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YANCHEP TAVERN – NOISE ASSESSMENT

Report 10.00561R-02
prepared on 12/10/2023

REPORT PREPARED BY

Acoustics Consultants Australia
ABN 25 646 422 899
Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6981
PHONE **(08) 6186 4122**
EMAIL **perth@acousticsconsultants.com.au**

BASIS OF REPORT

This report has been prepared by **Acoustics Consultants Australia (ACA)** with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with the Client. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

REFERENCE	DATE	PREPARED	REVIEWED	AUTHORISED
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CONTENTS

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Report 10.00561R-02

1. INTRODUCTION

This report presents the findings of the noise assessment conducted by Acoustics Consultants Australia (ACA) for the proposed Tavern to be located in the corner Marmion Avenue & Peony Boulevard, Yanchep.

The aims of this assessment are:

- To identify the main sources of noise from the proposal and the nearest noise sensitive receivers;
- to conduct an objective noise assessment based on a 3D noise model calibrated with measurements conducted at similar venues during busy operations; and
- to provide recommendations that will set basis for noise management, where required.

Noise from the proposal may impact surrounding sensitive receivers. The site lays within commercial use land and it is in close proximity to other lots of commercial and residential use.

This assessment has been prepared in accordance with the WA Environmental Protection (Noise) Regulations 1997 (EPNR). The methodology and Standards used to conduct the assessment, as well as the numeric assessment results are presented in the following sections of this report.

Acoustic terms used in this report are defined in the Glossary of **Appendix A**.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

2. BACKGROUND INFORMATION

The proposal is for a new entertainment, food and beverage venue. The venue will include a new building with indoor bar, dining areas, kitchen and preparation areas, outdoor patron seating areas, toilets and service yard. This noise impact assessment includes all the potential worst-case noise generating scenarios from the proposal that could generate impacts at the nearest sensitive receivers.

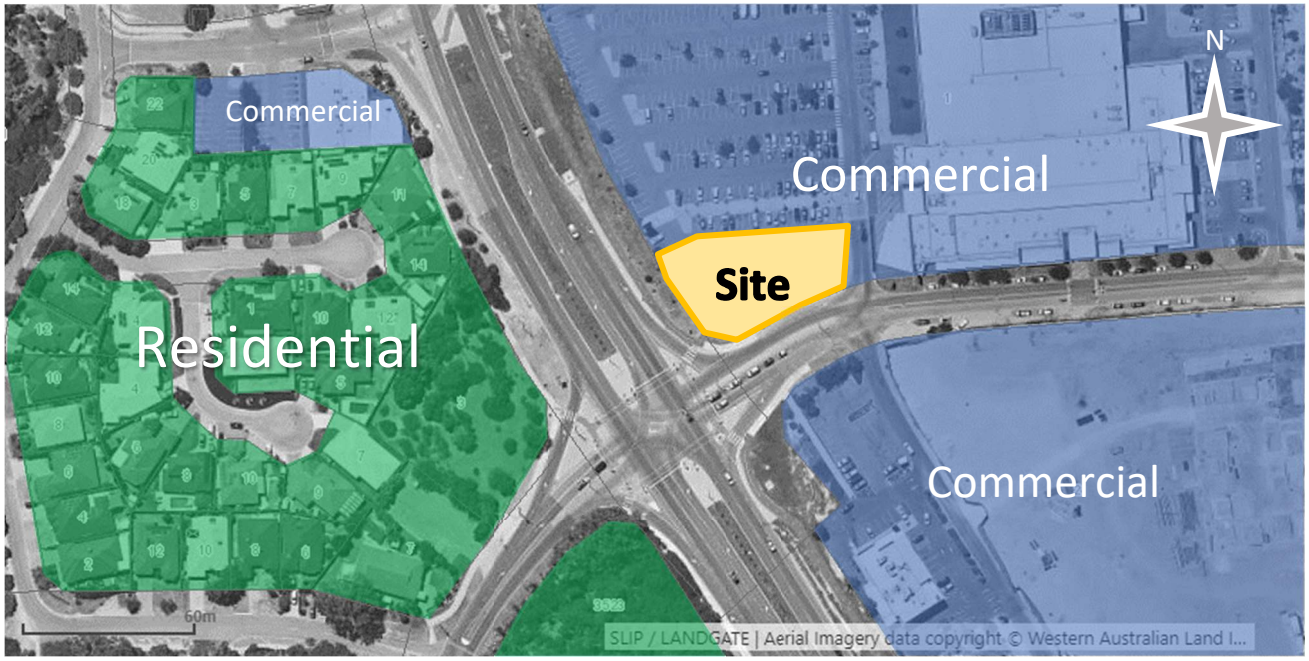
It is understood that the City of Wanneroo would require a review of operations to ensure they are compliant with the State Noise Regulations, identification of the potential impacts and mitigation requirements, due to closeness to residential premises.

Noise emitted from the proposed venue and received at the sensitive premises is to be assessed considering highly sensitive receivers, as per the WA Noise Regulations (**Section 3**). Other commercial units are also considered noise sensitive receivers. Further details of the proposed operations are provided in the following sections.

2.1. Location

The site is proposed to be within a lot currently used as part of the car park within the "Yanchep Central" shopping centre, located in the corner of Marmion Avenue & Peony Boulevard, Yanchep. The site is within 'Commercial' use land, and it is surrounded by commercial and residential lots. The nearest identified noise sensitive receivers are residential dwellings across Marmion Avenue. **Figure 1** depicts an annotated aerial view of the site and its surroundings.

Figure 1 Site location and nearest sensitive land



The nearest and most exposed highly-sensitive receivers, as defined in Regulations (**Section 3**), have been identified and labelled R1 to R3 in **Figure 2**.

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ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Figure 2 Noise sensitive receivers

The most exposed noise sensitive receivers are:

- R1 – 3 Lagoon Drive (vacant lot zoned for residential use)
- R2 – 14 Benbulben Rise (single storey dwelling)
- R3 – 11 Benbulben Rise (single storey dwelling)

Other commercial premises are located adjacent to the site directly across Peony Boulevard at No. 1 and No. 2 Peony Boulevard respectively.

It is expected that noise emissions from the site would be dominated by noise from crowd on external seating terraces.

2.2. Operations and Site Description

Principal access to the building will be via the shopping centre car park, through a set of French doors facing north and there are folding doors to connect with courtyards facing north, east and south. The west side of the tavern will not have major openings, but there are full height fixed windows to the south side of the building. The site has two small courtyards located south and north of the building and a third courtyard/verandah with more crowd capacity located east of the site.

Figure 3 shows the proposed layout of the venue with notes on the approximate crowd capacity and overall distribution of the areas of interest. The crowd distribution presented in this report is a reasonable worst-case snapshot for noise assessment purposes and it does not represent a limitation for occupation or capacity.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Figure 3 Proposed layout and approximate crowd distribution

Piped music would be played throughout the venue using distributed speakers. Sound levels within the courtyards will be played at background levels outside, that is at a level that would allow for conversational voice. Music sound levels indoors may be played at higher than background levels and this will include DJs or bands, subject to mitigation.

Other noise contributors identified from typical operations on site are goods' deliveries and waste disposal. Whilst these activities have not been numerically assessed due to their low frequency and short duration, they are still required to meet the environmental standards. These activities will be restricted to take place Monday to Friday between 7am and 7pm; hence the risk for disturbance at nearby residents will be minimised.

2.3. Operational Noise Scenarios

The key noise sources identified in the previous section define the following noise generation scenarios:

1. Scenario 1 – Entertainment noise L_{A10}: Indoor and outdoor areas at capacity.

   - Noise emissions during steady operations at maximum capacity of the site. Doors and terraces open.

   - Foreground Music (piped, bands and DJ)[1] restricted to indoor areas.

[1] 'Foreground Music' as defined in Table 2 of the Association of Australasian Acoustical Consultants *Licensed Premises Noise Assessment Technical Guideline V 2.0*.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au REF *Report 10.00561R-02*
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

2. Scenario 2 – Entertainment noise L_{A10}: Indoors and outdoors areas at capacity, indoor areas with acoustic conditioning.
    - Noise emissions during steady operations at maximum capacity of the site.
    - Foreground Music (piped, bands and DJ) restricted to indoor areas.
    - Acoustic conditioning inside the venue included.
3. Scenario 3 – Entertainment noise L_{A10}: Indoor and outdoor areas at capacity with mitigation.
    - Noise emissions during steady operations at maximum capacity of the site.
    - Foreground Music (piped, bands and DJ) restricted to inside the venue.
    - All building noise mitigation measures included.
4. Scenario 4 – Mechanical plant noise L_{A10}: Mechanical plant in continuous operation.
    - 1 x air conditioning unit.
    - 1 x kitchen extraction fan.

It is noted that from the noise generating scenarios, a combination of them will provide a resultant noise prediction (**Section 4**), which will be assessed against the applicable noise criteria (**Section 3**).

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

3. ACOUSTIC CRITERIA

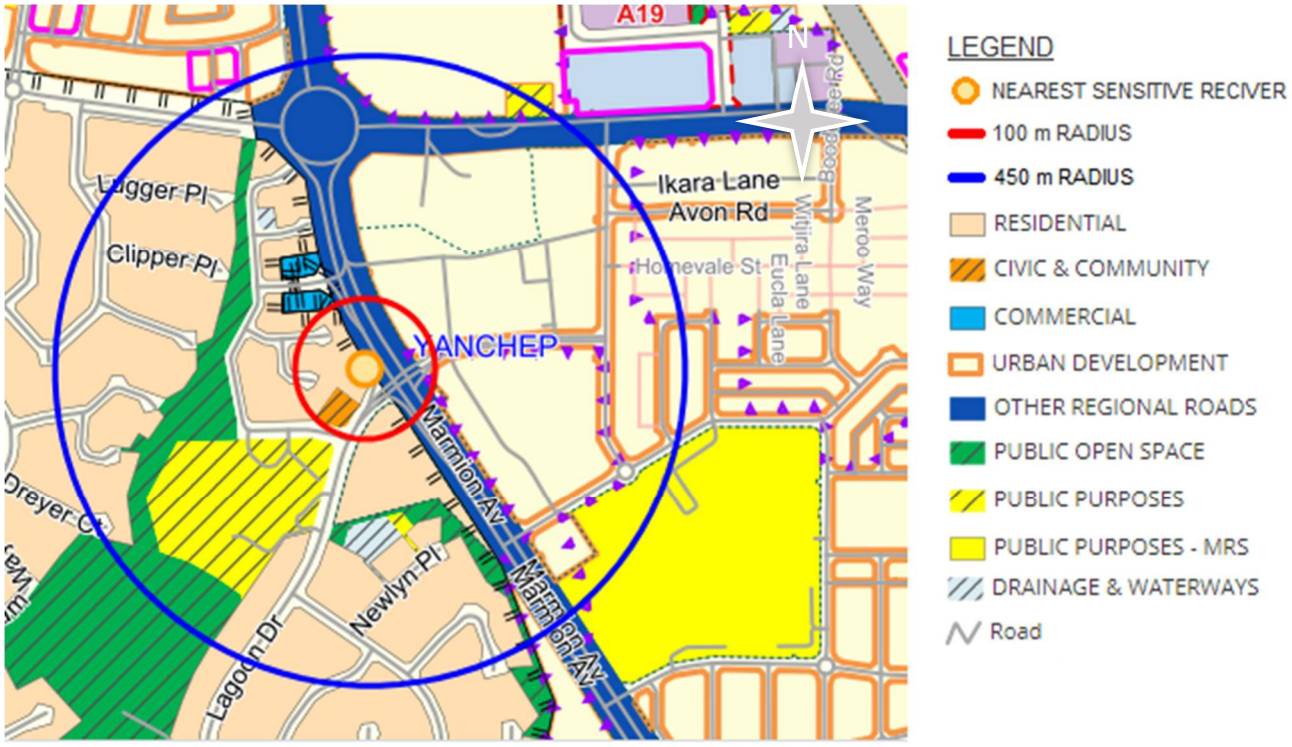
Noise criteria have been determined in accordance with the Western Australia *Environmental Protection (Noise) Regulations 1997* (EPNR).

3.1. WA Environmental Protection (Noise) Regulations 1997

Noise emissions from commercial premises are regulated by state noise policy in the form of the Western Australia Environmental Protection (Noise) Regulations of 1997 (EPNR). To achieve compliance with this policy, noise levels at nearby residential areas are not to exceed defined limits. These limits are determined from consideration of prevailing background noise levels and 'influencing factors' that consider the level of commercial and industrial zoning in the locality.

The influencing factor considers zoning and road traffic volumes around the sensitive receiver of interest, within a 100 and 450 m radius (see **Figure 4**).

Figure 4 Influencing factor calculation map



The resulting influencing factor is 7.5 dB, based on:

- Transport factor of 6 dB due to a major road (Marmion Ave 15,636 total weekday vehicles, according to 2021/2022 MainRoads report 53413) in the inner circle.
- A commercial/mixed use zoning factor of 1.5 dB due to 13% commercial/mixed use area within the inner circle, and 17% commercial/mixed use area in the outer circle.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

- An Industry use zoning factor of 0.3 dB due to 3% industry use area within the outer circle.

A summary of the applicable outdoor noise criteria is provided in the following table.

Table 1 WA EPNR Assigned Noise Levels

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday	53	63	73
	0900 to 1900 hours Sunday and public holidays	48	58	73
	1900 to 2200 hours All days	48	58	63
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	43	53	63
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

A series of adjustments must be added to the noise source levels if noise received at the sensitive premises cannot reasonably be free of audible characteristics of tonality, modulation and impulsiveness, and the adjusted level must comply with the assigned level. Definition of these terms (tonality, modulation and impulsiveness) are provided by Regulation 9(1) of the EPNR. **Table 2** summarizes the adjustments, as defined by the Regulations.

Table 2 Noise character adjustments

Adjustment where noise emission is music		Adjustment where noise emission is not music		
Impulsiveness is not present	Impulsiveness is present	Tonality is present	Modulation is present	Impulsiveness is present
+10 dB	+15 dB	+5 dB	+5 dB	+10 dB

It is expected that the dominant noise source from the site would be crowd during busy times (Friday evening or weekend afternoon).

Based on the activities proposed and the relevant periods of the day, the most stringent noise criterion is expected to be for either evening periods or Sundays when the outdoor noise limit of L_{A10} 43 dB applies at the nearest residential sensitive receivers' locations. Adjustment for +10 dB will be applied in music emission and +5 dB tonality adjustment will apply to mechanical plant noise.

3.2. Internal Noise Levels

For reference on acoustic amenity at internal spaces, Australian Standard 2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors* (AS/NZS 2107) and

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

the World Health Organization Guidelines for Community Noise 1999 (The WHO Guidelines) documents provide recommended noise limits for specific room usages.

While AS2107 does not intend to set out environmental impact criteria, in some situations, indoor targets are considered appropriate to noise sensitive activities such as sleep and residential living since they generally occur indoors. Where it can be shown that the *outdoor* Assigned Noise Levels are impracticable to achieve, consideration may be given to appropriate application of guidelines such as Australian Standard 2107:2016.

Further, Regulation 19 of the EPNR provides an alternative to conduct compliance measurements indoors, when measuring outdoors is not a viable option.

The following table presents recommended internal noise levels recommended for residential houses and apartments near major roads in Table 1 of AS/NZS 2107.

Table 3 AS/NZS 2107 Recommended design sound levels

Type of occupancy	Design sound levels ($L_{Aeq,t}$ range) – dB
Houses near major roads	
Living areas	35-45
Sleeping areas (night-time)	35-40
Work areas	35-45

From this table, a referential internal noise target of L_{Aeq} 35 dB is considered reasonable for living areas. The recommended sound levels given are not necessarily appropriate in all circumstances and may not reflect each occupant's expectations of quality; this is particularly the case when noise has considerable low frequency energy or when the levels do not correspond to a quasi-steady noise source (i.e. sound fluctuates by a significant range in a short period of time).

The WHO Guidelines (World Health Organization) provide internal noise limits recommended to avoid negative health impacts based on sleep disturbance scenarios. The guidelines are not specific to entertainment noise; however, acknowledge that when a significant low frequency component is present, a 10 dB safety factor may be applied.

The recommended limits by the WHO Guidelines are shown in **Table 4**.

Table 4 WHO Guidelines, sleep disturbance recommended noise limits.

Noise metric	Recommended indoor levels – dB
Sleep disturbance, inside bedrooms	
$L_{Aeq,8hour}$	35
L_{Amax}	50

Note: The WHO Guidelines set out outdoor limits based on assumptions of 10dB indoor-outdoor difference. For windows closed, indoor to outdoor level difference may be 5-15 dB higher than with windows open.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au REF *Report 10.00561R-02*
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

4. ASSESSMENT

4.1. Approach

The assessment has been conducted based on the following steps:

- A review of the proposed activities and functional spaces to identify the key noise emissions.
- Noise modelling based on reasonably worst-case scenarios.
- Assessment of predictions against the applicable noise criteria.

External crowd noise has been estimated using the Haynes formulae. Internal crowd noise has been estimated using the Rindel method. All crowd calculations have been undertaken under the following assumptions:

- Third of the patrons may be talking at any given time with raised vocal effort (G = 3).
- Absorption of internal areas to match 1.5 seconds reverberation time.

Mechanical plant noise data have been extracted from standard libraries provided by manufacturers.

4.2. Noise Levels

The source noise levels used in the assessment are summarised in **Table 5**.

Table 5 Noise Source Levels

	1/1 Octave Band Sound Level – dB								
	63 Hz	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	**dBA**
Entertainment Noise									
	Outdoor crowd 300 patrons – L_{10} Sound Power Levels								
L_W	n/a	85	91	94	90	83	78	69	97
	Outdoor crowd 50 patrons – L_{10} Sound Power Levels								
L_W	n/a	73	79	82	78	72	66	57	85
	Outdoor crowd 25 patrons – L_{10} Sound Power Levels								
L_W	n/a	68	74	78	74	67	61	53	81
	Outdoor Background Music (typical) – L_{10} Sound Pressure Level at listener's Ears (Scenario1)								
L_{10}	75	73	72	73	71	63	62	60	80
	Outdoor Background Music (typical) – L10 Sound Pressure Level at listener's Ears (Scenario2)								
L_{10}	65	63	62	63	61	53	52	50	70
	Indoor crowd 425 patrons – L_{10} Sound Pressure Reverberant (1.5 s) Level at listener's Ears								
L_{10}	n/a	83	89	92	88	82	76	68	96
	Indoor Foreground Music (typical) – L_{10} Sound Pressure Level at Listeners' Ears								
L_{10}	90	88	87	87	86	78	75	77	95

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ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Mechanical Plant									
Air conditioning unit (Typical) – L_{10} Sound Power Levels									
Lw	73	70	73	73	70	68	57	53	75
Kitchen extraction fan (Typical) – L_{10} Sound Power Levels									
Lw	76	73	76	76	73	71	60	56	78

NOTES: (*) The levels of background and foreground music have been referenced in Table 1 of AAAC guideline.

4.3. Noise Modelling

4.3.1. 3D Model

Geometry from the site and surroundings, surfaces, existing buildings, barriers and sound sources from the site were modelled using internationally recognized noise prediction algorithms. A three-dimensional noise model was developed using a software called SoundPLAN Essential V5.1. An adaptation of the algorithm contained within ISO 9613:1996 *Acoustics – Attenuation of sound during propagation outdoors* was used in this instance.

The following items are considered:

- Three-dimensional location, height and orientation;
- shielding/reflection effects due to surrounding structures (such as awnings, parapets and roofs); and
- meteorological/thermal effects. However, since propagation distances in this case are smaller than 50 m, such influences are considered insignificant with use of ISO 9613 methodologies.

It is noted that these noise predictions are considered reasonably representative of 'worst case' scenarios, and it is expected that actual noise levels would typically be less than that predicted for the majority of adjacent receivers.

Figures 5 a/b show depicted figures with details of the noise model, including the point of assessment (receivers) and the key noise generating sources (i.e. outdoor patron areas and mechanical plant).

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Figure 5a Noise model: Entertainment noise setup

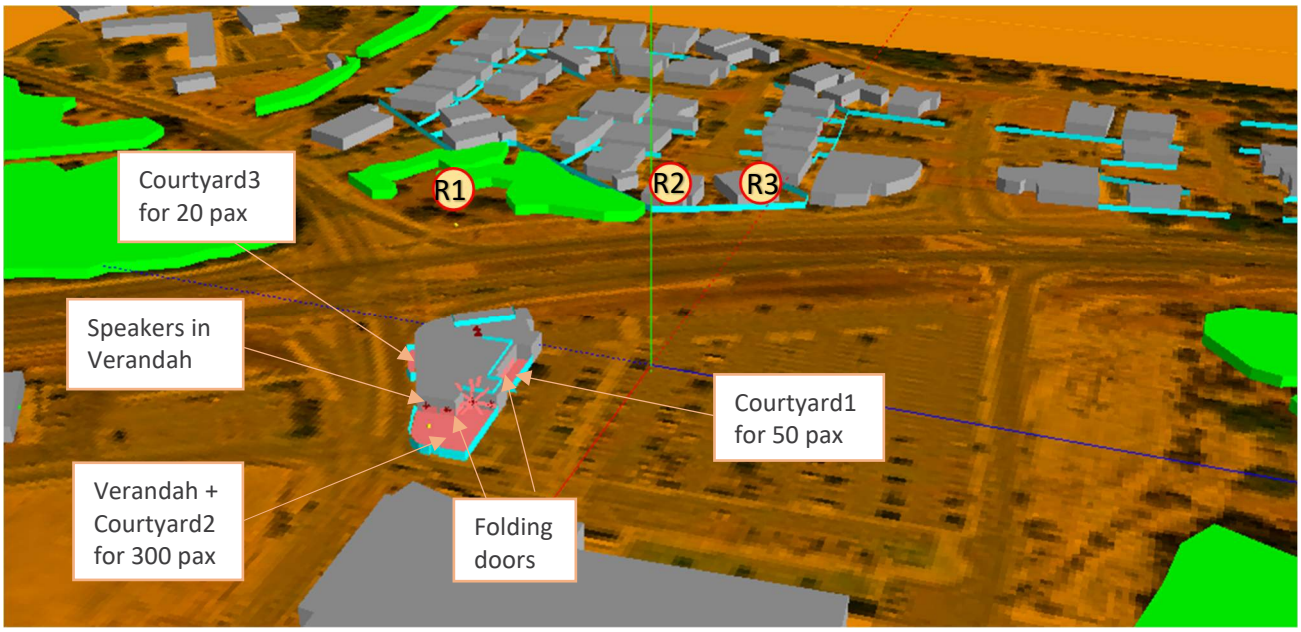
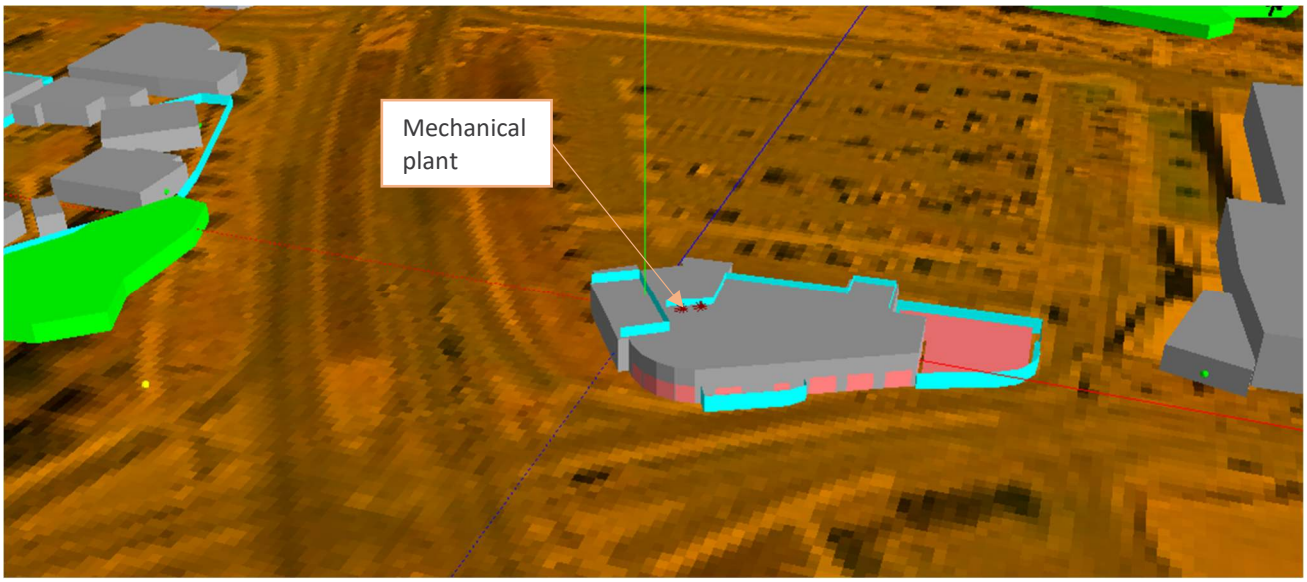


Figure 5b Noise model: Mechanical plant setup



4.3.2. Modelling Scenarios

The noise modelling scenarios described in **Section 2.3** are:

1. Scenario 1 – Entertainment (music and crowd) noise, all doors open - L_{A10} noise levels.

   Point sources were placed on the Verandah representing speakers generating a contribution of L_A 80 dB within the Verandah.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

A breakdown of maximum capacity is set out below:

a. Courtyard 1 = 50 persons

b. Verandah + Courtyard 2 = 300 persons

c. Courtyard 3 = 25 persons

d. Internal Areas (all doors open) = 425 persons

2. Scenario 2 – Entertainment (music and crowd) noise, all doors close - L_{A10} noise levels

   a. The background music levels produced by the outside speakers decrease by 10 dB compared to scenario 1; and

   b. keeping all doors closed (details described in **Section 5**, Recommendations)

3. Scenario 3 – Mechanical plant in continuous operations – L_{A10} noise levels.

4.3.3. Results

Noise contour maps have been generated in SoundPLAN V5.1 (See **Appendix B**). From the results presented obtained in SoundPLAN, a detailed analysis was undertaken to determine individual contributions per noise source and the applicable adjustments applied (See **Table 2** in **Section 2**). That is, noise predictions from music have been penalised with 10 dB and mechanical plant have been penalised with 5 dB.

These resulting noise character-adjusted predictions are presented in **Table 6**.

Table 6 Outdoor adjusted noise level predictions

Receiver / Location	Predicted L_{A10} Noise Levels: Scenario 1	Predicted L_{A10}Noise Levels: Scenario 2	Predicted L_{A10} Noise Levels: Scenario 3
R1 – 3 Lagoon Drive	49 dBA	42 dBA	35 dBA
R2 – 14 Benbulben Rise	52 dBA	41 dBA	33 dBA
R3 – 11 Benbulben Rise	52 dBA	40 dBA	31 dBA

From the results presented in **Table 6** a detailed analysis was undertaken to determine predictions for the cumulative noise levels at the receivers.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au REF *Report 10.00561R-02*
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Table 7 Cumulative Noise Prediction

Receiver	Cumulative Noise Prediction – L_{A10}	
	Crowd (all doors open) and Mechanical Plant	Crowd (doors closed, lower background music outdoors) + Mechanical Plant
R1	49 dBA	43 dBA
R2	52 dBA	42 dBA
R3	52 dBA	41 dBA

NOTE: Noise character adjustments included, where applicable.

Based on the results, it has been established that noise mitigation, represented by Scenario 2, will be required for time periods other than for daytime (i.e. after 7pm, Monday to Saturday), Sundays and public holidays.

Mechanical noise generated from the site shall be designed to be 10 dB below the entertainment noise predictions so as the cumulative impact is driven by entertainment noise. This is due to the relatively simple and focused options available to mitigate mechanical noise. Thus, When the project develops further building services details, these shall be reviewed to ensure noise emissions do not exceed the baseline.

4.4. Assessment and Discussion

The results presented in the previous section have been combined for potential operations and assessed to the applicable noise criteria (per **Section 3**) and the results are presented in **Table 8**.

Table 8 Assessment of results

Receiver	Time Period	Noise Criteria	Noise Prediction	Difference (dB)	Comments
R1	Daytime	L_{A10} 53 dB	49 dB	-4	Compliant
	Evening, Sunday, or public holidays	L_{A10} 48 dB	43 dB	-5	Compliant
	Night-time	L_{A10} 43 dB	43 dB	0	Compliant
R2	Daytime	L_{A10} 53 dB	52 dB	-1	Compliant
	Evening, Sunday, or public holidays	L_{A10} 48 dB	42 dB	-6	Compliant
	Night-time	L_{A10} 43 dB	42 dB	-1	Compliant
R3	Daytime	L_{A10} 53 dB	52 dB	-1	Compliant
	Evening, Sunday, or public holidays	L_{A10} 48 dB	41 dB	-7	Compliant

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au REF *Report 10.00561R-02*
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

Receiver	Time Period	Noise Criteria	Noise Prediction	Difference (dB)	Comments
	Night-time	L_{A10} 43 dB	41 dB	-2	Compliant

The assessment suggests that the proposed venue will be compliant with the EPNR assigned noise levels subject to noise management.

The following must be noted:

- Compliance is predicted for all combined operations during all periods.
- After 7 pm it will be necessary to keep all doors closed and open them only to provide access to the outdoor areas, when needed.
- All external noise emissions have been predicted on the basis of a 2.4 metre high boundary fence (details in **Section 5**).
- Mechanical plant treated to ensure that noise emissions do not exceed those predicted in this report.

Other considerations set by the assessment basis:

- The kitchen extraction fan shall be assessed by the acoustic consultant before installation to ensure that the system meets the requirements (**Table 6** noise levels).
- Music can be played at both background and foreground listening levels at all times indoors, and at background levels outdoors. Further, music levels:
  - Should not contain excessive low frequency component;
  - Be played through distributed speakers to avoid larger speakers pointing away from front windows and doors, mounted on rigid structures with vibration isolation pads.

The following section summarizes the analysis above into a set of recommendations.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au REF *Report 10.00561R-02*
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

5. RECOMMENDATIONS

Table 9 outlines the noise mitigation required to reduce impact on residents from operations at the proposed venue.

Table 9 Noise Mitigation

Item #	Recommendation	Reasoning
Treating the Source		
1	Music inside the venue (piped or live) to be played to not to exceed $L_{Aeq,5min}$ 85 dB at listeners' locations. Avoid excessive low frequency emissions, do not use subwoofers.	To avoid music exceeding the modelled terms.
2	Music outside the venue to be played at background levels only. Indicatively not to exceed $L_{Aeq,5min}$ 70 dB in daytime and 60 dB in night-time at listeners' locations.	
3	A distributed network of speakers should be sought in place of large stereo system. The directivity of the sound system is to be designed to minimize spillage and projection towards noise sensitive receivers.	
Treating the Path		
4	**Lounge/Bar Fitout** Fit sound absorption panelling to the internal bar to achieve reverberation time of 1.5 seconds (occupied). NRC 0.8 absorptive panels throughout the ceiling are recommended.	To minimize reverberation and noise build-up indoors.
5	**Noise Barriers** Wall/fence glass panels to be 2.4 m above the finished floor level surrounding the courtyards, according to actual plans.	To contain noise from outdoor crowd
Management		
6	From 10 pm any day until 7 am Monday to Saturday, and until 9 am on Sunday and public holidays: - Close all doors. - Reduce the sound level of the background music in the courtyards.	To meet the modelled terms
7	Limit good's deliveries to daytime hours (e.g. between 7am and 7pm, Monday to Saturday).	To reduce risk of cumulative venue noise.
8	Limit staff to undertake waste disposal (particularly glass) during daytime hours only (i.e. between 7am and 7pm, Monday to Saturday).	

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

APPENDICES

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway East Victoria Park, WA 6101

APPENDIX A: GLOSSARY

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway East Victoria Park, WA 6101

1 Sound Level or Noise Level

Sound consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. Noise is often used to refer to unwanted sound.

The human ear responds to changes in sound pressure over a very wide range. The loudest sound pressure to which the human ear responds is ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable range by using logarithms.

The symbols SPL, L or L_P are commonly used to represent Sound Pressure Level.

The symbol L_A represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2×10^{-5} Pa.

2 "A" Weighted Sound Levels

The overall level of a sound is usually expressed in terms of dB(A), which is measured using a sound level meter with an "A-weighting" filter. This is an electronic filter with a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dB(A) is a good measure of the loudness of that sound. Different sources having the same dB(A) level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB(A) change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels:

Typical noise levels and subjective scale

Sound Pressure Level dB(A)	Noise Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely loud
110	Grinding on steel	
100	Loud car horn at 3 m	Very loud
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (e.g. B, C and D) are less commonly used than A-weighting in environmental acoustics. Sound Levels measured without any weighting are referred to as "linear" and the units are expressed as dB(Lin) or dB.

3 Sound Power Level

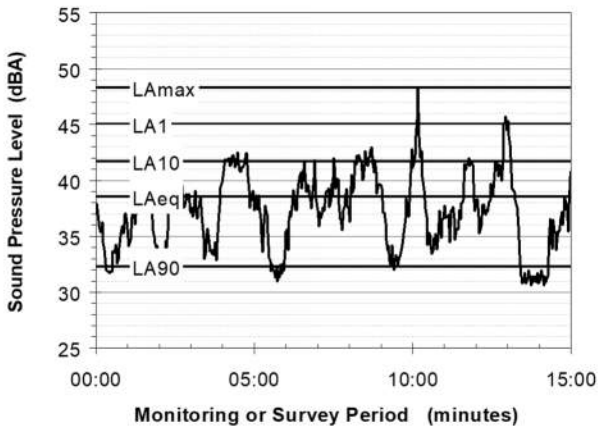
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units, and these may be identified by the symbols SWL or L_W. The Sound Power definitions expressed in dB are typically referenced to the acoustic energy unit 10^{-12} W.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

4 Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels L_{AN}, where L_{AN} is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the L_{A1} is the noise level exceeded for 1% of the time, L_{A10} the noise exceeded for 10% of the time.

The following figure presents a hypothetical 15-minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

L_{A90} The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

L_{Aeq} The A-weighted equivalent noise level (basically the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

When dealing with numerous days of statistical noise data, it is sometimes necessary to define the typical noise levels at a given monitoring location for a particular time of day. Standardized methods are available for determining these representative levels. Different jurisdictions would choose to define their own preferred Standard.

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway ▸ East Victoria Park, WA 6101

APPENDIX B: NOISE MODELLING CONTOURS

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway East Victoria Park, WA 6101

Proposed Tavern - Yanchep Central, Crn Marmion Av & Peony Blvd, Yanchep
Predicted Environmental Noise Emissions

J:\01 PER\02 MODELLING\JOBS SOUNDPLAN\
10.00561 Yanchep Tavern\

Project No: 10.00561
Consultant: MdlM
Date: 28/08/2023

SCENARIO 1: Max Capacity

- Indoor bar/lounge 425 patrons and Music
- Doors open
- Outoor Verandah and Courtyards 375 patrons
- Background Music in Verandah

- Reflective ground (Alpha = 0.1)
- Meteorological conditions:
  T = 10deg / RH = 50%

- Noise contours @ 1.5m above the ground

Legend

- Ground absorption
- Absorption areas
- Barrier
- Point source
- Surface source

Levels in dB(A)

< 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
66 - 69
>= 69

1 : 1654

0 10 20 40 60 80 m

N

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Proposed Tavern - Yanchep Central, Crn Marmion Av & Peony Blvd, Yanchep
Predicted Environmental Noise Emissions

J:\01 PER\02 MODELLING\JOBS SOUNDPLAN\
10.00561 Yanchep Tavern\

Project No: 10.00561
Consultant: MdlM
Date: 28/08/2023

SCENARIO 2: Max Capacity

- Indoor bar/lounge 425 patrons and Music
- Doors Close
- Outoor Verandah and Courtyards 375 patrons
- Background Music in Verandah

- Reflective ground (Alpha = 0.1)
- Meteorological conditions:
  T = 10deg / RH = 50%

- Noise contours @ 1.5m above the ground

Legend

- Ground absorption
- Absorption areas
- Barrier
- Point source
- Surface source

Levels in dB(A)

< 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
66 - 69
>= 69

1 : 1654

0 10 20 40 60 80 m

N

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Proposed Tavern - Yanchep Central, Crn Marmion Av & Peony Blvd, Yanchep
Predicted Environmental Noise Emissions

J:\01 PER\02 MODELLING\JOBS SOUNDPLAN\
10.00561 Yanchep Tavern\

Project No: 10.00561
Consultant: MdlM
Date: 28/08/2023

SCENARIO 3: Mechanical Plant

- Air conditioning unit
- Kitchen extraction fan

- Reflective ground (Alpha = 0.1)
- Meteorological conditions:
  T = 10deg / RH = 50%

- Noise contours @ 1.5m above the ground

Legend

- Ground absorption
- Absorption areas
- Barrier
- Point source
- Surface source

Levels in dB(A)

< 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
66 - 69
>= 69

1 : 1654

0 10 20 40 60 80 m

N

acoustics consultants AUSTRALIA

APPENDIX C: ACOUSTIC MARKUPS

PHONE (08) 6186 4122 EMAIL perth@acousticsconsultants.com.au
ADDRESS Suite 4A 755 Albany Highway East Victoria Park, WA 6101

NORTH-EAST PERSPECTIVE VIEW

SOUTH-WEST PERSPECTIVE VIEW