PacificHydro

Noise Management Plan

23 April 2020

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Revision Control

Revision	Date	Change Description	Author	Review	Approved
A	3 November 2014	Original document	A Robinson	E Smith	A Robinson
B	5 November 2014	Original document	A Robinson	C Turnbull	A Robinson
C	19 November 2014	-	A Robinson	P Vozone	P Vozone
D	23 December 2014	-	A Robinson	C Turnbull	P Vozone
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Document Control

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8	Xxx xxx	Department of Planning, Industry and Environment

Abbreviations

BoP	Balance of Plant
DPIE	The NSW Department of Planning Industry and Environment (formally the Department of Planning and Environment)
EPA	Environmental Protection Agency
EPL	Environmental Protection License
ER	Environmental Representative
NMP	Noise Management Plan
NMS	Noise Management System
OEMP	Operation Environmental Management Plan
WTG	Wind Turbine Generator

Definitions

Conditions of Consent Conditions of the State approval issued by the Land and Environment Court of NSW and subsequently modified and approved by the DPIE

Secretary of the NSW Department of Planning Industry and Environment (DPIE), or nominee

Service Compound Fenced area containing the Site Office and workshops, located as shown in Appendix A

Site Covers the disturbed areas defined by the road, hardstand envelope and Substation

Substation The 33 / 132 kV substation located on Site, as shown in Appendix A.

Wind Farm The entirety of the Taralga Wind Farm, including WTG, roads, buildings and electrical infrastructure.

1. Introduction

1.1 Background

This Noise Management Plan (NMP) details the noise and vibration impacts that may result from operation of the Taralga Wind Farm and the measures that will be implemented to mitigate those impacts. Impacts from all on-site infrastructure, including the Wind Turbine Generators (WTGs), electrical substation and operations and maintenance building are addressed.

Reference numbers for the Conditions of Consent, provided by the Department of Planning Industry and Environment (DPIE), and Environmental Protection Licence (EPL) requirements, provided by the NSW Environment Protection Authority (EPA), that are relevant to noise and vibration management are shown in Table 1 below, with full conditions available in Appendix B of the OEMP.

Table 1 - Operational Noise and Vibration Conditions

Authority	Relevant Conditions
DPIE	39, 42-54
EPA	L3, L5

Condition 39 specifically requires that this NMP is prepared and implemented to minimise operational noise emissions.

1.2 Applicable Guidelines

Guidelines that are applicable to this plan include:

- "*Wind Farms – Environmental Noise Guidelines*", South Australia EPA, 2003 (SA EPA Guidelines);
- "*Wind Turbine Generator Systems – Part 11: Acoustic noise measurement techniques*" (IEC 61400-11:2002);
- "*Assessing Vibration – a technical guideline*", 2006; and
- "*NSW Industrial Noise Policy*", EPA, 2001.

1.3 Objectives

The Objectives of the NMP are:

- To identify all major sources of noise that may be emitted as a result of operation;
- To identify and implement the best practice management techniques for minimisation of noise emissions for the development;
- To specify the wind farm operational noise criteria for all relevant receivers as required by the Conditions of Consent and EPL;
- To outline procedures for noise compliance testing and addressing noise complaints; and
- To outline the procedure to be undertaken if any non-compliance is detected.

1.4 Vibration

Although Condition 39 requires an Operational Noise and *Vibration* Management Plan, there are no conditions relating to vibration during operation. The vibration from operational wind farms has previously been measured and it has been found that all relevant vibration criteria (including those in the NSW Department of Environment and Conservation's "Assessing Vibration – a technical guideline",

2006) are easily achieved at typical residential setback distances. Therefore, there are no mitigation measures outlined for vibration during operation of the wind farm.

2. Operational Noise Sources

2.1 Wind Turbine Generators

The 51 WTGs on-site will be the most significant noise source during wind farm operation. WTGs produce aerodynamic noise as the blades pass through air as well as mechanical noise from the turbine drive train equipment (the gearbox and generator).

The WTGs will operate 24 hours per day, 7 days per week over the course of the year, whenever sufficient wind is available for operations.

2.2 Electrical Substation

The Substation contains a transformer that is used for transforming the incoming low voltage power generated by each of the WTGs to higher voltages suitable for export to the neighbouring electricity network. The transformer may on occasion emit a characteristic 'hum' during operations. The Substation, however, is located amongst operational WTGs and away from sensitive receivers.

The Substation is located next to the Service Compound and any excessive noise is likely to be rapidly identified by site staff.

2.3 Site Operations and Maintenance

Noise will be generated from vehicle movements associated with site operations and maintenance, predominantly site staff light vehicle movements. Trucks and cranes will also access the site periodically. Estimated operational traffic volumes are provided in the Operational Traffic Management Plan.

Other activities that may generate noise during the operations phase of the wind farm include the maintenance of WTGs, the Substation and the access tracks. These activities may occasionally require the use of high noise tools and heavy plant and machinery.

As per Section 1.3 of the OEMP the operations and maintenance activities will be carried out during the standard working hours of Monday-Friday, 7am-6pm and Saturday, 8am-1pm.

No work is to be carried out on Sundays and public holidays. However, the following activities may be carried out in association with operations outside of these hours:

a) any works that do not cause noise emissions to be audible at any nearby residences not located on the site;

b) the delivery of materials as requested by Police or other authorities for safety reasons; and

c) emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

Any work undertaken outside the specified construction hours, other than those specified in (a) to (c) of this condition, must not be undertaken without prior consent of the EPA.

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3. Risks

The key noise and vibration risks associated with the operation of the Taralga Wind Farm are shown in

Table 2. The Risk Score is determined using the matrix in Appendix E of the OEMP.

The Management Controls identified in the table are used to mitigate the risks identified. More details on these controls are given in Section 4.

Table 2 - Operational Noise and Vibration Risks

Risk Description	Cause	Potential Impact	Probability	Consequence	Risk Score	Management Control
Noise from WTGs exceeding noise criteria	WTGs operating above design levels or outside of design parameters.	WTGs operating above design levels or outside of design parameters.	WTGs operating above design levels or outside of design parameters.	WTGs operating above design levels or outside of design parameters.	High	Operation of the wind farms must comply with New Zealand Noise Standard (NZ 6808:1998) and established limits via pre and post construction noise compliance monitoring Follow PH complaint management procedure and community consultation WTG regular maintenance to prevent noise from occurring Guaranteed maximum sound power levels and tonality performance Noise ameliorative measures
Excessive noise from substation	Operating plant not performing to specification	Disturbance to local residences	Rare	Moderate	Medium	Pre and post construction noise compliance monitoring Follow PH complaint management procedure and community consultation Regular inspections and maintenance to ensure the substation is operating as intended
Excessive noise from Site operations and maintenance	Site vehicles Use of high noise tools Heavy plant and machinery	Disturbance to local residents	Unlikely	Moderate	Low	Enforce 40km/h speed limit Limit engine breaking Follow PH complaint management procedure and community consultation Standard working hours Use approved heavy transport routes

4. Management Controls

Table **3** provides details on the Management Controls and best practice management techniques that will be used to minimise noise emissions during operation.

Table 3 - Operational Noise and Vibration Management Controls

Risk Description	Cause	Potential Impact	Probability	Consequence
Noise compliance monitoring	See noise compliance monitoring in Section 6 and a procedure for dealing with non-compliance in Section 7.	Site Manager	Within 6 months of operation (as defined in Conditions of Consent)	*n/a*
PH complaint management procedure	See procedure in Section 8.	Site Manager	As required	*Complaints Register*
WTG Maintenance	WTGs are inspected and maintained regularly to ensure they are operating as intended.	Site Supervisor	6 monthly	
Guaranteed Maximum Sound Power Levels and Tonality Performance	The wind farm's contract with the WTG supplier includes guaranteed maximum sound power levels and tonality performance for each WTG type.	WTG Supplier	Ongoing	*EPC Contract, Schedule 17*
Noise Ameliorative Measures	See Section 9. Ameliorative measures may be provided to the receivers H1, H3, H5 or 'the Farm' if requested within the specified time.	Site Manager	As requested within the first 2 years of operations	*n/a*
Substation Maintenance	The Substation is inspected and maintained regularly to ensure it is operating as intended.	Site Manager BoP Maintenance Contractor	Monthly inspections 6 monthly scheduled maintenance	*Site Inspection Checklist*

Risk Description	Cause	Potential Impact	Probability	Consequence
Standard Working Hours	Operations and maintenance activities will be carried out during the standard working hours of Monday-Friday, 7am-6pm and Saturday, 8am-1pm, except for the following activities: a) any works that do not cause noise emissions to be audible (defined as 5dBA above the background noise level) at any nearby residences not associated with the wind farm; b) the delivery of materials as requested by Police or other authorities for safety reasons; and c) emergency work to avoid the loss of lives, property and/or to prevent environmental harm.	All Site Staff	Ongoing	Site Induction
Enforce 40km/h speed limit	All site traffic will be restricted to the maximum speed shown on signs at all site entries.	All Site Staff and Visitors	Ongoing	Site Induction
Limit engine breaking	Where available engine breaking is not to be used on approach to TWF or onsite	All Site Staff and Visitors	Ongoing	Site Induction (if applicable)
Use approved heavy transport routes	Apply for over size / over mass permit from Roads and Maritime Services.	All Site Staff and Visitors	Ongoing	Site Induction (if applicable)

5. Operational Noise Criteria

The Conditions of Consent and EPL Requirements that determine the operational noise criteria are discussed in this section with a summary of all criteria provided. Receiver locations that are referred to by the criteria are shown on the map in Appendix A.

5.1 WTG Noise Criteria

Condition 42 states:

The Applicant must design, operate and maintain the development to ensure that for each non associated residence, while they continue to not be associated with the development, the equivalent noise level (L_{Aeq} (10 minute)) from the development at each of these receiver locations does not exceed:

a) *35 dB(A); or*

b) *The pre-existing background noise level (L_{Aeq} (10 minute)) at each receiver location*

(as determined under condition 41), respectively by more than 5 dB(A),

whichever is the greater for each integer wind speed (measured at 10m height) during operation of the development, measured in accordance with the SA Guidelines.

EPL Requirement L3.1 is consistent with Condition 42 except the pre-existing background noise level is measured as L_{A90} (10 minute) in the EPL rather than L_{Aeq} (10 minute). The L_{A90} descriptor is used by the SA Guidelines (2003) and was used for all background measurements at Taralga Wind Farm. It is noted that if the L_{Aeq} were used, compliance would be easier to achieve.

Background noise levels were measured in April 2009 and December 2013 by Sonus Pty Ltd (report number S2570C18 and S2570C34 respectively) at the closest relevant receiver locations surrounding the wind farm. The noise criteria derived from these background levels, determined in accordance with Condition 42, are reproduced in Table 4.

Table 4 - Operational noise criteria as determined by Conditions 42 and EPL Requirement 3.1

10m Integer Wind Speed (m/s)	3	4	5	6	7	8	9	10	11	12
	dB(A)									
H1	35	35	35	36	38	41	44	47	50	53
H5	40	41	41	42	44	45	47	49	51	54
H7	35	35	37	40	44	47	51	54	57	59
H12[1]	41	40	40	40	41	43	44	46	48	50
H41	35	35	35	36	38	40	42	43	44	45
H77 (The Farm)	35	36	37	39	41	44	46	49	51	53

[1] H12 is a residence that is now associated with the wind farm and is therefore exempted from Condition 42 and EPL Requirement 3.1.

5.2 Tonality Criteria

Condition 48 states:

> *The presence of excessive tonality shall be measured using the methodology in ISO 1996.2: 2007 Acoustics — Description, measurement and assessment of environmental noise – Determination of environmental noise levels, and in accordance with the procedures described in Attachment 6 of this consent.*

Attachment 6 exert (tonality):

> *The presence of excessive tonality (a special noise characteristic) is consistent with that described in ISO 1996.2: 2007 Acoustics — Description, measurement and assessment of environmental noise – Determination of environmental noise levels and is defined as when the level of one-third octave band measured in the equivalent noise level $L_{eq(10minute)}$ exceeds the level of the adjacent bands on both sides by:*
>
> - *5dB or more if the centre frequency of the band containing the tone is in the range 500Hz to 10,000Hz;*
> - *8dB or more if the centre frequency of the band containing the tone is in the range 160 to 400Hz; and/or*
> - *15dB or more if the centre frequency of the band containing the tone is in the range 25Hz to 125Hz.*
>
> *If tonality is found to be a repeated characteristic of the wind turbine noise, 5 dB(A) should be added to measured noise levels from the wind farm. If tonality is only identified for certain wind directions and speeds, the penalty is only applicable under these conditions. The tonal characteristic penalty applies only if the tone from the wind turbine is audible at the relevant receiver. Absence of tone in noise emissions measured at an intermediate location is sufficient proof that the tone at the receiver is not associated with the wind farm's operation. The assessment for tonality should only be made for frequencies of concern from 25 Hz to 10 KHz and for sound pressure levels above the threshold of hearing (as defined in ISO 389.7: 2005 Acoustics - Reference zero for the calibration of audiometric equipment - Part 7: Reference threshold of hearing under free-field and diffuse-field listening conditions).*[2]
>
> - *The maximum penalty to be added to the measured noise level from the wind farm for any special noise characteristic individually or cumulatively is 5 dB(A).*
>
> Notwithstanding condition 42 of this consent, the noise limits specified under this condition do not apply to any residence where a noise agreement is in place between the Applicant and the owner(s) of the residence in relation to noise impacts and/or noise limits. For this condition to take effect, the noise agreements shall satisfy the relevant requirements of Guidelines for Community Noise (WHO, 1999).

The Environmental Protection Licence (EPL) includes:

> *L3.4 To determine compliance with Condition L3.1, 5dB(A) must be added to measured noise levels where tonality is present. The presence of tonality must be determined using a methodology based on the modifying factor for tonality presented in Section 4 of the NSW Industrial Noise Policy (EPA, 2001).*

[2] For the purposes of these conditions, a special noise characteristic is defined as a repeated characteristic if it occurs for more than 10% of an assessment period. This equates to being identified for more than 54 minutes during the 9 hour night from 10pm – 7am, or for more than 90 minutes during the 15 hour day from 7am – 10pm. This definition refers to verified wind farm noise only.

5.3 Low Frequency Noise Criteria

Condition 48A states:

> *Low frequency noise shall be managed in accordance with the procedures described in Attachment 6 of this consent.*

Attachment 6 exert (low frequency noise):

> *The presence of excessive low frequency noise (a special noise characteristic) [i.e. noise from the wind farm that is repeatedly greater than 65 dB(C) during the day time or 60 dB(C)) during the night time at any relevant receiver] will incur a 5 dB(A) penalty, to be added to the measured noise level for the wind farm, unless a detailed internal low frequency noise assessment demonstrates compliance with the proposed criteria for the assessment of low frequency noise disturbance (UK Department for Environment, Food and Rural Affairs (DEFRA, 2005)) for a steady state noise source.*[3]

5.4 Substation Noise Criteria

Condition 43 states:

> *The Applicant shall ensure that the noise generated by the operation of the substation does not exceed 35 dB(A) $L_{Aeq(15\ minute)}$ at any non-associated residence.*
> *Noise generated by the project is to be assessed in accordance with the relevant requirements of the NSW Industrial Noise Policy (as may be updated from time-to-time), as modified by the provision in Attachment 6.*
>
> *However, these criteria do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to generate higher noise levels and has advised the Department in writing of the terms of this agreement.*

[3] For the purposes of these conditions, a special noise characteristic is defined as a repeated characteristic if it occurs for more than 10% of an assessment period. This equates to being identified for more than 54 minutes during the 9-hour night from 10pm – 7am, or for more than 90 minutes during the 15 hour day from 7am – 10pm. This definition refers to verified wind farm noise only.

The maximum penalty to be added to the measured noise level from the wind farm for any special noise characteristic individually or cumulatively is 5 dB(A).

Notwithstanding condition 42 of this consent, the noise limits specified under this condition do not apply to any residence where a noise agreement is in place between the Applicant and the owner(s) of the residence in relation to noise impacts.

6. Noise Compliance Testing

Taralga Wind Farm engaged Sonus Environmental (a DPIE approved independent acoustic consultant) within six months of the commencement of operation to undertake initial compliance testing, as per Condition 51.

An acoustic consultant will also be engaged in the event of a noise complaint which the DPIE considers to be valid (see Section 8 for noise complaint procedure).

This section summarises the procedure that was followed for Initial compliance monitoring or further testing in the event of a valid complaint.

6.1 Receiver Locations

Continuous post-construction noise logging was conducted in accordance with the *Taralga Noise Management Plan* and *SA Environmental Noise Guidelines: Wind Farms (2003)* at six residences (H01, H05, H07, H12, H41 and H77) between the 3 August and 23 September 2015.

The receiver locations listed above were chosen in consultation with the EPA and were the closest non-associated receivers that surrounded the wind farm in all directions. The locations differed slightly from the table in EPL Requirement 3.1 for the following reasons:

- H12 is now an associated property and is therefore exempted from the Condition 42 noise limits and Condition 51 compliance testing requirements. However, H12 will be included in the Initial Compliance Testing, rather than H13, as background data was collected at H12 pre-construction and not H13. H12 is located closer to the wind farm than H13 and by demonstrating compliance at H12 (as if it were non-associated) it will demonstrate compliance at H12.
- Initial Compliance Testing will not be undertaken at H27 and H29 that are listed in EPL Requirement 3.1 as there is no pre-construction background data, H29 is a shed and not habitable, and both locations are at such a distance (over 2500 m) that it will be hard to distinguish between wind farm and background noise.

In the event of a valid complaint from a receiver, other than those where Initial Compliance Testing was performed, measurements may be made at a location closer to the turbines, as outlined in Section 6.5, Intermediate Monitoring.

6.2 Equipment

For all noise compliance testing, sound level meters with a noise floor no greater than 20 dB(A) will be used. Microphones will be protected with windshields with a minimum diameter of 120mm. A calibrated reference sound source will be used before and after the compliance testing regime.

The equipment will be either Type 1 or Type 2 sound level meters in accordance with the Australian Standard AS 1259-1990 Acoustics – Sound Level Meters and IEC 61672.1-2004 Electroacoustics – Sound Level Meters as relevant. Type 1 sound level meters shall be used for tonality testing and sound power level assessments.

The location of the equipment will be generally consistent with the positions documented in the pre-construction, background noise monitoring assessment, subject to the microphone being positioned 1.2 to 1.5m above the ground and at least 5m from any reflecting surface (other than the ground) but within 20m of the dwelling (SA EPA Guidelines) and on the wind farm side of the dwelling without any local structures blocking line of sight to turbines. An alternate position may be used if the contribution of noise from the turbines at the relevant location can be more accurately measured at an alternate location. The measurement location will be documented, and the rationale will be provided for any alternate location, if used.

6.3 Data

The noise compliance testing will collect L_{90} data to enable comparison against the noise criteria summarised in Section 0. For Initial Compliance Testing at relevant receiver locations, the measurements will be made over 10-minute intervals for a total of 6 weeks following the commencement of operations.

Data points "adversely affected" by rain or wind on the microphone will be removed based on a weather logger placed at an equivalent location to one of the noise loggers. Data will be deemed to be adversely affected where rain occurs in a 10-minute period or where a wind speed greater than 5 m/s is exceeded for 90% of a 10 minute period.

The relative number of data points collected when the wind is within 45° of the direction from the closest turbine to the residence should be representative of the long-term average wind in that direction. If, during the monitoring period, a significantly lower percentage of downwind data points are collected than the long-term average, all other data (upwind and crosswind) shall be removed from the analysis for that dwelling.

Following removal of data, the remaining noise data will be correlated with the corresponding wind data at 10m above ground at the wind farm site, for each monitored dwelling. Wind data from the permanent masts located on-site will be used, as per best practice.

6.4 Testing Methodology – Special Audible Characteristics – Tonality

Condition of consent 48 states:

> *The presence of excessive tonality shall be measured using the methodology in ISO 1996.2: 2007 Acoustics — Description, measurement and assessment of environmental noise – Determination of environmental noise levels, and in accordance with the procedures described in Attachment 6 of this consent.*

The following procedure, which is consistent with Condition 48 and Attachment 6 of the consent, is proposed to determine tonality.

The tonality testing shall be conducted in two stages, with the first stage conducted close to a turbine, and the second stage conducted at a residence if required.

Stage 1

The first stage will be conducted by measuring the sound power level of turbines in un-weighted one third octave bands in accordance with IEC61400-11 (2007), including the requirements for measurement location (close to turbines), length of measurements, and adjustment of background noise. The test will be conducted in one third octave bands with centre frequencies between 25Hz and 10,000Hz at a representative turbine for each type of turbine installed.

Stage 2 testing shall be conducted where the sound power level at any hub height integer wind speed, in any one third octave band exceeds the level of the adjacent bands on both sides by the following levels as specified in the *NSW Industrial Noise Policy (EPA, 2001)*:

a) 5 dB or more if the centre frequency of the band containing the tone is in the range 500Hz to 10,000Hz;

b) 8 dB or more if the centre frequency of the band containing the tone is in the range 160 to 400Hz; and/or

c) 15 dB or more if the centre frequency of the band containing the tone is in the range 25Hz to 125Hz.

In other cases, no penalty for tonality shall be applied and no further testing for tonality is required.

Stage 2

If the Stage 1 criteria is exceeded at the residence being tested, Stage 2 testing shall be conducted.

If the testing is being carried out to address a complaint made at another receiver, Stage 2 testing shall be conducted at this receiver location if the Stage 1 criteria are exceeded in the most recent test.

The equivalent noise level (L_{eq}) shall be measured in un-weighted one third octave bands in 10-minute intervals over a period of at least 1 week. If rain was recorded in the vicinity during the collection period, data collected during the rainfall period must be excluded.

A 10-minute interval shall be deemed to be tonal where a one third octave band exceeds the level of the adjacent bands on both sides by the following levels as specified in the *NSW Industrial Noise Policy (EPA, 2001)*:

a) 5 dB or more if the centre frequency of the band containing the tone is in the range 500Hz to 10,000Hz;

b) 8 dB or more if the centre frequency of the band containing the tone is in the range 160 to 400Hz; and/or

c) 15 dB or more if the centre frequency of the band containing the tone is in the range 25Hz to 125Hz and there is no evidence (such as an audio recording) that the tone is from a source unrelated to the wind farm.

Where the number of night time intervals identified as tonal is more than 10% of intervals in any of the night periods (10pm to 7am), a penalty of 5 dB(A) shall be added to the measured (or modelled in accordance with Section 6.5, Method 2) noise level at the particular residence at all integer wind speeds, prior to comparison with the criteria.

Where the number of day time intervals identified as tonal is more than 10% of intervals in any of the day periods (7am to 10pm), a penalty of 5 dB(A) shall be added to the measured (or modelled in accordance with Section 6.5, Method 2) noise level at the particular residence at all integer wind speeds, prior to comparison with the criteria.

6.5 Assessment Methodology

Primary Testing

The derived wind farm noise contribution (from Section 6.3) after any penalty for tonality is added (in accordance with Section 6.4) will be compared against the noise criteria specified in Condition 42 (see Table 4). Where the wind farm contribution is less than or equal to the specified levels, the wind farm will be deemed to be in compliance with Condition 42.

However, the above test method cannot be used to determine compliance in all circumstances. This is primarily related to changes in local conditions or extraneous noise sources when compared to the conditions and noise sources that existed at the time of the original testing regime. That is, the variation in the background noise level (without the WTGs) over a noise logging period has been found to be approximately 40 dB(A) for some locations. Therefore, an increase of 5 dB(A) above the levels measured without the WTGs could be associated with the operation of the turbines, from a natural variation in background noise or a combination of the two.

Where the primary test method described above does not demonstrate compliance, then “on/off” testing will be used.

“On/Off” Testing

If required, “on/off” testing will be conducted as follows:

- Only at dwellings where the primary test method cannot be used to determine or demonstrate compliance;
- Only at integer wind speeds where the primary test method cannot be used to determine or demonstrate compliance;
- With the noise monitoring equipment generally at the same position where the primary test had been conducted;

- Conducted under a downwind condition;
- Over a minimum interval of 2-minutes with the wind farm operational, then a measurement over the same interval with the wind farm shut off to obtain the background noise level;
- Monitoring the wind speed and direction over the measurement intervals to identify the comparable "on" and "off" measurements;
- Repeating the above "on" and "off" process to collect at least 10 intervals with comparable wind speed and direction conditions at each integer wind speed of interest.
- The supplementary "on/off" test method cannot be used in all circumstances to determine or demonstrate compliance. This would occur where it is not practicable to consistently achieve comparable wind conditions between the on and off conditions.

Where the supplementary "on/off" testing cannot be used to determine or demonstrate compliance, an alternative method such as measurement at an intermediate location and extrapolation of the results will be developed and submitted to the relevant authorities for approval.

Intermediate Monitoring

Intermediate monitoring involves conducting measurements close to the turbines to determine the noise emitted by the turbines. These noise levels will then be compared with the most recent noise model which was used to predict the noise at the relevant receiver locations. The measurement location will be selected such that it is away from trees and is close enough to turbines that the noise from turbines controls the acoustic environment.

Where a penalty for tonality is required in accordance with Section 6.4, 5 dB(A) shall be added to the modelled noise level for the particular residence where tonality has been identified. Where the modelled noise level, including any penalty for tonality, achieves Conditions 42 and EPL Requirement 3.1, the wind farm will be deemed to comply.

6.6 Low Frequency Noise Analysis

A low frequency noise analysis shall be conducted at a non-associated residence where pre-construction background data was collected. The analysis will be done in accordance with Condition 48A and Attachment 6 of the consent (see Section 5.3).

6.7 Substation Noise

The closest non-associated residence to the substation is located 2.84 km away (H05). The substation will easily comply with the noise limits set within Condition 43 at this distance. If an unusually high level of noise is being produced by the substation for some reason, the noise will easily be detected by the wind farm staff working the site office located less than 100m from the substation.

6.8 Compliance Test Reporting

For any noise compliance testing, the independent acoustic consultant will prepare a detailed monitoring report that includes:

- An assessment of the noise performance of the development against the noise criteria;
- The outcome of all noise complaints investigated; and
- Recommendations and a timetable for implementation for any reasonable and feasible additional measures necessary to ensure compliance with the relevant noise-related conditions of this consent.

Where possible, the report will be provided to the Environmental Representative (ER), Site Manager, the DPIE, the EPA and each landholder for which monitoring was undertaken within 28 days of the monitoring event. Where additional monitoring or information is required, the monitoring report will be provided to the ER, the DPIE, the EPA and landholder as soon as practicable following the

completion of monitoring. The report will be made publically available on the Taralga Wind Farm website.

7. Non-compliance Procedure

There the results of the noise compliance testing indicate that the noise criteria during operation is exceeded, the following process will be followed to determine the cause of exceedances and to develop and implement a *Noise Management System* (NMS) to ensure compliance:

1) Inspect the WTGs to determine if a maintenance related issue or mechanical defect is the cause of excessive noise generation. Where such issues or defects are found, resolve the issue or defect and conduct noise compliance testing again as per Section 6.
2) Review the status of any parameters such as WTG modes required from the design stage to see if the actual operating parameters are different to that required from the design stage.
3) Review the WTG manufacturer's near field1 sound power level test results to see if the actual sound power level results differ from that used in the modelling.
4) If a penalty is applied for tonality, consider the application of acoustic treatment to the relevant turbines in order to eliminate the tonality at the dwellings.
5) Determine other management systems for further noise reduction, if required, which will include the following options in order of their hierarchy:
    a) the operation of WTGs under reduced noise level modes for particular conditions (such as certain wind speed and direction); and
    b) the parking of turbines for particular conditions.
6) Conduct noise modelling to ensure that compliance with the noise criteria can be achieved. The noise modelling is to include any differences in the turbine modes (Step 2), the installed turbine sound power levels (Step 3), the effect of any tonality penalties (if the penalties could not be removed in Step 4) and any further modifications to operations required (Step 5).
7) Where compliance with the noise criteria is not achieved, repeat Steps 5 and 6 until modelling indicates compliance can be achieved.
8) Conduct compliance noise testing again with the wind farm operating under the measures determined by the previous steps. Where compliance with the noise criteria is not achieved, repeat Steps 5, 6 and 8 until compliance can be achieved.
9) Prepare a summary of the NMS, to be provided to the DPIE and EPA. The summary will include the following information:
    a) Results for the primary testing for each dwelling;
    b) Results for any required secondary testing for each dwelling;
    c) The make, model and sound power levels in octave bands of all WTGs, identified using a consistent project nomenclature;
    d) The WTGs which are to operate under reduced noise level modes;
    e) The modes that each turbine must operate under and the wind speeds and directions that initiate that mode;
    f) The turbines required to be parked and the wind speeds and directions that initiate that parking;
    g) A timeframe for the implementation of the NMS and any other reasonable and feasible measures to be taken.
    h) Evidence that the actions will reduce noise levels based on revised modelling;
    i) Photographs of the noise logging location and a general description of the local conditions in the vicinity of the location including structures, vegetation, and any noise generating plant and equipment.

j) All equipment used during the noise monitoring assessment will be appropriately calibrated with certification available upon request. The data and associated reporting will be appropriately reviewed prior to submission to relevant stakeholders.

10) Operate the wind farm in accordance with the NMS.

The DPIE and EPA will be notified of any changes to a NMS determined using the above process. Evidence will be given as to why this change is justified (e.g. a relevant receiver becomes associated with the wind farm).

8. Noise Complaints and Response

8.1 Receipt of Complaint

Section 4.8 of the OEMP provides details in relation to the management of community complaints. Complaints will be received, acknowledged and lodged in the manner described in this section.

In addition to the standard complaint information collected and recorded, the complainant will be contacted to collect the following extra information on the nature of the noise they are experiencing:

1) What is the subjective description of the noise?
2) Does the noise relate to the typical operation of the wind farm (i.e. operation of WTGs)?
3) Does the noise relate to the operation of the wind farm under certain weather conditions? If so, what are those weather conditions (e.g. wind strength and direction)?
4) What time of day is the noise heard?
5) Where is the noise heard? Inside or outside of the dwelling and with windows open or shut?
6) Does the noise relate to a new noise source that has not appeared previously during the typical operation of the wind farm?

8.2 Noise Complaint Response

A response to a noise complaint will be conducted in the following way:

8.2.1 Maintenance Issues or Mechanical Defects

1) Determine whether the issue is related to a maintenance issue or a mechanical defect based on either the:
    a) Information collected during receipt of the complaint; or
    b) Discussion with operational employees; or
    c) An inspection of the location during the conditions of the complaint.
2) Where the issue is related to a maintenance issue or a mechanical defect, rectify the issue and provide the ER, Site Manager, the complainant and the DPIE and EPA with a summary of the above investigations. No further action is required.

8.2.2 Typical Operation

1) Where the issue is not related to a maintenance issue or a mechanical defect, review the noise monitoring conducted in the first six months of operation to determine the following:
    a) Whether compliance noise monitoring has been conducted at the dwelling; or
    b) Whether compliance noise monitoring has been conducted at a dwelling in the vicinity of the complainant that is closer to the nearest turbine.
2) In the circumstance where both 1a) or 1b) are not confirmed, proceed to Step 4;
3) In the circumstance where either 1a) or 1b) are confirmed, compare the operational status of the turbines, the weather conditions at the time of the complaint and any potential change in local conditions that might result in modified results such as the construction of structures, change in vegetation or the installation of pumps or air conditioning units. Where the wind farm is found to be operating consistently with the conditions of the operational noise compliance testing and there has been no change in the local conditions, provide the ER, Site Manager, the complainant and the DPIE and EPA with a summary of the above investigations and a copy of the operational noise compliance testing report, where that document has not been provided to the complainant previously. Record the above information. No further action is required;
4) In all other circumstances, refer the complaint to the DPIE to determine if the complaint is considered to be valid in accordance with Condition 53A;

5) Where directed by the DPIE, conduct compliance testing in accordance with the procedure described in Section 6 and take action (if required) in accordance with Section 7;

6) Provide a report into the noise measurements and actions to the ER, Site Manager, the complainant and to the DPIE and EPA. No further action is required.

9. Noise Ameliorative Measures

Regardless of the outcome of noise compliance testing, Taralga Wind Farm is obliged, under Condition 42, to provide 'Reasonable and Feasible ameliorative measures' at the receivers H1, H5, H7, H12 and 'The Farm', at the owner's request, while they continue to not be associated with the wind farm. This condition no longer applies to H12 which is associated with the wind farm.

Noise ameliorative measures must be designed such that the acoustic suppression of the façade would increase the noise mitigation of the façade of that dwelling by 5dB(A) beyond that existing at the date of the request, to a maximum façade suppression effect of 15dB(A).

Any requests for ameliorative measures must be made within two years of the commencement of operations and are to be agreed to between Taralga Wind Farm and the landowner. Where agreement cannot be reached, either party may refer the matter to the DPIE for resolution.

Appendix A - Noise Receivers Map