



Noise and vibration

EIS information guideline



Queensland
Government

Prepared by: Environmental Impact Assessment, Operational Support, Department of Environment and Science

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Citation

Department of Environment and Science 2022, *Noise and vibration—EIS information guideline*, ESR/2020/5305, Queensland Government, Brisbane.

ESR/2020/5305, version 1.02, last reviewed: 21 Apr 2022

Contents

Introduction	1
What is noise?	1
Legislation and policy	1
What should the EIS address?	1
Environmental values and the acoustic environment	2
Background noise levels	2
Assessing impacts	3
Avoidance or mitigation of impacts	4
Commitments and conditions	5
References.....	5

Introduction

This guideline advises proponents about the information and assessment requirements in relation to noise and vibration when preparing an environmental impact statement (EIS).

What is noise?

Section 12 of the *Environmental Protection Act 1994* (EP Act) says: 'Noise includes vibration of any frequency, whether emitted through air or another medium.' That is, for the purposes of assessing impacts, noise includes any vibrations through the air, water, and/or the ground. Furthermore, it is not only the audible effects that are important—for example, the EIS must assess any vibrations through the ground that might cause damage to natural or fabricated structures.

Legislation and policy

In Queensland, noise is regulated under the EP Act and subordinate legislation including the Environmental Protection Regulation 2019 (EP Regulation), and the Environmental Protection (Noise) Policy 2019 (EPP(Noise)). Resource projects and other environmentally relevant activities are issued an environmental authority that includes conditions that stipulate how the project must be managed. One of the statutory purposes of an EIS is to help the administering authority decide an environmental authority application, and its conditions.

The EP Act includes noise in the list of 'contaminants' (see s. 11), and in the list of things that can cause 'environmental nuisance' (see s. 15). Chapter 8, Part 3B, of the EP Act regulates offences relating to noise standards, and in doing so provides several relevant definitions and sets several default standards for audible noise, airblast overpressure and ground vibration that should be considered when preparing an EIS.

Chapter 5, Part 4, of the EP Regulation includes several regulations related to prescribed standards for noise and standard methods for measuring noise.

The EPP(Noise) addresses the following matters:

- the application and purpose of the policy
- environmental values and acoustic quality objectives
- ways of avoiding, minimising or managing noise, including a management hierarchy for noise
- requirements for controlling background creep.

Other applicable international sources of standards and objectives for best practice include:

- *Guidelines for community noise* (WHO 1999)
- *Environmental noise guidelines for the European Region* (WHO Regional Office for Europe 2018)
- *Night noise guidelines for Europe* (WHO Regional Office for Europe 2009).
- *Burden of disease from environmental noise. Quantification of healthy life years lost in Europe* (WHO Regional Office for Europe 2011)

What should the EIS address?

The EIS must identify and address the following three key areas relating to noise matters:

- environmental values of the receiving environment and any nearby sensitive places
- potential impacts, and all associated risks, of the proposed activity on the environmental values
- measures to avoid, minimise and mitigate the identified impacts and risks to the environmental values.

These three areas are addressed in the following sections of this guideline. As well as this guideline, the EIS must meet the requirements of the department's guideline [Application requirements for activities with impacts to noise](#) (DES 2019).

When describing any matter, illustrate using appropriate maps, diagrams, charts and/or photographs. Use multiple graphics when needed to adequately illustrate a matter.

If a particular matter is not relevant, explain how it has been considered rather than being silent.

Environmental values and the acoustic environment

Identify the relevant environmental values that might be impacted by the project before assessing the potential level of impact on the values.

The EP Act defines an environmental value as ‘a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.’

The EPP(Noise) declares the environmental values for the acoustic environment that are to be enhanced or protected as:

- (a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- (b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—
 - (i) sleep;
 - (ii) study or learn;
 - (iii) be involved in recreation, including relaxation and conversation; and
- (c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Schedule 1 of the EPP(Noise) provides a table of acoustic quality objectives for relevant environmental values. The table lists those environmental values as:

- health and wellbeing
- health and wellbeing in relation to the ability to sleep
- health and wellbeing in relation to the ability to converse
- health and biodiversity of ecosystems
- community amenity

Schedule 1 of the EPP(Noise) also lists sensitive receptors that must be identified as areas or places for measuring noise when assessing the potential impacts of noise and vibration. In effect, sensitive receptors are areas or places at which acoustic environmental values must be protected. Among others, the list of sensitive receptors includes: a dwelling, a library or educational institution, childcare centre, hospital, commercial or retail premises, a protected area and public park.

Describe, and illustrate on maps and/or aerial photographs, the locations of all sensitive receptors that may be impacted by the project, and identify the relevant acoustic environmental values that must be protected at those locations.

Develop, describe and tabulate acoustic quality objectives for each sensitive receptor that might be impacted by the project, and specify which environmental value(s) each objective is associated with. State the noise descriptor for each objective, and indicate the time of day to which each objective applies.

Background noise levels

Undertake background noise and vibration monitoring at representative locations within the potential full extent of the acoustic footprint of the project. Monitor background at each individual sensitive receptor or cluster of receptors that the project might affect. Ensure that the monitoring locations are fully representative of the acoustic environment at the sensitive receptors, for example, by not placing all monitoring locations close to roads, and by taking account of local topography that could reduce or increase incident noise near the receptor. Avoid measuring in locations where unusual disturbance, such as nearby short-term construction work, would make the measured noise levels not typical of the long-term background.

Background monitoring must fulfil the following requirements:

- locations must be within 100m of the sensitive receptor(s) they represent
- measurements must be taken continuously over an extended time of at least 1 week
- data sets should include winter noise levels
- weather conditions at the time of measuring must be recorded and provided with the noise data
- data should be excluded if, when measured, the wind speed was over 3m/s or rainfall was over 0.3mm/h (DTMR 2013)
- measuring equipment should be attended as much as possible by a trained person.

Measure the daily variation of background noise levels, with particular regard to: variations at different periods of the evening and night, and variations that are due to different levels of activity throughout the day and on different days of the week. Include low-frequency (<200Hz) noise.

Account for seasonal variations in background noise levels. For example, in some parts of Queensland, insects may be a significant source of background noise in summer, while their absence in winter might lower the background level. Also, noise propagation in winter, particularly during the evening and night, can be dominated by atmospheric temperature inversion causing enhanced noise propagation compared to summer.

Collect the data in accordance with: quality-assured, best practice methodologies; relevant requirements of the EP Regulation and the EPP(Noise); Australian Standards; and relevant departmental guidelines. In particular, obtain advice from the department's [Noise measurement manual](#) (EHP 2013).

Report the following noise descriptors and data related to the background noise measurements:

- LAeq,adj,15min, LA90,adj,15min, LA10,adj,15min, LA1,adj,15min and LAmax
- dates and times of the noise measurements
- wind speed, wind direction, and rainfall when each block of measurements was taken
- site map showing sensitive receptors and monitoring points
- photographs of each monitoring point
- contour map of noise levels.

Assessing impacts

Identify the activities, equipment and locations of the project that will emit noise, and describe the expected noise level, tonality and spectrum that each source will emit. Also, describe whether the sources will be continuous, intermittent, fluctuating, vibrating or impulsive. Furthermore, discuss whether the expected noise levels are based on measured emissions from identical or similar sources elsewhere, or whether the levels have been estimated. Address sources of noise during the different phases of the project, such as construction, commissioning, operation, decommissioning and closure, and include upset and maintenance conditions. If a source will not be continuous, list the times of day, week, and/or month, that each noise source will be active.

Describe the topography of the area, and assess how natural and/or constructed features of the landscape affect the propagation of noise. Also, assess how the nature of the local and regional climate would affect noise propagation, due to such factors as: wind strength and direction at different seasons and times of the day; temperature inversions; and so on.

Develop a suitable acoustic model, calibrated to the measured background levels, for noise propagation from the project site(s). The model must adequately predict the sound environment around the project, particularly at sensitive receptors and the project's boundary. The model must incorporate the existing and proposed features of the landscape (hills, valleys, spoil dumps, bunds, etc.) that would affect the propagation of noise. The model must be able to predict the variations in noise at different times of the day under both average and worst-case conditions. It must also predict the cumulative impacts of the project added to existing sources of noise that are experienced at relevant sensitive receptors.

Describe the models predictions for appropriate noise descriptors, and illustrate the results with noise contour maps that also show the proposed project boundary and sensitive receptors.

The outputs of the noise model must include both summer and winter conditions, and specifically must include temperature inversions. For that latter requirement, model noise propagation for both typical and maximum strengths of temperature inversions, and report the results with their occurrence statistics.

When assessing outdoor to indoor noise attenuation at sensitive receptors, do not use the World Health Organisation guideline's value of 25dB as it was developed for European buildings with double-glazed windows. Instead, use an outdoor to indoor attenuation value of 7dB, which is appropriate for typical Queensland buildings with open windows.

Compare the predictions at each sensitive receptor to its acoustic quality objectives. Make use of the guideline *The health effects of environmental noise - other than hearing loss* (enHealth Council Commonwealth of Australia 2004) when assessing noise impacts on human health and wellbeing.

Describe and illustrate the local government's planning scheme zones for land uses in the wider area around the project site, and assess whether the project's noise emissions may impact on any foreseeable future land uses. That is, assess known future land uses as if they were already in use. For example, assess whether land that is zoned for future residential could experience noise emissions from the project above the acoustic objectives that would apply if the land already had dwellings.

Assess the potential environmental impacts of noise and vibration on amenity at places other than sensitive receptors.

Assess the potential environmental impacts of noise and vibration on any nearby protected areas, and on terrestrial, aquatic and marine animals, and birds, including migratory species. If the project would involve underwater pile driving, or another significant source of noise, determine whether the bed substrates are acoustically reflective or absorptive, and assess how noise would propagate through the water column. Assess how far distant marine animals would need to be from the source of underwater noise to avoid impacts.

If the project would involve blasting, describe the locations, frequency and expected size of blasts, and predict the noise levels, airblast overpressure, and ground vibration that would result from the blasts. Assess the potential impacts of the expected noise, airblast overpressure, and ground vibration from the blasts. Refer to the department's guideline [Noise and vibration from blasting](#) (EHP 2016) for further information about measurements and criteria for blasting related effects.

Assess any potential noise and vibration impacts that may occur off the project site, such as may be due to increased rail or road traffic. Assess the impacts of rail traffic in consultation with the rail transport provider and regulator. Refer to the *Transport Noise Management Code of Practice* (Department of Transport and Main Roads, 2013) for more information about assessing and managing road traffic and construction noise.

Avoidance or mitigation of impacts

Section 8 of the EPP(Noise) stipulates a management hierarchy for activities involving noise. The priorities in which management measures must be applied are as follows:

Firstly, **avoid**—for example, by locating a noise source away from a sensitive receptor.

Secondly, **minimise**—for example, by (a) facing a source so that it emits noise away from a sensitive receptor, or (b) using best available technology, such as quietest machines or shielding.

Thirdly, **manage**—for example, by using heavy machinery only when people's sleep or recreation will not be disturbed.

Section 9 of the EPP(Noise) also stipulates how background creep must be controlled. Specifically, the EPP(Noise) states that to the extent that it is reasonable to do so, noise from an activity must not be:

- (a) for noise that is continuous noise measured by $L_{A90,T}$ —more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or
- (b) for noise that varies over time measured by $L_{Aeq,adj,T}$ —more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

Propose avoidance and mitigation measures for the project that accord with the management hierarchy and will adequately control background creep. The measures must also be able to:

- achieve the acoustic objectives for each sensitive receptor that could be impacted by the project
- mitigate any cumulative impacts
- mitigate any low-frequency (<200Hz) emissions.

Describe each proposed mitigation measure in detail, and assess how each accords with current best practice.

Describe who has responsibility for putting each measure in place, and when the measures must be initiated or installed.

Describe whether each measure is passive or active. Passive measures need little or no ongoing operation or maintenance once installed (e.g. earth bunds or acoustic walls). Active measures need ongoing intervention to keep them effective. For active measures, describe who has responsibility for them, and what actions they must take to keep the measures effective.

If the project has the potential to cause significant underwater noise impacts, propose measures that would minimise the impacts, such as using a bubble curtain around pile driving.

Propose monitoring and corrective action measures that will ensure that all mitigation measures achieve their objectives. Also, include auditing and reporting requirements that will be able to demonstrate that noise and vibration objectives are being met should the project proceed.

Describe the system that would receive any complaints from the community about noise or vibration, including how the complaints would be addressed, managed and reported. Community should include businesses and commercial sites. Specify the personnel roles that would have responsibility for dealing with complaints.

Commitments and conditions

Provide a consolidated description of commitments relating to noise impacts. Propose conditions for noise that may be included in the project's environmental authority. The conditions may be based on the department's existing model conditions and eligibility criteria, and/or modified or developed to suit site and project specific matters.

References

Note: These references were correct at the time of publication. Where more recent versions are available, these must be used. For all Department of Environment and Science publications, the latest version of a publication can be found by using the publication number as a search term at the [Queensland Government website](http://www.qld.gov.au) <www.qld.gov.au>.

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