Noise Impact Assessment

West Pilbara Iron Ore
Hardey Mine Project

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EXECUTIVE SUMMARY

The noise resulting from mining and transportation associated with the proposed West Pilbara Iron Ore Project Hardey Project has been assessed against the appropriate criteria for Western Australia.

For mining operations, the assessment shows that the most affected noise sensitive receiver is the accommodation village, which is predicted to receive a noise level of L_{A10} 30 dB. The noise to the nearest noise sensitive premise is predicted to be inaudible. The noise from the mining operations is therefore complaint with the Environmental Protection (Noise) Regulations 1997.

Based on the expected charge size, the airblast levels are likely to be in compliance with the Environmental Protection (Noise) Regulations 1997 at all locations. Ground vibration levels will also be below acceptable criteria.

The noise from the railway was found to be compliant with the “Target” criteria at all noise sensitive receivers adjacent to the alignment and at the mine accommodation village, when compared against the State Planning Policy 5.4 *Road and Rail Transport Noise and Freight Considerations in Land Use Planning.* In addition, when compared against the draft *EPA Statements for EIA No. 14,* the “N0 Rating”, which is ‘Acceptable’ for rural residential premises, is achieved at all noise sensitive receivers adjacent to the alignment and at the mine accommodation village.

1 INTRODUCTION

The Hardey Project consists of two open cut mines, waste dump, processing plant and rail infrastructure. It is located approximately 50 km northwest of Paraburdoo in the Pilbara region of Western Australia. The Hardey Project is a potential extension of the West Pilbara Iron Ore Project (WPIOP), which is a direct ship iron ore mining and export project involving the development of open cut mines and associated infrastructure, a heavy haulage railway, iron ore stockpiles and processing plant and a port/export facility.

The ore will be mined through a combination of conventional drill, blast and excavation methods and continuous strip mining. Mined ore will be delivered to ore crushing and screening facilities by haul truck. Crushing and screening is planned at the processing area and then loaded on to trains. The railway from the Hardey Project would connect to the WPIOP railway infrastructure.

The noise resulting from the proposed mining and transportation, will be assessed against the appropriate criteria for Western Australia. Noise mitigation will be recommended where predicted noise levels exceed these criteria.

Appendix A contains a description of some of the terminology used throughout this report.

2 CRITERIA

2.1 Mining Operations

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

The Regulations are based on maximum allowable noise levels for different times of the day, determined by a combination of a “base noise level” and an “influencing factor”, which is added to the base noise level (*Table 2.1*). The influencing factor is determined for each receiver location by considering the land use within two circles having a radius of 100 metres and 450 metres from the noise sensitive premises of concern. It takes into consideration the amount of industrial and commercial land and the presence of major and secondary roads. Refer to *Appendix A* for more detail on the influencing factor calculation.

Table 2.1 – Baseline Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise Sensitive[2]	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

1. Applies within 15metres of a building associated with a noise sensitive use, as defined in Schedule 1, Part C.
2. Applies at a noise sensitive premises greater than 15metres from a building associated with a noise sensitive use.

Regulation 7 defines the prescribed standard for noise emissions as follows:

“7. (1) Noise emitted from any premises or public place when received at other premises –

(a) Must not cause or *significantly contribute to*, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) Must be free of –

i. Tonality;

ii. Impulsiveness; and

iii. Modulation.

“(2) For the purposes of subregulation (1) (a), a noise emission is taken to significantly contribute to a level of noise if the noise emission… exceeds a value which is 5dB below the assigned level…”.

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

(a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) The noise emission complies with the standard after the adjustments of *Table 2.2* are made to the noise emission as measured at the point of reception.

Table 2.2 – Adjustments For Intrusive Characteristics

Tonality	**Modulation**	**Impulsiveness**
+ 5dB	+ 5dB	+ 10dB

Note: The above are cumulative to a maximum of 15dB.

As closest receiving premises associated with the Hardey Project is over 15 km away and is a rural station. The influencing factor has been calculated as zero at this location, therefore no addition to the Baseline Assigned Levels shown in *Table 2.1* would apply.

The assessment also considers the noise to the proposed mine accommodation village. As the village is located on the same premises as the mine, the Regulations would not apply, however, as described in the *draft* EPA *Guidance for the Assessment of Environmental Factors No.8 Environmental Noise*, the EPA assesses the noise to minesite accommodation villages as follows:

"It is the EPA's view that, if a construction camp is located on the same premises as the proposal, then compliance with the assigned levels is not required. In this case, the EPA policy is that an aspirational goal based on indoor levels inside the accommodation sleeping areas of L_{A10} 40 dB and L_{Amax} 50 dB should be considered. With regard to camps for operational staff, the EPA view is that these should be located and designed so as to achieve compliance with the assigned levels and acceptable standards".

2.2 Blasting Noise Criteria

Blasting levels are covered by regulation 11, which provides the following criteria:

No airblast level resulting from blasting on any premises or public place, when received at any other premises, may exceed –

(a) *125dB $L_{Linear\ peak}$ between 0700 hours and 1800 hours on Monday to Saturday inclusive; or*

(b) *120dB $L_{Linear\ peak}$ between 0700 hours and 1800 hours on a Sunday or public holiday.*

Notwithstanding subregulation (3), airblast levels for 9 in any 10 consecutive blasts (regardless of the interval between each blast), when received at any other premises, must not exceed –

(c) *120dB $L_{Linear\ peak}$ between 0700 hours and 1800 hours on Monday to Saturday inclusive; or*

(a) *115dB $L_{Linear\ peak}$ between 0700 hours and 1800 hours on a Sunday or public holiday.*

2.3 Blasting Vibration Criteria

Although there are no legislated ground vibration levels, ground vibration impact resulting from blasting is usually assessed against *Australian Standard* AS 2187.2-2006 *Storage and use - Use of explosives [Appendix J Table J4.5(A)].* In this standard where blasting may occur for greater than 12 months or for more than 20 blasts, a peak particle velocity (PPV) level of less than 5mm/s for 95% of the blasts should be considered the limit for human comfort. This level is also unlikely to result in cosmetic damage to non-fragile buildings.

2.4 Railway Operations

Noise from the operation of railways is exempt from the *Environmental Protection (Noise) Regulations 1997*. For noise sensitive premises adjacent to railways, the *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (SPP 5.4) produced by the Western Australian Planning Commission (WAPC) and the draft *EPA Statements for EIA No. 14 (Version 3) - Road and Rail Transportation Noise* are the most relevant criteria, both of which have been reproduced below.

Generally the EPA would use the SPP 5.4 to assess the impact of noise from new railways and would use the draft *EPA Statements for EIA No. 14,* to assess the acceptability of a noise impact from increases in traffic or train volumes resulting from a specific project, such as an upgrade or product increase. However, they may also use the *EIA No. 14* policy for quiet locations such as rural stations.

State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning

The Policy's outdoor noise criteria are shown below in *Table 2.3*. These criteria applying at any point 1-metre from a habitable façade of a noise sensitive premises and in one outdoor living area.

Table 2.3 – Outdoor Noise Criteria

Period	Target	Limit
Day (6am to 10pm)	55 dB $L_{Aeq(\mathbf{Day})}$	60 dB $L_{Aeq(\mathbf{Day})}$
Night (10pm to 6am)	50 dB $L_{Aeq(Night)}$	55 dB $L_{Aeq(Night)}$

Note. The 5 dB difference between the *target* and *limit* is referred to as the *margin*.

In the application of these outdoor noise criteria, the objectives of this policy is to achieve -

- acceptable indoor noise levels in noise-sensitive areas (eg bedrooms and living rooms of houses); and
- a 'reasonable' degree of acoustic amenity in at least one outdoor living area on each residential lot.

Where outdoor noise levels are predicted to meet the *target*, no further measures are required under this policy.

In areas where the *target* is exceeded, but noise levels are likely to be within the 5 dB margin (i.e. less than the *limit*), mitigation measures should be implemented with a view to achieving the *target* levels in at least one outdoor living area on each residential lot. Where indoor spaces are facing any outdoor area in the *margin*, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces.

In areas where the *limit* is exceeded (i.e. above $L_{Aeq(Day)}$ of 60dB(A) or $L_{Aeq(Night)}$ of 55dB(A)), a detailed noise assessment is to be undertaken. Customised noise mitigation measures should be implemented with a view to achieving the *target* in at least one outdoor living area, or if this is not practicable, within the *margin*. Where indoor spaces are facing outdoor areas that are above the *target*, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces.

EPA Statements for EIA No. 14 (Version 3) - Road and Rail Transportation Noise

Under the draft *EPA Statements for EIA No. 14 (Version 3) - Road and Rail Transportation Noise* a noise rating is applied depending on existing noise levels at the residence. The noise rating applicable to this assessment would be N0. The Noise Amenity Reatings are reproduced below in *Table 2.4.*

Table 2.4 – EPA Noise Amenity Ratings

Rating	$L_{Aeq,T}$ (Day)	$L_{Aeq,T}$ (Night)
N0	≤ 50	≤ 40
N1	51 - 55	41 - 45
N2	56 - 60	46 - 50
N3	61 - 65	51 - 55
N4	66 - 70	56 - 60
N5	≥ 70	≥ 60

The draft EPA policy states: *The noise emissions should be reduced as far as is practicable by means of corridor alignment, use of cuttings and noise barriers to achieve the "acceptable" levels in Table 2.5. Where these levels cannot be practicably achieved, the equivalent internal level to N1 in the "conditionally acceptable" cases should be achieved by means of acoustic treatment to the building envelope and provision of mechanical ventilation/airconditioning. In the "unacceptable" cases, provision should be made for the purchase of the noise-sensitive premises.*

3 NOISE MODELLING

Existing and future noise levels for the mine operations and the railway have been predicted using the computer program *SoundPLAN 7.0.* This is an internationally used noise modelling program and is accepted by the Department of Environment & Conservation (DEC) for the use of noise assessment.

Noise resulting from the mining operations has been predicted using the *CONCAWE* algorithms as they explicitly deal with the influence of wind and the stability of the atmosphere.

Railway noise has been predicted using a modified version of the Nordic Rail Prediction Method (Kilde Rep. 130) algorithm. The Nordic Rail Prediction Method (Kilde Rep. 130) algorithm is for generic train types in Europe and requires modification to align with measured noise levels of locomotives and wagons used in the Pilbara. In addition, to accurately predict the effect of barriers (hills or buildings), the noise source height of the locomotive was raised from the standard 0.5 metres above the railhead to 4.0 metres.

Detailed below is a description of the variables used to predict noise levels for this project.

3.1 Mine Noise Sources

The following mine noise sources have been considered in this assessment.

Table 3.1 Number of Mine Noise Sources Considered in the Assessment

Plant Item	Number of Sources
Hydraulic Excavators 250t	3
Haul Trucks 135t	18
Graders	3
Hydraulic Loader	3
Water Carts	2
Blast Hole Rigs	2
Front end Loaders	4
Primary Crusher	1
Secondary Crusher	1
Tertiary Crusher	1
Vibrating Screens	9
Train Unloader	1
Product Conveyors	6

Note: The modelling assumes all plant for each scenario will operate simultaneously, which although is a worst-case scenario, is expected to occur on occasions.

3.2 Meteorological Conditions

The propagation of sound over distance is greatly influenced by meteorological conditions, in particular, wind direction, wind strength and temperature gradient from ground level to approximately 300 metres.

The EPA have provided draft guidelines on the meteorological conditions to be used for conducting environmental noise modelling (*EPA Guidance for the Assessment of Environmental Factors No. 8 Draft*). The EPA default conditions are based on data collected within the Perth region and are shown in *Table 3.2*.

Table 3.2 Default Weather Conditions

Parameter	Day (0700 - 1900)	Night (1900 – 0700)
Wind Speed	4 m/s	3 m/s
Pasquil Stability Factor	Type E	Type F
Temperature	20^{O}C	15^{O}C
Relative Humidity	50%	50%

From meteorological data relevant to Roebourne, obtained from the Bureau of Meteorology Internet site, the average worst-case meteorological condition for noise propagation was determined to be as follows (Aug 9.00am):

- 3 m/s wind strength;
- 15°C air temperature;
- 41% relative humidity; and
- Temperature gradient- unknown.

It can be seen that the EPA default condition for night-time are very similar to the worst case conditions determined for the Roebourne meteorological data and thus the EPA default night-time conditions have been adopted for this assessment.

3.3 Topographical Data

Digital topographical data (3-dimentional contours) of the project area was used in the assessment. The computer model uses this information to determine ground attenuation and barrier effects from landform. No modifications to these contours have been undertaken for items such as stockpiles, hence the assessment may be conservative.

3.4 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. grass). In this instance, a value of 0.7 has been used as an average for the study area consisting of sand, rocks and bush.

3.5 Sound Power Data

Sound power levels for the plant considered in this assessment were derived from measured noise levels of similar plant in the Pilbara region.

Details of the sound power levels, in one-third-octave bands, used in the noise level predictions are presented below in *Table 3.3.* The plant has been positioned to simulate a typical mining operation.

Table 3.3 Sound Power Levels Used in Noise Modelling (dB)

Source/Quantity	One-Third-Octave Band Centre Frequency (Hz)								Overall, dB(A) per Unit
	25 31.5 40	50 63 80	100 125 160	200 250 315	400 500 630	800 1k 1.25k	1.6k 2k 2.5k	3.15k 4k 5k	
Haul Truck (CAT 785)	106	108	110	110	114	109	107	101	117
	113	111	110	110	112	107	105	100	
	108	108	105	107	106	106	105	97	
Dozer (CAT D10)	94	99	105	105	105	104	104	95	112
	103	101	107	104	106	102	98	92	
	97	103	107	102	102	101	96	91	
Grader (CAT 16G)	87	95	107	100	106	106	101	96	113
	95	97	106	100	104	105	100	95	
	99	99	104	97	101	103	98	93	
Front-End Loader (CAT 994)	88	105	110	104	108	102	101	94	113
	95	107	116	99	107	103	102	93	
	105	106	104	108	103	102	96	91	
Excavator * (Hitachi Ex2500)	123	130	133	127	123	119	118	110	126
Water Cart *(CAT 773)*	116	119	121	118	110	108	110	107	116
Product Conveyor Standard Idlers *	80	84	89	82	86	83	79	74	88/m
Drill Rig (Typical)	113	105	122	109	109	109	109	102	118
	105	107	116	114	108	107	107	99	
	107	120	112	108	109	106	104	99	
Primary Crusher (Typical)	116	119	120	118	117	112	107	106	121
	117	121	118	120	115	110	106	101	
	119	123	116	118	113	109	106	98	
Secondary Crusher (Typical)	107	107	112	110	117	116	113	106	123
	107	111	113	112	116	115	111	103	
	105	111	114	114	115	114	108	100	
Tertiary Crusher	111	116	108	109	111	112	108	105	119
	110	106	109	107	111	109	107	104	
	109	105	109	107	109	109	106	102	

* Only centre octave frequency data available.

Table 3.3 (cont) Sound Power Levels Used in Noise Modelling (dB)

SOURCE	One-Third-Octave Band Centre Frequency (Hz)								OVERALL, dB(A) per Unit
	25 31.5 40	**50 63 80**	**100 125 160**	**200 250 315**	**400 500 630**	**800 1k 1.25k**	**1.6k 2k 2.5k**	**3.15k 4k 5k**	
Train Unloader		101	105	97	94	89	84	81	98
	103	111	100	93	90	86	84	77	
	103	107	98	91	88	85	82	75	
Vibrating Screen (Typical)	105	101	100	98	94	92	92	90	103
	110	101	101	93	93	93	93	88	
	101	99	101	95	92	92	91	87	
Stacker		96	102	102	102	98	97	91	109
	95	97	98	99	101	98	97	89	
	94	100	99	102	101	101	94	87	

3.6 Blasting Noise Predictions

The predicted ground vibration and airblast levels from the blasting have been calculated using equation J7.3(i) of Australian Standard AS 2187-2006 *Explosives – Storage, Transport and Use*, applicable to free face blasting in “average field conditions.

The equations used are:

$$PVS \text{ (Ave conditions)} = 1140\ (R/Q^{0.5})^{-1.6}$$

$$dB \text{ (assumes 20\% higher than ave)} = 168.9 - 24(\log_{10}R - 0.33\ \text{Log}_{10}\ Q$$

Where

PVS = Peak Vector Sum ground vibration level (mm/s)

dB = Peak airblast level (dB(Lin)

R = Distance between charge and receiver (m)

Q = Charge mass per delay (kg)

For the assessment, we have been advised that the charges are sequential and that the charge mass per delay is 90 kg.

3.7 Railway Noise Predictions

The assessment of noise from the railway is based on measured noise levels of similar iron ore trains operating in the Pilbara and assuming the input data detailed in *Table 3.4*.

Table 3.4 Input Data for Assessment of Railway Noise

Parameter	Value
Locomotive maximum noise level at 15m	93 dB(A)
Wagons maximum noise level at 15m	81 dB(A)
Train Speed	70 km/h on main line
Number of Locomotives	5
Train Length	2000 metres
Number of Train Movements/day	6

Note: Trains assumed to be evenly distributed throughout a 24-hour period.

4 RESULTS

The results for each aspect of the assessment are provided below as predictions to individual receivers of interest and graphically as noise level contour maps.

4.1 Mine Operations

The results of the noise modelling to key locations, assuming fixed and mobile plant operating at the minesite are summarised below in *Table 4.1* and presented in *Figure 4.1*.

Table 4.1 – Summary of Noise from Mine Operations to Key Receivers

Location	Overall L_{A10} Noise Levels Assuming Worst-Case Downwind
Mine Accommodation Village	30 dB
Mine Administration Area	58 dB
Closest Noise Sensitive Premise	<5 dB

4.2 Blasting

The airblast and ground vibration levels to the key receivers are shown in *Table 4.2*. Both the Airblast and ground vibration levels are within the allowable criteria for blasting.

Table 4.2 – Summary of Blast Levels to Key Receivers

Location	Airblast Levels $L_{Linear\ peak}$	Ground Vibration Levels
Mine Accommodation Village	101 dB	0.28mm/s
Mine Administration Area	114 dB	2.36 mm/s
Closest Noise Sensitive Premise	79 dB	-

4.3 Rail Operations

The results of the rail noise modelling are summarised below in *Table 4.3* and presented in *Figures 4.2*.

Table 4.3 – Summary of Noise from Rail Operations to Key Receivers

Location	Overall $L_{Aeq\ night)}$ Noise Levels
Mine Accommodation Village	26 dB
Mine Administration Area	57 dB
Closest Noise Sensitive Premise	<5 dB

5 ASSESSMENT

5.1 Mine Operational Noise

The assessment shows that the most affected noise sensitive receiver is the accommodation village, which is predicted to receive a noise level of L_{A10} 30 dB. As the mine accommodation village is on the same premises as the mine, the Regulations are not strictly applicable, however, it is the EPA's view that accommodation villages *"should be located and designed so as to achieve compliance with the assigned levels and acceptable standards".* An external noise level of L_{A10} 30 dB would result in acceptable internal noise level. The noise to the nearest noise sensitive premise is predicted to be inaudible.

5.2 Mine Blasting

Based on the expected charge size, the airblast levels are likely to be in compliance with the Regulations at all noise sensitive receivers. Ground vibration levels will also be below acceptable criteria.

5.3 Railway Operations

When compared against the SPP 5.4, the predicted night-time noise level from trains is compliant with the "Target" criteria at all noise sensitive receivers adjacent to the alignment and at the mine accommodation village.

When compared against the draft *EPA Statements for EIA No. 14,* the "N0 Rating", which is '*Acceptable*' for rural residential premises is achieved at all noise sensitive receivers adjacent to the alignment and at the mine accommodation village.

APPENDIX A

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

Sound Power Level (L_w)

Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

Sound Pressure Level (L_p)

The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}

This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}

This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

L_{APeak}

This is the maximum reading in decibels using the A frequency weighting and P time weighting AS1259.1-1990.

L_{Amax}

An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{A1}

An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{A10}

An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{Aeq}

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}

An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "*background*" noise level.

One-Third-Octave Band

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

L_{Amax} assigned level

Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded at any time.

L_{A1} assigned level

Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.

L_{A10} assigned level

Means an assigned level which, measured as a $L_{A\ Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period.

Tonal Noise

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

> the presence in the noise emission of tonal characteristics where the difference between —
>
> (a) the A-weighted sound pressure level in any one-third octave band; and
>
> (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,
>
> is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

This is relatively common in most noise sources.

Modulating Noise

A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of tonality is:

> a variation in the emission of noise that —
>
> (a) is more than 3 dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;
>
> (b) is present for at least 10% of the representative

Impulsive Noise

An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of tonality is:

> a variation in the emission of a noise where the difference between $L_{A\ peak}$ and $L_{A\ Max\ slow}$ is more than 15 dB when determined for a single representative event;

Major Road

Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

Secondary / Minor Road

Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Influencing factor

$$= \frac{1}{10}\left(\%\ \text{Type}\ A_{100} + \%\ \text{Type}\ A_{450}\right) + \frac{1}{20}\left(\%\ \text{Type}\ B_{100} + \%\ \text{Type}\ B_{450}\right)$$

where:

$\%\ \text{Type}\ A_{100}$ = the percentage of industrial land within a100m radius of the premises receiving the noise

$\%\text{Type}A_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\ \text{Type}\ B_{100}$ = the percentage of commercial land within a100m radius of the premises receiving the noise

$\%\text{Type}B_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

Representative Assessment Period

Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Background Noise

Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise

Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise

Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

Satisfactory Design Sound Level

The level of noise that has been found to be acceptable by most people for the environment in question and also to be not intrusive.

Maximum Design Sound Level

The level of noise above which most people occupying the space start to become dissatisfied with the level of noise.

Reverberation Time

Of an enclosure, for a sound of a given frequency or frequency band, the time that would be required for the reverberantly decaying sound pressure level in the enclosure to decrease by 60 decibels.

RMS

The root mean square level. This is used to represent the average level of a wave form such as vibration.

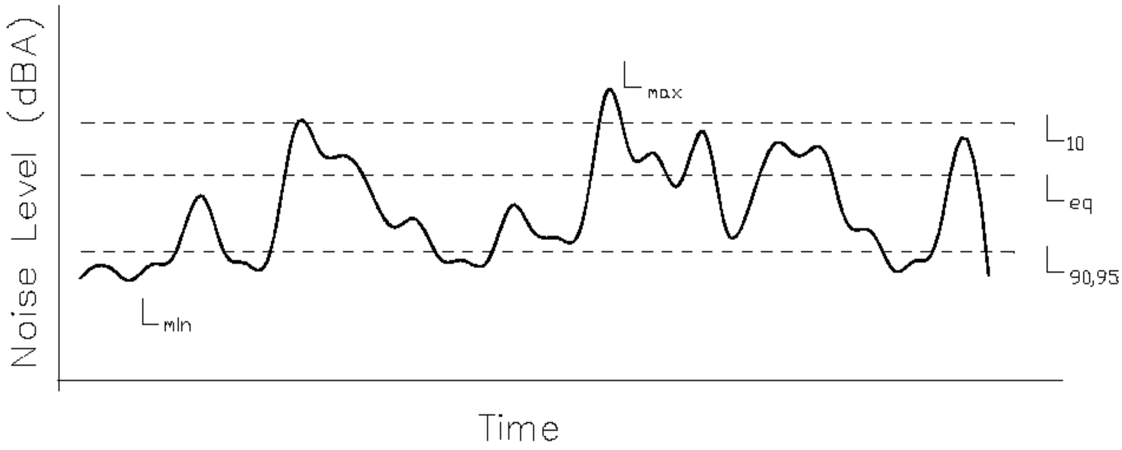
Vibration Velocity Level

The RMS velocity of a vibration source over a specified time period. Units are mm/s.

Peak Velocity

Level of vibration velocity measured as a non root mean square (r.m.s.) quantity in millimetres per second (mm/s).

Chart of Noise Level Descriptors



Typical Noise Levels