MARSHALL DAY Acoustics

SOUTHLAND WIND FARM
CONSTRUCTION NOISE MANAGEMENT PLAN

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Project: **SOUTHLAND WIND FARM**

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1.0 INTRODUCTION

Marshall Day Acoustics (MDA) has been engaged by Contact Energy Ltd to prepare a Construction Noise Management Plan (CNMP) for Southland Wind Farm. The Farm comprises up to 55 turbines located within the project envelope. Adjacent properties are zoned rural, and included farm land and associated dwellings.

This CNMP is required to satisfy [Consent Conditions NO2 and NO3]. It identifies the performance standards for the Project and sets out best practicable options (BPO) for noise and vibration management. It has been prepared generally in accordance with Section 8 and the relevant annexes of New Zealand Standard NZS6803:1999 Acoustics – Construction Noise.

The objective of this CNMP is to ensure construction related noise effects are designed and implemented to comply with the requirements of NZS6803:1999, and implemented in accordance with the requirements of section 16 of the Resource Management Act 1991 and adopt the best practicable option to ensure the emission of noise during construction activities does not exceed a reasonable level.

This CNMP covers the matters listed in consent condition [NO3].

This CNMP will be implemented throughout the construction period. It should be considered a 'living document' that will be expanded and updated as the Project progresses. It is the primary tool for managing the Project's construction noise effects.

Note that a number of the details in the CNMP are to be finalised as part of detailed design, with the detailed design version of the CNMP to be subject to certification as set out in the consent conditions. Those details to be finalised later are marked with square brackets.

A glossary of terminology is included in 0.

2.0 PROJECT DESCRIPTION

2.1 Overview

The works involve earthworks to establish site access, internal tracks and turbine platforms; operation of a concrete batching plant, erection of turbines , and the construction of a sub-station, transmission line and switching station.

Site maps showing works, sensitive receivers, and site access locations are shown in Figure Noise-3 (Part G).**Error! Reference source not found.**

The works are scheduled for approximately [24 months], between [month year] and [month year]. This means that the long-duration construction noise limits apply (Section 0).

In general, physical works on site will be limited to the daylight hours between half an hour before sunrise to half an hour after sunset, but there will be times when longer hours must be worked e.g. turbine assembly, continuous concrete pours for turbine foundations or where the acceleration of works is required (including earthworks).

Lifting operations are weather dependent therefore turbine assembly may occur at night when wind speeds are generally lower. Daytime lifting operations may be suspended due to high wind conditions, in cases where delays occur, lifting at night may be required to ensure that the turbine assembly programme is not affected. Likewise, pouring of concrete foundations for a turbine will need to be carried out until the pouring works have been completed. Vehicle movements will also be necessary to support any pouring or lifting operations.

2.2 Construction Methodology

The general construction methodology and equipment employed is as follows:

1. Site entrance works and track formation [X months]

- This work comprises excavation and formation of access roads and tracks using bulldozers/scrapers, excavators, trucks, rollers and compactors. Rock breaking may occur at some sites. Blasting may be required in limited circumstances.

2. Building construction [X months]
   - Buildings including site village, batching plant facilities, substation, and permanent O&M building will be constructed, using excavators, cranes, trucks, compactors, power and hand tools.
3. Excavation and foundations [X months]
   - Turbine platforms will be established, using excavators, rock breakers, piling rigs, trucks, compactors, concrete trucks and pumps, and with the operation of the batching plant. Some work will occur at night during concrete pours.
4. Erection of turbines [X months]
   - Turbines will be erected using a large crane, trucks, impact wrenches and other power and hand tools. Some work may occur at night.
5. Cable trenching [X months]
   - Cable trenching will be carried out with excavators, slot trenchers, trucks and compactors.
6. Transmission line [X months]
   - Transmission line construction will involve an excavator, a crane, and trucks, and in some place using helicopter stringing.
7. Restoration and landscaping [X months]
   - Restoration and landscaping will involve excavators, trucks, hydroseeders, and power and hand tools

A number of these tasks will occur concurrently and the overall construction programme is expected to be about 24 months.

2.3 Contact Details

Contact details for the relevant personnel are listed in Table 1. The Project Manager is responsible for implementing this CNMP, and is the site supervisor / Project Liaison Person for the purposes of the CNMP.

Table 1: Contacts

Role	Name	Organisation	Phone	Email
Project Manager	Kenn Wood	Contact	0275 334514	Kenn.wood@contactenergy.co.nz
Engagement	Felicity Hayman	TBC	TBC	TBC
Acoustic Specialist	Miklin Halstead	MDA	04 499 3016	Miklin.halstead@marshallday.co.nz

2.4 Conditions of Consent

The CNMP satisfies the following Conditions of Consent:

[NO2: *In accordance with Condition MP2, the Consent Holder shall engage a Suitably Qualified and Experienced Person to prepare a Construction Noise Management Plan to form part of the CEMP. This shall be prepared generally in accordance with Section 8 and the relevant annexes of New Zealand Standard NZS6803:1999 Acoustics – Construction Noise which detail the types of construction and procedures that will be carried out to ensure compliance with the Standard. The*

Consent Holder shall adhere to the requirements of the Construction Noise Management Plan at all times during the construction of the Project.]

[NO3: *The objective of the Construction Noise Management Plan shall be to ensure construction related noise effects are designed and implemented to comply with the requirements of NZS6803:1999, and implemented in accordance with the requirements of section 16 of the Act and adopt the best practicable option to ensure the emission of noise during construction activities does not exceed a reasonable level. The Construction Noise Management Plan shall include the following information:*

a) Operating hours of construction works and any time restrictions on the operation of particular machinery and equipment;

b) 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;

c) Predictions of sound levels from machinery and equipment to be utilised during the construction works;

d) Procedures for the reporting and logging of noise related complaints;

e) The construction noise standards for the Project in accordance with Condition NO1;

j) Procedures for communication and engagement with nearby residents and stakeholders, including notification of proposed construction activities; and

k) Contact details of the Project Liaison Person or site supervisor.]

3.0 NOISE

3.1 Noise Performance Standards

Construction noise must be measured and assessed according to New Zealand Standard NZS 6803:1999 "*Acoustics – Construction Noise*". The noise limits apply at 1m outside the façades of buildings, and only while they are occupied.

The construction noise limits from [Condition NO1] are summarised in Table 2.

Table 2: Construction noise levels for activities sensitive to noise (e.g. occupied dwellings)

Time of week	Time period	Long-term duration[1]	
		dB L_{Aeq}	dB L_{AFmax}
Weekdays	0630 – 0730	55	75
	0730 – 1800	70	85
	1800 – 2000	65	80
	2000 – 0630	45	75
Saturdays	0730 – 1800	70	85
	1800 – 0630	45	75
Sundays and public holidays	0730 – 1800	55	85
	1800 – 0630	45	75

3.2 Best Practicable Option

All producers of noise have an obligation under Section 16 of the Resource Management Act to adopt the Best Practicable Option (BPO) to control noise to a reasonable level. This requires that quiet methods are used when practicable, regardless of whether the noise level produced complies with noise limits.

BPO is defined as:

'… the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to:

- *The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and*
- *The financial implications, and the effects on the environment, of that option when compared with other options; and*
- *The current state of technical knowledge and the likelihood that the option can be successfully applied.'*

To address BPO requirements we have summarised some items of good practice later in this CNMP.

3.3 Predicted Noise Levels

Table 3 presents the calculated levels of high-noise construction activities at the nearest noise sensitive locations. It will be kept up to date by the Acoustic Specialist when new information becomes available.

[1] Construction work at any one location with a duration exceeding 20 weeks

Table 3: Calculated noise levels at 1m from a building façade[2]

Construction Activity	Sound Power Level (dB L_{Aeq})	Sound Pressure Level (dB L_{Aeq}) At nearest noise sensitive location[2]
Site Entrance Construction	119	62
Road and Track Formation	119	40
Turbine Platform Construction	119	40
Concrete Batching Plant	110	Below audible threshold
Construction Traffic (Trucks)	111	38
Worker Vehicles (Light Vehicles)	83	24
Helicopter Transmission Line Stringing		< 70

3.4 Noise Effects

The noise level received inside a sensitive space (e.g. bedroom, office, living room) will depend on the external noise level, the façade performance (particularly the glazing) and the acoustics of the room. These factors can vary widely.

NZS 6803 states that, where it is not possible to measure at 1 metre from the façade, an internal assessment can be done instead assuming a façade sound level difference of 20 decibels. With partially open windows, 15 decibels of attenuation is expected.

The activities described in section 3.2 are expected to produce indoor noise levels of less than 30 dB L_{Aeq} in all conditions. The following information is provided to allow evaluation of other scenarios should they arise.

Table 4: Daytime noise levels in commercial & industrial buildings and habitable rooms in dwellings

External Noise Level (dB L_{Aeq})	Estimated Internal Noise Level (dB L_{Aeq})		
	Closed windows (modern building)	Closed windows (older building)	Open windows (all buildings)
90 – 95	65 – 70	70 – 75	75 – 80
85 – 90	60 – 65	65 – 70	70 – 75
80 – 85	55 – 60	60 – 65	65 – 70
75 – 80	50 – 55	55 – 60	60 – 65
70 – 75	45 – 50	50 – 55	55 – 60

The responses of building occupants vary, but with effective prior engagement (Section 7.0) can be summarised as follows:

- < 45 dB L_{Aeq} Noticeable, but unlikely to interfere with daily activities
- 45 – 50 dB L_{Aeq} Typically acceptable, but concentration and communication would begin to be affected

[2] In accordance with the requirements of NZS 6803: 1999 (Section 0), inclusive of 3 decibels façade reflection

- 50 – 55 dB L_{Aeq} Annoyance for some occupants and personal conversations would require a slightly raised voice
- 55 – 60 dB L_{Aeq} Generally unacceptable and occupants would actively seek respite for any extended periods
- > 60 dB L_{Aeq} Unacceptable for extended periods

4.0 7.1BLASTING

Blasting may be necessary at some turbine platform sites, or potentially during parts of the track construction. Noise from blasting is regulated on the basis of the "startle threshold" which according to British Standard BS5228 is 120 dB L_{Zpeak}. For blast charges typical of this type of work, the startle threshold would be achieved at a 1400 metre setback. Through good blast practice, noise levels are expected to be significantly less than this within that radius, and will be kept well below the startle threshold where humans or stock are present.

Should it be necessary to conduct blasting which would exceed 120 dB L_{Zpeak} where dwellings or stock are present, the following practices shall be followed:

- Use a proprietary shroud or temporary barrier around the blast hole drilling rig where practicable
- Undertake blasting between 9am and 5pm, Monday to Friday
- Explain the intended scheduled blasting windows (i.e. times and dates) are communicated to neighbours at the beginning of the project, and supply text warnings one hour prior to a blasting event.
- Ensure that neighbours with stock on land within 800m of the blasting site are consulted at least two days in advance, so that paddock rotations can be used to minimise stock exposure to blasting noise
- Keep blasting windows tight (e.g. 10 minutes duration). If a window is missed, then blasting will not occur until the next scheduled window
- Have an audible countdown sequence so neighbours know a blast event is imminent

Blasting vibration is not significant at the distances relevant to this project.

5.0 POSSIBLE HELICOPTER TRANSMISSION LINE STRINGING

The transmission line will be established along the corridor illustrated in Figure Noise-3 (Part G). It is possible that once towers are established, a helicopter will be used to string the lines along this corridor. This is a fast and efficient means of completing this work.

We have evaluated the noise level of a typical helicopter used for this type of work by Transpower and others, and have established that the long-term construction noise limit (70 dB L_{Aeq}) can be met at any noise sensitive receiver outside of a corridor 400m each side of the line path.

The proposed path includes only the site compound (which is not an external noise sensitive activity) within this corridor. We can therefore conclude that this activity can meet this noise standard and is likely the best practicable option in terms of noise effects in that it completes the work quickly.

Once the precise transmission line path is confirmed and the contractor is selected, a specific methodology will be prepared and included in the final 'for certification' version of this CNMP. That methodology will demonstrate that this noise limit will be met based on the specific aircraft and flight path to be used.

6.0 MITIGATION AND MANAGEMENT

6.1 Training

All staff will participate in an induction training session before starting work on the construction, with attention given to the following matters:

- Activities with the potential to generate high levels of noise
- Mitigation and management measures (Section 4.0)
- Sensitive receivers and any agreements made through engagement (Section 7.0)

As the construction progresses, any updates of noise matters will be addressed during regular site meetings and/or 'toolbox' training sessions.

6.2 Equipment Selection

When selecting construction equipment:

- Use quieter construction methodologies where practicable
- Use electric motors rather than diesel engines where practicable
- Use equipment that is suitably sized for the task
- Maintain equipment well to minimise rattles, squeaks etc
- Fit engines with exhaust silencers and engine covers where practicable
- Avoid tonal reversing or warning alarms (beepers). Alternatives include broadband alarms (squawkers/quackers), flashing lights, proximity sensors, reversing cameras and spotters

6.3 Scheduling

Given the separation distances between the proposed construction activities, it is unlikely that specific scheduling hours are necessary, however if required the following will be considered:

Avoid night works unless it can be demonstrated to be the BPO.

Scheduling is an important management tool, particularly where a receiver expresses concern about construction works at a certain time of day. Where necessary, high noise and noisy works will be programmed to minimise disturbance.

Scheduling activities to be undertaken when nearby sensitive receiver buildings are unoccupied is the most effective measure as it avoids the effect. For example, piling works could be undertaken during the daytime when occupants of a dwelling are at work/school.

Scheduling should be considered as the first measure for all activities which are predicted to exceed the relevant noise limits. If scheduling is not practicable, then other measures such as noise barriers, revising methodology and temporary relocation should be considered.

6.4 General Measures

Complaints can arise even if the noise levels comply with the Project limits. To minimise complaints, the following common mitigation measures are recommended:

- Avoid unnecessary noise. This means managing the site to minimise shouting or unnecessary use of horns except where necessary for safety
- Controlling the level of site radios
- Avoiding rough handling of material and equipment
- Minimising banging or shaking excavator buckets

- Avoiding unnecessary steel on steel contact (e.g. during the loading of scaffolding on trucks) where other methods are practicable
- Avoiding high engine revs. This includes choosing the right sized equipment and turning engines off when idle.
- Mitigate track squeal from tracked equipment, such as excavators. This may include tensioning and watering or lubricating the tracks regularly

7.0 ENGAGEMENT

7.1 Communication Before Construction

Written communication (e.g. newsletter) will be provided to members of the local community prior to the commencement of site works. It will include:

- Details of the overall works, its timing and duration
- Contact details and names of personnel whose job is to receive complaints and enquiries (should also match a person identified in Section 2.3)
- Acknowledge that some activities (listed in this document) are predicted to generate high noise levels and may result in disturbance for short periods

7.2 Communication During Construction

Once construction has begun, ongoing communication is important. Regular communication during the works will include:

- Public site signage that includes contact details
- Details of upcoming activities that may result in disturbance
- Any changes to scheduled timing and duration of activities

7.3 Error! Reference source not found.Complaints Response

Complaints will be acknowledged immediately where practicable and responded to within one day. If a more detailed response is needed, it will be provided within a timeframe agreed with the complainant.

All construction noise complaints will be recorded in a complaints file that is available to affected parties and Council on request. For each complaint, an investigation will be undertaken as soon as practicable using the following steps:

- Acknowledge receipt of the concern or complaint and record:
  - The name, address and contact details of the complainant (unless they elect not to provide)
  - Time and date the complaint was received and who received it
  - Time and date of the activity that caused the complaint (estimated where not known)
  - The complainant's description of the activity and its resulting effects
  - Any relief sought by the complainant (e.g. scheduling of the activity)
- Identify the relevant activity and review the activity log to verify the complaint (or otherwise)
- Review the mitigation and management measures in place to ensure the BPO has been applied (Section 4.0). Review the relief sought by the complainant. Adopt further mitigation and management measures as appropriate.
- Report the findings and recommendations to the Project Manager, implement changes and update this CNMP as appropriate

- Report the outcomes of the investigation to the complainant, identifying where the relief sought by the complainant has been adopted or the reason(s) otherwise.

APPENDIX A GLOSSARY OF TERMINOLOGY

Noise	A sound that is unwanted by, or distracting to, the receiver.

dB	Decibel (dB) is the unit of sound level. Expressed as a logarithmic ratio of sound pressure (P) relative to a reference pressure (Pr), where dB = 20 x log(P/Pr).
dBA	The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) to more closely approximate the frequency bias of the human ear. A-weighting is used in airborne acoustics.
$L_{Aeq\ (t)}$	The equivalent continuous (time-averaged) A-weighted sound level commonly referred to as the average level. The suffix (t) represents the period, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.
L_{AFmax}	The A-weighted maximum noise level. The highest noise level which occurs during the measurement period.
L_{peak}	The peak instantaneous pressure level recorded during the measurement period (normally not A-weighted).
NZS 6803:1999	New Zealand Standard NZS 6803: 1999 "Acoustics - Construction Noise"
BS 5228:2009	British Standard BS 5228:2009 "Code of practice for noise and vibration control on construction and open sites, Part 1: Noise, Part 2: Vibration"