



Environmental Protection Authority

Guidance for the Assessment of Environmental Factors

(in accordance with the
Environmental Protection
Act 1986)

Environmental Noise

No.8

Draft

June 1998

Western Australia

FOREWORD

The Environmental Protection Authority (EPA) is an independent statutory authority and is the key provider of independent environmental advice to Government.

The EPA's objectives are to protect the environment and to prevent, control and abate pollution. The EPA aims to achieve some of this through the development of environmental protection guidance for the environmental impact assessment (EIA) of proposals.

In 1992, when the Environmental Protection Act 1986 was reviewed, a key sentiment expressed related to the uncertainty of outcome of the EIA process. The EPA expressed this concern by identifying priority factors for which EPA guidance and position statements needed to be developed to establish the grounds for judging the environmental acceptability of developments in advance of project planning and design.

This guidance statement is one in a series being issued by the EPA to assist proponents, consultants and the public generally to gain additional information about the EPA's thinking in relation to aspects of the EIA process. This series provides the basis for EPA's evaluation of and advice on development proposals subject to EIA. The guidance statements are only a small part of the overall process of achieving an environmentally acceptable proposal. Consistent with the notions of continuous environmental improvement and adaptive environmental management, the EPA expects proponents to take all reasonable and practicable measures to do better than the minimal requirements of this guidance.

This draft guidance deals with the assessment of environmental noise emissions, where those emissions come under the *Environmental Protection (Noise) Regulations 1997*. This guidance may also be used in assessing the impact of an existing industrial area on a proposed residential development. Guidance on road and rail transportation noise is being developed separately.

This guidance uses a two-step approach:

- a screening procedure, to assist in deciding whether or not noise emissions are a relevant environmental factor; and
- a detailed procedure for noise assessment, to ensure that compliance with the regulations is demonstrated in a manner which is both consistent with best practice for noise assessment and acceptable to the EPA.

The EPA will expect to see this two-step approach used in the assessment information provided by proponents for the vast majority of projects which are referred to the EPA.

This guidance statement has the status "draft", which means it has been endorsed by the EPA for release for "stakeholder review" for 4 months.

I am pleased to release this document and encourage you to comment on it.



Bernard Bowen
CHAIRMAN
ENVIRONMENTAL PROTECTION AUTHORITY

30 June, 1998

**ENVIRONMENTAL PROTECTION AUTHORITY
GUIDANCE FOR THE ASSESSMENT OF ENVIRONMENTAL
FACTORS**

**DRAFT GUIDANCE No. 8:
GUIDANCE FOR ENVIRONMENTAL NOISE**

How to comment on this document

This document is released for stakeholder comment for a period of 4 months. Your comments are welcome.

Please send your comments by 30 October 1998 to:

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Guidance No. 8

Environmental Noise

Keywords: Noise, guidance, regulations, noise prediction, noise assessment

1 PURPOSE

The purpose of this statement is to provide guidance to proponents submitting proposals for environmental impact assessment:

- (a) to ensure that the noise emissions from the premises on which the proposal is based comply with the *Environmental Protection (Noise) Regulations 1997* (the regulations);
- (b) to protect the environment as defined by the *Environmental Protection Act 1986* (the Act) with focus on noise emissions from premises;
- (c) to address the factor of uncertainty of outcome of the EIA process as raised in 1992 during the review of the Act;
- (d) to address the factor of noise emissions from both construction and operational phases of the proposal; and
- (e) to present to proponents who have proposals subject to environmental impact assessment (EIA), to consultants who act on their behalf, and to the general public, the Environmental Protection Authority (EPA) position on noise emissions from premises to ensure adverse impacts are prevented.

2 INTRODUCTION

2.1 General

This document has been prepared to assist proponents of new projects, their environmental consultants, acoustical consultants, local and State government officers in the preparation and evaluation of noise impact assessments for the purposes of Part IV of the *Environmental Protection Act 1986*.

The guidance material in this document falls into two parts:

- a simple “screening” procedure for deciding whether or not the noise emissions from a proposal are likely to require detailed analysis; and
- detailed guidance on the methodology to be followed for the derivation and presentation of technical information for the assessment of noise impacts.

The aim of the guidance material is to enhance the environmental approvals process whilst ensuring that an appropriate standard of technical and public information relating to noise impacts is presented.

This guidance statement does not address road and rail transportation noise, which is covered in a separate guidance statement (EPA, 1998).

2.2 Noise and its Effects

Section 3 of the *Environmental Protection Act 1986* defines "noise" as including "vibration of any frequency, whether transmitted through air or any other physical medium". Thus, in considering whether a proposal may cause a noise impact, one may need to look at noise at frequencies below the audible frequency range ("infrasound") or even above the audible frequency range ("ultrasound") as well as in the audible frequency range, although the latter is by far the most common problem. An example of infrasound is the airblast overpressure wave associated with blasting operations, often perceived as shaking of the dwelling and rattling of the windows.

Similarly, vibration can also cause discomfort for building occupants, whether it is in the form of an impulsive shock or continuous vibration.

Audible noise is, however, the most common problem in most situations. Noise may cause disturbance to rest or recreational activities, especially for the elderly or sick. Noise which occurs at night is more likely to disturb a community than noise which occurs during the day only. Noise may contain annoying characteristics, such as tonality ("humming", "whining"), modulation (regular changes in level or pitch, eg a siren), or impulsiveness ("hammering").

In considering the likely impact of a proposed operation it is therefore important to note the times when noise will be emitted and whether the noise emissions are likely to contain annoying characteristics.

2.3 The Environmental Protection Act 1986

Part IV of the Act sets out requirements for the referral of proposals to the Environmental Protection Authority (EPA) and for their assessment and implementation. Where a proposal is to be formally assessed under the Act, Section 40 (2) of the Act states that "*The Authority may, for the purposes of assessing a proposal... require the proponent to undertake an environmental review and to report thereon to the Authority...*"

The three possible forms which the environmental review may take are the Consultative Environmental Review (CER), Public Environmental Review (PER) and Environmental Review and Management Plan (ERMP). Information on possible noise impacts is normally presented in the environmental review report in summary form, with more detailed technical information in a supplementary report. The supplementary report has normally been prepared by an acoustical consultant retained by the proponent.

Even in cases where the proposal has not been formally assessed under Part IV of the Act, it is quite common for a report on noise emissions to be prepared for the purpose of satisfying the Department of Environmental Protection (DEP) that the noise emissions can be managed to achieve compliance with the noise legislation.

2.4 Noise Regulations

The *Environmental Protection (Noise) Regulations 1997* were gazetted on 31 October 1997, to replace the *Noise Abatement (Neighbourhood Annoyance) Regulations 1979*.

The requirements specified in regulations 7 and 11 are prescribed standards for noise emissions from premises under sections 51, 62 (4) (c), 65, 74 (3) (a) and clause 22 of Schedule 4 of the Act.

Regulation 7 requires that noise emitted from any premises must comply with assigned noise levels when received at any other premises and be free of the intrusive characteristics of tonality, modulation and impulsiveness. The assigned levels are specified under regulation 8, according to the type of premises receiving the noise, the time of day and the presence of commercial and industrial land use zonings and major roads within a 450 metre radius of the receiver. Regulation 11 specifies noise limits for airblast due to blasting.

The regulations also make special provision for farming vehicles on rural premises (regulation 12), construction work on construction sites (regulation 13), specified equipment used on residential premises (regulation 14) and bellringing and calls to worship (regulation 15). Provided certain conditions are met, regulations 7 and 11 do not apply to noise emitted under these special regulations. There is also a category of noise emissions called "exempt noise", to which regulations 7 and 11 do not apply and for which no conditions are specified, but for which the regulations specify certain noise control procedures (regulation 16).

Regulation 17 provides for a person who believes that his or her proposal cannot reasonably or practicably comply with the assigned levels to apply to the Minister for the Environment for approval to allow the noise emission to exceed or vary from the assigned levels. The Minister makes a decision to grant or refuse the application on advice from the Environmental Protection Authority. Regulation 18 provides for the Chief Executive Officer to grant an approval for a "non-complying event" (normally an outdoor concert), which would lose its character or usefulness if required to meet the assigned levels. Regulation 7 does not apply to the event provided the conditions of the approval are met.

This guidance statement focuses on proposals which need to demonstrate compliance with assigned levels specified by regulation 7 and the airblast limits in regulation 11. It is also applicable to persons applying under regulation 17 for approval to exceed or vary from the assigned levels as part of the assessment of a proposal under Part IV of the Act.

Further information on the regulations is contained in the booklet "*Environmental Protection (Noise) Regulations 1997 - Summary of the Regulations*", which is available from the Department of Environmental Protection Library.

3 GUIDANCE

3.1 The Environmental Objective

The EPA's environmental objective is to ensure that -

- (a) all potentially significant noise emissions are identified in the environmental review information submitted by the proponent; and
- (b) compliance with the *Environmental Protection (Noise) Regulations 1997* is demonstrated in a consistent manner which is acceptable to the EPA.

3.2 EPA Policy

The EPA policy is that proponents must demonstrate compliance with the *Environmental Protection (Noise) Regulations 1997*, where the noise emissions are covered by those regulations.

Provided the EPA is satisfied with the acoustic analysis, then -

- compliance may be deemed to have been demonstrated when a proposal is shown not to have a significant noise component by using the Screening Procedure in Section 4 of this document; and
- compliance will be deemed to have been demonstrated when a proposal is shown to comply with the regulations when the Detailed Assessment in Section 5 of this document is followed.

It should be recognised that the detailed procedure defines a "worst case" for the assumptions to be made in acoustic modelling, particularly in relation to meteorological conditions which can significantly affect sound propagation. This "worst case" may allow noise levels to exceed the regulations for a period of up to two per cent of the "worst month", that is, for up to seven hours at night and up to seven hours during the day in the month which has the weather conditions most suited to enhanced sound propagation. These conditions include low to moderate winds blowing from the noise source towards the receiver, possibly combined with temperature inversion conditions at night.

The choice of the "worst case" conditions has been made to provide proponents with a degree of certainty in the design of their project, such that noise controls can be specified to achieve a known noise level under defined conditions. At the same time, the public are provided with a very high degree of protection from noise, partly as a result of the strict noise limits in the regulations, but also because the "worst case" conditions are defined so as to occur only rarely. When these conditions do occur, the level of the noise emission would be unlikely to exceed the permitted level by more than a small amount.

This guidance statement position is not intended to in any way pre-empt the enforcement procedures of the Department of Environmental Protection.

4 SCREENING PROCEDURE

4.1 General

When considering the likely environmental issues associated with a proposal, it is helpful to have a screening procedure to assist in deciding whether an issue such as noise is significant enough to require detailed assessment. The following procedure is designed to allow a quick preliminary noise analysis to be done for this purpose and takes the form of a worksheet (see Appendix 1 for a proforma).

The first question on the worksheet covers the general issue of community concern, viz:

- (1) *Is the proposal particularly sensitive within the community?* The community sensitivity could relate to the type of proposal (eg. a speedway) or to the history of the proposed site (eg. a proposed mine expansion adjacent to a town). If the answer is “yes”, then the proposal may warrant detailed assessment even if the remainder of the procedure indicates the noise issue may be insignificant.

The remainder of the screening procedure is based on answering the following questions about noise emissions:

- (2) *Is operational noise likely to be above the relevant screening criterion?*
- (3) *Is construction noise likely to be above the relevant screening criterion?*
- (4) *Is the proposal likely to involve blasting?*

If the screening procedure indicates a “yes” answer in relation to any of the above issues, then the guidance material in Section 5 of this document should be followed.

It should be recognised that this screening procedure is not a precise tool but merely provides a quick indication that noise is unlikely to be a significant issue. There are a number of relevant factors which this procedure does not take into account, thus it includes a “safety factor”. For this reason, there will be some situations where a detailed assessment will show the noise impact to be of low significance. The procedure should also pick up proposals where a marginal noise impact is identified and can be brought within compliance by noise control measures.

4.2 Operational Noise

To determine whether noise from the operations associated with the proposal are likely to require detailed assessment, the screening procedure is as follows:

- (1) Identify a point on the proposed site where the noise sources could be said to be concentrated.
- (2) Estimate a total A-weighted sound power level for all noise sources on the site.

Notes:

- a. There may need to be a sound power level for sources operating during daytime which is separate to that for sources operating at night.
- b. The assistance of an acoustical consultant may be needed to estimate the total sound power level.
- c. The estimate should not include the effects of any specific noise control measures.

- (3) Identify the locations of all nearby residences not owned by the proponent and estimate their distances from the source point on the site.
- (4) Plot the sound power level(s) for day and/or night operations on Graph 1 of Appendix 1 for the nearest residence or residences.
- (5) If the plotted points are below the lines for daytime and night-time operations, respectively, then operational noise is not likely to be significant. If on or above the lines, operational noise needs to be assessed in detail (see Section 5.2 below).

4.3 Construction Noise

The screening procedure for construction noise involves two questions:

- (i) *If construction is likely to take place within the hours 7.00 am to 7.00 pm Monday to Saturday, are particularly noisy activities such as impact piling envisaged?* If the answer is “yes”, then detailed assessment procedures should be followed with a view to developing the elements of a noise management plan under regulation 13 (2) (c) for inclusion in the environmental review.
- (ii) *Is construction activity likely to take place outside the hours 7.00 am to 7.00 pm Monday to Saturday?* The noise regulations make allowance for construction activities carried out between the above hours, where the machinery used meets certain “normal” noise emission criteria, as specified in Australian Standard 2436-1981 (Standards Australia, 1981). Thus, if the answer to the question is “no”, then detailed assessment would not be required unless there was a particularly noisy activity proposed, as discussed above.

If on-site construction activities are to take place outside the hours 7.00 am to 7.00 pm, then the activities should be subjected to the screening procedure in 4.2 above. In this case, the sound power levels for various items of construction plant can be taken from Table D2 of AS 2436-1981 and summed according to Table B2 of that Standard.

Where the screening procedure in 4.2 shows that the noise emission is on or above the lines on Graph 1 of Appendix 1, then a detailed assessment should be conducted (see section 5.2 below), with a view to developing the elements of a noise management plan under regulation 13 (3) (c) for inclusion in the environmental review.

If construction activity is likely to involve heavy vehicle movements through residential streets, the EPA draft Guidance No. 14 - Road and Rail Transportation Noise (EPA, 1998) should be applied.

4.4 Blasting

The screening procedure for both operational and construction noise in relation to blasting involves only one question:

- (i) *Is construction activity likely to involve blasting?* If “yes”, then detailed assessment should be undertaken as per Section 5.2.7 below.

5 DETAILED ASSESSMENT

5.1 General

The following guidelines should be used where a detailed assessment is indicated through the screening procedure described in Section 4 above.

The detailed assessment should be carried out by a person competent in environmental noise assessment, eg. a member of the Australian Acoustical Society.

5.2 Operational Noise

5.2.1 Ambient Noise

Rationale -

Where a detailed assessment of operational noise is needed, measurements of existing ambient noise levels should be carried out.

The purpose of these measurements is threefold:

- to identify the impact of noise level increases over low ambient noise levels;
- to identify the likelihood of noise exceedances resulting from the combination of the ambient noise with that of the proposal; and
- to enable assessment of the likely audibility of any tonal, modulation or impulsive components in the noise from the proposal.

Measurement Procedure -

Ambient noise measurements should be carried out without any activity related to the proposal in progress. If the proposal is for an expansion of an existing operation, then the noise of the normal existing operations should be included in the ambient. In this case the operating periods for the existing operations need to be logged and reported along with the ambient noise data.

Ambient noise level measurements should be conducted at location(s) representative of the noise environment at or near the nearest affected residence(s) or other premises. One representative measurement location may suffice, or more than one may be needed if the noise environment varies significantly across the area of interest. The measurements should be conducted outdoors with the microphone at least 3 metres from any reflecting surface other than the ground, and at a height of at least 1.2 metres above the ground.

Noise levels should be logged continuously at one or more locations over a period of at least two weeks, including at least two weekends, using sample periods of 15 minutes' duration. Continuously logged data may be supplemented with data taken over shorter overall measurement periods at other locations in the area of interest. Measurements should be conducted in accordance with Clause 5 of Australian Standard 1055.1-1990 (Standards Australia, 1990).

The measurement period should contain days which are representative of the typical quietest ambient noise in the area of interest. It is desirable that relevant meteorological factors such as wind speed and direction and temperature lapse rate be logged during the

measurement period, or if this is not practicable, "spot" measurements should be taken and supplemented with meteorological data from other sources such as the Bureau of Meteorology or the DEP.

Data Presentation -

The noise level data should be presented graphically as L_{A1} , L_{A10} and L_{A90} noise levels with no more than one week of data to one A4 sized page. The assigned noise levels determined under the regulations should also be presented on the graph, together with the meteorological data and the operating times of any existing operations on the subject site.

In addition to the above, background noise levels should be determined for each measurement location, by extracting from the full data the "L₉₀" of the L_{A90} noise levels. These data should be presented for the following periods:

- 0700-1900 hours Monday to Saturday;
- 1900-2200 hours Monday to Saturday and 0900-2200 hours on Sundays and public holidays; and
- 2200-0700 hours Monday to Saturday and 0900-2200 hours on Sundays and public holidays.

In cases where the audibility of tonal, modulation or impulsive components may be marginal, an octave band spectrum, or preferably a one-third octave band spectrum of the typical background noise, should be presented for the relevant time period.

5.2.2 Noise Level Predictions

General -

For most projects where a detailed assessment of noise is needed, noise level predictions are carried out using a computer noise model. It is not a requirement that predictions be done with a computer model and "hand" calculations are acceptable provided the principles outlined below for computer modelling are followed.

Examples of proprietary computer models which are likely to be used in Western Australia are RTA Technology's Environmental Noise Model (ENM), Bruel and Kjaer type 7810 "Predictor" and Vipac Engineers and Scientists' "Soundplan". While these and other packages would be acceptable, any model used should preferably have algorithms complying with the sound propagation methods laid down in ISO 9613 (Standards Australia, 1994).

These models generally involve:

- the inputting of topographical data over the area of interest;
- modelling of noise sources in terms of the sound power level of an equivalent point source and locating each source or group of sources on the map;
- nominating types of ground cover and meteorological conditions; and
- computation of received sound levels over the map area and presentation of the data as a series of noise contours.

These aspects are discussed further below.

Topographical Data -

The area of interest should be selected to cover all noise-sensitive or other receiving locations where noise levels may exceed assigned levels.

In selecting the spacing between grid points or radial lines, care should be taken to ensure sufficient detail is maintained.

Details of any pits, bund walls or noise barriers included in the topographical model need to be carefully recorded and documented in the report.

In selecting ground cover parameters, consideration needs to be given to modelling for summer conditions when the ground is typically very hard with minimal cover.

Source Sound Levels -

The major noise sources associated with the proposed operations should be identified and point sound power levels determined for each source in an octave or one-third octave band format. It is crucial that the data have a sound basis in terms of both the original measurements and subsequent calculations to determine point source sound power levels.

Data sources and assumptions made should be documented in the report, in particular:

- sources of original measurements;
- factors used for scaling from original data to equipment of different size, operating speed, etc;
- relevant operating conditions for the equipment modelled;
- the construction of any buildings in which equipment is proposed to be housed;
- specific noise control measures incorporated in any noise source or building;
- whether the sound level of a source represents its L_{max} , L_1 or L_{10} or other level;
- sources included in each noise source grouping; and
- location and height of each noise source group on the map.

Meteorological Conditions -

The meteorological conditions selected for the model can have a significant effect on the result. The EPA policy is that compliance with the assigned noise levels needs to be demonstrated for 98 per cent of the time, during the day, evening/Sunday and night periods, for the month of the year in which the "worst case" weather conditions prevail.

There are two alternative methods by which this may be demonstrated under this policy:

(A) Default conditions -

Where there is a lack of appropriate meteorological data which are applicable to the particular site, the modelling conditions should be set as follows:

Parameter	Day (0700 - 1900)	Night (1900 - 0700)
Wind speed	4 m/s	3 m/s
Temperature inversion lapse rate	Nil	2 °C/100m.
Temperature	20 °C	15 °C
Relative humidity	50 %	50 %

These default conditions were based on preliminary analysis of DEP meteorological data collected at the Cullacabardee Weather Station (DEP, 1998). These weather conditions approximate the typical "worst case" weather conditions for enhancement of sound propagation. Under these conditions, the increase in sound level compared with calm conditions, using a typical industrial noise source, would be predicted by the ENM model

to be approximately 11 dB(A), for a distance of 1 km from the source, for both the day and night scenarios. Note that at wind speeds greater than those shown above the wind itself is likely to elevate background noise levels from local vegetation, thus dominating the noise emission.

The wind directions selected for the model should cover the worst-case situation as well as the prevailing wind direction, even if the worst-case wind direction may only occur for a small portion of the time. It is acceptable to produce up to four models, each with the wind blowing from a different quarter, or a composite model with four directions included on the one map.

(B) Site-specific conditions -

Where there is at least 12 months of weather data available for a monitoring site which is representative of the subject site, then the following procedure may be used to select modelling parameters:

1. Select the wind data representing the "worst case" month from the latest 12 months of data, that is, with the highest percentages of winds blowing from the source to the receiver at speeds in the following ranges:
 - 0.5 - 4 m/s during day time (0700 - 1900 hours); and
 - 0.5 - 3 m/s during night time (1900 - 0700 hours).

If temperature lapse rate data is available, then select the month with the highest combination of night time wind speeds in the range 0.5 - 2 m/s and the presence of a temperature inversion.

2. For the worst case month, determine the percentage incidence of winds blowing from the source to the receiver at the speeds indicated above, as a total of the three most influential directions over a 90 degree span. For example, if the receiver is to the east of the source, the incidence should be the total of the incidences for the westerly, north-westerly and south-westerly directions. Call this quantity I, and determine it for both day and night, as a percentage of the day time and night time hours in the month.
3. If I is less than or equal to 2 per cent, then model for calm conditions.

If I is greater than 2 per cent, then model for a wind velocity V determined from the following formula:

$$V = I - 2 \text{ m/s, (rounded to the nearest whole number),}$$

up to the maximum value for V of 4 m/s (day) or 3 m/s (night).

4. If temperature lapse rate data is available, then use the typical lapse rate corresponding to the wind velocity assumed for night time.

If there is no temperature lapse rate data, then use a value T for night time, such that

$$T = 5 - V \text{ degC/100m.}$$

5.2.3 Adjustments to Predicted Noise Levels

General -

The computer models predict the overall A-weighted sound levels over the area of interest. Before comparing these with the assigned noise levels, there are two factors which need to be considered:

- Do the predicted levels represent $L_{A \text{ max}}$, $L_{A 1}$ or $L_{A 10}$ levels or another statistical indicator of the time history of the noise?

- Is adjustment required for tonal, modulation or impulsive noise characteristics?

Statistical Indicators -

The assigned noise levels in the regulations are specified in terms of the $L_{A \max}$, (maximum level on the Slow meter response), $L_{A 1}$ and L_{A10} percentile level (the levels exceeded for 1 per cent and 10 per cent of a representative assessment period, respectively). The choice of representative assessment period should be justified in the report. Therefore, computer predictions need to specify which of the above parameters have been modelled, to enable comparison with the relevant assigned levels.

In creating $L_{A \max}$, $L_{A 1}$ and $L_{A 10}$ models, it is acceptable to use the following methods:

- generate sound power levels for the various sources which are representative of the $L_{A \max}$, $L_{A 1}$ or the $L_{A 10}$ noise level at the receiving premises; and/or
- determine the relationship between these parameters at the receiving locations from measurements on similar operations or by estimation, and adjust the predicted noise levels accordingly.

It should be noted that the difference between the maximum level and the L_{A10} will normally diminish as one moves away from the region near the sources.

In carrying out these estimations it also should be noted that the sound propagation data used in ISO 9613 (on which some computer models are based) predicts an *average* attenuation. Thus in some situations, the use of maximum source sound power levels may well correspond to an L_{A10} level at the receiving locations under worst case conditions.

It is important that all assumptions or base noise level measurements be well documented in the report.

Adjustments for noise character -

Under the regulations, the overall requirement is to eliminate tonality, modulation and impulsiveness as far as practicable. Thus, the first analysis of the received noise under the proposed regulations should be to determine whether these components are likely to be present and whether they can be removed. The process of identifying the source of the noise characteristic and assessing whether it can be removed needs to be documented.

If it is not practicable to remove the noise characteristic, then adjustments must be applied to the measured (predicted) noise level. Adjustments of +5 dB(A) are added for tonality and modulation; the adjustment for impulsive noise character is +10 dB(A), and the total adjustment is not to exceed +15 dB(A). If the emission is music, the adjustment is to be +10 dB(A), or +15 dB(A) if the sound is impulsive.

In the first instance, noise contours or noise levels predicted for individual locations should be presented without adjustments for noise character.

5.2.4 Comparison with Noise Criteria

General -

There are two methods by which the comparisons with the relevant noise criteria are generally presented, as follows:

- by individual noise receiver, with the predicted level(s) compared with assigned levels, including any adjustments for noise character; and/or

- by area, using a map of noise contours with areas of noise exceedance shaded.

These methods are discussed further below.

Individual noise receiver -

The procedure is as follows:

- (1) Determine the assigned noise levels ($L_{A \max}$, $L_{A 1}$ and L_{A10}) in accordance with regulation 8 for the following time periods:
 - 0700-1900 hours Monday to Saturday (“Day”);
 - 1900-2200 hours Monday to Saturday and 0900-2200 hours Sunday or Public Holidays (“Evening”); and
 - 2200-0700 hours every day (“Night”).
- (2) Compare the Background Noise Levels (determined for the Day, Evening and Night periods in accordance with Section 5.2.1 above) with the assigned levels to identify whether the predicted levels need to be less than the assigned levels in order not to contribute to an exceedance of the assigned level.
- (3) Determine the predicted $L_{A \max}$, $L_{A 1}$ and $L_{A 10}$ levels for the proposal, for each of the three time periods.
- (4) Adjust the predicted levels to account for any tonal, modulation or impulsive characteristic which cannot be practicably removed.
- (5) Compare the adjusted predicted levels with the adjusted assigned levels and tabulate any exceedances.

The report must include a discussion of the results.

Comparison over an area -

A tentative procedure has been identified, as follows:

- (1) Construct a base map showing roads, property boundaries and other features as appropriate.
- (2) Identify and mark the various map areas as either Industrial/Utility, Commercial or Noise-Sensitive according to Schedule 1 of the regulations.
- (3) For the worst-case time period of the day, determine the assigned levels (L_{A10}) over the map area within 3 dB(A) ranges as follows:
 - 35 to 37 dB(A);
 - 38 to 40 dB(A); etc.
- (4) Adjust the assigned levels if the presence of Background Noise would require a lower predicted noise level in order to avoid contributing to an exceedance of the assigned level, as in the above procedure for individual noise receivers.
- (5) Determine the predicted $L_{A 10}$ noise levels over the map area.

- (6) Adjust these levels for tonal, modulation or impulsive characteristic which cannot be practicably removed.
- (7) Plot the adjusted predicted L_{A10} noise levels for the corresponding time of day on the map, using 3 dB(A) intervals, with the plotted values corresponding to the assigned level in the centre of the 3 dB(A) ranges.
- (8) Compare the plotted contour values with the assigned levels in the centre of the 3 dB(A) ranges, identify any areas where the predicted noise levels exceed the assigned levels and shade or colour these areas in 3 dB(A) increments as follows:
 - 0 to 1 dB(A) exceedance;
 - 2 to 4 dB(A) exceedance; etc

Comment on the results should be provided in the report.

5.2.5 Noise Reduction Measures

General -

In order to demonstrate compliance with statutory noise levels, it is often necessary to incorporate noise reduction measures into the noise model. The assumptions made in so doing are often crucial in the noise management plan for the project and need to be carefully documented. In particular, an assessment report by an acoustical consultant needs to contain sufficient documentation to enable the proponent to present the noise reduction measures in the form of meaningful commitments in the main environmental review report.

The common types of noise reduction measures are as follows:

- procurement specifications for new equipment;
- retrofit treatments for existing equipment or groups of items, eg. enclosures, silencers;
- adjustments to site layouts to increase separation between sources and receivers and to provide shielding;
- provision of noise barriers; and
- management procedures to control the types of equipment or operating conditions at certain times of the day or under certain weather conditions.

While it is not necessary to provide an engineering specification of these measures, they need to be described unambiguously. Some guidelines for the description of such measures are given in more detail below.

Procurement specifications -

In cases where the sound power levels assume some noise reduction measures, it is not sufficient to merely provide a list of equipment and sound power levels.

The consultant's report needs to identify the following:

- the equipment item involved;
- the type of noise test procedure which will be needed - this may include a reference to a published test method or details of the method to be used, including microphone position and so on;
- any specific operating conditions required for the test (given that these may need to be the same as those assumed in the model); and
- the required noise level(s).

Retrofit treatments -

The description of retrofit treatments may include such details as:

- minimum insertion loss performance of a silencer, enclosure or louvre;
- typical wall/roof construction of a building or enclosure; or
- the type and extent of acoustical absorbing material in a sound absorptive treatment.

Noise barriers -

In describing noise barriers assumed in a model, the following details are needed:

- the position of the barrier;
- the height of the barrier relative to a known reference;
- the width or length of the barrier or details of any bends or returns in the barrier; and
- any details relevant to the final construction of the barrier, eg. whether the barrier was assumed to be absorptive on one side.

Management procedures -

The acoustical consultant's report should identify the management areas which need to be involved in achieving and maintaining the modelled noise emissions through the noise management plan. A number of management areas may be affected by the noise management plan, including the following:

- plant design staff need to be aware of overall noise level constraints in the design stage;
- operations staff need to be aware of limitations on plant operating conditions and numbers and locations of plant items, and times of the day or meteorological conditions when restrictions may apply;
- purchasing staff need clear policy guidelines for procurement of new plant to ensure that noise levels do not increase over time; and
- maintenance staff may need to implement a maintenance programme to prevent noise levels increasing over time.

While the acoustical consultant's report and the environmental review report need not provide details of these programmes, the need for such programmes should be clearly identified in both reports.

5.2.6 Other Activities Associated with the Operations

There are activities associated with many operations which, because of their occasional nature, are not normally included in an acoustical model. These may include public address systems, hooters, emergency warning systems and rare operations such as steam venting.

These types of noise sources are capable of resulting in significant noise disturbance and should not be omitted from the noise assessment. An attempt must be made to identify such noise sources within the proposal.

Some of the ways in which they may be dealt with are outlined below.

- Where the noise is rare but unavoidable, its noise emission should be predicted and the likely impact discussed in the report;
- where it is believed that devices such as public address systems and hooters may be used, comment should be provided on the likely noise impacts and the need for appropriate design of the system or consideration of alternatives; and
- where emergency warning devices are required by law, eg. reversing beepers on some mobile equipment, comment should be provided on the likely noise impacts and the need for selection of devices with variable noise emission in order that the impact can be minimised.

5.2.7 Blasting

It is recognised that it is difficult to provide a detailed assessment of the likely impacts of blasting in terms of airblast overpressure and ground vibration levels prior to the actual blasting, as some of the factors involved in the predictions are site-specific.

Predictions of ground vibration levels should be carried out for the nearest residence for a typical blast of the size proposed, using Appendix J7 of AS 2187.2-1993 (Standards Australia, 1993). The results should be compared with the criteria given in Appendix J3 of AS 2187 and where the predicted level exceeds 5 mm/s peak particle velocity, an initial limit on the charge per delay should be identified.

In relation to airblast levels, comment should be made regarding the likelihood of any impacts, based on the size of a typical proposed blast and the distance to nearest residences, based on experience with similar situations.

The environmental review report should include a commitment regarding compliance with regulation 11 in relation to airblast levels, and an appropriate monitoring and control programme for ground vibration and airblast as an appendix.

5.2.8 Noise Monitoring

The acoustical consultant's report should identify the elements of a monitoring programme aimed at verifying the acoustical model by measurements. The overall environmental review report should also address the question of noise monitoring in a more general sense, and should contain an appropriate commitment to a monitoring programme.

5.3 Construction Noise

5.3.1 On-site Operations

Where a detailed assessment of the noise emissions of construction operations is indicated by the screening procedure, the following procedure should be used.

The construction activities would presumably be within the definition of "construction noise" and therefore would not need to comply with the assigned levels, provided they complied with the conditions specified in regulation 13.

Regulation 13 requires that construction work carried out between 0700 hours and 1900 hours on any day which is not a Sunday or public holiday need not comply with the assigned levels provided that -

- (i) the construction work was carried out in accordance with good noise control practice as defined in Section 6 of AS 2436-1981 (Standards Australia, 1981); and
- (ii) the equipment used was the quietest reasonably available.

The report must specify whether the work is to be carried out within these times. Should there be a need to work on a Sunday or public holiday, then in addition to the above, the proponent would need to -

- (i) carry out the work in accordance with a noise management plan which has been approved by the CEO;
- (ii) notify the affected occupiers nearby at least 24 hours before the work started; and
- (iii) show the out-of-hours work was necessary,

or else meet the assigned noise levels specified under the regulations.

The report therefore needs to achieve the following:

- describe the main stages of construction work, identifying any activities likely to result in high levels of either noise or vibration;
- specify the hours of work for all relevant stages and activities;
- predict noise levels for the major construction activities. The operations should be modelled according to the procedure set out in Sections 5.2.2 to 5.2.4 above. This may not be necessary if it is shown that the total noise emission of construction operations is less than that of the normal operations;
- if the predicted noise levels are likely to exceed the assigned levels in regulations 7 and 8, the report should present a noise management plan in accordance with regulation 13; and
- if the predicted noise levels are not likely to exceed the assigned noise levels, then the results and assumptions need to be documented and consequent management measures identified.

If noise reduction measures are warranted, the comments in Section 5.2.5 above should be considered, together with the information in Appendices E and F of AS2436-1981.

The comments in Section 5.2.6 above also apply to any associated activities.

5.3.2 Construction Traffic

The movement of light vehicles to and from the construction site, which normally peaks at shift changeovers, is generally unlikely to result in a significant noise impact. However, the estimated numbers of light vehicles and the shift changeover times should still be reported in the environmental review report.

The main noise impact usually results from heavy vehicles associated with earthworks, especially when the route is through residential streets or along quiet country roads and particularly if the movements occur outside daytime hours.

In such cases, the report should:

- estimate the likely volumes, routes and times of construction traffic; and
- present an analysis of likely noise impacts due to construction traffic and identify management measures as appropriate.

The analysis should be carried out in accordance with EPA draft Guidance No. 14 - Road and Rail Transportation Noise (EPA, 1998).

5.3.3 Construction Blasting

Where construction activities include blasting, the comments in Section 5.2.7 above should be noted.

6 APPLICATION

6.1 Area

This guidance statement applies to noise emitted from premises and public places throughout the State of Western Australia and shall apply to all new proposals.

6.2 Duration and review

(To be inserted when final guidance is released)

6.3 Noise sources

This guidance statement applies to noise sources which are covered by the *Environmental Protection (Noise) regulations 1997*, and excludes noise from -

- the propulsion and braking systems of traffic on roads;
- trains and aircraft, except model trains and aircraft; and
- noise from safety warning devices.

Road and rail transportation noise is covered under EPA draft Guidance No. 14 - Road and Rail Transportation Noise (EPA, 1998).

6.4 Proposed residential developments

This guidance statement may be applied to noise assessments for proposed residential (or other) developments adjacent to noise sources such as industrial areas.

7 RESPONSIBILITIES

7.1 Environmental Protection Authority Responsibilities

The EPA will apply this guidance statement in deciding whether or not to assess proposals and when assessing such proposals.

The EPA will recommend to the Minister the imposition of these requirements following its assessment of proposals for which environmental noise is a relevant factor.

7.2 Department of Environmental Protection Responsibilities

The Department of Environmental Protection will assist the EPA in applying this guidance statement in environmental impact assessment and in conducting its functions under Part V of the *Environmental Protection Act 1986*.

7.3 Proponent Responsibilities

Where proponents demonstrate to the EPA that these guidance requirements are accountably and enforceably incorporated into their proposals, the assessment of such proposals is likely to be facilitated.

8 DEFINITIONS

The following technical terms are used in this document -

A-weighted	an A-weighted sound level includes the "A" frequency weighting in the measurement of a sound, to approximate the frequency response of the normal human ear.
dB(A)	the level of a sound, measured in decibels, A-weighted.
L_{A max}	the maximum A-weighted sound level in dB(A), measured on the "Slow" meter response.
L_{A 1}	the A-weighted sound level exceeded for 1% of a specified period.
L_{A 10}	the A-weighted sound level exceeded for 10% of a specified period.
Noise-sensitive premises	are defined as in regulation 2 (1) of the <i>Environmental Protection (Noise) Regulations 1997</i> .

9 LIMITATIONS CLAUSE

This guidance statement has been prepared by the Environmental Protection Authority to assist proponents and the public. While it represents the contemporary views of the Environmental Protection Authority, each proposal which comes before the Environmental Protection Authority for environmental impact assessment will be judged on its merits. Proponents who wish to deviate from the requirements of this document should provide robust justification or the proposed departure.

10 REFERENCES

Department of Environmental Protection, 1998. Report No. EN 23/97. Analysis of Meteorological Conditions and Sound Propagation for the Cullacabardee Weather Station, Western Australia, (in preparation).

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Standards Australia, 1981. Australian Standard 2436-1981. Guide to Noise Control on Construction, Maintenance and Demolition Sites, Sydney.

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Standards Australia, 1994. ISO Draft International Standard ISO/DIS 9613-2.2. Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation, Sydney.

Index

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Status

Not signed-off by EPA at draft guidance stage.

Citation

This draft guidance cannot be cited at this time but may be used by the EPA for the purposes of environmental impact assessment (EIA) with respect to this factor.

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Appendix 1

Sheet 1

Screening Procedure for Noise - Worksheet

*Detailed assessment should be done on any of the questions in **bold type** for which the answer is "Yes".*

1. Community Concern

Is the proposal particularly sensitive within the community?

2. Operational noise

(a) Estimated total sound power for all sources on site

• daytimedB(A)

• nighttimedB(A)

(b) Distance to nearest residencem

(c) Plot the two points (a) against (b) on Graph 1-

GRAPH 1

(d) *Is operational noise above the relevant line in Graph 1?*

Appendix 1

Sheet 2

3. Construction activities on site

3.1 Where construction activity is likely to take place within the hours
7.00 am to 7.00 pm Monday to Saturday -

*Are particularly noisy activities such as impact piling
envisaged?*

3.2 Where construction activity is likely to take place outside the hours
7.00 am to 7.00 pm Monday to Saturday -

(a) Estimate total sound power for all sources on site -

• daytimedB(A)

• nighttimedB(A)

(b) Distance to nearest residencem

(c) Plot (a) against (b) on Graph 1 above.

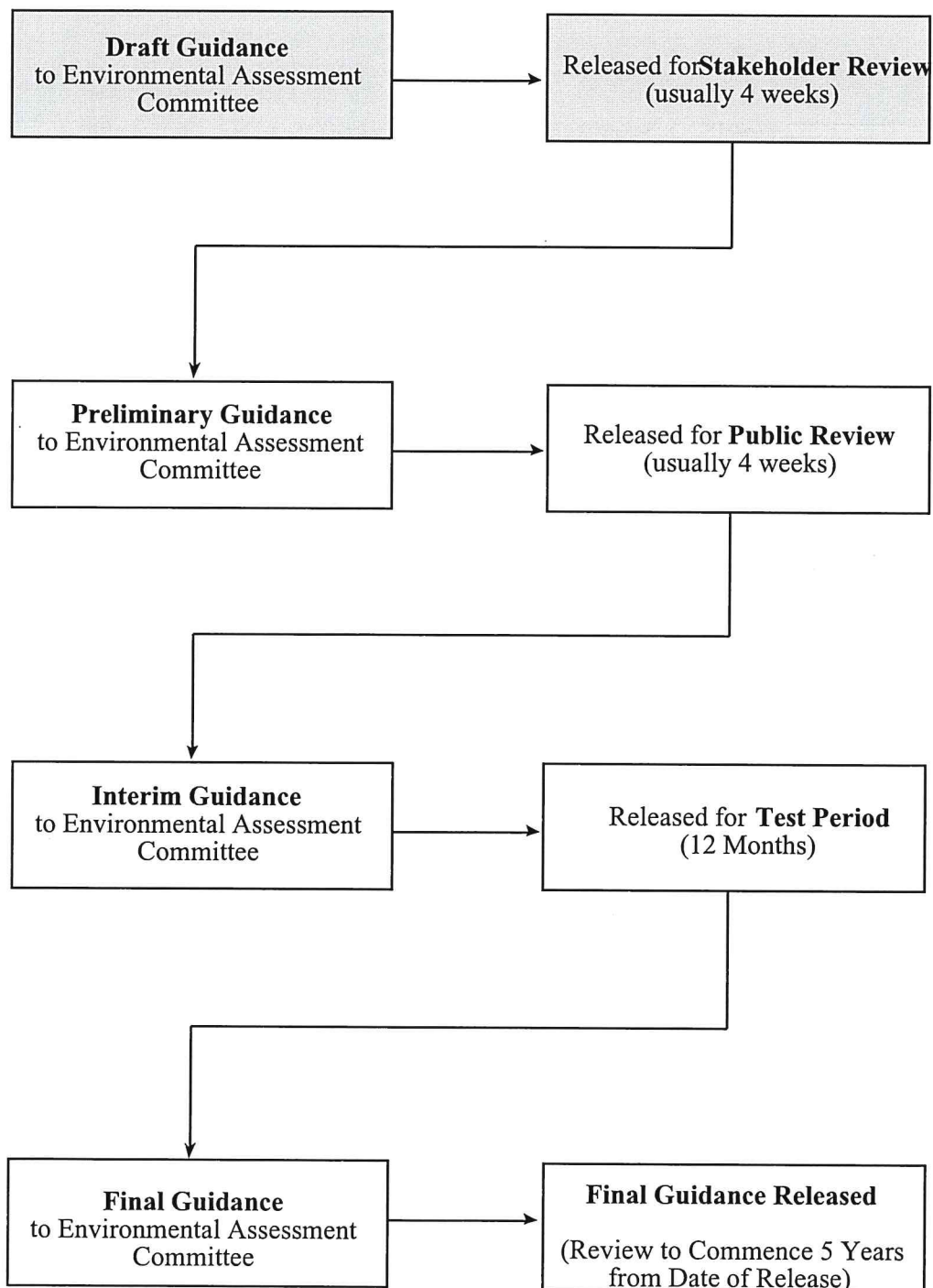
(d) *Is construction noise above either line in Graph 1?*

4. Blasting

(c) *Is the construction/operation likely to involve blasting?*

Appendix 2

Guidance for the Assessment of Environmental Factors Flow Diagram



Note: Shaded areas denotes those parts of the process completed