



# Wind farm noise guidelines

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## Consultation – response to submissions

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## **Wind farm noise guidelines consultation – preliminary response document**

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# 1 Introduction

In 2018 the EPA carried out a technical review of the *Wind farms environmental noise guidelines*, to ensure that the guidelines are still appropriate. This was last reviewed in 2013.

The technical review considered national and international research, and revised international standards on noise measurement techniques. It also examines the noise criteria, infrasound, low frequency sound, tonality and amplitude modulation noise characters.

Subsequent to the review, the World Health Organization (WHO) *Noise guidelines for the European Region*<sup>1</sup> were released in October 2018. This triggered the need to compare the South Australian noise criteria with the WHO guidelines, and other Australian and international jurisdictions.

The EPA published a revised draft of the guidelines for consultation that took into account the technical review and addressed:

- multi-stage wind farm developments and new wind farms near existing ones
- infrasound and low frequency sound
- revised monitoring methodologies
- tonality provisions.

The EPA sought feedback from the community, local government, other development authorities, state agencies, acoustic engineers, wind farm development proponents, interstate regulators, and other stakeholders on the draft guidelines.

This document has been prepared to summarise the responses received by the EPA to date, and to update the public on how it has addressed submissions.

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<sup>1</sup> <https://www.euro.who.int/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018>

## 2 Responses received

A total of 39 unique submissions provided comments during this public consultation period. This consisted of:

- Community – 26
- Consultants – 3
- Non-government organizations (NGO) – 3
- Government organisations – 3
- Academic sector – 2
- Industry operators – 2.

Each response discussed a range of issues and comments, which have been broken down and categorised under 10 topics. Below are the topics and the number of submissions.

Topic	Number of submissions
General comments and suggestions	24
Noise criteria	25
Data collection	4
Data analysis	16
Propagation model	3
Amplitude modulation	19
Tonality	15
Low frequency	23
Infrasound	11
Vibration	10

Responses have been helpful in providing clarity on the issues important to the public and other stakeholders.

The EPA response falls into four main categories:

- **Submissions that have been accepted.** Once wording has been finalised, these will be incorporated into the guideline.
- **Submissions that have not been accepted but will be considered during future reviews.** As the EPA tracks developments in the literature and science of wind farm noise, these submissions will be further considered as part of future reviews of the guidelines.
- **Submissions that have not been adopted.** So far as practicable the rationale for not adopting these has been given.
- **Submissions that are outside the scope for EPA guidelines.** These are discussed at the end of this document.

## 3 Summary of considerations

### 3.1 General comments and suggestions

Issue	Comments
Difference of noise descriptors used for prediction ( $LA_{eq,10min}$ ) and compliance checking ( $L_{90,10min}$ )	Not adopted, but may be considered in future reviews
Clarification on the application of the new guidelines and how it would impact existing developments	Accepted. Wording currently under consideration.
Clarification for enforcement, complaints management, etc	Not adopted, but may be considered in future reviews
Ongoing real-time acoustics monitoring of wind farms	Considered but not adopted
Licensing of wind farms	Considered but not adopted
External report auditing for: <ul style="list-style-type: none"> <li>• Pre-construction modelling</li> <li>• Post-construction monitoring</li> </ul>	Considered but not adopted
Compliance testing to be undertaken by an acoustics engineer chosen by community at the expense of the operator	Considered but not adopted
Changes to the recommended noise levels for receivers with agreements	Not adopted, but may be considered in future reviews
Cumulative noise impact of all wind farms to meet criteria is impractical to achieve	Not adopted, but may be considered in future reviews
Instead of limiting sound power levels of turbines to be installed during planning stages, require that a final acoustic assessment be undertaken with final choice turbine and layout before the construction phase begins.	Accepted. Wording currently under consideration.
Expanding on alternative compliance checking methods in section 4.5 of guidelines	Not adopted, but may be considered in future reviews
Provide clarity that noise levels are to be measured externally	Accepted. Wording currently under consideration.
All raw acoustic and weather data measured for wind farm projects should be publicly available	Considered but not adopted.
General wording changes proposed*	Under consideration on a case-by-case basis

\*Responses calling for better clarification or request changes to the wordings used within the guidelines are included here. All changes (whether adopted or not) will be discussed in the final response.

### 3.1.1 Clarification for issues not adopted

#### ***Ongoing real-time acoustic monitoring of wind farms***

The cost of requiring wind farm operators to have constant ongoing noise monitoring of a wind farm is not a practical option. This requirement would introduce several other issues such as where these monitors would be deployed and also the usability of the data. The option to undertake such monitoring will be left for the industry to determine if the development requires such an option to be included. Further monitoring when non-compliance is suspected will be addressed separately.

#### ***Licensing of wind farms***

The EPA has considered this and the decision has been made to not license wind farms, given the level of scrutiny that is applied both pre-construction and post-construction via the development assessment process.

#### ***External third party auditing of acoustic reports***

Auditing of acoustic reports is currently undertaken by acoustical engineers from the EPA. A further requirement to audit the reports by a separate party was deemed to not add significant additional benefit to the community or the operators.

#### ***Compliance testing to be undertaken by an acoustics engineer chosen by community at the expense of the operator***

The EPA has defined the requirements of an acoustical engineer as someone who is eligible for membership of both Engineers Australia and the Australian Acoustical Society. These professional bodies have code of conduct requirements that aim to ensure all members act ethically and professionally. The EPA also requires that the post-construction compliance monitoring be done by a different acoustic engineering company than that used for the pre-construction background noise monitoring and noise modelling.

#### ***All raw acoustic and weather data measured for wind farm projects should be publicly available***

The EPA does not require the disclosure of commercial-in-confidence information. The public availability of such raw data will be left to the operators to decide on whether it should be released.

## 3.2 Noise criteria

Sub-issues	Comments
Noise criteria should be reduced from 40dB(A) to 35 dB(A) for areas not in rural living zones	Not adopted, but may be considered in future reviews depending on developments in wind farm noise and international literature reviews
Separate day and night time assessments	
Reduce the background criteria from +5dB to +3dB	
Removal of 'whichever is greater' term from noise criteria	Not adopted. Further information on this issue is provided below.

### 3.2.1 Clarifications for issues not adopted

#### **Noise criteria should be reduced from 40dB(A) to 35 dB(A)**

Noise impacts from wind farms meeting current criteria are less than or approximately the same in most circumstances than the conditional WHO recommended level of 45dB(A)  $L_{den}$ . That is, the guidelines criteria are in line with WHO

recommendations. The EPA will continue to review science and literature, and noise criteria will be an important part of future reviews.

### **Removal of ‘whichever is greater’ term from the noise criteria**

If a location has lower background noise levels when measured in accordance to the guidelines, a baseline noise criteria is set, eg 35 or 40dB(A). However, only having a baseline noise criterion is considered inappropriate for locations where the background noise measured in the area already exceeds this baseline noise criteria. For these cases, an increment of an additional 5dB above the measured background noise levels is considered to be reasonable for a wind farm proposal. It should be recognised that the natural background noise (such as wind noise) has the potential to mask wind farm noise.

Furthermore, most wind farms do not consider this higher background noise criteria during the planning and design stage. The wind farms are normally only designed and modelled against the baseline criteria.

An increment of 3dB is considered to be a barely perceptible change, while 5dB is considered to be a perceptible change. There has also been a call for a reduction of the background +5dB criterion to be reduced to +3dB. This is currently under consideration for future guideline development.

### **3.3 Data collection methods**

<b>Sub-issues</b>	<b>Comments</b>
Clarification for weather data collection technology when collecting data	Not adopted, but may be considered in future reviews depending on developments in wind farm noise and international literature reviews
Clarification of number of different periods required for compliance checking	
Exclusion of microphone-location-specific (local) wind speed data for 5m/s	
Data should be excluded after rain periods for 24 hours	
Require a minimum number of non-host dwellings for background noise testing and distances to wind farms for background noise testing	

### **3.4 Data analysis methods**

<b>Sub-issues</b>	<b>Comments</b>
Analysing up to wind speed with highest sound power level of a turbine sufficient. Analysing up to rated power wind speed not necessary.	Not adopted
Using day-evening-night levels ( $L_{DEN}$ ) for analysis	Not adopted
Clarification of number of points for each wind speed bin	Not adopted, but may be considered in future reviews depending on
Arithmetic averaging instead of logarithmic averaging for statistical noise measures such as $L_{A90,10min}$	
Finer resolution for wind speed bins in order to further align with the IEC Standard	

Sub-issues	Comments
Data collected during complete stoppage of turbines should not be included in compliance assessment	developments in wind farm noise and international literature reviews
Change to background subtraction method (subtracting background noise as a function of local wind speed at microphone height) for compliance checking	

### 3.4.1 Clarifications for issues not adopted

#### ***Analysing up to wind speed with highest sound power level of a turbine sufficient. Analysing up to rated power wind speed not necessary***

It has been proposed by industry that because sound power levels of wind turbines generally reach their peak before the rated power of the turbine, it would not be required to analyse data up to the wind speed of the rated power of the proposed turbine. Furthermore, background noise levels at higher wind speeds would be able to mask noise from the turbines at wind speeds above the highest sound power levels.

The EPA has decided not to change this from the current process of analysing data to rated power. This allows for more data to be analysed for periods when the turbine would be operating at its highest sound power levels, providing better statistical analysis of wind turbine noise.

#### ***Using Day-Evening-Night levels (LDEN) for analysis***

It was recommended that  $L_{DEN}$  levels be used to analyse noise data from wind turbines, which is the metric used in the WHO guidelines.  $L_{Aeq}$  is the preferred metric across Australia, as the shorter averaging period is more appropriate to assessing the impact of wind farm noise on communities. When levels are constant throughout the day, evening and night the  $L_{den}$  is 6.4 dB higher than the  $L_{Aeq}$  noise metric used in South Australia, that is, the current metric is more restrictive in most circumstances. The proposed assessment method provide a strong and clear means to determine compliance of a wind farm within a reasonable time frame. Therefore, the  $L_{Aeq,10\text{ min}}/L_{A90,10\text{ min}}$  metric will be continued to be used. The EPA will not be adopting this recommendation.

## 3.5 Propagation modelling

Sub-issues	Comments
Hard ground propagation too conservative	Not adopted, but may be considered in future reviews depending on developments in wind farm noise and international literature reviews
Use of ISO9613-2 vs CONCAWE	
Adopting UK Institute of Acoustics <i>Good practice guide for propagation model</i> (2013)	

### 3.6 Amplitude modulation

Sub-issues	Comments
Provide clarity where amplitude modulation has been taken into account	Explanation provided below
Penalty should be imposed for 'excessive' amplitude modulation	Not adopted, but may be considered in future reviews depending on developments in wind farm noise and international literature reviews
Adopting UK Institute of Acoustics <i>Assessment method for amplitude modulation assessments</i> (2016)	

#### 3.6.1 Provide clarity where amplitude modulation has been taken into account

The guidelines inherently take the unique characteristics of wind farm noise, such as amplitude modulation, into account when originally developed by setting lower noise criteria for wind farms than for other industries in the same land use zone.

Zone	Noise Policy Indicative noise factor Day dB(A)	Noise Policy Indicative noise factor Night dB(A)	Wind farm guidelines Noise criteria Day and Night dB(A)
Rural Living	47	40	35
Residential	52	45	40
Rural Industry	57	50	40

The noise criteria for wind turbines are at least 5dB lower when compared to the requirements of all other industries in similar zones, accounting for its unique noise characteristics. Noise criteria for wind farms are more stringent than any other noise sources regulated by the EPA.

### 3.7 Tonality

Sub-issues	Comments
Provide further clarification regarding the application of penalties for annoying noise characteristics such as tonality	Not adopted, but may be considered in future reviews depending on developments in wind farm noise and international literature reviews
One-third octave screening method should not be utilised for wind farm operations	Accepted, this method not considered as suitable screening method for wind farms.
Further clarification regarding how IEC61400 is to be applied at the receiver	Further wording under consideration

### 3.8 Low frequency

Sub-issues	Comments
Low frequency criteria to be adopted into the wind farm guidelines	Not adopted, but may be considered in future reviews depending on developments in wind farm noise and international literature reviews

### 3.9 Infrasonnd

Sub-issues	Comments
Infrasonnd criteria to be adopted into the wind farm guidelines	Not adopted

#### 3.9.1 Infrasonnd criteria to be adopted into the wind farm guidelines

Based on studies previously undertaken by the EPA and other independent studies, noise levels in the infrasonnd spectrum regions caused by the wind farm did not exceed levels that may be considered perceptible. The EPA will continue to keep up to date with studies regarding infrasonnd from wind farms. If newer studies show that infrasonnd due to wind farms has the potential to cause levels of discomfort above the recommended levels, the EPA may reconsider this stance.

### 3.10 Vibration

Sub-issues	Comments
Vibration criteria to be adopted into the wind farm guidelines	Not adopted

#### 3.10.1 Vibration criteria to be adopted into the wind farm guidelines

Studies have shown that vibration due to wind farms when compared to international standards, do not exceed the relevant criteria required. No further criterion for vibration will be introduced for this version of the guidelines. The EPA will continue to keep up to date with studies regarding vibration from wind farms. If newer studies show that vibration due to wind farms has the potential to cause levels of discomfort above the recommended levels, the EPA will reassess this.

### 3.11 Referred to SA health

Responses that contain explicit references to health or health impacts have been forwarded to SA Health for consideration.

### 3.12 Out of scope

Several issues during the consultation period were considered out of scope for the purposes of the guidelines. These topics include:

- Separation distances
  - This issue is managed by the planning authority, usually the local council or Department of Planning, Transport and Infrastructure (DPTI). The EPA has provided DPTI with a summary of stakeholders' views on separation distances. DPTI will take this into consideration for future editions of its Planning and Design Code.
- Ethical conduct
  - This is outside of the guidelines consultation process.

- Transparency of information
  - This is outside of the guidelines consultation process.
- Regional background noise testing database for access by developers.
- Impacts on the health of birds and other fauna.
- Discussion of alternative types of power generation.
- Property value impacts.