Appendix 7 – Lloyd George Acoustics Environmental Noise Assessment

Environmental Noise Assessment

Impact from the Southern River Kennel Zone to Lots 13, 14, 21, 22 Southern River Road & Lots 18, 19, 20 Matison Street, Southern River

Prepared For

Housing WA
&
Maddestra Group

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LLOYD GEORGE Acoustics

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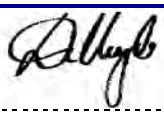
Approved for Issue:	Daniel Lloyd 
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A Terminology

1 INTRODUCTION

Housing WA and the Maddestra Group are proposing to develop the land on Lots 13, 14, 21 & 22 Southern River Road and 18, 19 & 20 Matison Street, Southern River. The location of the proposed subdivision is shown in *Figure 1.1*.

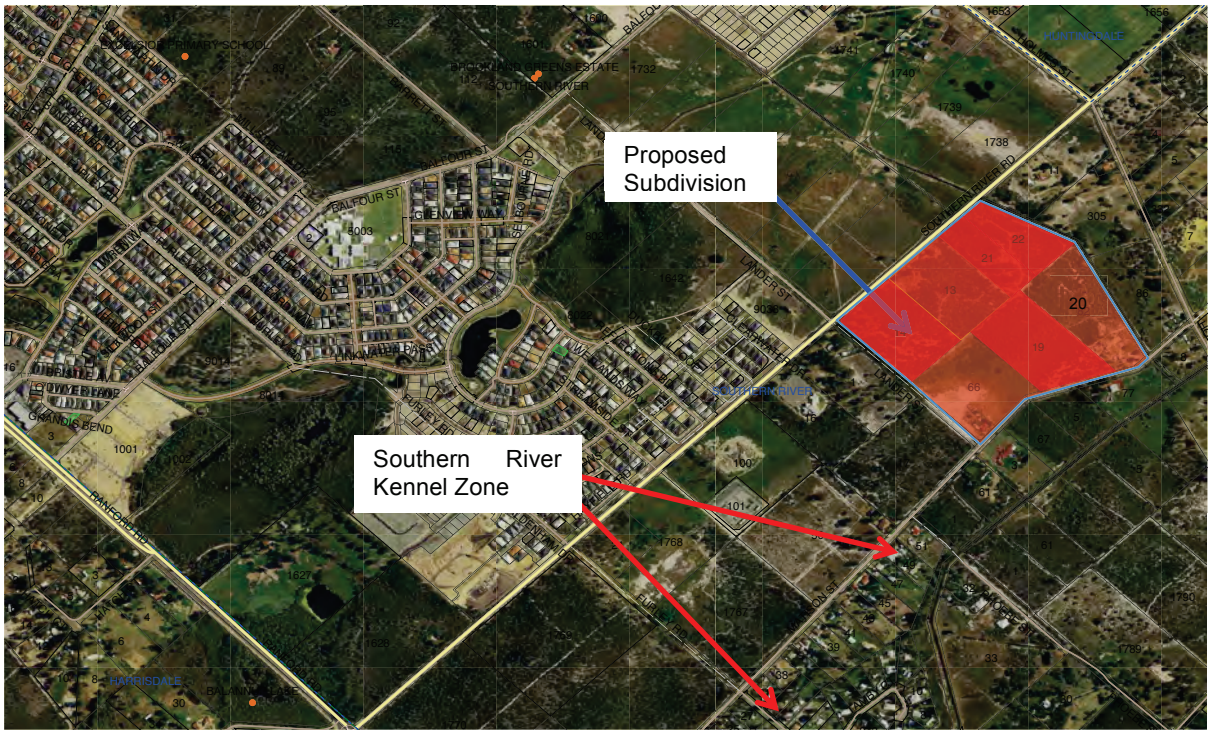

Figure 1.1 Location of Subdivision

Lloyd George Acoustics has been commissioned to assess the noise resulting from the Southern River Kennel Zone, which is located within 500 metres of the subdivision boundary, and provide recommendations on noise mitigation measures where appropriate. The assessment included the measurement and recording of ambient noise levels on two occasions over a period of approximately 10 days and these results are compared against the *Environmental Protection (Noise) Regulations 1997.*

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

2 CRITERIA

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

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".

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 2.1* are made to the noise emission as measured at the point of reception.

Table 2.1 – Adjustments For Intrusive Characteristics

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

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

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

Table 2.2 – Baseline Assigned 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

1. Applies within 15 metres 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 15 metres from a building associated with a noise sensitive use.

The influencing factor is calculated based on the percentage of industrial or commercial zoned land and major transportations corridors within 450 metres of the receiving premises. This is further explained in *Appendix A*. The land to the south of the proposed subdivision is zoned commercial. Therefore sensitive premises closest to the kennel zone would have an influencing factor of approximately 3 dB, however, the proportion of commercial land within a circle of radius 450m would decrease quickly moving towards the northeast of the development, to a point where the influencing factor is zero. Therefore, for the purposes of this assessment we are assuming an influencing factor during the most critical night period as presented in *Table 2.3*.

Table 2.3 –Critical Assigned Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Lots 14 & 66	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	38-36	48-46	58-56
Lots 13, 19, 21, 22 & 82	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35	45	55

Note: There are no major transport corridors within 450 metres of the proposed subdivision.

3 NOISE MEASUREMENT METHODOLOGY

Noise measurements were made on two occasions over a period of 10 days from 4 to 13 February 2012, at Location 1, and from the 28 June to 8 July 2012, at Location 2. The noise measurement locations are shown in *Figure 3.1*.

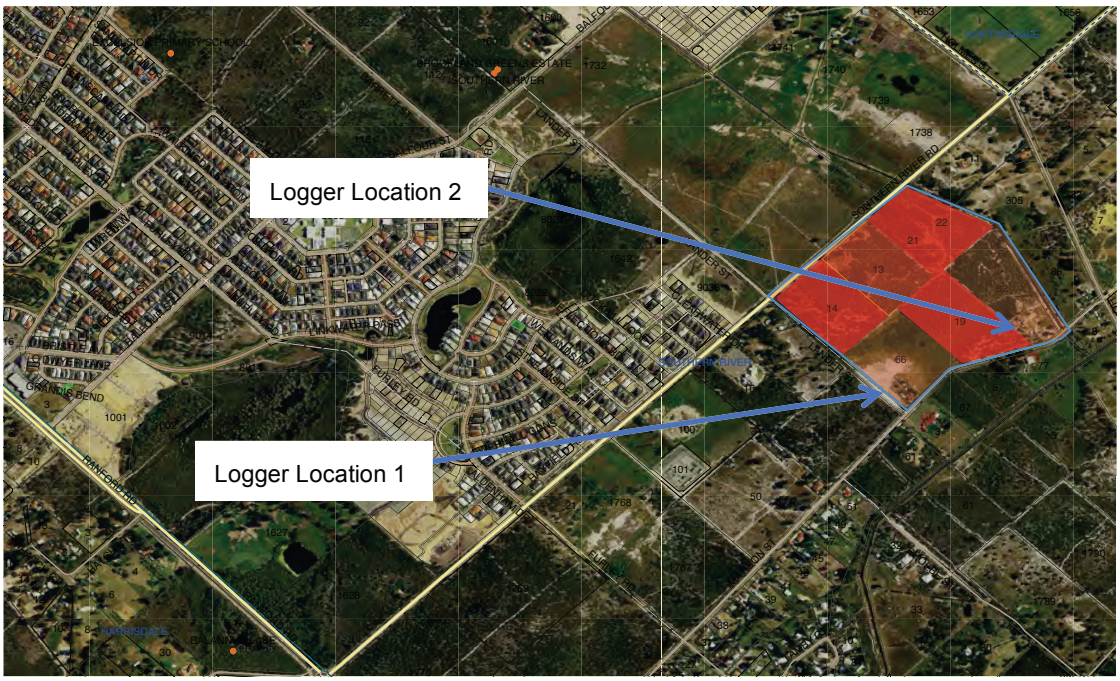

Figure 3.1 Noise Measurement Locations

Under the regulations, there are certain requirements that must be satisfied when undertaking measurements and are defined in Regulations 19, 20, 22 and 23 and Schedule 4. In undertaking the measurements, these have been satisfied, specifically noting the following:

- The sound data logger used for the measurements was an ARL Ngara type (S/N: 87803A), which holds current laboratory certificates of calibration and was field calibrated before and after the measurements and found to be within +/- 0.5 dB. This meter simultaneously measures the sound pressure levels and records the sound onto a hard drive for future listening or analysis.

- The microphone was at least 1.2 metres above ground level and at least 3.0 metres from reflecting facades (other than the ground plane) and as such no adjustments have been applied for reflected noise;

4 MEASUREMENT RESULTS

The overall results of the noise logging are presented in *Figures 4.1 and 4.2.* These results show the overall noise levels, which includes noise from road traffic, wind, birds and insects.

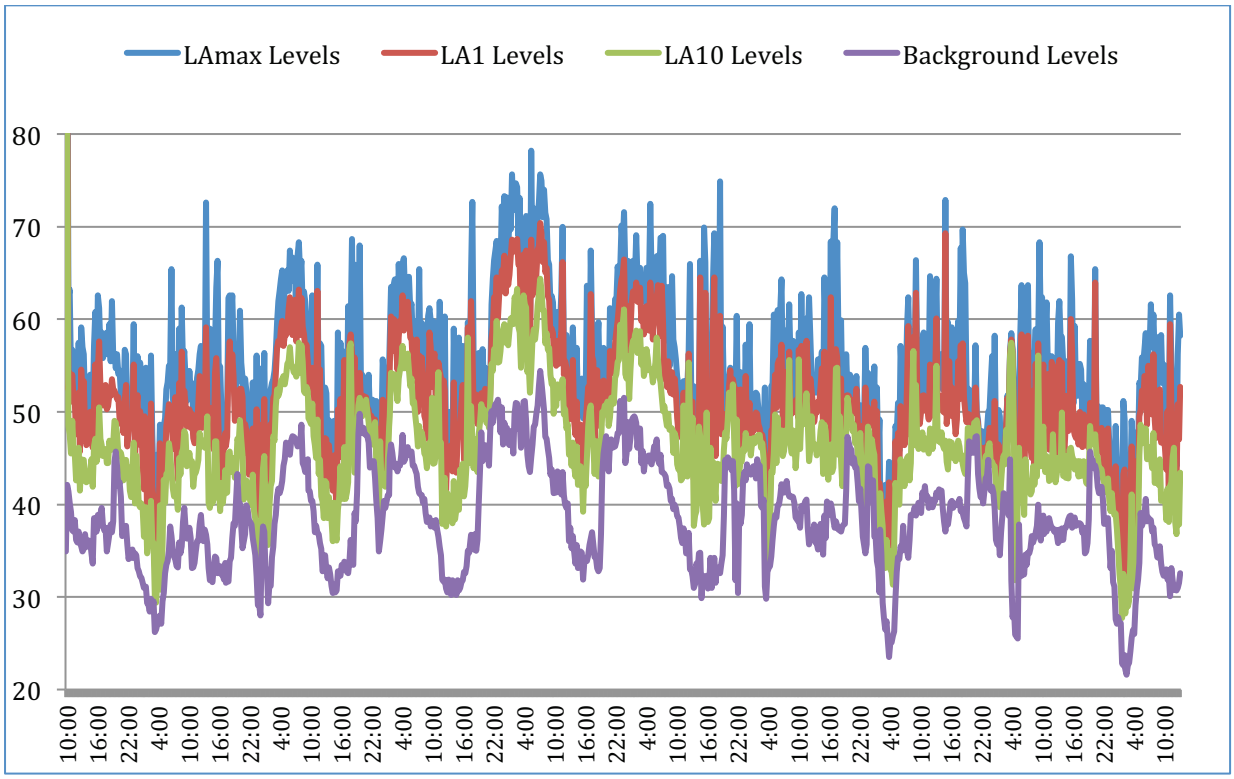

Figure 4.1 Noise Measurement Results over 15 minute Periods at Location 1

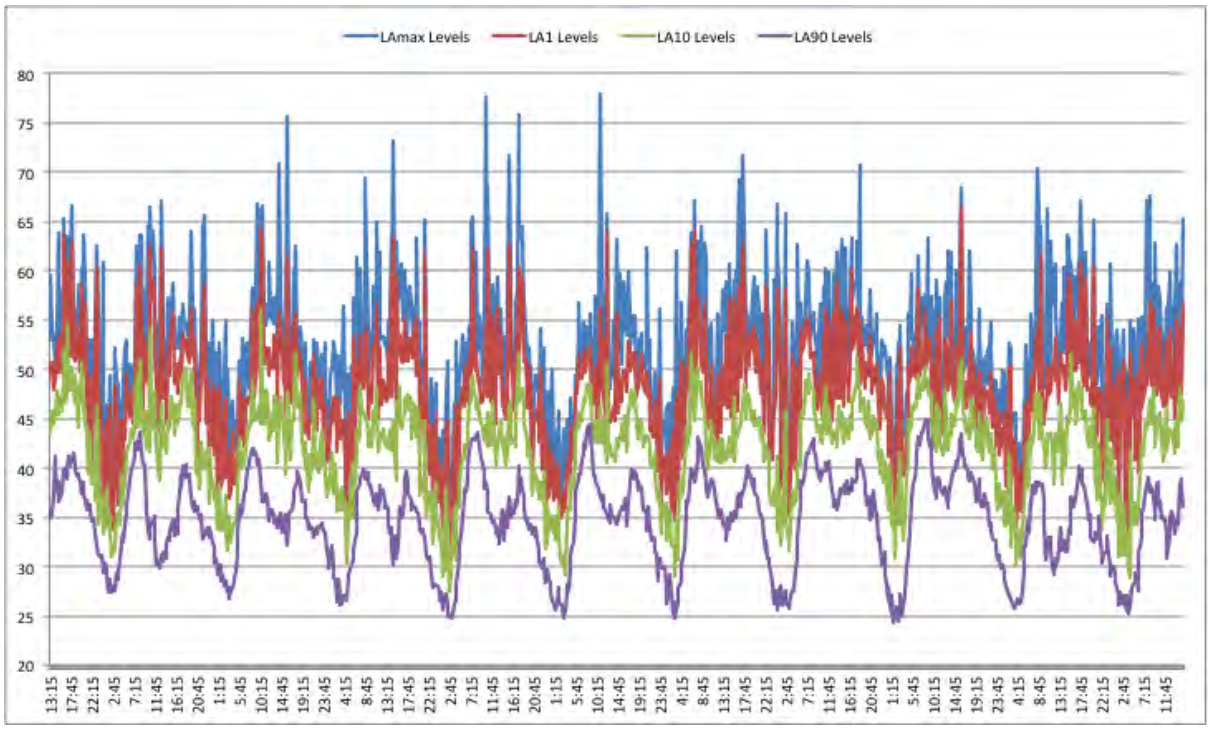

Figure 4.2 Noise Measurement Results over 15 minute Periods at Location 2

To determine the impact from the Southern River Kennel Zone on the proposed subdivision, detailed analysis of times when background levels were low and the wind was reported as coming from the southwest, was undertaken.

Location 1

For Location 1, the time period chosen was between 3.00 am and 7.00 am on Sunday 12 February 2012. From analysis of the recorded noise during this period, *Figure 4.3* shows a "snap-shot" of the instantaneous noise levels when background noise level, resulting mainly from insects (crickets) and birds, was at least 10 dB lower than the noise from dogs barking and therefore not influencing the levels. It should be noted that, although the overall noise levels were influenced by the background noise, the barking was audible throughout this entire time period. From this analysis, it has been determined that the L_{A10} noise level, which is the level considered by the Department of Environment and Conservation to be relevant to dog barking, is L_{A10} 42 dB.

Location 2

For Location 2, the time period chosen was between 11.00 pm and Midnight on Saturday 7 July 2012. From analysis of the recorded noise during this period, *Figure 4.4* shows a "snap-shot" of the instantaneous noise levels when background noise level, was at least 10 dB lower than the noise from dogs barking and therefore not influencing the levels. From this analysis, it has been determined that the L_{A10} noise level is L_{A10} 38 dB.

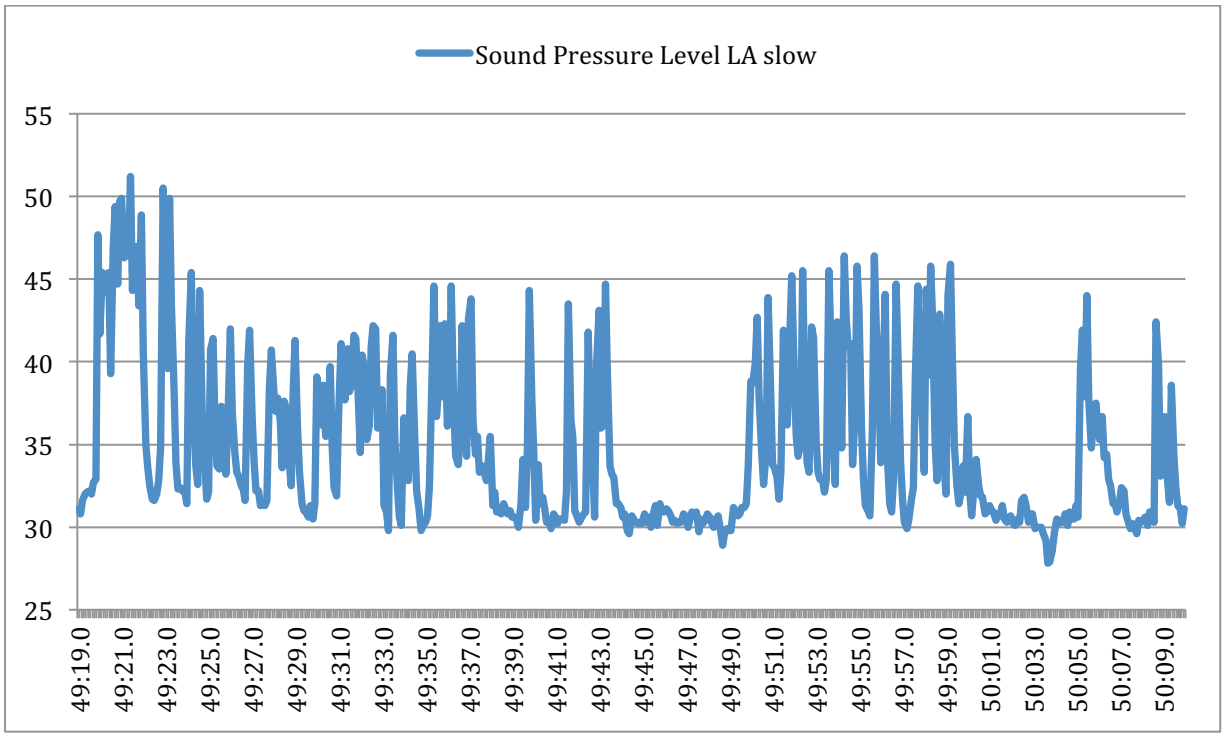

Figure 4.3 Barking Dominant Over Background 3.49 am at Location 1

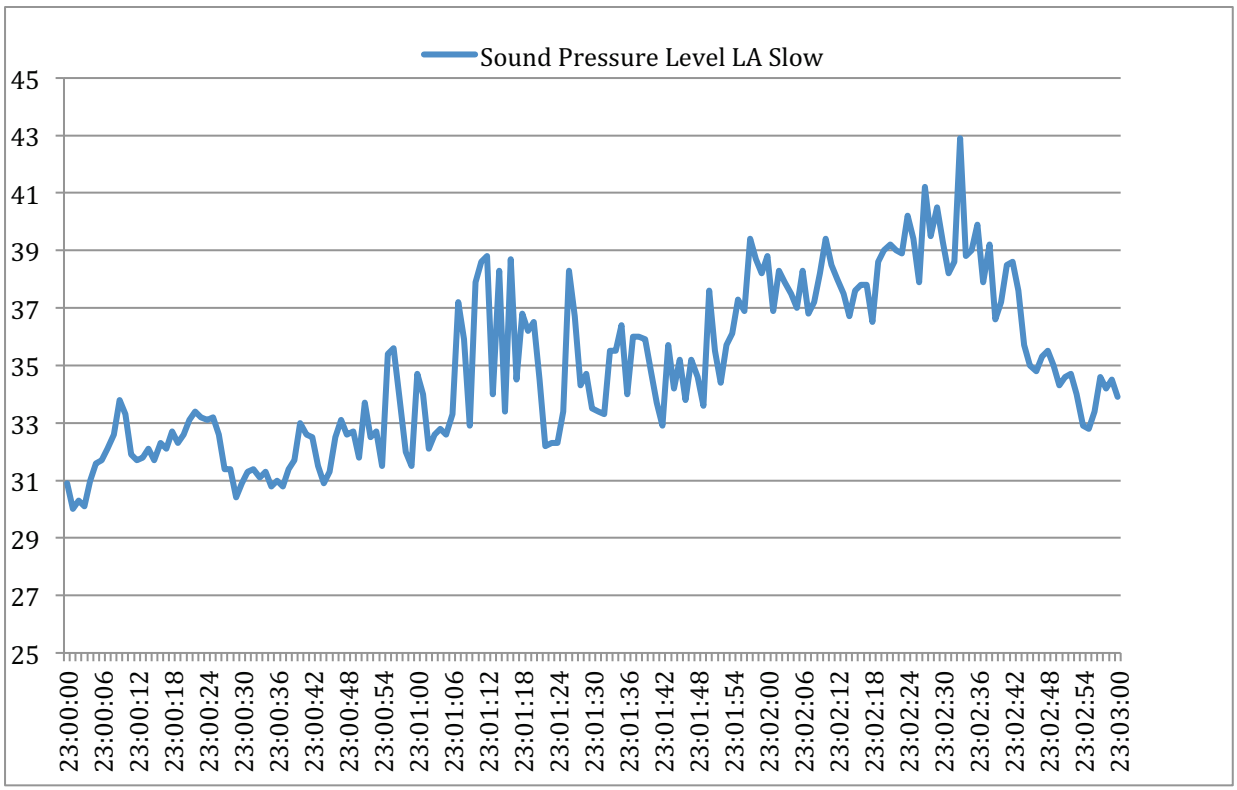

Figure 4.4 Barking Dominant Over Background 11.00 pm at Location 2

5 ASSESSMENT

The most critical time period, in terms of compliance with the Regulations, is the night period from 10.00 pm to 7.00 am Monday to Saturday and 10.00 pm to 9.00 am Sundays and Public Holidays. Detailed analysis of the noise resulting from dogs barking from the Southern River Kennel Zone shows that although the noise does vary considerably, due to different dog breeds or kennel locations etc., the L_{A10} noise level at Location 1 is calculated to be L_{A10} 42 dB and the L_{A10} noise level at Location 2 is L_{A10} 38 dB. Our analysis also shows that annoying noise characteristics, such as tonality or impulsiveness, are not present over the representative time period.

The noise level contours, based on the measurement data, are presented in *Figure 5.1*. It can be seen from the contour map that as the distance from the kennel zone increases, the noise level from the dogs barking will decrease. It should be noted that *Figure 5.1*, is used for calibration purposes and does not take into account barrier effects resulting from future industrial buildings or housing.

Using the calibrated noise model, the predicted noise levels assuming buildings located on the industrial land to the south of the development, houses on lots within the development and a 2 m high wall along the southern boundaries of the subdivision are presented in *Figure 5.2.*

In comparing these results against the Regulations, as described in *Section 2* (*Table 2.3),* the assigned noise levels vary depending on the distance from the commercially zoned land located to the south of the proposed development. At the southern extremities of the proposed sub-division, the assigned noise levels are predicted to be exceeded by approximately 3 dB, however, as we move further north, both the noise level and the assigned level reduces, with a combined effect of the majority of the southern half of the development marginally exceeding the assigned levels by approximately 2 dB. It should be noted that unless a building has a specific indoor use or there are no habitable outdoor areas, the assigned level under the regulations must be complied with within 15 metres of a noise sensitive use.

6 CONCLUSION

The results of the assessment show that assuming buildings are constructed on the industrial land to south (providing some shielding) and houses are constructed on the proposed lots, the predicted noise levels exceed the assigned levels under the Regulations by between 2 and 3 dB in the southern section of the proposed development under worst-case meteorological conditions.

Although the assigned levels are exceeded, a good level of amenity could be achieved within a house by the use of facade protection, similar to that specified in the State Planning Policy 5.4 (which addresses transportation noise impacts). In addition, outdoor entertainment areas should be positioned behind the house, so that the house acts as a barrier to shield the noise from the kennel zone. The recommended facade protections included in the State Planning Policy 5.4 Guidelines are reproduced in *Table 6.1.*

As there are other residential developments being constructed in close proximity to the kennel zone, the relevant Authorities may accept that the regulations are likely to be exceeded. Under these circumstances, there would generally be a requirement to place memorials on property titles to make prospective buyers aware of the noise impact from the kennel zone. In addition, conditions may be placed on the building construction.

Table 6.1 Guidelines Used in State Planning Policy 5.4

Area type	Orientation	Package A measures
Indoors		
Bedrooms	Facing road/rail corridor	• 6mm (minimum) laminated glazing • Fixed, casement or awning windows with seals • No external doors • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/airconditioning
	Side-on to corridor	• 6mm (minimum) laminated glazing • Closed eaves • Mechanical ventilation/airconditioning
	Away from corridor	No requirements
Living and work areas[1]	Facing corridor	• 6mm (minimum) laminated glazing • Fixed, casement or awning windows with seals • 35mm (minimum) solid core external doors with acoustic seals[2] • Sliding doors must be fitted with acoustic seals • Closed eaves • No vents to outside walls/eaves • Mechanical ventilation/airconditioning
	Side-on to corridor	• 6mm (minimum) laminated glazing • Closed eaves • Mechanical ventilation/airconditioning
	Away from corridor	No requirements
Other indoor areas	Any	No requirements
Outdoors		
Outdoor living area[3]	Facing corridor	• Minimum 2.0m high solid fence (e.g. Hardifence, pinelap, or Colorbond) • Picket fences are not acceptable
	Side-on to corridor	
	Away from corridor	No requirements

[1] These deemed-to-comply guidelines adopt the definitions of indoor spaces used in AS 2107-2000. A comparable description for bedrooms, living and work areas is that defined by the Building Code of Australia as a "habitable room". The Building Code of Australia may be referenced if greater clarity is needed. A living or work area can be taken to mean any "habitable room" other than a bedroom. Note that there are no noise insulation requirements for utility areas such as bathrooms. The Building Code of Australia describes these utility spaces as "non-habitable rooms".

[2] Glazing panels are acceptable in external doors facing the transport corridor. However these must meet the minimum glazing requirements.

[3] The Policy requires that at least one outdoor living area be reasonably protected from transport noise. The protected area should meet the minimum space requirements for outdoor living areas, as defined in the Residential Design Codes of Western Australia.

Figure 5.1

Signs and symbols

Property Boundaries

Project Area

N

Length Scale

0 100 200 400 600 800 1000 m

WA Housing - Southern River Development
Predicted Noise Levels From Barking Dogs
L_{A10} Noise Level Contours

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Figure 5.2

Southern River Residential Development
Predicted Noise Levels From Barking Dogs
L_{A10} Noise Level Contours

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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

$\%\ \text{TypeA}_{450}$ = 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

$\%\ \text{TypeB}_{450}$ = 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

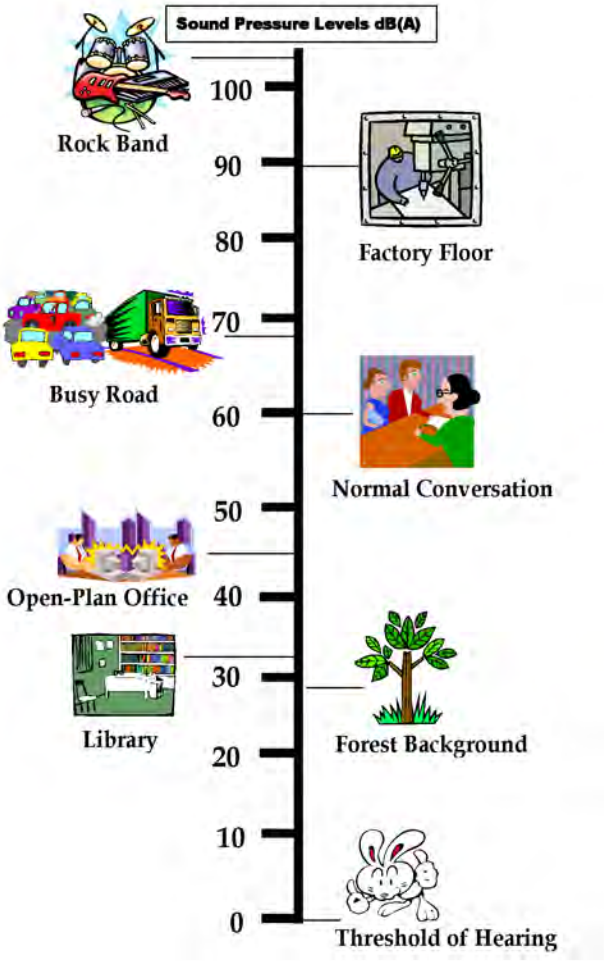
Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, 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.

Chart of Noise Level Descriptors

Typical Noise Levels