

Te Rere Hau Repowering

Construction Noise Management Plan (CNMP)

Client: Te Rere Hau Project LP
Date: 13 September 2024
Ref: 24-106/R01/A



Prepared for (the Client)
Te Rere Hau Project LP

Prepared by the Consultant)
Altissimo Consulting Ltd

Project Te Rere Hau Repowering
Report Construction Noise Management Plan (CNMP)
Reference 24-106/R01/A

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Version history:

Version	Date	Comment
A	13 Sept 2024	Issued for community engagement

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1 Introduction

This Construction Noise Management Plan (**CNMP**) forms part of the suite of environmental controls for the construction phase of the Te Rere Hau Repowering Project (the **Project**), including the decommissioning of the existing turbines. This CNMP is an appendix to the Construction Environmental Management Plan (**CEMP**) for the Project.

This draft has been prepared prior to the tendering of major engineering and procurement packages. It will be reviewed and updated as required prior to the commencement of construction.

The CNMP is required to be certified by the Palmerston North City Council (**PNCC**) and Tararua District Council (**TDC**), collectively the **Councils**.

The Te Rere Hau Project LP (the **LP**) is taking the role of the Consent Holder.

In general, the project is "Low risk" from a construction noise perspective, given the setback from works to houses. However, the transportation of turbine components on the public road will be in close proximity to neighbouring properties and will require enhanced management. In addition, any night works have the potential to cause annoyance and will need to be managed.

1.1 Purpose

The objective of this plan is to provide a framework for construction noise management to ensure that noise levels at neighbouring dwellings remain within reasonable limits throughout the works.

The purpose of the CNMP required by clause (a) shall be to ensure construction related noise effects are:

- i. Designed and implemented to comply with the requirements of 'NZS6803:1999 Acoustics - Construction Noise', as measured and assessed in accordance with the long-term noise limits set out in the standard;

- ii. Implemented in accordance with the requirements of section 16 of the [Resource Management] Act so as to adopt the best practicable option to ensure the emission of noise during construction activities does not exceed a reasonable level.

This CNMP has been prepared to comply with conditions NO2 of the repowering consent, and Condition 2 of the existing consent regarding the decommissioning of turbines.

1.2 Construction noise management

Proactive management and consistent application of good construction behaviours is required to minimise construction noise effects. Figure 1 outlines the key steps that this CNMP adopts to achieve its purpose.



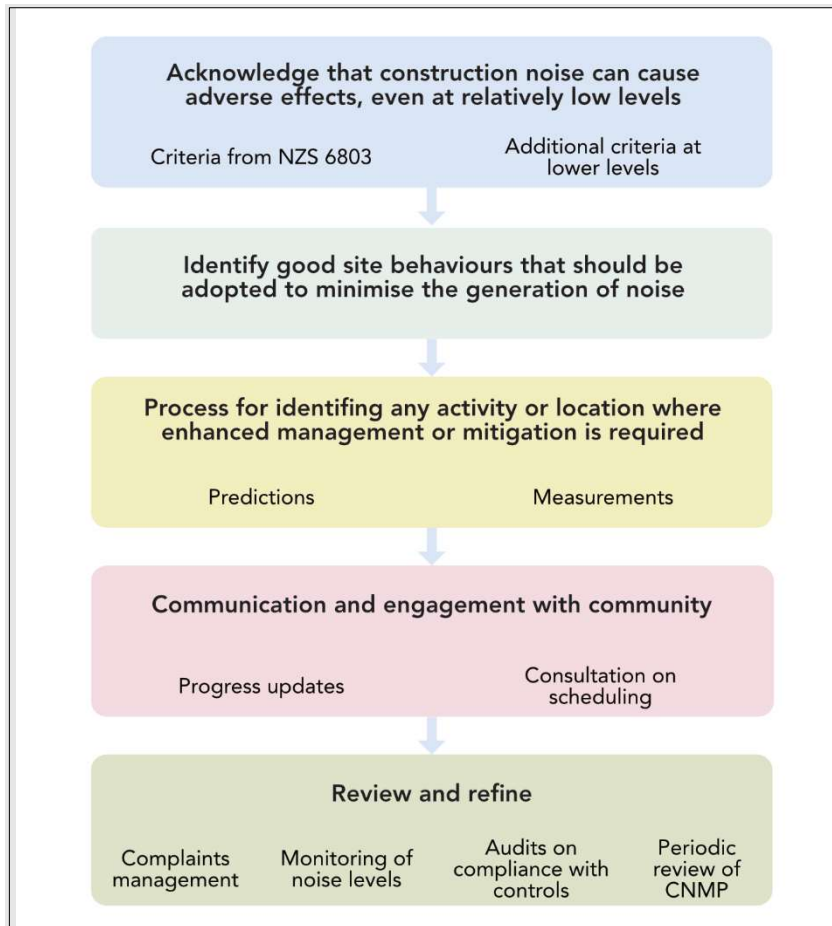


Figure 1 Process overview

1.3 Roles and Responsibilities

The CEMP details roles and responsibilities associated with managing environmental effects from construction on the Project. The LP has appointed an Environment

Manager who has the overall responsibility for the implementation of this CNMP. The LP has suitably qualified noise specialist (see Section 1.4) available to the project during the construction period to provide advice on when construction activities may require an enhanced level of mitigation or monitoring in order to reduce impacts on receivers.

The Environment Manager will be responsible for ensuring that this CNMP is correctly implemented. They will review all documentation relating to construction noise before it is issued.

1.4 Suitably Qualified and Experienced Person

This CNMP has been prepared by Michael Smith, a Principal Acoustics Engineer of Altissimo Consulting. He has a degree in Mechatronic Engineering and over 18 years of experience in acoustics. He is a graded member of the Acoustical Society of New Zealand (MASNZ). He has significant experience in both assessment of wind turbine noise and managing the noise effects from the construction of large infrastructure projects.

He has been assisted by Rob Wareing who has a degree in Mechanical Engineering and a PhD in acoustics. He has over 10 years of experience in acoustics.

Michael and Rob will be available to assist the project team with the implementation of the CNMP.

1.5 Relationship to Other Plans

As construction traffic on public roads is a significant construction noise effect, the CNMP is closely linked to the Construction Traffic Management Plan (**CTMP**). The CTMP is required to be certified by the Councils, and Traffic Management Plans (**TMPs**) will require approval from the relevant Road Controlling Authorities.



1.6 Consultation

In accordance with NO2(e), the Consent Holder is required to provide a copy of the CNMP to the adjoining properties and invite their view on it. The CNMP was issued to the residents in late 2024. A record of this consultation and comments received, together with an indication on how the comments were dealt with, is contained Appendix B.

[Any changes to address council comments will also be listed in Appendix B]

1.7 CNMP Review

This draft CNMP will be updated prior to the commencement of construction to reflect any changes or additional information available.

The CNMP will be updated throughout the course of the Project to reflect material changes associated with changes to construction techniques or the natural environment. Any amendments will be made in accordance with the processes agreed with the Councils. A management review of the CNMP will be undertaken at least annually.

2 Proposed works

2.1 Project Overview

The Project can be summarised as follows:

- Decommission and remove the existing 97 two-bladed Wind Flow turbines.
- Upgrade the internal site roads as necessary to allow the transportation of new turbine components.
- Installation of 39 new wind turbines, including foundations
- Installation of 3.3 km of new transmission line, including 16 towers
- Installation of substation and associated cabling
- Potential installation of a new operations and maintenance building - TBC

2.2 Timeframe

The high-level construction sequence and programme is listed in Table 1.

Table 1 Construction sequence

Stage	Estimated duration	Programme
Decommissioning	6 months	April 2025 - October 2025
Early and enabling works	9 months	January 2024-October 2024
Earthworks / civil	15 months	October 2025 - December 2026
Electrical	TBC	TBC
Transmission line	12 months	January 2026 - December 2026
Turbine installation	11 months	January 2027 - November 2027

2.3 Hours of operation

The typical work hours are:

- Weekday: 0700-1800h
- Saturdays: 0700-1800h
- Sundays and public holidays: Not standard working days.

3 Potentially Affected Properties

Appendix A to the resource consent condition identifies potentially affected properties, and the specified noise limits apply at these properties. These properties are show graphically in Figure 2.

Note that 81 North Range Road (Dwelling 31) will be leased for the duration of construction, and is not considered noise sensitive.



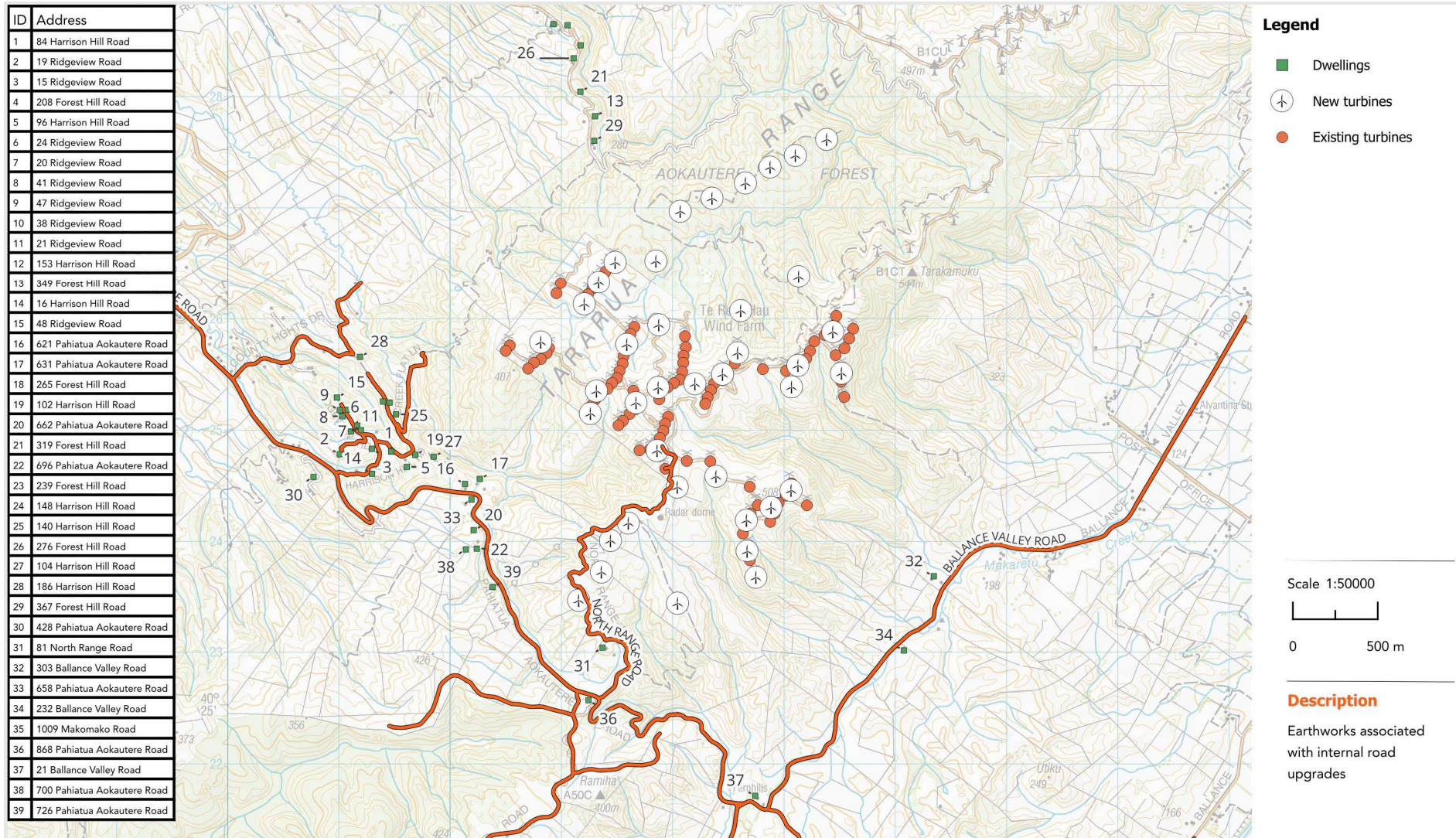


Figure 2 Receiver locations



4 Criteria

4.1 Resource Consent Conditions

The relevant resource consent conditions are identified in Appendix A, which also cross references how they have been addressed in this plan.

4.2 Construction Noise

The resource consent conditions reference the New Zealand Standard NZS 6803:1999, including the application of noise limits. This standard includes guideline noise limits which vary throughout the day, and also includes reduced noise limits for Sundays and public holidays.

The relevant criteria from NZS 6803 are presented in Table 2 for residential receivers. Work is specifically discouraged in the greyed-out time periods. It can be observed that there is a morning and evening 'shoulder' period which allows some increased noise activity prior to the main 'daytime' period.

The daytime noise limits are quite permissive, due to typical constraints regarding construction nearby dwellings. Noise at these levels for extended periods will generally not be acceptable to residents and have significant adverse effects.

For this project, additional criteria (Table 3) have been developed to assist with communicating likely effects to nearby residents, and also to identify to project staff that despite compliance with the noise limits from NZS 6803, the adoption of practices to further reduce noise is warranted.

Table 2 Project noise limits from NZS 6803:1999

Time of week	Time period	Long-term duration (greater than 20 weeks)	
		dB LAeq	dB LAFmax
Weekdays	0630-0730	55	75
	0730-1800	70	85
	1800-2000	65	80
	2000-0630	45	75
Saturdays	0630-0730	45	75
	0730-1800	70	85
	1800-2000	45	75
	2000-0630	45	75
Sundays and public holidays	0630-0730	45	75
	0730-1800	55	85
	1800-2000	45	75
	2000-0630	45	75



Table 3 Construction noise criteria (daytime)

Level range	Colour coding	Effect
< 50 dB	No shading	Construction noise may be audible but unlikely to cause annoyance.
50-60	Green	Construction will be clearly audible and may cause annoyance depending on the duration of the noise and the time of day, but unlikely to interfere with domestic activities.
60-70 dB	Orange	Intermittent noise at this level may cause moderate annoyance and some disturbance with domestic activities. Site specific mitigation should be considered at this level.
> 70 dB	Red	Exceeds NZS 6803. Noise will only be acceptable for limited durations, with advance warning

Where noise is predicted or measured to exceed the limits in Table 2, additional assessment should occur and mitigation be considered. While this is not anticipated for this project due to the generally large separation distances, this process is documented in Section o.

In contrast to the daytime criteria, the nighttime limit from NZS 6803 (45 dB) is quite restrictive. Table 4 presents the proposed graduated criteria proposed for this project.

Table 4 Construction noise criteria (nighttime)

Level range	Colour coding	Effect
< 40 dB	No shading	Construction noise may be audible outside but unlikely to cause annoyance. No restrictions for working at this noise level.
40-45 dB	Green	Construction noise is likely to be audible outside but unlikely to cause annoyance. Work at this noise level should still be minimised.
45-55 dB	Orange	Exceeds NZS 6803. Noise at this level is likely to cause minimal annoyance, provided it is of limited duration and for a specific purpose. Site / activity specific mitigation will need to be adopted and documented. Residents will need to be notified.
> 55 dB	Red	Exceeds NZS 6803. Noise will be clearly audible outside and slightly audible inside. Residents will want to close windows to minimise internal noise levels. Site / activity specific mitigation will need to be adopted and documented. Residents will need to be notified.



5 Noise Sources

5.1 Equipment

Table 5 lists indicative equipment for the key noise sources associated with each stage of construction. The sound level for each item of equipment has generally been taken from library data in British Standard BS 5228-1:2009 or from measurements on other construction projects. There will often be 5-10 dB in variability between similar equipment depending on the make and model, age of the equipment, and the material being handled (eg ground conditions).

The make and model of key construction equipment will be identified prior to construction, and the calculations will be updated accordingly. During initial site noise monitoring, the noise emission assumptions will be verified and if there are significant discrepancies, noise modelling will be updated.

Predicted sound levels are provided for a range of distances, and also the required distance to achieve each of the criteria from Table 3 is provided. These predictions do not take into site specific conditions such as terrain screening, nor do they include air absorption. They are therefore very conservative, particularly at large distances.

5.2 Noise modelling

In addition to the indicative sound levels from individual equipment items, overall sound levels for the turbine removal and earthworks phases, along with the use of helicopters for installation of transmission towers have been predicted using a three-dimensional environmental noise model of the site and surrounds. The modelling parameters are detailed in Table 6.

The ISO 9613-2 algorithm predicts typical downwind noise levels or noise levels that are typical of a mild ground-based temperature inversion. This results in a

conservative prediction, and for other environmental conditions sound levels will generally be lower.

Noise contour plots are shown in Figure 3 to Figure 5. These figures show generally low noise levels at the nearby dwellings, with the exception of helicopter usage, which will be at a moderate (orange) level for some dwellings.



Table 5 Indicative sound levels, $L_{Aeq(15min)}$

Item	Sound level at 10m	Sound level at distance				Distance to achieve criteria			
		100 m	250 m	500 m	1000 m	70 dB	60 dB	50 dB	40 dB
Decommissioning									
Concrete breaker	88 dB	71 dB	63 dB	57 dB	51 dB	112 m	355 m	1122 m	3548 m
Concrete saw	80 dB	63 dB	55 dB	49 dB	43 dB	45 m	141 m	447 m	1413 m
Digger	78 dB	61 dB	53 dB	47 dB	41 dB	35 m	112 m	355 m	1122 m
Dump truck	75 dB	58 dB	50 dB	44 dB	38 dB	25 m	79 m	251 m	794 m
Earthworks / civils									
Digger	78 dB	61 dB	53 dB	47 dB	41 dB	35 m	112 m	355 m	1122 m
Excavator	80 dB	63 dB	55 dB	49 dB	43 dB	45 m	141 m	447 m	1413 m
Scraper	92 dB	75 dB	67 dB	61 dB	55 dB	178 m	562 m	1778 m	5623 m
Surface mining machine	89 dB	72 dB	64 dB	58 dB	52 dB	126 m	398 m	1259 m	3981 m
Concrete pump / truck / vibrator	88 dB	71 dB	63 dB	57 dB	51 dB	112 m	355 m	1122 m	3548 m
Dump truck	75 dB	58 dB	50 dB	44 dB	38 dB	25 m	79 m	251 m	794 m
Concrete plant									
Mobile crusher	91 dB	74 dB	66 dB	60 dB	54 dB	158 m	500 m	1581 m	5000 m
Batching plant	78 dB	61 dB	53 dB	47 dB	41 dB	34 m	106 m	336 m	1062 m



Table 6 Modelling parameters

Modelling parameter	Value
Software package	Predictor v2024
Propagation algorithm	ISO 9613-2
Ground absorption	0.8
Terrain resolution	5m contour interval
Air temperature	20°C
Humidity	70%
Receiver type	Façade (includes 2.5 dB correction)
Receiver height	1.5m - ground floor
Contour type	Free-field
Contour resolution	5m

5.3 Vehicle movements

Table 7 provides indicative vehicle pass-by noise levels for different vehicle classes.

Table 7 Indicative vehicle pass-by noise levels (L_{AFmax})

Item	Sound level at 10m	Sound level at distance (L_{AFmax})			
		25 m	50 m	100 m	200 m
Light vehicle (ute)	70 dB	62 dB	56 dB	50 dB	44 dB
Dump truck	80 dB	72 dB	66 dB	60 dB	54 dB
Turbine transporter (TBC)	100 dB	92 dB	86 dB	80 dB	74 dB



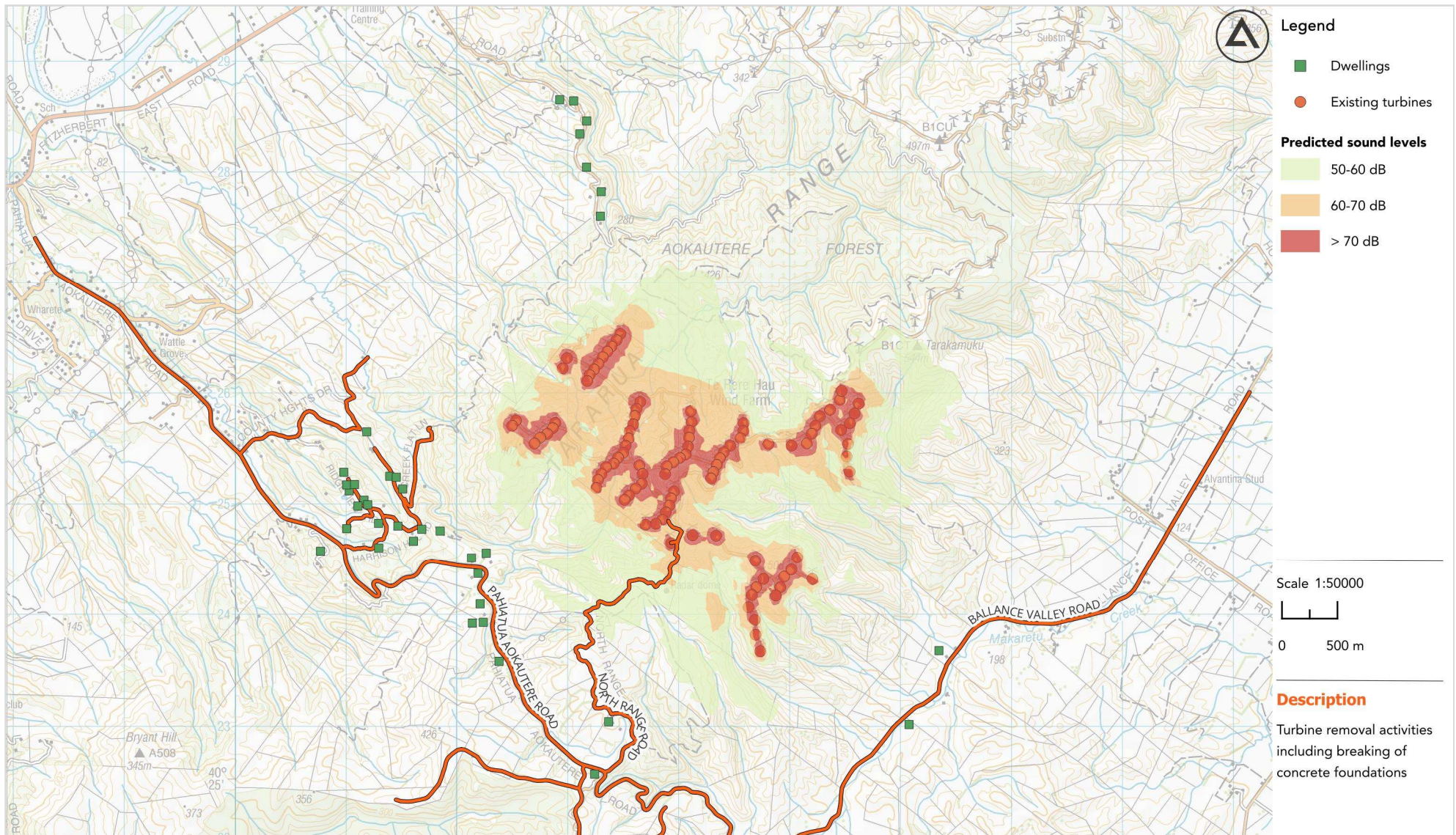


Figure 3 Noise contours from turbine removal



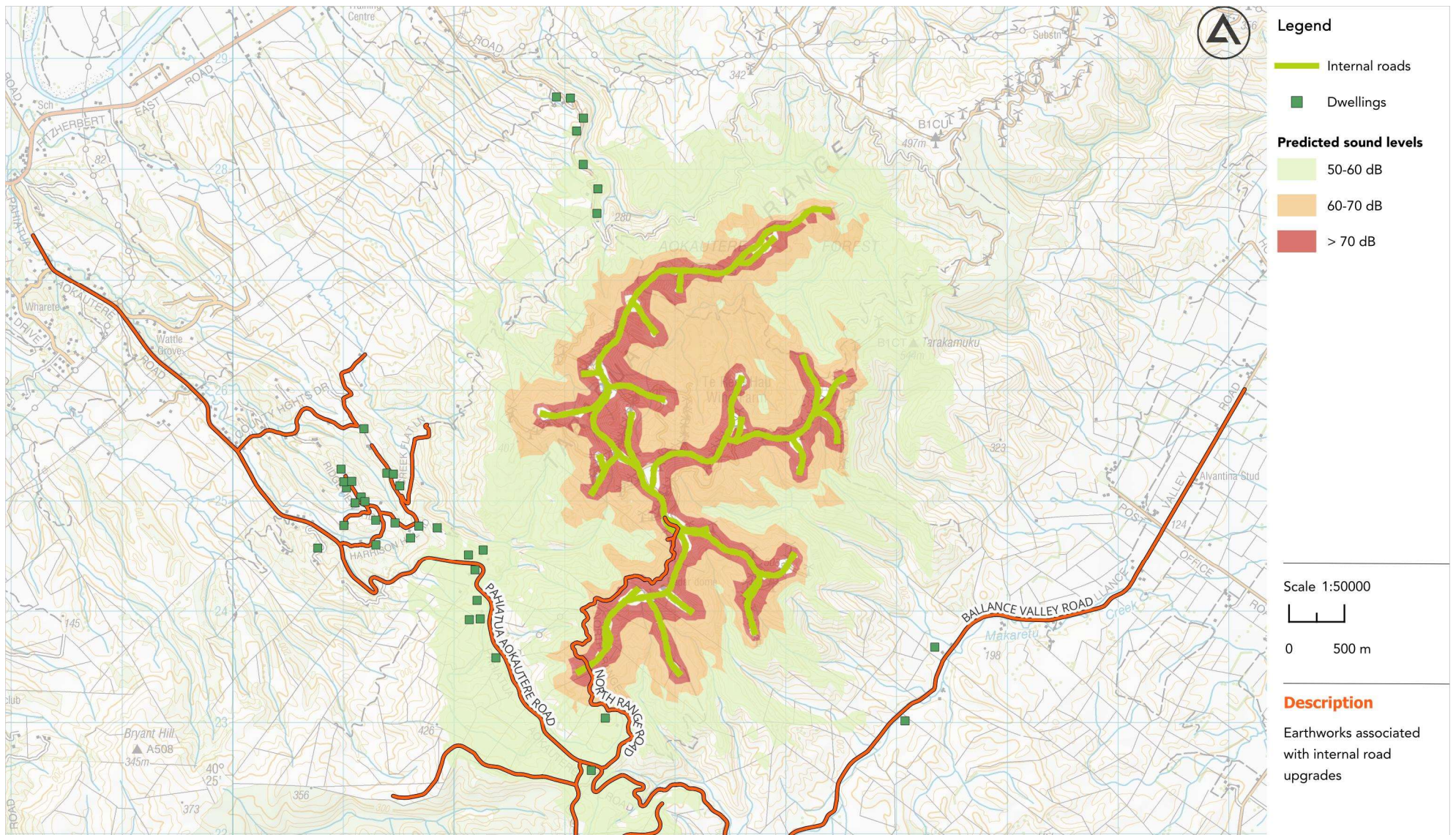


Figure 4 Noise contours from earthworks associated with internal roads



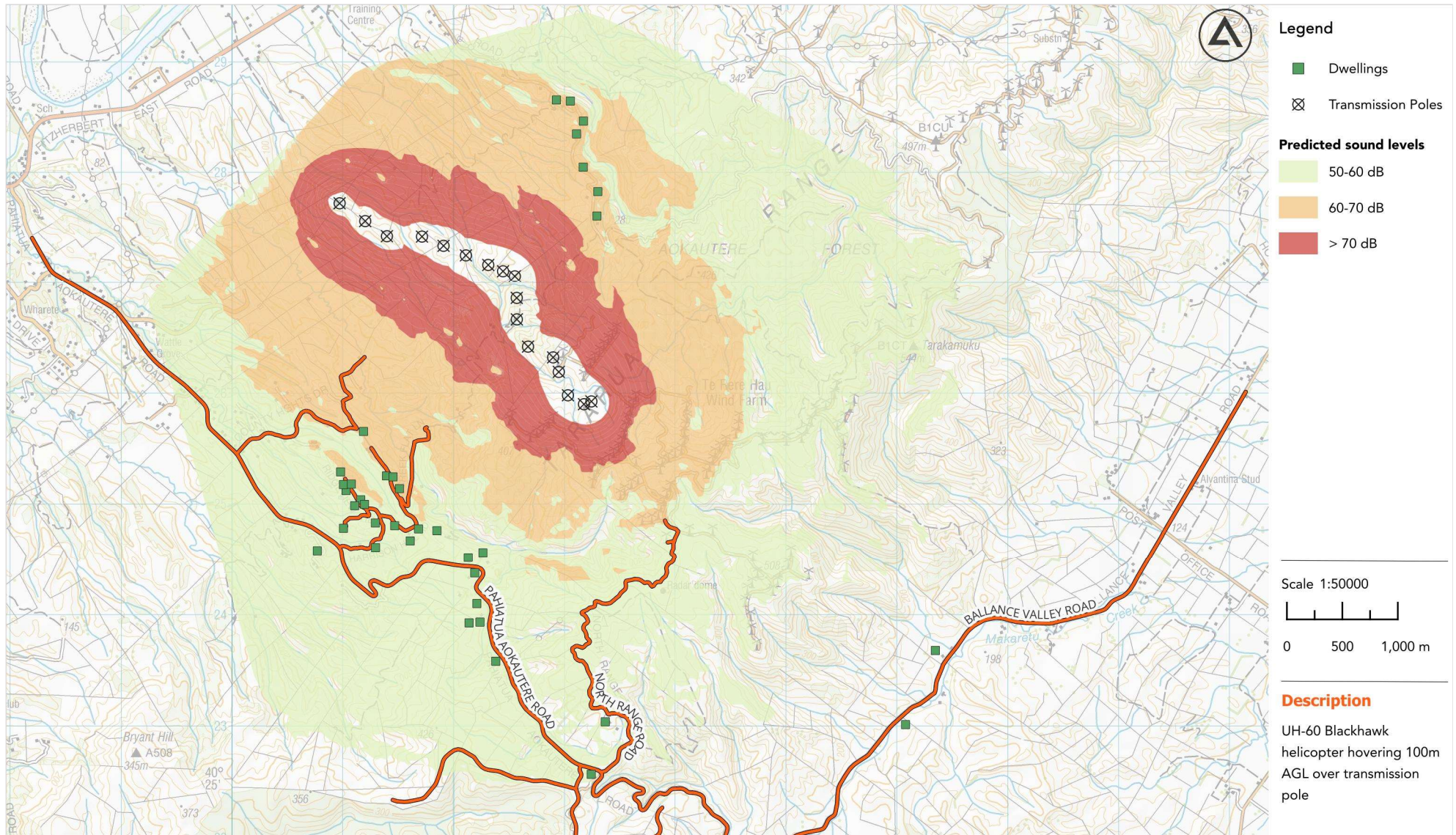


Figure 5 Noise contours helicopter use for transmission lines



6 Management practices and noise mitigation

The management practices required to minimise noise effects (as set out in Figure 1) are:

- Identification of good site practices to minimise the generation of noise
- Processes for identifying activities or location where enhanced management / site specific mitigation is required, and
- Community engagement

6.1 Good site practices

6.1.1 General

To minimise disturbance to occupants of adjacent buildings the following general noise control measures are recommended:

- Selecting construction plant and methodologies to limit noise and emissions
- Use of plant and equipment in accordance with manufacturer's instructions
- Ensure plant and equipment is well maintained and excessively noisy equipment is serviced
- Where plant items (such as compressors, generators etc) are temporarily positioned at an elevated turbine location, it will be located away from outside edge of the wind farm so as not to allow sound freely to propagate in the direction of neighbours;
- Locate stockpiles and haul roads as far as practical from adjacent receivers
- Not leaving engines idling or equipment running when not required
- Use of hoardings, sheds, storage containers to screen stationary equipment from sensitive receivers

- Stationary equipment such as pumps and generators should be located away from neighbours.
- Where suitable, noise enclosures and/or silencers should be fitted to plant and equipment
- Broadband directional reversing alarms should be utilised as far as practicable

6.1.2 Haulage noise

Noise from heavy vehicles servicing the site shall be managed using the following:

- All vehicles operating on the site will be restricted to 30km/h. Management will enforce site speed limits in relation to staff and site visitors.
- Ensuring vehicles are well maintained
- Ensuring loads are correctly fastened (to avoid crashing or banging of loads)
- Avoiding engine breaking
- Avoiding use of horns
- Keeping speed over bumps (e.g., potholes, etc.) to a minimum
- Providing smooth entry and exit onto site
- Keeping revving of vehicles to a minimum on site
- Turning off vehicles when not in use

6.1.3 Transportation of turbine components

The CTMP anticipates that delivery of over-dimension new turbine componentry will occur over a secondary haul road, expected to be through the Tararua Windfarm to the north along Hall Block Road, Back Road and Centre Road. This will also minimise the noise effects for residents on North Range Road and Pahiatua Aokautere Road.



6.2 Process of identifying activity/site specific mitigation

The noise predictions in Section 5 have identified that relatively low levels of noise will be received at dwellings, and adherence to the good site practices in Section 6.1 will be sufficient to manage construction noise effects.

Where any new major activity such as concrete batching, blasting, road improvements adjacent residents, or significant night works are planned, noise levels will be calculated by the projects acoustics specialist or trained environmental staff. This will include the use of helicopters.

Where noise exceeds any of the criteria from Table 3, then specific mitigation should be considered to reduce the noise levels where practicable.

Where the NZS 6803 noise limits are predicted or measured to be exceeded, a Schedule to the CNMP should be prepared which details:

- the predicted noise levels
- the anticipated duration of these levels, including their time of day
- the results of discussions with residents where noise levels are predicted to exceed criteria
- the mitigation that will be adopted to minimise effects.

A copy of any Schedules will be submitted to the Council for information.

6.3 Scheduling and hours of operation

As set out in Section 2.3, the typical construction hours are 0700 and 1800h Monday to Saturday. There will, however, be times when longer hours have to be worked e.g. for the continuous concrete pour for a turbine foundations or turbine assembly. Night

works with predicted noise levels below 40 dB can occur without restriction. While compliant with the NZS 6803 limits, works with predicted noise levels between 40-45 dB should be avoided where practicable, and noise measurements undertaken to confirm these predictions. Residents should be advised of significant activities occurring at night (Section 6.4)

6.4 Community engagement

A key aspect of managing construction noise effects is clear and regular communication with nearby residents. Table 8 sets out the critical communication elements with timing and their "Type", which is aligned to the IAP2 Framework (see communications plan) with the most relevant types being Inform and Consult..

Table 8 Timing and nature of communication and engagement

Timing	Detail	Type
Prior to construction	This CNMP is provided to neighbours and they have the ability to comment on it	Consult
	Details on the project	Inform
	Key contact for any questions or issues	Inform
Prior to significant activity, including road transport	Specific details on timing, likely noise level, duration and effects	Inform Where noise effects a single or small number of dwellings, consult with them and avoid particularly sensitive times if possible
Quarterly	General progress update	Inform



6.5 Complaint management

Complaints should be documented as specified in the CEMP, with the following specific actions:

- Complaint to be acknowledged with a clear point of contact for follow up enquires provided and a timeframe for investigation.
- The investigation should identify the activity generating the noise complaint and whether there are an unusual site conditions or other factors that could be causing more noise than usual. Consider noise monitoring both nearby the source and at the dwelling.
- Update noise predictions measurements indicate a change in source level.
- Identify any changes to site practices / mitigation as appropriate.
- Respond to complainant.



7 Monitoring

7.1 Purpose

Attended noise monitoring will generally be undertaken to:

- Verify source noise levels for key construction equipment, which then can be used to update noise predictions, or
- Quantify noise levels at a dwelling to confirm compliance with noise criteria and/or to assist with community engagement

In addition, long-term noise monitoring may be undertaken to understand how construction noise levels vary with time.

While the construction equipment used for this project will be similar to other wind farms that Meridian has constructed recently (specifically Harapaki) where regular noise monitoring was undertaken, it is best practice to verify source levels on site.

7.2 Procedure

Noise monitoring will be undertaken by the project's acoustics specialist, or a member of the site Environmental Team with suitable qualifications and/or experience, who has been briefed by the project acoustics specialist.

Table 9 Attended noise monitoring / observation programme

Item	Frequency	Location	Person
Commencement of each construction phase / introduction of new equipment	As required	Nearby source	Project environment team
Periodic observation of site behaviours and levels at residents	Monthly - quarterly	Combination of source and dwelling	Project environmental staff
Biannual project inspections	Every 6 months	Combination of source and dwelling	Altissimo Consulting

The noise monitoring will be conducted in general accordance with the methods set out in NZS 6801:2008 Acoustics - Measurement of environmental sound, summarised below:

- With a sound level meter (Class 1 or 2),
- For measurements not at a building, these should be 1.5m above ground level (ideally on a tripod) away from reflecting objects
- For measurements at buildings, the measurement should be undertaken at 1 metre from the most exposed façade, at 1.5m above ground. Where this is not possible, measurement at a representative position may be required.



7.3 Equipment

The project team has a dedicated sound level meter available (Figure 6), with details in Table 10. Calibration will be arranged by the project acoustics specialist.



Figure 6 Sound level meter

Table 10 Sound level meter details

Item	Value
Make / model	Center 392
Type	IEC 61672-1 class 2

7.4 Observations

In addition to sound level measurements, monitoring should include observation of contractor behaviour and compliance with the mitigation measures outlines in Section 6.1.

The various construction managers should make daily observations:

- Is fixed mitigation in place and in good condition?
- Does any equipment need maintenance?
- Is equipment stationary enough that a temporary noise barrier would reduce noise to a group of receivers?
- Can the operation be completed using quieter techniques or equipment?

Where opportunities for improvement are identified, these should be investigated with input from environmental manager and as appropriate.

7.5 Reporting

The results of any noise monitoring will be summarised in a brief report. Any reports indicating any exceedance of the resource consent noise limits will be sent to the Council within 5 working days.

7.6 Long-term unattended monitoring

Unattended noise monitoring is being considered to assist with community engagement. An example of this monitoring equipment is shown in Figure 7. Data from this monitoring could be provided on a web dashboard similar to Figure 8. Noise monitoring within the windfarm site would reliably identify construction activities including their duration/variability, however the overall noise level would not



be representative of a dwelling location. Monitoring at dwellings would include non-construction related noise sources (eg domestic and local traffic).



Figure 7 Example of long term monitoring

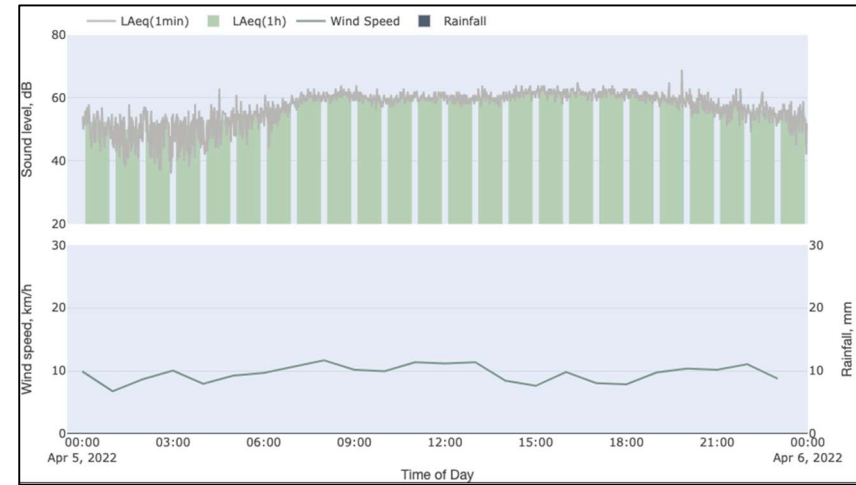


Figure 8 Example of monitoring dashboard



Appendix A - Resource consent conditions

Consent for existing turbines

No	Condition	CNMP Reference
2	<p>2. Noise from all construction and decommissioning work including (but not limited to):</p> <p>(a) site works;</p> <p>(b) wind turbine generator (WTG) foundation construction;</p> <p>(c) WTG assembly and placement;</p> <p>(d) WTG removal;</p> <p>(e) foundation demolition and removal; and</p> <p>(f) land reinstatement</p> <p>shall be measured, assessed and controlled using NZS 6803:1999 Acoustics - Construction Noise. The noise limits shall be those set out in Table 2 of NZS 6803:1999 for works of a "long term" duration.</p>	<p>Entire document</p> <p>Criteria referenced in Section 4.2</p>

Consent for repowering and expansion

No	Condition	CNMP Reference
NO1	Construction Noise - General	
	Noise generated from all activities associated with the construction of Te Rere Hau Wind Farm Repowering Project shall be measured and assessed in accordance with the requirements of and limits within 'NZS6803:1999 Acoustics - Construction Noise'.	<p>Entire document</p> <p>Criteria referenced in Section 4.2</p>
NO2	Construction Noise Management Plan	
a	At least forty (40) working days prior to the commencement of construction activities authorised by these resource consents, the Consent Holder shall submit a CNMP to the Palmerston North City Council and Tararua District Council for certification. The CNMP shall be prepared generally in accordance with Section 5 and the relevant annexures of 'NZS6803:1999 Acoustics - Construction Noise' detailing the applicable construction methodologies and procedures to be carried out to ensure compliance with the relevant standards.	



No	Condition	CNMP Reference
b	The CNMP shall be prepared by an independent SQEP in acoustics.	Section 1.6
c	The purpose of the CNMP required by clause (a) shall be to ensure construction related noise effects are: <ul style="list-style-type: none"> i. Designed and implemented to comply with the requirements of 'NZS6803:1999 Acoustics - Construction Noise', as measured and assessed in accordance with the long-term noise limits set out in the standard; ii. Implemented in accordance with the requirements of section 16 of the Act so as to adopt the best practicable option to ensure the emission of noise during construction activities does not exceed a reasonable level. 	Section 1.1
d	The CNMP shall include the following information: <ul style="list-style-type: none"> i. Operating hours of construction works and any time restrictions on the operation of particular machinery and equipment; ii. Details on the machinery and equipment to be utilised during the construction works, and any required mitigation measures associated with the operation of machinery and equipment; 	Section 6.3 Section 5.1 and Section 6

No	Condition	CNMP Reference
	iii. Predictions of sound levels from machinery and equipment to be utilised during the construction works;	Section 5.2
	iv. Procedures for the reporting and logging of noise related complaints;	Section 6.5 Appendix B
	v. A summary of any feedback received from any consultees about the CNMP, changes made in response to that feedback (if any), and where a change is not made the reason(s) for that.	
e	At least 15 working days prior to the CNMP being submitted for certification, the Consent Holder must provide a copy of the draft CNMP to the adjoining properties listed in Schedule [1] of these consents and invite their views on it.	Section 1.6



Appendix B - Consultation summary

A summary of comments received by residents is provided in Table 11, along with how the CNMP has been updated to address their comments.

Table 11 Consultation summary

Section	Respondent	Issue raised or comment provided	How comment was incorporated (or if not incorporated, reason why not)

