

TOPIC OF THE MONTH

Infrasound

The Sound You May Not Hear

When wind-turbine noise is discussed, attention often centres on audible sounds such as whooshing, humming and pulsing. Wind turbines also produce sound energy at very low frequencies, including frequencies below the usual range of human hearing.

Infrasound is a real and measurable physical phenomenon. However, detecting infrasound is not the same as proving that it has caused a particular symptom or illness. A responsible community discussion must distinguish what can be measured, what people may perceive and what current research has established.

MAIN MESSAGE

The presence of infrasound does not, by itself, prove harm. However, low-frequency sound should be assessed with equipment and methods suited to it, and the community should be shown the full frequency spectrum and measurement methodology—not only a single dB(A) figure.

1. What is infrasound?

Sound has two basic dimensions. Frequency, measured in hertz (Hz), describes how quickly air pressure rises and falls. Sound level, measured in decibels (dB), describes the size of those pressure changes. A very-low-frequency sound can be weak or strong, just as an audible sound can be quiet or loud.

Human hearing is generally described as covering approximately 20 Hz to 20,000 Hz, although hearing sensitivity differs between people and changes with age. Sound below about 20 Hz is called infrasound. The NSW Wind Energy Noise Technical Supplement uses the broader term low-frequency noise for sound with major components between 10 and 160 Hz.

Frequency describes how quickly sound pressure rises and falls

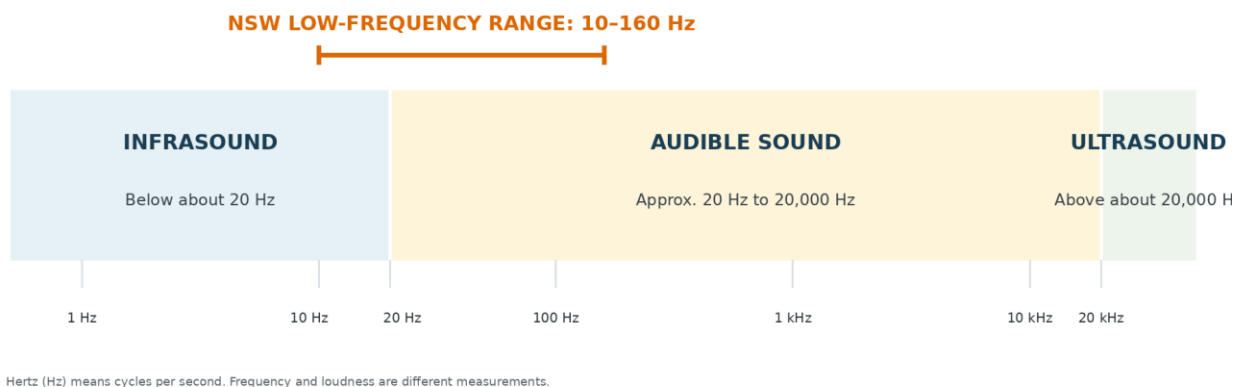


Figure 1. Infrasound, audible sound and the NSW low-frequency assessment range. The diagram is explanatory and not measured Reddestone data.

2. How can wind turbines produce infrasound?

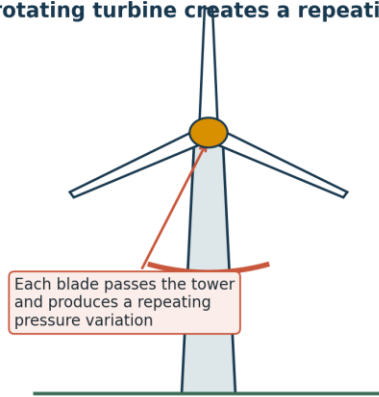
Wind turbines generate sound as the blades move through the air and as mechanical and electrical equipment operates in the nacelle. The rotating blades also create repeating pressure variations. One important repetition rate is the blade-pass frequency—the number of times a blade passes a fixed point each second.

For an illustrative three-bladed turbine turning at 12 revolutions per minute, the blade-pass frequency would be 0.6 Hz. This frequency lies in the infrasonic range. Harmonics at multiples of the blade-pass frequency and audible

aerodynamic or mechanical sound may occur at the same time. The actual spectrum depends on the turbine model, operating conditions, wind and distance.

Wind turbines produce both audible sound and very-low-frequency pressure variations

How a rotating turbine creates a repeating pattern



Illustrative blade-pass pulses

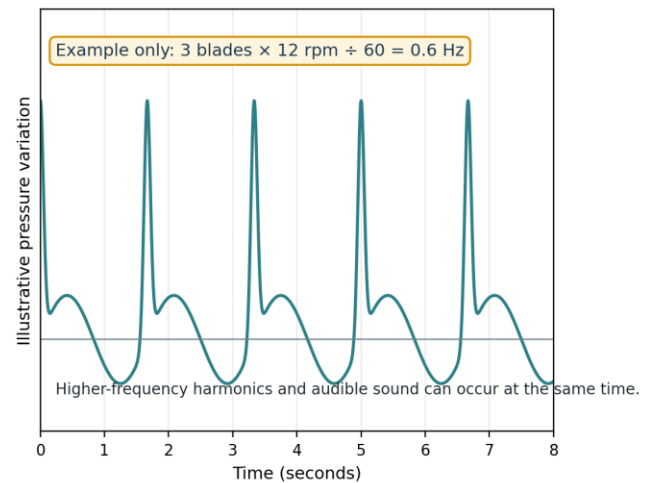


Figure 2. Illustrative blade-pass frequency and repeating pressure pulses. The turbine speed shown is an example only.

3. Why does a dB(A) number not tell the whole low-frequency story?

Most environmental-noise limits are expressed in A-weighted decibels, written as dB(A). A-weighting reduces the contribution of low and very high frequencies to approximate the sensitivity of human hearing. It is useful for comparing overall audible noise, but it is not a full frequency-by-frequency description.

C-weighting, written dB(C), retains more low-frequency energy. Z-weighting, written dB(Z), is essentially unweighted across the relevant range. For that reason, an acoustic report may need to present A-, C- and Z-weighted results, together with one-third-octave frequency bands, when low-frequency noise is being investigated.

Why a dB(A) number does not show the full low-frequency spectrum

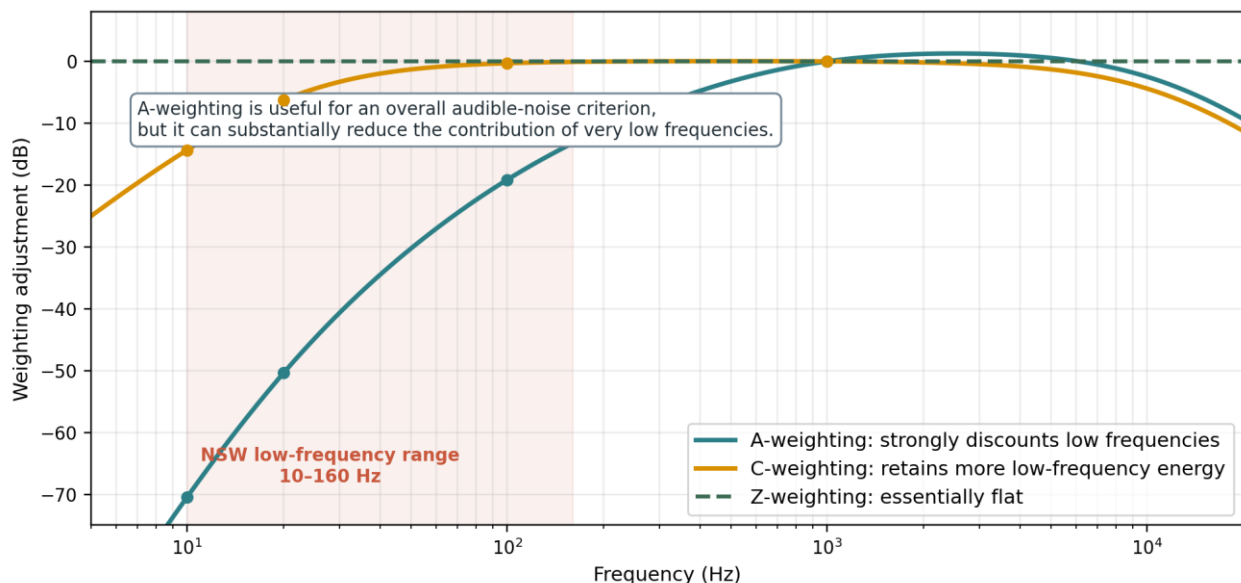


Figure 3. Conceptual comparison of standard A-, C- and Z-weighting responses. A-weighting substantially discounts very low frequencies.

IMPORTANT DISTINCTION

A project reading of 35 dB(A) does not mean that every frequency band is 35 dB. It is one weighted total. Low-frequency assessment requires additional information about the spectrum.

4. How does NSW assess low-frequency wind-turbine noise?

The main NSW residential wind-turbine criterion is based on the predicted or measured equivalent noise level over ten minutes, adjusted for tonality and low-frequency noise. It should not exceed 35 dB(A), or the existing background LA90 level plus 5 dB(A), whichever is greater, at relevant receivers from turbine cut-in to rated power.

For low-frequency noise, the NSW supplement provides two levels of assessment. A repeated C-weighted level above 60 dB(C) can trigger further consideration. A more detailed method compares Z-weighted one-third-octave levels from 10 to 160 Hz with specified thresholds. Depending on the size of an unmitigated exceedance, a 2 or 5 dB(A) adjustment can be added to the project noise level, with the combined adjustment for special characteristics capped at 5 dB(A).

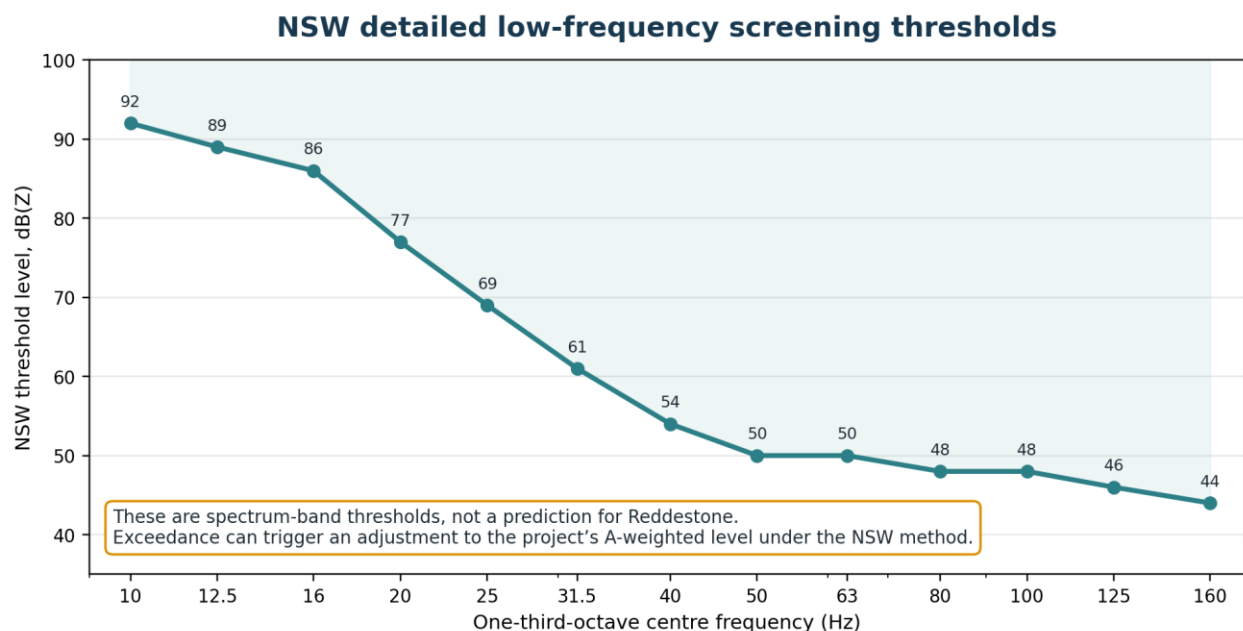


Figure 4. NSW one-third-octave low-frequency screening thresholds from 10 to 160 Hz. These are regulatory thresholds, not predicted Reddestone levels.

The NSW guideline also warns that wind passing over a microphone can contaminate C-weighted and low-frequency measurements. The selected microphone and windscreen must be suitable, and potentially wind-affected data must be identified and handled transparently.

5. What does current research say about health?

Residents' reports and scientific causation are related but different questions. A responsible assessment should document symptoms, examine whether they coincide with turbine operations and test possible acoustic, medical and non-acoustic explanations.

5.1 What residents report

Some people living near operating wind farms, including non-host neighbours, have described headaches or migraines, nausea, dizziness, ear pressure, tinnitus, fatigue, difficulty concentrating and disturbed sleep. Some say symptoms are strongest at home, during particular wind conditions or at night, and improve when they leave the

area. Similar reports have appeared in community submissions, case accounts, websites and social media. (Sources 2, 4–6.)

These accounts are important evidence of lived experience and should trigger respectful investigation. They may show what a person experienced and when it occurred, but individual reports cannot by themselves identify the responsible frequency or prove that infrasound caused the symptoms. Headache, nausea, dizziness and sleep disturbance can have many possible causes, and the acoustic environment is only one part of the investigation.

5.2 What scientific studies have found

The National Health and Medical Research Council's current published position is that there is no consistent evidence that wind farms cause adverse health effects in humans. It also acknowledges limitations in the evidence and calls for further high-quality research. (Source 2.)

Health Canada studied 1,238 adults living at a range of calculated wind-turbine noise levels. It did not find an exposure-related increase in frequent migraines or headaches, dizziness, tinnitus, self-reported sleep disturbance, stress or the chronic conditions examined. It did find that increasing turbine noise was associated with increased annoyance, and that high annoyance was associated with several health indicators. The study could not determine whether those health conditions preceded, were worsened by, or contributed to the annoyance. (Source 5.)

A Finnish population survey of 1,411 respondents specifically examined headache, nausea, dizziness, ear fullness, tinnitus, fatigue, sleep difficulty, anxiety and stress. Annoyance and wind-turbine-noise-related sleep disturbance were more common closer to the turbines, but the prevalence of the listed symptoms, diseases and medications was essentially the same across the distance groups. (Source 6.)

Controlled exposure studies provide stronger evidence about whether infrasound itself produces an immediate response. A Finnish Government project found that participants who attributed symptoms to turbine infrasound could not reliably detect its presence during testing, and it did not produce the measured autonomic stress response. In a 2023 Australian double-blind randomised crossover study, 37 noise-sensitive adults received 72 hours of simulated wind-turbine infrasound and sham exposure. Infrasound did not worsen the physiological, psychological or sleep measures tested compared with sham exposure. (Sources 3 and 4.)

These findings do not prove that every person, under every long-term real-world condition, is unaffected. They do mean that current controlled research does not support inaudible turbine infrasound as a demonstrated cause of the reported symptom cluster. Research on audible and amplitude-modulated turbine noise is a separate question: one laboratory study found worse self-rated sleep and changes in REM sleep, while a systematic review found no significant overall effect on the main objective sleep indicators and highlighted the small and inconsistent evidence base. A 2026 longitudinal study of more than 120,000 US households found no detectable effects at typical distances on headaches, insomnia, sleep problems, depression or anxiety, while noting that small effects could not be ruled out. (Sources 7–9.)

5.3 What remains uncertain and should be investigated

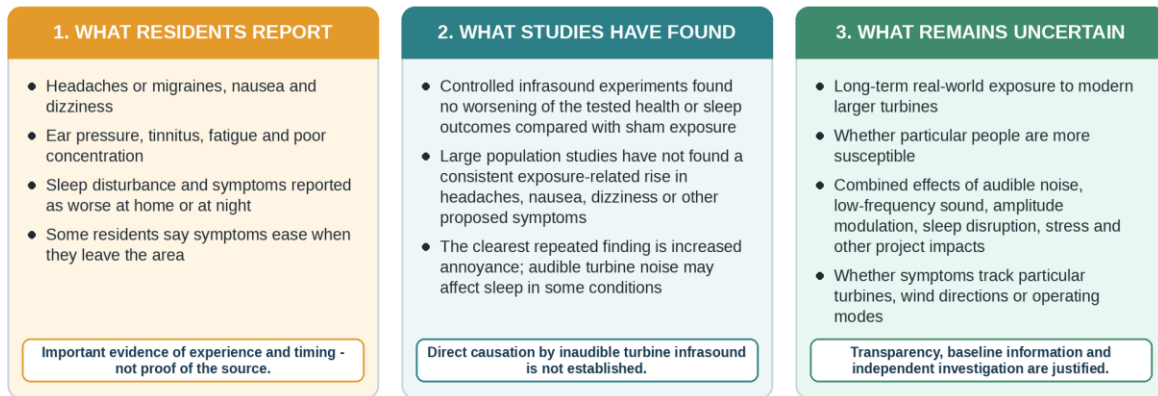
Important questions remain about long-term real-world exposure to modern larger turbines; whether people with migraine, vestibular disorders, severe noise sensitivity or sleep disorders may be more susceptible; indoor night-time conditions; and the combined effects of audible noise, low-frequency sound, infrasound, amplitude modulation, shadow flicker, visual intrusion, stress and loss of control.

Expectation and concern can influence symptom reporting in some experimental settings, but this does not mean that symptoms are imagined. It means that the pathway may be multifactorial and should be investigated without prejudging either the resident or the cause.

For Reddestone, prudent investigation should include voluntary and privacy-protected pre-construction baseline information on sleep and commonly reported symptoms; full-spectrum indoor and outdoor monitoring; a confidential complaint and symptom register synchronised with weather and turbine operating data; independent health and acoustic review; and enforceable procedures to investigate and mitigate verified problems.

RWFAG's position: Resident reports should neither be dismissed nor represented as proof that infrasound has caused a particular illness. The responsible response is transparent measurement, independent investigation and practical mitigation where problems are verified.

Health reports, research findings and remaining questions



Reported symptoms should not be dismissed - and they should not be represented as proof of a cause that research has not established.

Figure 5. Three separate questions: what residents report, what scientific studies have found, and what remains uncertain.

THE FAIR CONCLUSION

RWFAG does not need to claim that infrasound has been proven to cause a specific illness. The stronger position is that any low-frequency assessment must be technically competent, transparent, independently reviewable and clear about what the evidence does—and does not—show.

6. How should low-frequency sound be measured for Reddestone?

When Iberdrola releases a proposed turbine model and layout, the community should expect the acoustic assessment to disclose more than an overall dB(A) prediction. The assessment should show how very-low-frequency sound was predicted, measured, filtered and compared with the NSW criteria.

- Full one-third-octave results across at least the NSW 10–160 Hz low-frequency range, with A-, C- and Z-weighted totals clearly identified.
- Outdoor measurements at representative residences and, where indoor impacts are being investigated, indoor measurements reported separately from outdoor results.
- Night-time and adverse or worst-case wind conditions, with results linked to wind speed, wind direction, temperature and rainfall.
- Turbine operating records, including power output, rotor speed, operating mode, curtailment and shutdown periods, synchronised with acoustic data and complaint times.
- The make and model of microphones, windshields and data-processing methods, including the method used to identify wind-induced microphone noise.
- Raw and processed data, every excluded period and the technical reason for each exclusion, followed by an independent acoustic peer review.

A credible low-frequency assessment needs more than one microphone and one dB(A) number

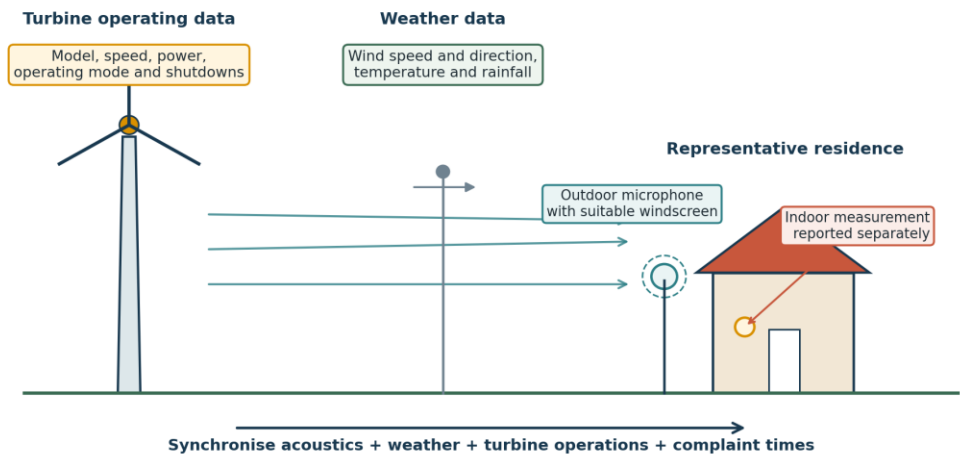


Figure 6. Elements of a credible low-frequency monitoring program. The diagram is explanatory rather than a proposed Reddestone monitoring layout.

7. What information should the community request from Iberdrola?

The following information should be provided early enough for residents and independent specialists to understand and review the assessment—not only after the project design and assumptions have been finalised.

Information the community should receive	Why it matters
Turbine make, model, rotor diameter, hub height and operating modes, including complete spectral sound-power data.	The frequency spectrum and blade-pass pattern depend on the selected turbine and operating state.
Predicted A-, C- and Z-weighted levels and one-third-octave results at each potentially affected non-associated residence.	An overall dB(A) total cannot show how sound energy is distributed across low frequencies.
All monitoring locations, photographs, distances from homes and descriptions of roads, vegetation, machinery and other nearby sound sources.	Monitoring must represent where people live and sleep and identify sources that may contaminate the results.
Weather data, turbine operating data and time-synchronised acoustic records.	This allows conditions at the time of a measurement or complaint to be independently checked.
Raw data, processed data, exclusions, filters, calculations and uncertainty margins.	A summary graph alone is not enough to test whether the methodology was applied consistently.
Separate analysis of night-time conditions, low-frequency noise, tonality and amplitude modulation.	Different sound characteristics may not be adequately described by one average number.
A clear complaint-response process and auditable curtailment or shutdown triggers where mitigation is required.	Residents need to know how a concern will be investigated and what action will follow a verified exceedance.
Independent acoustic peer review, with the reviewer’s scope and findings made public.	Independent scrutiny strengthens confidence in both the assessment and the eventual compliance process.

RWFAG POSITION

Infrasound should neither be dismissed simply because it is usually inaudible nor presented as proof of illness merely because it can be detected. The community is entitled to full-spectrum information, suitable measurement methods, transparent data handling and independent review before conclusions are drawn about the proposed Reddestone Wind Farm.

The absence of a sound that can be consciously heard does not make measurement irrelevant. Equally, the detection of an infrasonic signal does not establish a medical effect. Good assessment requires both technical accuracy and honest communication about uncertainty.

Sources and explanatory notes

This community information document is based on the current NSW assessment framework and selected official and peer-reviewed sources. It is intended for public education and is not medical advice.

IMPORTANT NOTE ABOUT THE VISUALS

All graphs and diagrams in this document are original explanatory illustrations. They are not measured data, predictions or acoustic assessments for the proposed Reddestone Wind Farm.

1. NSW Department of Planning, Housing and Infrastructure: Wind Energy Guideline - Technical Supplement for Noise Assessment, November 2024, version 1.0.
2. National Health and Medical Research Council: Statement and Information Paper - Evidence on Wind Farms and Human Health, 2015 (current published NHMRC position).
3. Marshall NS et al. The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study in Noise-Sensitive, Healthy Adults. *Environmental Health Perspectives*. 2023;131(3):037012. doi:10.1289/EHP10757.
4. Finnish Government analysis, assessment and research activities: Infrasound Does Not Explain Symptoms Related to Wind Turbines. Final report, 2020.
5. Health Canada and Statistics Canada: Wind Turbine Noise and Health Study - Summary of Results, including questionnaire, objective health measures and more than 4,000 hours of acoustic measurements.
6. Turunen AW et al. Self-reported health in the vicinity of five wind power production areas in Finland. *Environment International*. 2021;151:106419. doi:10.1016/j.envint.2021.106419.
7. Liebich T et al. A systematic review and meta-analysis of wind turbine noise effects on sleep using validated objective and subjective sleep assessments. *Journal of Sleep Research*. 2021;30(4):e13228. doi:10.1111/jsr.13228.
8. Smith MG et al. A laboratory study on the effects of wind turbine noise on sleep: results of the polysomnographic WiTNES study. *Sleep*. 2020;43(9):zsaa046. doi:10.1093/sleep/zsaa046.
9. Rott N, Almond D and Giuntella O. Wind turbine proximity and health: Longitudinal evidence from US households. *Proceedings of the National Academy of Sciences*. 2026;123(21):e2525715123. doi:10.1073/pnas.2525715123.
10. World Health Organization: Environmental Noise Guidelines for the European Region, 2018.
11. NSW Department of Planning, Housing and Infrastructure: Renewable Energy Planning Framework.

Frequency descriptions are approximate and individual hearing sensitivity varies. The detailed NSW thresholds shown in Figure 4 are reproduced from the NSW technical supplement for educational explanation. Resident accounts are included as reports of experience and are not treated as proof of medical causation. Any project assessment must use the applicable consent conditions, standards and current regulatory requirements.