



Eaton – Padel Court Environmental Noise Assessment

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Glossary

A-weighting	A spectrum adaption that is applied to measured noise levels to represent human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
dB	Decibel: a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of the loudness of that sound.
Frequency (Hz)	The number of times a vibrating object oscillates (moves back and forth) in one second. Fast movements produce high frequency sound (high pitch/tone), but slow movements mean the frequency (pitch/tone) is low. 1 Hz is equal to 1 cycle per second.
L ₁₀	Noise level exceeded for 10 % of the measurement time. The L ₁₀ level represents the typical upper noise level and is often used to represent traffic or industrial noise emission.
L ₉₀	Noise level exceeded for 90 % of the measurement time. The L ₉₀ level is commonly referred to as the background noise level.
L _{AS}	A-weighted (slow weighted) sound pressure level
L _{A10}	A-weighted L ₁₀
L _{A10,adj}	Adjusted L _{A10} . Adjustment based on obvious tonality, impulsive or Modulation characteristics in the audible noise at a receiver point. Based on the adjustment methodology in Environmental Protection (Noise) Regulations 1997 Regulation 9.
L _{A1,adj}	Adjusted, A-weighted noise level exceeded for 1 % of the measurement time. The L _{A1, adj} level represents mostly short duration, high level sound events.
L _{Amax,adj}	Adjusted, A-weighted, slow-weighted maximum instantaneous noise level.
L _{WA}	A-weighted sound power level

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1.Introduction

Reverberate Consulting has been commissioned to conduct an environmental noise assessment for the proposed Padel courts at the Eaton Bowling and Social Club, Pratt Road, Eaton. The nearest and potentially most-affected residences are to the east of the site across the road from the courts.

This report details the assessment of noise emission in accordance with the Environmental Protection (Noise) Regulations 1997.

It was found that the noise generated from the Padel Court activity can be controlled to meet the Assigned Levels from the Noise Regulations. Treatments have been recommended to enable this.

2. Site Description

The Padel courts are to be located on a disused lawn bowls green at the Eaton Bowling and Social Club, refer Figure 1. This recreation club also contains other greens with lawn bowls activities. There are four Padel courts planned. For the court layout refer to Appendix D.

The usage of the courts is planned for day and evening, between the hours 7am – 10pm Monday to Saturday, and 9am to 10pm on Sundays and public holidays.

The nearest and potentially most affected residences are to the east of the site. These are identified as 59 Pratt Road, and 3 and 3A Bobin St. Other neighbours, through a combination of increased distances and increased shielding would be less affected by noise from the Padel site.



Figure 1: Site Plan – Eaton Padel Courts

3. Noise Assessment Criteria

3.1. Environmental Protection Act

The Environmental Protection Act (1986) provides for the prevention, control and abatement of pollution and environmental harm. This Act limits environmental noise in Section 3 (3) as follows:

For the purposes of this Act, noise is taken to be unreasonable if –

- (a) it is emitted, or the equipment emitting it is used, in contravention of –*
 - (i) this Act; or*
 - (ii) any subsidiary legislation made under this Act; or*
 - (iii) any requirement or permission (by whatever name called) made or given by or under this Act;*

or

- (b) having regard to the nature and duration of the noise emissions, the frequency of similar noise emissions from the same source (or a source under the control of the same person or persons) and the time of day at which the noise is emitted, the noise unreasonably interferes with the health, welfare, convenience, comfort, or amenity of any person; or*

- (c) it is prescribed to be unreasonable for the purposes of this Act.*

Reverberate has used the above legislation to assess the noise impact from the site. More particularly, noises which have a distinct character, and are different to the ambient noise environment are assessed under the subsidiary legislation; the Environmental Protection (Noise) Regulations 1997.

The Noise Regulations have been used to assess Padel court noise emissions.

3.2. Environmental Protection (Noise) Regulations 1997

The Environmental Protection (Noise) Regulations 1997 (the Regulations) provide limits for acceptable noise from operations and activities. The Regulations specify the maximum permissible noise levels (termed Assigned Levels) at noise sensitive premises, caused by excessive nearby noise, during various times of the day.

The Assigned Levels have been calculated for all properties using the method shown in Appendix B. The resultant Assigned Levels are presented below in Table 1 and are applicable at some of the nearest, and most-affected neighbouring residential sites.

Due to the proposed hours of operation, the Sunday period and evening periods, are the critical assessment periods for the Padel court noise reaching neighbours.

Table 1: Environmental noise emission criteria (Assigned Levels) – 59 Pratt & 3A Bobin

Receiving Premises	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise Sensitive Premises – Highly Sensitive	0700 to 1900 hours Monday to Saturday	47	57	67
	0900 to 1900 hours Sunday and public holidays	42	52	67
	1900 to 2200 hours all days	42	52	57
	2200 hours on any day to 0700 hours Monday to Saturday	37	47	57
	and 0900 hours Sunday and public holidays			

The Assigned Level at the houses to the east of 3A Bobin, and 39 Pratt was 2 dB lower than that shown in Table 1, This was due to the greater distance, in excess of 100m, from these houses to buildings at the Eaton Bowling and Social Club, refer Appendix B.

From the analysis below it was found that the Padel courts emit L_{Amax} noise from padel ball impacts, and L_{A1} noise from participant vocalizations. The L_{A1} noise was the limiting noise emission from the Padel courts. To comply with the L_{A1} emission requirements would result in compliance with the L_{Amax} requirements as well.

The applicable L_{A1} Assigned Level at the most-affected neighbours, during Evening/Sunday periods, was then:

59 Pratt Rd and 3A Bobin St	52 dB
Other residences	50 dB

The Assigned Level is 5 dB less stringent during the daytime hours of 7am to 7 pm on Monday to Saturday.

The corresponding L_{Amax} Assigned Level is 5 dB higher, at 55/57 dB, than the L_{A1} Assigned Levels discussed above.

4. Environmental Noise Emission

4.1. Modelled Noise Sources

Previous noise measurements at other venues found the dominant noises from the site were:

- Padel ball bounce, on court or on racket
- Participant vocalization such as yells, shouts and cheers
- Carpark activity, esp. car door closing

These are summarised below in Table 2.

Table 2 – Modelled Sound Power Levels

Activity	Sound Power Level L _w dB
Participant vocalization (yells, shouts & cheers)	L _{A1} 94
Padel ball bounce (on court/racquet)	L _{Amax} 95
Car doors closing	L _{Amax} 84

Note that adjustments are to be applied to the noise sources outlined above. Under the Noise Regulations this is required where specific characteristics associated with the noise sources can exacerbate the actual or perceived annoyance experienced by residences around the site.

The nature of the Padel court noise has been assessed at numerous sites and has been found to be similar to basketball court and tennis court noise, and so would attract a similar adjustment. More specifically these noises all meet the definition of “impulsiveness” defined in the Noise Regulations. But, as with basketball noise, they have been classified here as having a ‘modulation’ character, with a +5 dB adjustment.

The reason these noises are classified as having a ‘modulation’ character and not “impulsiveness” character is outlined by DWER (refer Appendix C). They write, with reference to basketball noise that in Section 6.2:

... While measurement has indicated that a ball bounce is impulsive under the criteria in the Noise Regulations, repetitive bouncing has characteristics, and is likely to elicit responses more similar to modulation....

... In addition, although one might potentially be initially startled by the first basketball bounce off the ground (e.g., at start of use of the pad) the highly repetitive nature of the basketball bouncing means the startling effect would quickly disappear as the relevance of the sound becomes obvious.

DWER also found that other activity such as shouting on the basketball court, would both attract an adjustment to the L_{Amax} of +5 for tonality and +10 for impulsiveness.

Reverberate has previously established that tonality was evident in the vocalizations at the other Padel courts, however impulsiveness was not. The impulsiveness of the padel ball impacts was equally reduced.

In summary, the following adjustments have been applied to the Padel court noise reaching the nearest neighbours:

Padel ball bounce -	$L_{Amax} = + 5 \text{ dB modulation}$
Padel court vocalisations -	$L_{A1} = + 5 \text{ dB tonal}$
Car door closing -	$L_{Amax} = + 10 \text{ dB impulsiveness}$

4.2. Noise model

Computer noise modelling was used to forecast the noise impacts to locations around the site. The software used was SoundPLAN Version 9, with the ISO9613 algorithms selected. These algorithms have been used as they allow for the influence of wind, atmospheric stability, barriers, building shielding and ground absorption. It is appropriate for the current configuration of noise sources and receiver locations.

The Input data used in modelling includes

- Meteorological Information;
- Topographical data;
- Buildings, barriers, fences, and other features which may shield noise
- Ground Absorption; and
- Source sound levels.

The corresponding 3-D noise model is shown overleaf in Figure 2, along with the Padel court locations, as well as surrounding buildings and barriers.

The following parameters were used as necessary in modelling for padel court activity.

- Pasquil Stability Factor F
- Temperature 15 °C (pre-7am)
- Temperature 20 °C (post-7am)
- Wind Speed 3 m/s
- Wind Direction Worst case – i.e., all directions
- Relative Humidity 50%
- Ground Absorption 0.65 in grassed areas
- 0.10 for paved areas such as roads and car parks

Adjustments were applied for the forecast noise reaching receptor locations, these are discussed above in Section 4.1.

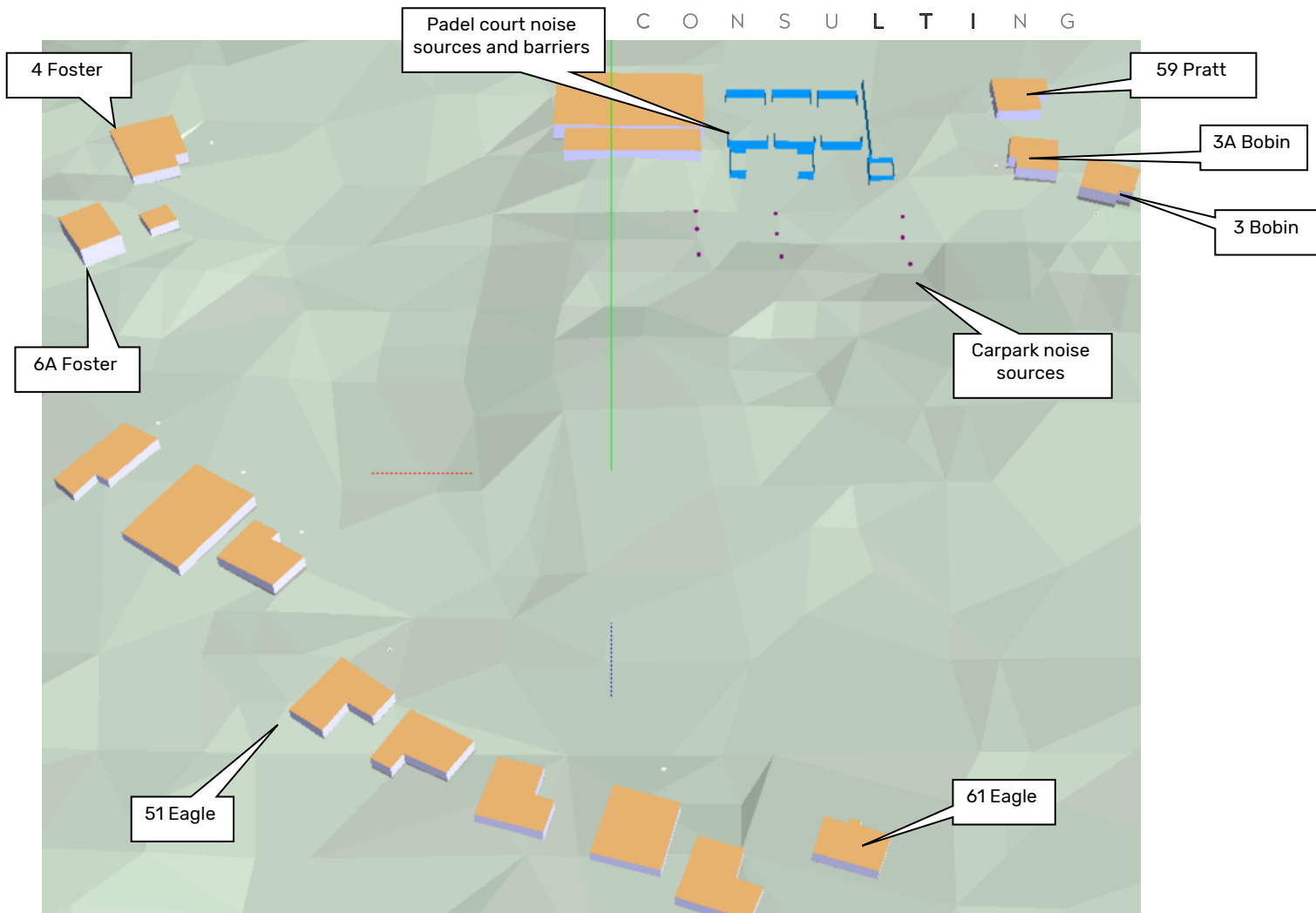


Figure 2 – 3-D SoundPLAN model of the proposed Padel court and surrounding neighbours

4.3. Forecast Noise and Discussion

The forecast noise levels at the closest and most-sensitive receivers are summarised in Table 3 below, using the maximum Sound Power Levels in Table 2 above. These results are based on the treatments in Appendix A being implemented.

Table 3 - Forecast Noise from Padel courts and surrounds

Noise Source	Receiver									
	3 Bobin Grnd Fl	3A Bobin Grnd Fl	43 Eagle Grnd Fl	45 Eagle Grnd Fl	47 Eagle Grnd Fl	51 Eagle Grnd Fl	57 Eagle Grnd Fl	4 Foster Grnd Fl	6A Foster 1st Fl	59 Pratt Grnd Fl
Players talking/shouting* - L1	49	52	49	50	48	45	44	42	46	52
Assigned Level - LA1	50	52	50	50	50	50	50	50	50	52
Compliance	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved
Padel Court - Lmax*	48	52	50	51	48	46	45	42	46	52
Assigned Level - LAmax	55	57	55	55	55	55	55	55	55	57
Compliance	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved
Note * Adjustment applied										
Cars in carpark- Lmax*	48	54	43	43	42	39	36	43	39	52
Assigned Level - LAmax	55	57	55	55	55	55	55	55	55	57
Compliance	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved	Achieved

Note * Adjustment applied

The Table 3 results for Players talking/shouting and for vehicle activity in the carpark are also plotted below in Figure 3 and Figure 4.

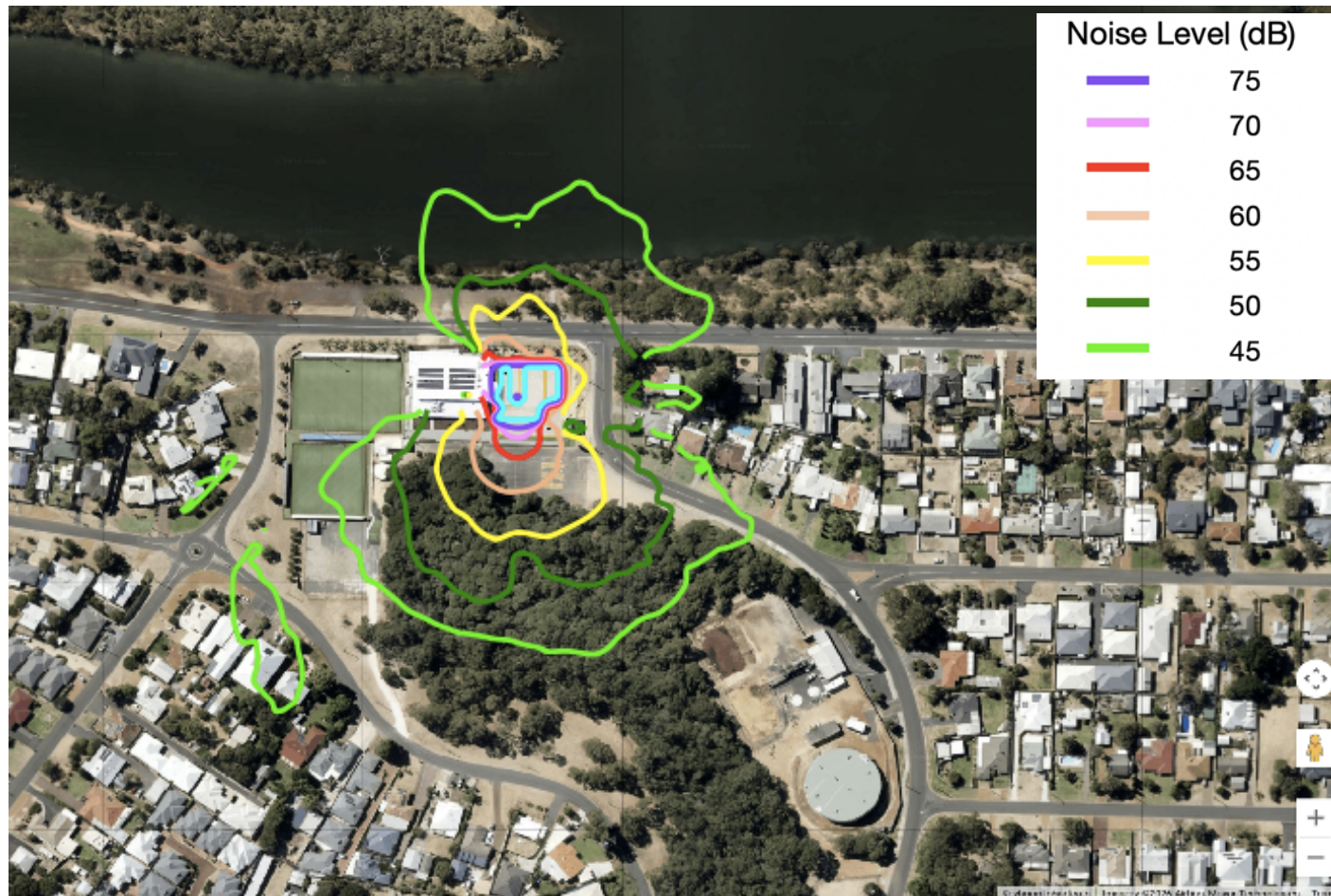


Figure 3 – Forecast Evening L_{A1} Padel Court noise – with treatments
(Assigned Level = 50/52)

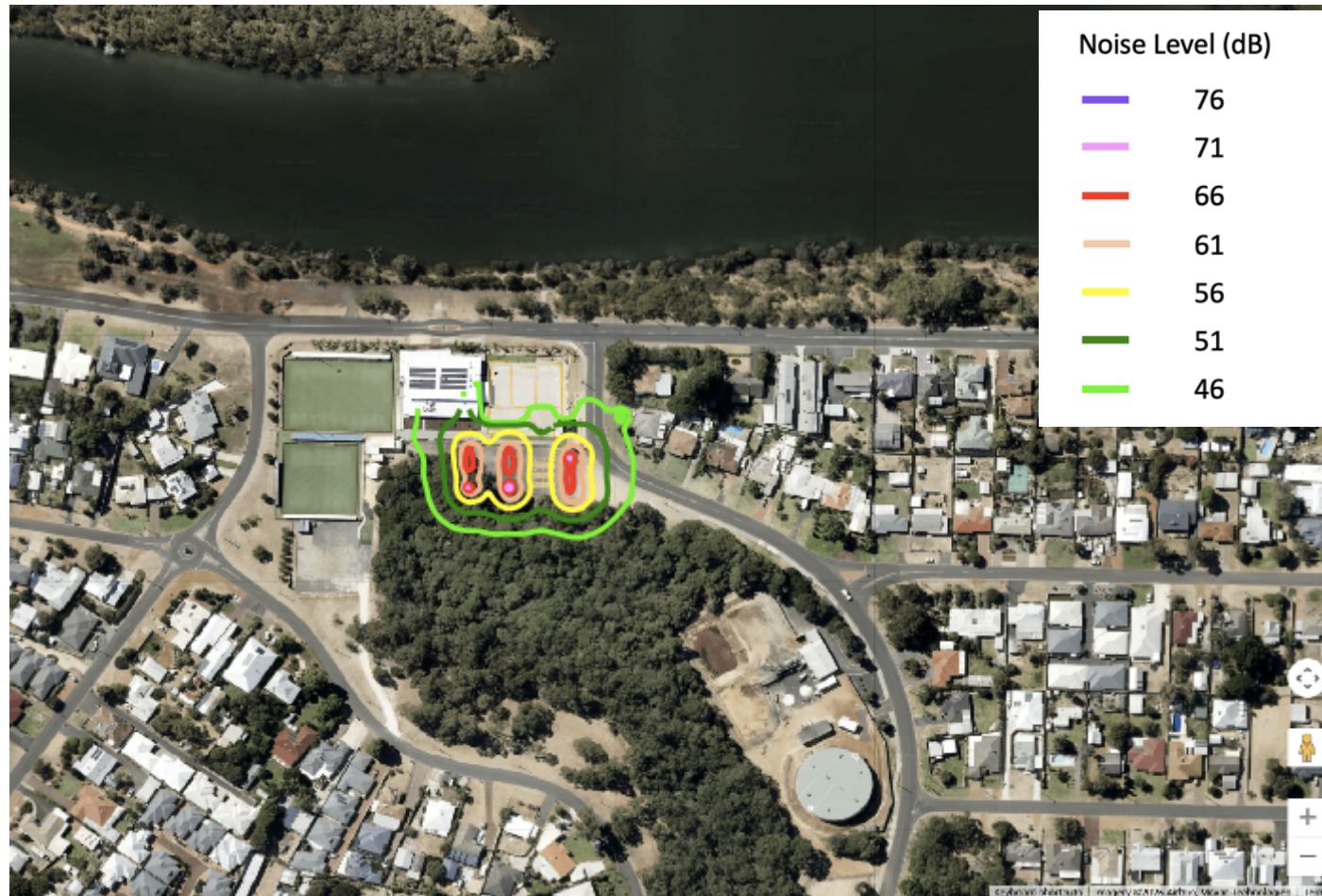


Figure 4 – Forecast Night-time carpark L_{Amax} noise
(Assigned Level = 55/57 dB)

5. Conclusion

Noise emissions from the Padel Courts and their associated activity have been forecast and assessed for the proposed Padel Courts at Eaton. Treatments have been recommended in Appendices A & D.

Using these treatments, the operation of all Padel Courts (i.e. 1 to 4) are forecast to meet the Assigned Levels during the day and the evening, and in the case of cars in the carpark, also during night-time periods.

On this basis the Padel court noise is considered acceptable.

Appendix A: Noise Management Plan

The elements outlined below are recommended as part of a comprehensive Noise Management Plan. They are recommended for compliance with the Environmental Protection Act 1986 and its subsidiary legislation: The Environmental Protection (Noise) Regulations 1997.

Noise Source or Activity	Requirement/Treatments ¹
Playing of music	No music played at the Padel court is to be audible at nearby neighbours.
Barrier	Noise barriers as outlined in Appendix D are recommended for evening and Sunday/public holiday operations. Barriers up to 3.3m high can be glass of equal thickness/ performance of existing padel court glazing. Alternatively, 2 x 0.48mm (i.e. 0.96mm) BMT colourbond, or other acoustically equivalent panelling can be used.

¹ The treatments outlined in this report are the minimum requirements for noise control. Increased thicknesses, heights, strengthened elements, or alternative treatments, may be required for other non-acoustic reasons including wind loading, weather proofing, buildability, structural stability, safety, or fire-rating

Appendix B: Determination of Assigned Level

The Environmental Protection (Noise) Regulations 1997 (EPR) provide limits for acceptable noise from operations generating excessive noise. The Regulations specify the maximum permissible noise levels (termed assigned levels) at noise sensitive premises, caused by surrounding noises, during various times of the day. Time of day affects the assigned levels for noise-sensitive premises, as follows –

- Lowest levels at night (10 pm to 7 am any day, or to 9 am Sundays and Public Holidays);
- Higher levels during the evenings (7 pm to 10 pm) and on Sundays and Public Holidays (9 am to 10 pm); and
- Highest levels during the day (7 am to 7 pm Monday to Saturday).

The baseline assigned levels from the Regulations are shown below in Table 4.

Table 4 – Baseline Assigned Levels

Receiving Premises	Time of Day	Assigned Level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise Sensitive Premises - Highly Sensitive	0700 to 1900 hours Monday to Saturday	45+IF	55+IF	65+IF
	0900 to 1900 hours Sunday and public holidays	40+IF	50+IF	65+IF
	1900 to 2200 hours all days	40+IF	50+IF	55+IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35+IF	45+IF	55+IF
Noise Sensitive Premises – any area other than highly sensitive area	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

The Assigned Levels above are then increased using an Influencing Factor (IF) as defined in the Regulations. The Influencing Factor is greater than zero where there are significant areas of land uses, within 100 m and 450 m radii of the receptor, including:

- industrial land use zonings;
- commercial zonings; and
- the presence of roads carrying significant traffic.
- A sporting facility with buildings associated with that use.

The Influencing Factor IF has been calculated for the applicable noise sensitive receptors in the current study. The percentage of industrial and commercial land within the prescribed circles centred on the noise sensitive premises, and the presence of roads with more than 6000 vehicles per day have been assessed for the properties.

No industrially zoned nor commercially zoned land was found in the areas surrounding the dwellings..

The Recreation Club, with its bowling greens is considered a sporting facility. There is a building within 100 m of the dwellings at 59 Pratt and 3A Bobin. This building is directly associated with the sporting facility use. Under the Noise Regulations Schedule 3, Cl 2 part (8), a +2 dB adjustment is applied for noise reaching these two dwellings.

For the other nearby dwellings, this building is more than 100m away and so no adjustment is applicable.

An example Influencing Factor calculation is shown below. These factors are based on the land zonings, high-traffic roads and sporting facilities as outlined above. and have been added to the baseline Assigned Levels to produce the final Assigned Levels in Section 3.2 above

Property = #3A Bobin

Type of Land	450m Radius	100m radius	Total	
Industrial Land	0%	0%	0	dB
Commercial Land	0%	0%	0	dB
Transportation Factor			0	dB
Sporting Facility with building			2	dB
TOTAL Influencing Factor			2	dB

Appendix C: DWER extract

The following extract is from Section 6.2 of *technical report - Noise emissions and impacts associated with outdoor community basketball facilities*, December 2022 by Government of Western Australia, Department of Water and Environmental Regulation.

...In the context of basketball noise, and based on complaints made to local government, the highly repetitive nature of the ball bouncing is generally the cause of annoyance. While measurement has indicated that a ball bounce is impulsive under the criteria in the Noise Regulations, repetitive bouncing has characteristics, and is likely to elicit responses more similar to modulation, so a similar 5 dB adjustment to the LAS10 measured level was considered to reflect the degree of annoyance it causes and reduce the likelihood of adverse reactions. In addition, although one might potentially be initially startled by the first basketball bounce off the ground (e.g., at start of use of the pad) the highly repetitive nature of the basketball bouncing means the startling effect would quickly disappear as the relevance of the sound becomes obvious. In this sense, a 10 dB adjustment for impulsiveness in accordance with the Noise Regulations, while appropriate for a conservative assessment, is considered to possibly overstate the adverse human response when applied to a LAS10 measured level of this sort.

Appendix D: Site Layout & Barrier treatment

