Meters per second
kN - 1,000 Newtons
mPa - 1,000,000 Pascals
kLb - 1,000 US pounds
ksi - 1,000 US pounds per inch²
mph - Miles per hour
Ø - Diameter

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
± 1/64 .XX ± .015 ± 1°
.XXX ± .005
DO NOT SCALE DRAWING
MATERIAL :
FINISH :

APPROVALS	DATE
DRAWN A Booth	26Apr03
CHECKED	
ISSUED	

NRG SYSTEMS INC
110 RIGGS ROAD, HINESBURG, VT., 05461

TITLE: 40 Meter TallTower
152 mm (6.0 inch) diameter tube

SIZE B | DWG.NO. TT1989 | REV C
SCALE NTS | SHEET 1

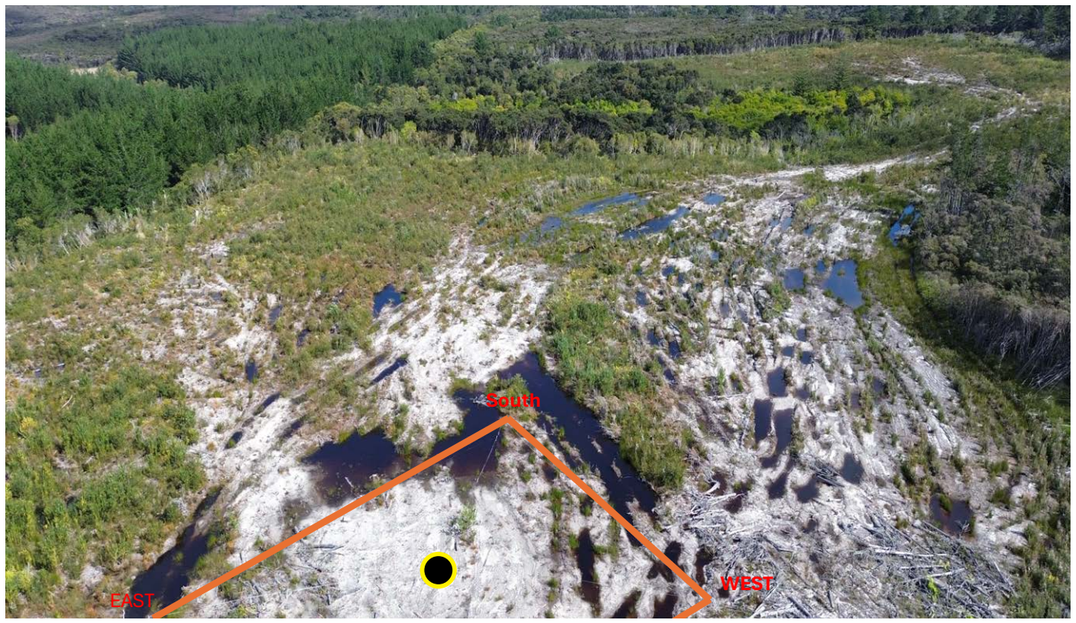
Figure 45: 40 m TallTower

LITTORALIS
LANDSCAPE ARCHITECTURE

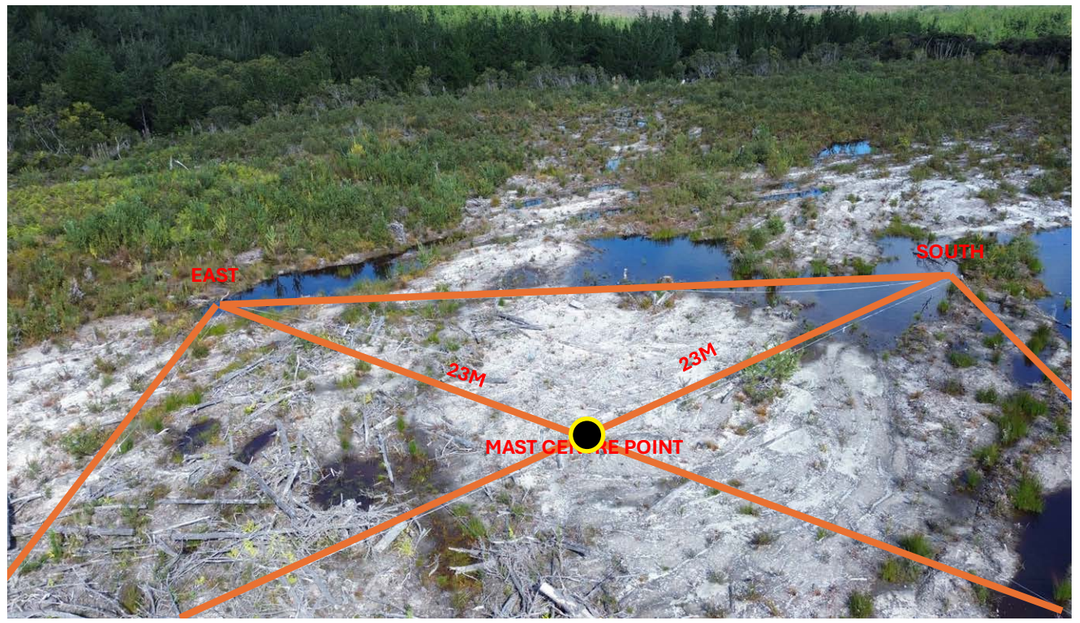
ATTACHMENT FOUR
INDICATIVE SITE LAYOUT PLAN

LITTORALIS
LANDSCAPE ARCHITECTURE

ATTACHMENT FOUR
INDICATIVE SITE LAYOUT PHOTOGRAPHS



Indicative wind monitoring mast location



Indicative wind monitoring mast location

Indicative wind monitoring mast location

Microgrid area with papakainga seen in the distance

LITTORALIS
LANDSCAPE ARCHITECTURE


Papakainga
Transformer
Cable to transformer
Draft microgrid layout
DP
DP
DP
Battery site
Possible wind turbine site
Wind monitoring site