EcoAcoustics

Proposed Childcare Centre

Lot 793 Aduro Street Corner Luminosity Grove, Eglington

Environmental Noise Assessment

12 November 2020

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Executive Summary

EcoAcoustics Pty Ltd was commissioned by J Prestipino Designs Pty Ltd to conduct an assessment of a proposed childcare centre located at Lot 793, Corner Aduro Street and Luminosity Grove in Eglington. The noise impact assessment has been completed to support the proposal, as part of the development application. The purpose of this report is to assess the noise emissions from the site in accordance with the prescribed standards contained in the *Environmental Protection (Noise) Regulations 1997*.

The predicted noise levels comply with the Regulations at all nearby residential premises, with the inclusion of the acoustic barriers located along the residential property boundaries, shown in *Figure 7.1*.

These fences are required to be solid in construction (ie no gaps between the fence and ground) and meet a superficial density of 11kg/m^3. Acceptable construction materials include compressed fibre cement fence sheeting (eg Hardifence), ship lapped palings, double skin Colorbond, Perspex or similar materials. The barrier may also be a combination of retaining wall with solid barrier on top to a maximum height of 2.5 metres (with specific heights and locations shown in *Figure 7.1*).

In addition to the assessment of noise levels in accordance with the regulations, to minimise the impact of the childcare centre on nearby residences, it is recommended that the following be considered:

- Air-conditioning installed as part of the development is to be selected for quiet operation, and the rated sound power level should not exceed the noise levels in Table 3.2. Any plant installed in areas different to this report will be required to be assessed to determine the noise impact, and as such, an acoustic report (completed by a suitably qualified acoustical consultant) will be required to be submitted to the Council once plant selection has occurred;
- Soft ground such as grass, soft-fall or sand should be installed to minimise impact noise and improve acoustic absorption within the outdoor play areas.

1 Introduction

EcoAcoustics Pty Ltd was commissioned by J Prestipino Designs Pty Ltd to conduct an assessment of a proposed childcare centre located at Lot 793, Corner Aduro Street and Luminosity Grove in Eglington. The noise impact assessment has been completed to support the proposal, as part of the development application. The purpose of this report is to assess the noise emissions from the site in accordance with the prescribed standards contained in the *Environmental Protection (Noise) Regulations 1997*.

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

1.1 Site Locality & Surroundings

The site is located on the corner of Aduro Street and Luminosity Grove in Eglington. This area is currently under development, with the Allara Town Centre to be developed to the north of the site. The site and surroundings are shown in an aerial photo in *Figure 1.1*. As can be seen on the aerial photo, existing residential premises are located to the south and west across Aduro Street. It is understood that residential premises are proposed to be located on Lot 9502 and the vacant lot shown adjacent to Lot 252

Figure 1.1: Site and Surroundings (Source: Google Earth)

1.2 Site Layout

It is proposed to construct a new double storey building housing five rooms for children, one on the upper floor for babies 0 to 2 years, along with an outdoor play space also on the upper floor, one room each on the ground floor for toddlers 2 – 3 years, kindy 3-4 years, schoolies over 4 years and after hours care. A central lobby, staff room and drop off area is located on the ground floor

between the rooms. Car parking will be located to the north east of the building, with entry and exit onto Glint Way. The site layout is presented on *Figure 1.2*. *Figures 1.3 and 1.4* presents the proposed building layout while *Figure 1.5* presents the Elevations of the proposed site.

The childcare centre will operate from 6am to 7pm Monday to Friday, catering for up to 112 children (including after-hours care) plus staff. A total of 22 car parking bays will be provided on the north eastern portion of the block, with entry and exit via Glint Way.

The outdoor play area is located to the northeast, adjacent to the building, towards the town centre. The outdoor areas will generally be used intermittently between 8am and 6pm. It is understood that the outdoor play areas will be used by each room individually, with a maximum of 45 children playing outside simultaneously.

It is understood that the models of external air conditioning plant has not been determined at this stage, however as shown on the plans all air conditioning plant will be located on the rooftop a/c plant deck as shown on *Figure 1.4*. The units are likely to be split system units capable of heating and cooling. Toilet exhaust fans have been assumed above the toilet areas on the roof. Kitchen exhaust fans have been assumed to be above the kitchen area on the roof.

Figure 1.2: Existing Site Plan (source: J. Presipino Designs)

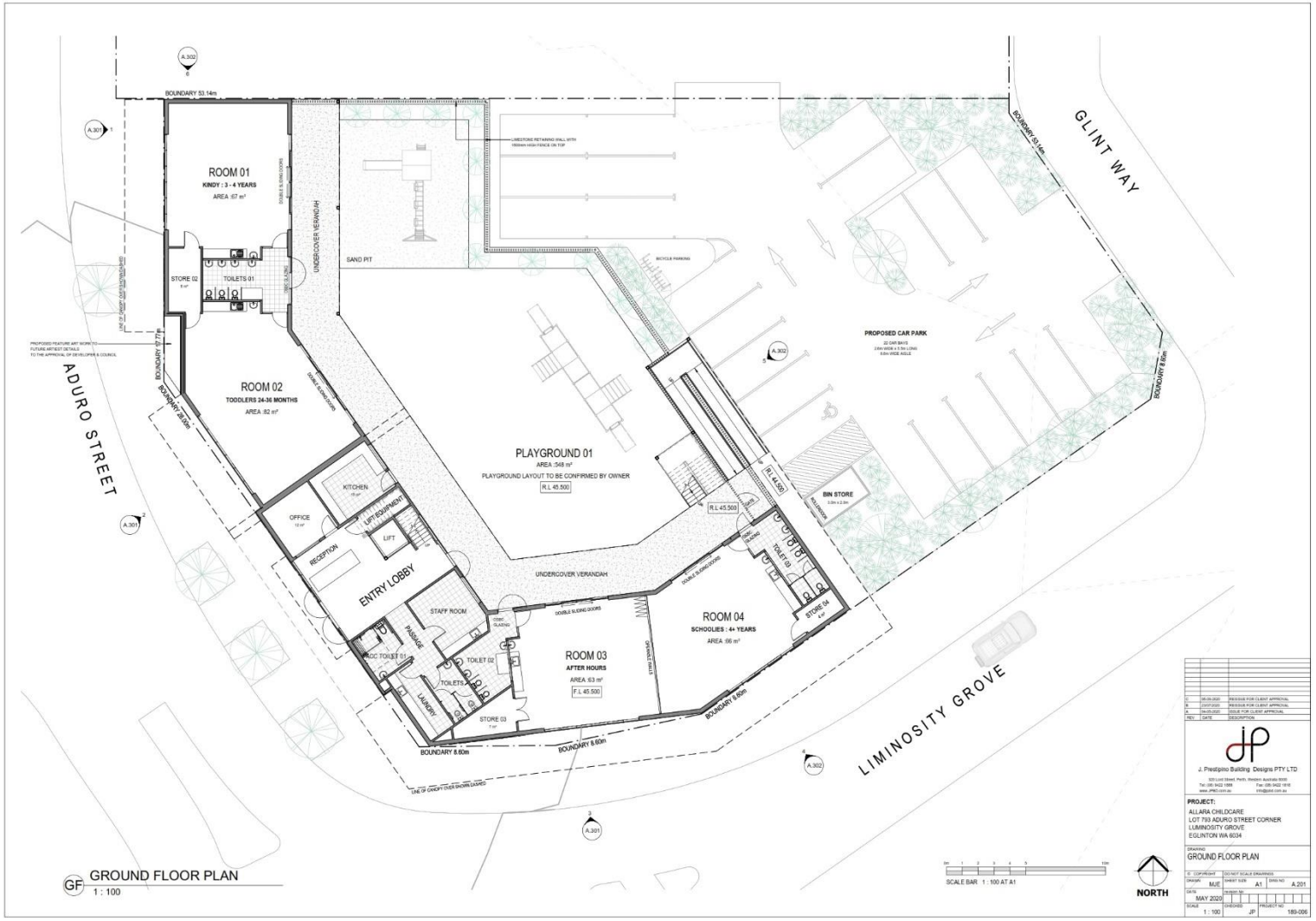


Figure 1.3: Proposed Building Plan (source: J. Prestipino Designs)

Figure 1.4: Proposed First Floor Building Plan (source: J. Prestipino Designs)

Figure 1.5: Proposed Site Elevations (source: J. Prestipino Designs)

2 Criteria

In Western Australia all Environmental noise is regulated by the *Environmental Protection Act 1986* and the *Environmental Protection (Noise) Regulations 1997*. Noise emissions from the child care centre are required to satisfy the assigned noise levels specified in Regulations 7, 8 and 9.

The standard stipulated in Regulation 7 of the Environmental Protection (Noise) Regulations 1997 states:

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 –

- *Tonality;*
- *Impulsiveness; and*
- *Modulation.*

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…*

Regulation 9 defines tonality, impulsiveness and modulation. It is regarded that noise is free of these characteristics if:

a) Tonality, impulsiveness and modulation cannot be equitably removed by means other than decreasing the overall level of noise emission; and

b) Subsequent to any adjustments as displayed in *Table 2.1* noise emissions remain compliant with the required standards when measured at the point of reception.

Table 2.1: Adjustments for Intrusive Characteristics

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

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown below in *Table 2.2*.

Table 2.2: Baseline Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive	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
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

The influencing factor of 3 has been determined based on the proximity to Marmion Avenue and the Town Centre. The assigned noise levels are shown in *Table 2.3*.

Table 2.3: Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Residences R1 to R3	0700 to 1900 hours Monday to Saturday **(Day)**	48	58	68
	0900 to 1900 hours Sunday and public holidays **(Sunday)**	43	53	68
	1900 to 2200 hours all days **(Evening)**	43	53	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays **(Night)**	38	48	58

3 Methodology

Computer modelling software has been used to calculate the noise levels at nearby residences. Noise modelling is used as it is not affected by background noise sources and can provide the noise level for various weather conditions.

The software incorporates the CONCAWE algorithms enabling the modelling to include the influence of wind and atmospheric stability. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1.1 Meteorological Information

Meteorological information utilised is based on that specified in the now repealed EPA *Guidance for the Assessment of Environmental Factors No.8 Environmental Noise draft*, and are shown below in *Table 3.1*.

Table 3.1: Modelling Meteorological Conditions

Parameter	Night (1900-0700)	Day (0700-1900)
Temperature (°C)	15	20
Humidity (%)	50	50
Wind Speed (m/s)	3	4
Wind Direction*	All & Prevailing	All & Prevailing
Pasquil Stability Factor	F	E

Note that the modelling package used allows for all wind directions to be modelled simultaneously.

The above conditions approximate the typical worst-case for enhancement of sound propagation. The EPA policy is that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

At wind speeds greater than those shown above, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

3.1.2 Topographical Data

Topographical data was based on information provided by J. Prestipino Designs and Google Earth.

3.1.3 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 value of 0.6 has been used.

3.1.4 Source Sound Levels

Table 3.2 shows the sound power levels used in the modelling. The sound power levels have been determined based on data provided by the *Association of Australasian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessments, October 2013*.

Table 3.2: Overall Source Sound Power Levels

Description	Overall
Children playing 0 to 2 years (10 children)[1]	77 to 80 dB(A)
Children playing aged 2 to 6 years (10 children)[1]	83 to 90dB(A)
Cars on the site	85 to 94 dB(A)
Air-Conditioning Condenser Units	80 dB(A)
Toilet Exhaust Fan	60 to 65 dB(A)

1. Note that the total numbers of children have been extrapolated to the specific number of children based on the formula contained in the AAAC Guidelines.

4 Assessment of Children's Outdoor Play Areas and Mechanical Plant

Table 4.1 presents the predicted noise levels associated with children playing in the outdoor play areas and compares this to the Regulations. Although the centre may operate during the night period (ie prior to 7am) children playing outside will only occur during the daytime period. Mechanical plant may operate prior to 7am and has been considered for all time periods. Noise level predictions have been made to the nearest façade of the nearby residences, however in accordance with the Regulations, the façade reflection has been omitted from the noise modelling.

The noise level predictions include the solid balustrading as shown in Section 1, *Figure 1.4*. The predictions have been based on children playing in all outdoor play areas including the rooftop babies play area, with up to 80 children playing outside simultaneously. Owing to the structured nature of a childcare centre, outdoor play time is structured based on the age of the child, for example babies under 2 years are likely to only play outside for short times during the day owing to their daily sleep patterns.

Noise level predictions also include the constant noise from mechanical plant installed as part of the development. The mechanical plant is located on the rooftop and a 1.5-metre-high acoustic screen has been included around the platform. A 5dB penalty adjustment has been applied to the mechanical plant predictions to account for tonality.

It is important to note that all nearby residential premises are single storey, thus it has been concluded that any future premises will similarly be single storey.

Table 4.1: Noise from Children Playing

Location (ref *Figure 1.1*)	Predicted Noise Level Mechanical Plant Only (night) L_{A10}, dB(A)	Worst Case Assigned Noise Level Night L_{A10}, dB(A)	Predicted Noise Level Children Playing and Mechanical Plant (Day) L_{A10}, dB(A)	Worst Case Assigned Noise Level Night L_{A10}, dB(A)	Complies with Worst Case Assigned Noise Level
R1 – Future residential	33	38	34	48	Complies
R2 – Lot 9502	26	38	28	48	Complies
R3 – Future residential	38	38	39	48	Complies

The results presented in *Table 4.1* show that the predicted L_{A10} noise levels from all constant sources, including children playing in the outdoor play areas and mechanical plant, complies with the regulatory levels during all time periods at all residential receiver locations.

Noise from children playing inside the building will be significantly lower than noise from children playing in the external play areas, owing to the attenuation provided by the building façade. A minimum reduction of 5 to 15 dB(A) can be expected depending on whether windows are open or closed. Based on the assessment, noise from children playing indoors will comply with the regulatory levels at all residential receivers.

5 Assessment of Car Park Noise

Table 5.1 presents the predicted noise levels associated with cars parking on the site and compares this to the Regulations. The car parking includes car doors closing, vehicles starting and moving around the site. To represent the worst-case scenario, the predictions have been based on the car doors closing during the night period as this is the noisiest activity.

Table 5.1: Noise from Car Park

Location (ref *Figure 1.1*)	Predicted Noise Level Car Doors Closing L_{Amax}, dB(A)[1]	Assigned Noise Level night L_{Amax}, dB(A)	Complies with Assigned Noise Level
R1 – Future residential	30 (40)	58	Complies
R2 – Lot 9502	17 (27)	58	Complies
R3 – Future residential	24 (34)	58	Complies

1. Level shown in brackets includes +10dB for impulsivness

The results presented in *Table 5.1* show that the predicted noise levels from the car park complies with the regulatory levels during the night period at nearby residential premises.

6 Recommendations and Discussion

The predicted noise levels comply with the Regulations at all nearby residential premises, with the inclusion of the acoustic barriers located along the residential property boundaries, shown in *Figure 7.1*. *Figure 7.1* presents the locations and heights of the required acoustic barriers.

Figure 7.1: Acoustic Barrier Location and Height

The acoustic barrier is required to be solid in construction (ie no gaps between the fence and ground) and meet a superficial density of 11kg/m^3. Acceptable construction materials include compressed fibre cement fence sheeting (eg Hardifence), ship lapped palings, double skin Colorbond, Perspex or similar materials.

In addition to the assessment of noise levels in accordance with the regulations, to minimise the impact of the childcare centre on nearby residences, it is recommended that the following be considered:

- Air-conditioning installed as part of the development is to be selected for quiet operation, and the rated sound power level should not exceed the noise levels in *Table 3.2*. It has been assumed that external condensers will be located as shown in *Figure 7.1*. Any plant installed additional to this area will be required to be assessed to determine the noise impact, and as such, an acoustic report (completed by a suitably qualified acoustical consultant) will be required to be submitted to the Council once plant selection has occurred;

- Soft ground such as grass, soft-fall or sand should be installed to minimise impact noise and improve acoustic absorption within the outdoor play areas;

7 Conclusion

The results of the noise predictions show that the proposed childcare centre can comply with the assigned noise levels associated with the *Environmental Protection (Noise) Regulations 1997* at nearby residential receivers with the proposed acoustic barrier discussed in Section 7 and shown in *Figure 7.1.*

Appendix A

Terminology

Terminology

Ambient Noise

Ambient noise refers to the level of noise from all sources, including background noise as well as the source of interest.

A-Weighting

An A-weighted noise level is a noise level that has been filtered as to represent the way in which the human ear distinguishes sound. This weighting indicates the human ear is more sensitive to higher frequencies than lower frequencies. The A-weighted sound level is described as L_A dB.

Background Noise

Background noise is the noise level from sources other than the source of interest. Background may originate from such things as traffic noise, wind induced noise, industrial noise etc.

Decibel (dB)

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

Impulsive Noise

An impulsive noise source is a short-term impact noise which may originate from such things as banging, clunking or explosive sound.

Influencing factor

=1/10 (% Type A_{100} + % Type A_{450}) + 1/20(% Type B_{100} + % Type B_{450})

Where:

% Type A_{100} = The percentage of industrial land within a 100m radius of the premises receiving noise

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

% Type B_{100} = The percentage of commercial land within a 100m radius of the premises receiving noise

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

+ Traffic factor (maximum 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 450m

L_{A1}

An L_{A1} level is the A-weighted noise level which is overreached for one percent of a measurement period. It represents the average of the maximum noise levels measured.

L_{A1} assigned level

An assigned L_{A1} level which is not to be exceeded for more than 1% of a delegated assessment period.

L_{A10} assigned level

An assigned L_{A10} level which is not to be exceeded for more than 10% of a delegated assessment period.

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_{A90}

An L_{A90} level is the A-weighted noise level which is overreached for 90 percent of the measurement period. It is represents the "*background*" noise level.

L_{Aeq}

L_{Aeq} refers to the comparable steady state of an A-weighted sound which, over a specified time period, contains the same acoustic energy as the time-varying level during the specified time period. It represents the "*average*" noise level.

L_{AFast}

The noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. L_{AFast} is used when examining the presence of modulation.

L_{Amax}

The L_{AMax} level is the maximum A-weighted noise level throughout a specified measurement.

L_{Amax} assigned level

The L_{Amax} assigned level describes a level which is not to be exceeded at any time.

L_{APeak}

The L_{APeak} level is the maximum reading (measured in decibels) during a measurement period, using the A frequency weighting and P time weighting AS1259.1-1990.

L_{ASlow}

A L_{ASlow} level is the noise level (measured in decibels) obtained using the A frequency weighting and S time weighting as specified in AS1259.1-1990

Major Road

A Major road has an estimated average daily traffic count of more than 15,000 vehicles.

Maximum Design Sound Level

Maximum Design Sound Level is the level of noise beyond hearing range of most people occupying the space start, become dissatisfied with the level of noise.

Modulating Noise

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

a fluctuation in the discharge of noise which;

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

One-Third-Octave Band

One-Third-Octave-Band are frequencies that span one-third of an octave which have a centre frequency between 25 Hz and 20 000 Hz inclusive.

Representative Assessment Period

Representative Assessment Period describes a period of time not less than 15 minutes, and not surpassing four hours. It is determined by an inspector or authorised person to be suitable for the assessment of noise emissions.

Reverberation Time

Reverberation time refers to an enclosure for a sound of a specified frequency or frequency band as well as the time that would be necessary for the reverberantly decaying sound pressure level in the enclosure to decrease by 60 decibels.

RMS

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

Satisfactory Design Sound Level

Satisfactory Design Sound Level refers to the level of noise that has been found to be acceptable for the environment in question, which is also to be non-intrusive.

Secondary / Minor Road

A Secondary / Minor road has an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Sound Pressure Level (L_p)

Sound Pressure Level refers to a noise source which is dependent upon surroundings, and is influenced by meteorological conditions, topography, ground absorption; distance etc. Sound Pressure Level is what the human ear actually hears. Noise modelling predicts the sound pressure level from the sound power levels whilst taking into account the effect of relevant factors (meteorological conditions, topography, ground absorption; distance etc).

Sound Power Level (L_w)

A sound power level of a noise source cannot be directly measured using a sound level meter. It is calculated based on measured sound pressure levels at recognised distances. Noise modelling includes source sound power levels as part of the input data.

Specific Noise

Specific Noise relates to the component of the ambient noise of interest. It can be specified as the noise of interest or the noise of concern.

Tonal Noise

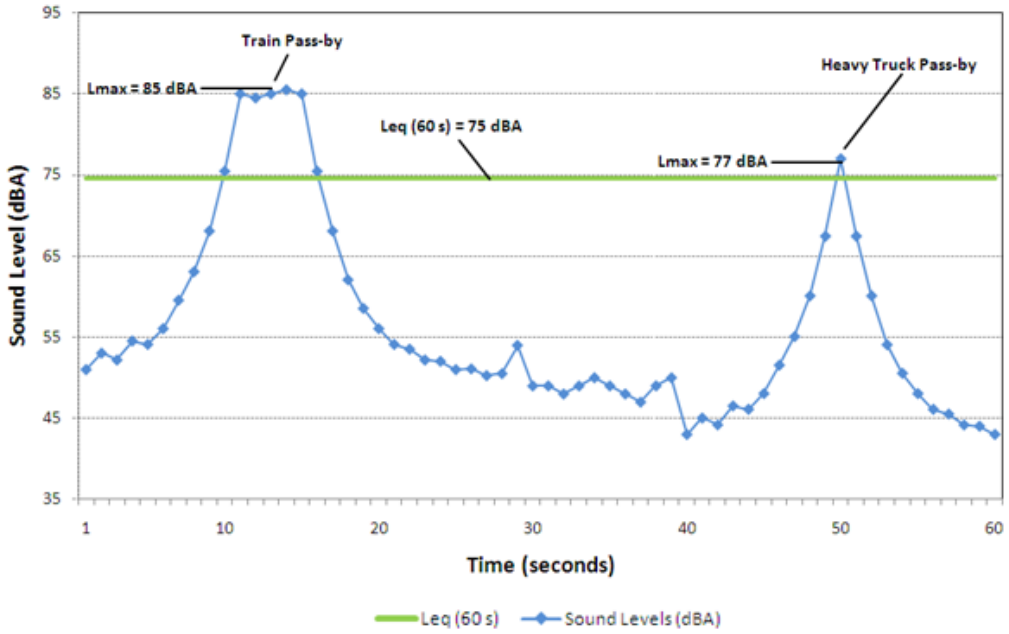
A tonal noise source can be designated as a source that has a specific noise emission over one or several frequencies, such as droning. The quantitative definition of tonality is:

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.

Chart of Noise Level Descriptors



Typical Noise Levels