Bassendean Hotel Refurbishment

Acoustic Report

Development Application

Prepared for: Queenrise Corporation Pty Ltd

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Executive Summary

Stantec were commissioned by Queenrise Corporation Pty Ltd to undertake an acoustic assessment for the proposed refurbishment of the Bassendean Hotel, located on Old Perth Road in Bassendean WA.

The Development Application proposes the refurbishment of the interior of the existing building and the introduction of new outdoor bars, alfresco courtyard areas and a playground. The venue will trade day and night 7 days a week.

Noise impact from the proposed introduction of outdoor areas has been assessed to criteria in accordance with the *"WA Environmental Protection (Noise) Regulations 1997"* (EPNR).

Noise modelling was used to assess patron noise emissions from the alfresco areas (being the dominant source of noise outside the building) and recommendations have been made based on predicted results. A 3D noise model was developed using the software package SoundPLAN 8.2 to predict the noise impact of patron activity on the nearest sensitive receivers located on Old Perth Rd, Kenny St, Parker St and Wilson St.

Noise management measures have been provided for other noise sources associated with the development. The noise sources considered are:

- Patron activity;
- Music;
- Mechanical services equipment;
- Car parking;
- Loading bays;
- Playground; and
- Waste collection and rubbish disposal.

In determining the impact on the acoustic amenity of the area, the existing acoustic environment must be considered. Noise emissions from the refurbished venue should be managed such that they do not increase above current levels. Stantec are not aware of any noise complaints against the venue in its current operation.

In summary, in view of the available information, we consider that the refurbishment and proposed expansion of the Bassendean Hotel will be able to comply with the EPNR. The predictions in this report consider that the assumptions, building recommendations and noise management measures provided will be implemented.

1. Introduction

Stantec were commissioned by Queenrise Corporation Pty Ltd to undertake an acoustic assessment for the proposed refurbishment of the Bassendean Hotel, located on Old Perth Road in Bassendean WA.

The Development Application proposes the refurbishment of the interior of the existing building and the introduction of new outdoor bars, alfresco courtyard areas and a playground. The venue will trade day and night 7 days a week.

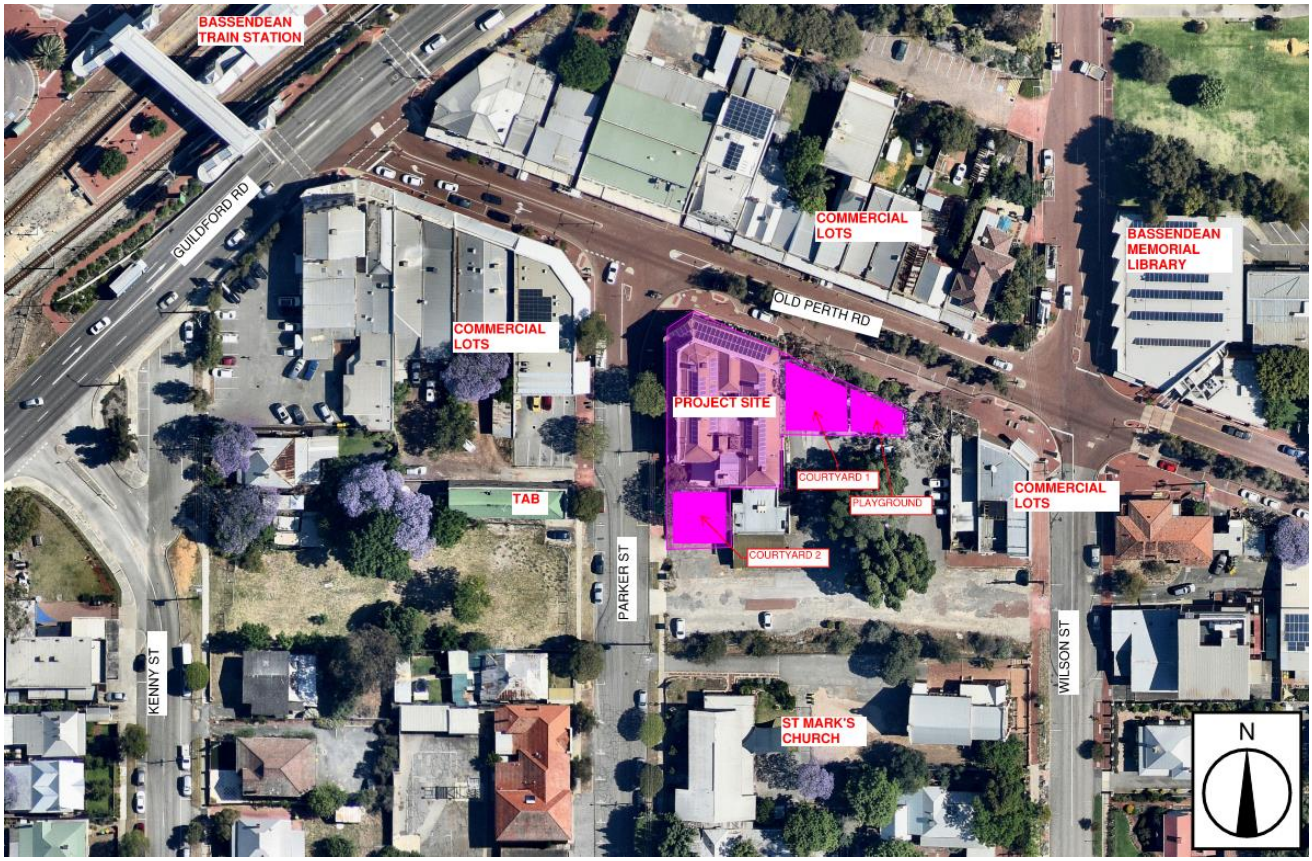
This report has been prepared as part of supporting documentation pertaining to the Development Application for the project. The noise regulations applicable to the project are the *"WA Environmental Protection (Noise) Regulations 1997"* (EPNR).

1.1 Site Description

The site is located on the corner of Old Perth Rd and Parker St in Bassendean, being approximately 100m east of Guildford Rd and the Bassendean passenger train station.

The project location and surrounds are indicated in Figure 1. New alfresco areas are shown in solid magenta.

The project site is largely surrounded by commercial developments, being located in a town centre area, with residentially zoned areas to the south.



Source: Nearmaps / Google Maps

Figure 1: Project Location

1.2 Scope Limitations

The following items are not part of this scope of work:

- Internal acoustic aspects of the building (e.g. internal noise levels, reverberation time);
- Construction noise and vibration management; and
- Provision or update of an operational noise management plan for the hotel.

2. Acoustic Criteria

2.1 Environmental Noise Emissions

Environmental noise impacts resulting from the noise emissions from the project are addressed through the Environmental Protection Act 1986, with the regulatory requirements detailed in the Environmental Protection (Noise) Regulations 1997 (EPNR).

The EPNR establishes the maximum permissible noise emission levels (assigned levels) to be received at all adjacent noise-sensitive premises during specific periods of the day as a result of the cumulative noise emissions from all sources proposed for the project site. Compliance to relevant noise limits outlined in the EPNR is compulsory.

The EPNR states noise emissions from any premises are considered not to *significantly contribute to* the noise at a receiver if the noise emissions are 5 dB or below the assigned levels.

In brief, the assigned levels are determined by considering of the amount of commercial and industrial zones, as well as main transport corridors and sporting venues surrounding the noise sensitive premises. In addition, the Environmental Protection (Noise) Regulations 1997 identify the following in Schedule 3, clause 2A:

"If the land within either of the circles is categorised on the land use map as land in respect of which mixed uses are permitted, the use of that land that results in the highest influencing factor is to be used in the determination of the influencing factor."

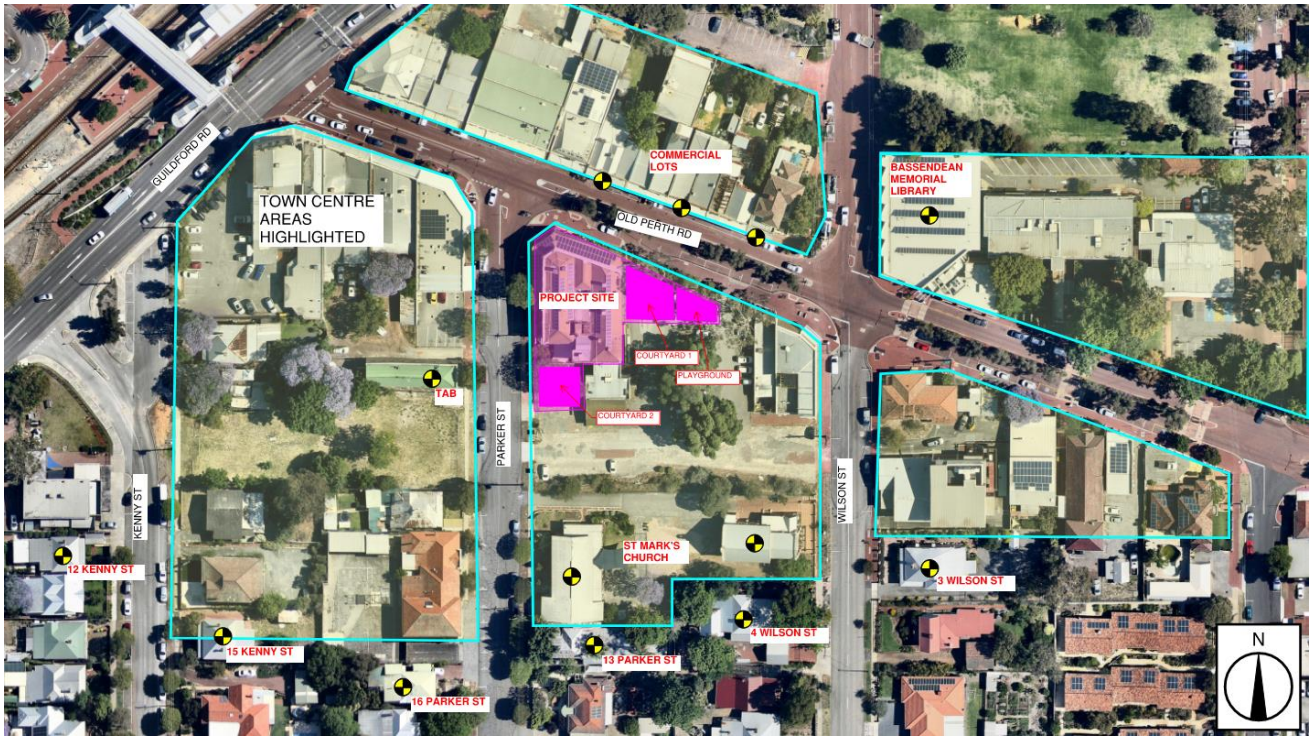
Town of Bassendean Local Planning Scheme Maps No. 1 & 2 (dated 11 January and 09 July 2019 respectively) were accessed via the WA Department of Planning Lands and Heritage website and were used in the determination of the influencing factor. The maps show the zoning of the area around the project site with reference to Local Planning Scheme 10 (LPS4) and the Metropolitan Regional Scheme (MRS).

The immediate area of the site is zoned as a 'Town Centre' area, surrounded by commercial or mixed-use developments, with residentially zoned premises further south along Kenny, Parker and Wilson streets. Residentially zoned areas will be considered as noise sensitive premises in highly sensitive areas, while areas zoned as 'Town Centre' will be considered as noise sensitive premises in 'areas other than highly sensitive areas', which per the EPNR have the same criteria as commercial developments (Table 2). Stantec believe that these criteria are appropriate for a vibrant Town Centre area.

The nearest noise sensitive receivers in the vicinity of the project are identified in Table 1 and shown in Figure 2.

Table 1: Noise sensitive receivers

Receiver	Zoning
Residences at 12 & 15 Kenny St	Residential
Residences at 13 & 16 Parker St	Residential
Residences at 3 & 4 Wilson St	Residential
St Mark's Anglican Church (2 Wilson St)	Town Centre
Bassendean Memorial Library (46 Old Perth Rd)	Town Centre
Commercial developments along Old Perth Rd	Town Centre



Source - Nearmaps

Figure 2: Nearby noise sensitive receivers and town centre areas

2.1.1 Assigned Levels

Table 2 summarises the assigned levels at the nearest noise sensitive premises. For highly sensitive areas, this includes an Influencing Factor (IF) as described in Section 2.1.2. It is required that all noise emissions from the development are below the assigned level criteria for all defined periods of the day and at the lot boundary of the receiver or 15m from any associated building.

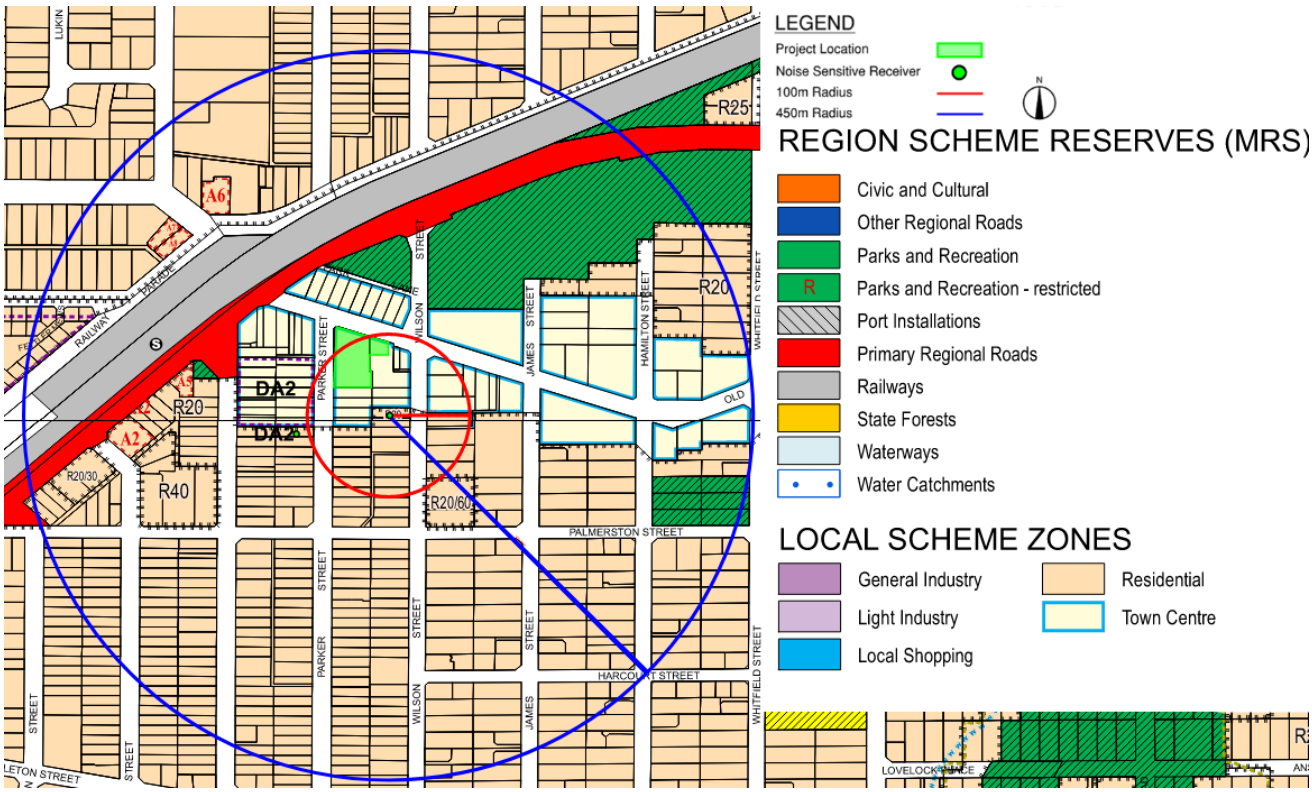
Table 2: Assigned levels

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	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday & 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 & public holidays	35 + IF	45 + IF	55 + IF
Noise sensitive premises: any area other than highly sensitive areas	All Hours	60	75	80
Commercial premises	All Hours	60	75	80
Industrial and utility premises	All Hours	65	80	90

2.1.2 Influencing Factor

The influencing factors for the residential premises identified above are 4 – 7 dB, as summarised in Table 4. This results from identifying major roads and land zoning types surrounding the premises.

Figure 3 indicates the land use zones surrounding 4 Wilson St.



Source: WA Department of Planning, Lands and Heritage

Figure 3: Zoning map of areas surrounding receiver at 4 Wilson St

Traffic data for roads surrounding the nearest noise sensitive receiver were obtained from Main Roads Western Australia (MRWA) on the 30th November 2020. The available traffic data has been presented in Table 3. Guildford Rd is identified as the nearest major transport corridor, with data for other minor roads within 450m of the site not recorded by MRWA.

Table 3: Traffic count data (MRWA)

Transport Corridors	EPNR Classification [1)]	Average Daily Traffic Volumes				
		2015/16	2016/17	2017/18	2018/19	2019/20
Guildford Rd (West of West Rd)	Major Road	-	-	-	20,142	-

1) As defined by the EPNR. Secondary roads have between 6000-15000 vehicles per day. Major roads have greater than 15000 vehicles per day.

Table 4: Influencing factor (IF) for noise sensitive (residential) receivers

Noise Sensitive Premises	Commercial Zones	Industrial Zones	Transport Corridors / Sporting Venues	Influencing Factor
12 Kenny St	19 % within 100m radius 7 % within 450m radius	0 % within 100m radius 0 % within 450m radius	Guildford Rd (major road) in inner circle	7 dB
15 Kenny St	25 % within 100m radius 8 % within 450m radius	0 % within 100m radius 0 % within 450m radius	Guildford Rd (major road) in outer circle	4 dB
13 Parker St	31 % within 100m radius 9 % within 450m radius	0 % within 100m radius 0 % within 450m radius	Guildford Rd (major road) in outer circle	4 dB
16 Parker St	33 % within 100m radius 8 % within 450m radius	0 % within 100m radius 0 % within 450m radius	Guildford Rd (major road) in outer circle	4 dB
3 Wilson St	36 % within 100m radius 9 % within 450m radius	0 % within 100m radius 0 % within 450m radius	Guildford Rd (major road) in outer circle	4 dB
4 Wilson St	27 % within 100m radius 12 % within 450m radius	0 % within 100m radius 0 % within 450m radius	Guildford Rd (major road) in outer circle	4 dB

2.1.3 Noise Character Adjustments

Regulation 7 states that the noise character must be “free” of annoying characteristics, namely —

- Tonality, e.g. whining, droning;
- Modulation, e.g. like a siren; and
- Impulsiveness, e.g. banging, thumping.

Regulation 9 (1) establishes the methodology for determining noise characteristics. If these characteristics cannot be reasonably and practicably removed, a series of adjustments to the measured levels are required, indicated in Table 5 .

Table 5: Noise character adjustment

Adjustment where noise emission is not music these adjustments are cumulative to a maximum of 15 dB			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

2.1.4 Noise Emissions from Mechanical Services

Typically, projects of this type involve noise emissions from mechanical services such as air conditioning units, refrigeration condensers and mechanical plant.

It is important that noise emissions from the site do not present any form of tonality, modulation or impulsiveness (as defined by the EPNR).

Given that data from mechanical plant manufacturers is generally limited to broadband data or in 1/1 octave band value, it is not possible to objectively determine tonality, as it is described in the EPNR. 1/3 octave band data is required yet is typically unavailable.

Therefore, a -5 dB penalty shall be conservatively assigned to the noise criteria when assessing noise emissions from mechanical equipment.

As the mechanical design is still in progress, mechanical plant selections will be reviewed in the later stages of design to ensure compliance to the EPNR.

3. Predictive Noise Assessment

Noise emissions from the proposed development will be primarily due to:

- Music and patron activity;
- Mechanical equipment; and
- Waste collection and rubbish disposal.

3.1 Noise Model Scenario

3.1.1 Operating Hours

Trading hours of the proposed development will be defined in its liquor license. Indicative operating hours for the refurbished Hotel are summarised in Table 6. These hours span the day, evening and night-time periods of the EPNR. Night-time operations and maximum patronage in the outdoor areas will be considered as a worst-case scenario for noise emissions.

Table 6 : Operating Hours

Day	Open	Close
Monday to Sunday	10 AM	12 Midnight

3.2 Noise Model Inputs

Noise emissions from the outdoor area were calculated using 3D noise modelling software (SoundPLAN 8.2).

ISO 9613-2:1998 industry noise propagation standard has been used for the noise model predictions. The noise model has taken into account noise source levels, distance from sources to receivers and screening effects due to the existing buildings, retaining walls/terrain effects and proposed outdoor bars.

Receivers
All noise receivers were located at 1.4 m above ground or each floor level and 1 m away from the receiving façade. Reflected noise from the building façade is included in the received noise levels.

Topography
Ground topography of the area surrounding the project site has been sourced from Geoscience Australia, '*5 Metre Digital Elevation Model (DEM) of Australia derived from LiDAR*' and processed with QGIS 3.6 software for use in SoundPLAN 8.2.

As the alfresco areas are intended to be partially or fully sunken, topographical data in these areas (Courtyard 1, Playground and Courtyard 2) was modified to represent the intended landscaping that forms part of the project.

A ground absorption coefficient of 0.6 was used to suit suburban conditions, which is in between a soft ground condition (1) and reflective ground condition (0).

Patron Noise Levels
A predictive desktop study has been undertaken to determine the impact of patrons in the new alfresco areas on the nearest noise sensitive receivers. Patron activity in the outdoor areas is expected to have a significantly greater noise impact on the nearest noise sensitive receivers than patron noise from within the building.

It is noted that patrons are able to move freely between the venue's indoor and outdoor areas. The maximum capacity of patrons in the alfresco areas has been considered as the worst-case scenario for environmental noise emissions.

Patrons were assumed to be evenly distributed around the alfresco areas and predominantly seated. Patrons were represented by area noise sources at heights of 0.8m.

The following papers were considered for the computation of Sound Power Levels of patrons in the alfresco areas:

1. Australian Acoustical Society (Western Australian Division), Technical Meeting 10 Mar 2016 on the topic of "Crowd Noise Sound Power Level for Alfresco Areas / Beer Gardens." (refer Appendix C);
2. Technical research paper "Prediction of Noise from Small to Medium Sized Crowds", (Hayne et al., Nov 2011, *Proceedings of Acoustics*, Conference Gold Coast Australia, pp. 133-140);
3. Association of Australian Acoustical Consultants, AAAC, 2019. "Licenced Premises Noise Assessment Technical Guideline". Version 1.0; and
4. J H Rindle, 2015, "The Acoustics of Places for Social Gatherings", Proceedings of EuroNoise, Maastricht.

Table 7 presents the relevant L_{10} Sound Power Level (SWL) formulae for 'N' number of patrons from each reference above, with appropriate corrections where the formula predicts the L_{eq}.

Table 7: Sound Power Level prediction formulae for 'N' number of patrons

Ref.	L_{10} SWL Formula	Comments
1	91 + 10.Log (N/100) + 3	Paper presents L_{eq} SWL of 100 patrons in alfresco area. Correction of +3 dB per Ref.2 for L_{10} SWL. Logarithmic average of 5 acoustic consultants' data, excluding the highest and lowest values.
2	15.Log (N) + 67 – 3	Paper presents L_{10} SWL formula of up to 100 patrons in a typical outdoor social setting. Correction of -3 dB for random orientation of patrons, per paper.
3	87 + 10.Log (N/100) + 3	Based on Table 1 Talker L_{WA} of 100 patrons (Scenario N). Correction of +3 dB per Ref.2 for L_{10} SWL. Patron SWLs include indoor room effects.
4	76 + 10.Log (N) + 3	Paper presents L_{eq} SWL for a single patron. Correction of +3 dB per Ref.2 for L_{10} SWL. Patron SWLs include indoor room effects.

Based on the literature review, References 1 and 2 address outdoor area patron noise, which excludes room effects that are not applicable to outdoor areas. The method in Reference 2 was selected to calculate the L_{10} Sound Power Level of patrons, as it presents a direct L_{10} formula with spectral data, provides a correction value for random orientation of sources and is applicable to outdoor social settings. In addition, the formula outputs a value in the middle of the range of papers reviewed.

The predicted Sound Power Level of patrons in the alfresco areas are summarised in Table 8. As a worst-case for noise emissions, the maximum allowable number of patrons for each area has been used. Typical spectrum is from Reference 2.

Table 8: Patron Noise Levels used in Predictive Assessment

Noise Source	Sound Power Level, L_{10} dBA	1/1 Octave Band Sound Power Level (dB)					
		250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Courtyard 1 – 185 Patrons	**98**	84	85	88	91	92	93
Courtyard 2 – 209 Patrons	**99**	84	86	89	92	93	93

As music in the alfresco areas is to be ambient in nature only, the contribution of music noise at the receiver is considered to be insignificant compared to patron noise levels. Document 2 also notes that larger crowds of patrons tend not to exhibit tonal characteristics, hence no adjustments to the received noise level for intrusive characteristics have been applied.

Music and Patron Noise within the Building

It is expected that patron noise from within the building will be adequately attenuated by the external façades, with the contribution to received noise emissions being insignificant compared to the noise from music and patrons in the alfresco areas.

During the refurbishment of the building, the following actions should be taken:

- Doors should be fitted with acoustic perimeter and drop seals; and
- Existing door and window seals should be checked to ensure there are no paths of noise leakage present.

Any amplifier / PA system used must be calibrated in level such that noise emissions from within the building do not become dominant at the site boundary. This should be determined by site measurements.

Given these considerations and the prescribed managements measures (Section 4.1), this noise source has not been included in the model.

Outdoor Music Noise
Music is expected to be present in the alfresco areas through the use of outdoor speakers.

Music must be at a 'conversational' level only and not be audible at nearby receivers.

Note that where the noise received at a premises is music, adjustments to the received level are required when assessing compliance to the EPNR. Should music become audible and dominant, adjustments of +10 to 15 dB are required per Table 5. This would likely result in non-compliance to the EPNR.

Noise management measures to control music emissions have been provided in Section 4.1. This source has therefore not been considered in the noise model.

Mechanical Services Noise
Mechanical services noise must comply with the EPNR criteria at all receivers and at all times of the day.

Assuming that mechanical plant will be selected/attenuated such that compliance with the EPNR will be achieved, it has not been considered in the noise model.

Treatment to mechanical services vents may be required such that noise emanating from within the building is adequately attenuated.

Noise Barriers

The slightly less elevated alfresco areas have been included in the noise model.

The following minimum changes in elevation are required around the sunken courtyards to produce an adequate barrier effect, to the extent shown in Figure 4:

- Courtyard 1 / Playground – retaining wall/ solid barrier to a minimum height of 1.5m above courtyard floor level;
- Courtyard 2 – retaining wall/ solid barrier to a minimum height of 2.5m above courtyard floor level.

This may be achieved through the planned landscaping (with retaining walls shielding the courtyards at lower elevation) and/or the provision of solid noise barriers. Adequate construction for solid noise barriers would include 90mm brick masonry or a solid continuous fence with minimum 15 kg/m^2 surface mass.

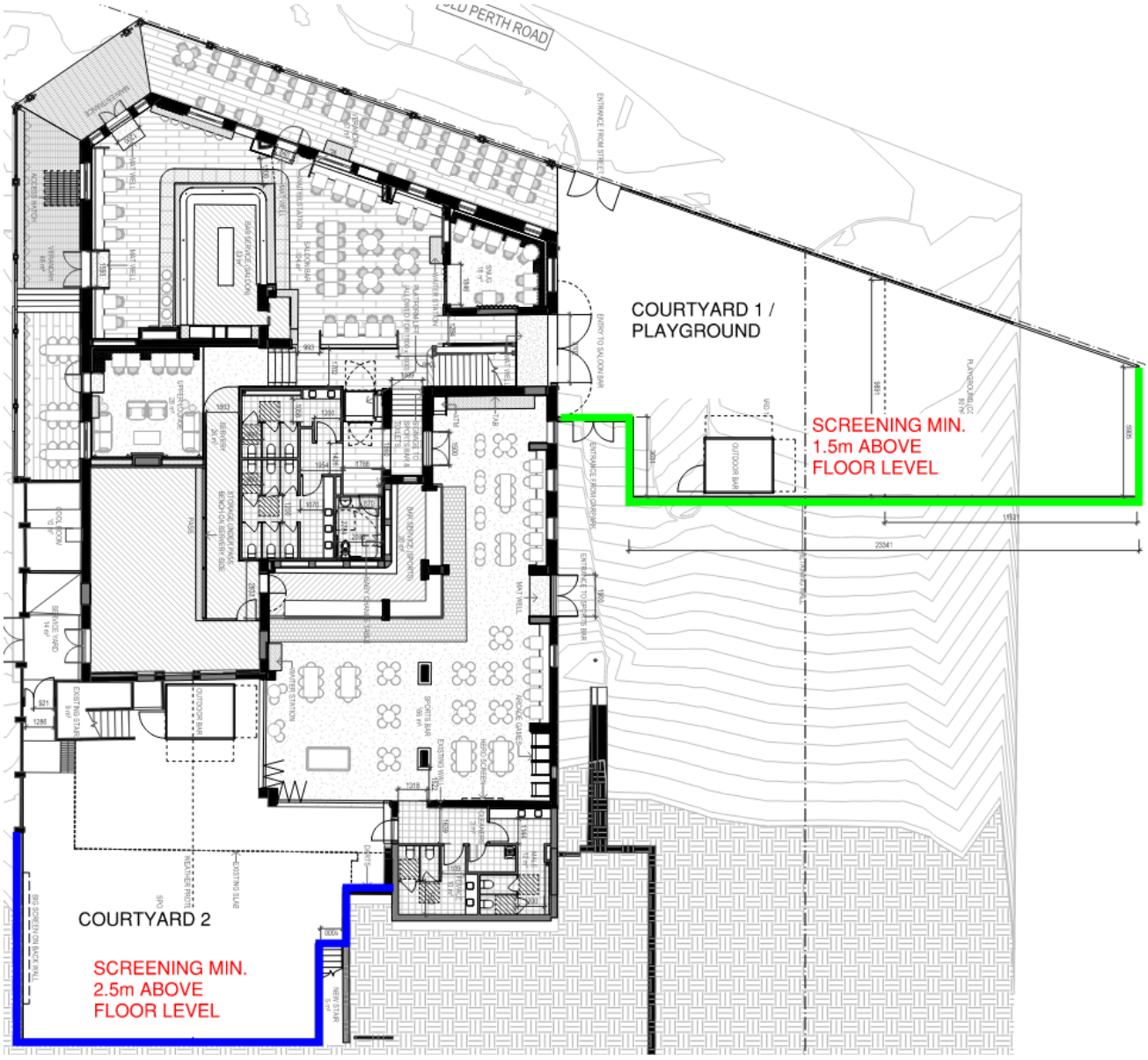


Figure 4: Extent of screening required

3.3 Noise Model Results

3.3.1 Patron Noise

The noise emissions from patrons have been modelled to predict the impact on the nearest sensitive receivers. As a worst-case, the maximum allowable patronage in Courtyards 1 and 2 has been assessed against the night-time criteria of the EPNR.

The predicted noise levels are summarised in Table 9, with noise contours provided in Appendix B.

Table 9: Predicted alfresco area patron noise levels

Nearest Sensitive Receiver	Zoning	Predicted Noise Level dB(A)	EPNR Night-time Criteria L_{10} dB(A)	EPNR L_{10} Comparison
12 Kenny St	Residential	35	42	**Complies**
15 Kenny St	Residential	33	39	**Complies**
13 Parker St	Residential	37	39	**Complies**
16 Parker St	Residential	36	39	**Complies**
3 Wilson St	Residential	37	39	**Complies**
4 Wilson St	Residential	39	39	**Complies**
32 – 34 Old Perth Rd	Town Centre	60	60	**Complies**
26 – 32 Old Perth Rd	Town Centre	59	60	**Complies**
St Mark's Church	Town Centre	54	60	**Complies**
Bassendean Memorial Library	Town Centre	51	60	**Complies**

As the maximum number of patrons in the alfresco areas are predicted to comply with the EPNR in a night-time scenario, compliance is also expected in the less stringent day and evening times.

Noise management measures should be put in place to ensure music noise is not dominant at the site boundary.

3.4 Acoustic Amenity Impact

The impact on the acoustic amenity of the area will be determined by the change in existing noise levels, if any, due to the proposed development. Noise emissions from the refurbished venue should be managed such that they do not increase above current levels. Stantec are not aware of any noise complaints against the venue in its current operation.

Based on predicted noise emissions, patron noise from the project is not expected to have a significant impact on the acoustic amenity of the community. Noise management measures for music in the new alfresco areas should be included in the venue's noise management plan.

4. Noise Management

This section presents noise management measures that may be relevant for inclusion in the venue noise management plan.

The key objective of noise management is to actively engage with affected properties to address the amenity impacts of noise emissions from the development, to the greatest practical extent possible.

Achieving this objective should minimise the number of complaints received, which reduces the likelihood of ongoing issues and compliance investigations.

The venue noise management plan should:

- Identify noise emission sources from this venue;
- Establish appropriate noise management measures to reduce amenity impacts as far as practicable;
- Target compliance with the Environmental Protection (Noise) Regulations 1997; and
- Encourage engagement with nearby noise sensitive premises on managing noise impacts.

The approach is to provide for ongoing dialogue, communication and mitigations with potentially affected residents, in the context of the intended use of the development.

4.1 Patrons and Music

It is critical that any music from the venue be level calibrated such that music noise is inaudible at all nearby receivers.

Any amplifier / PA system used should have known output sound levels indicated on the controls to assist in ensuring the amplified sound is kept within acceptable limits at nearby receivers. The limits should be set based on field measurements at nearby sensitive premises.

It is recommended that any amplifier / PA system incorporate a frequency equalizer that is set to control low frequency sound (bass).

The following indicative patron numbers have been predicted to comply with the EPNR:

- 185 patrons in the Courtyard 1 and verandah areas;
- 209 patrons in the Courtyard 2 area; and
- The noise from any amplifier / PA system (within the building and/or in alfresco areas) is to be calibrated by field measurements, limited so as not to exceed the set levels and made tamper proof.

Given the movement of patrons between indoor and outdoor areas, noise emissions from the venue should be managed, ensuring that they do not become a dominant source of noise at the site boundaries at any time.

In addition, the following administrative controls are recommended:

- The venue amplifier / PA system should be locked away, accessible by management only; and
- Venue staff are to monitor dispersal of patrons after closing and manage any noise issues arising.

4.2 Mechanical Plant

The design should ensure that mechanical plant selected for the development is the quietest possible, is located away from noise sensitive premises and shielded and/or attenuated as required to meet the assigned levels of the EPNR.

The development is expected to use the following typical plant:

- Refrigeration condensers;
- Kitchen extract fans; and
- Condenser units.

The existing plant deck (shown in Figure 5) is intended to be used for new air conditioning condensers. Kitchen extract fans and refrigeration condenser locations are to be advised by the kitchen consultant.

Figure 5: Rooftop plant deck

4.3 Car Parking

Patrons are encouraged to use the existing available parking facilities available on the site and consider public transport options.

Given the location of the development in a Town Centre area and proximity of the Bassendean train station within 150m of the site, the impact on premises near the site is expected to be minimal.

4.4 Loading Bay

It is expected that the existing loading bay outside the venue on Parker St will be continued to be used. Loading bay usage should be limited to daytime hours Monday to Saturday where possible.

4.5 Waste Collection

4.5.1 Refuse and Recycling Collection

The follow administrative measures are recommended:

- Where possible, in communication with the Town of Bassendean, endeavor to have waste and recycling collected after 7 am, as this is the 'daytime' period of the EPNR and may be less of a disruption to local residents;
- An effort should be made to avoid the waste collection and recycling trucks being on site at the same time;
- If a truck is waiting in the carpark for bin access, the engine should be switched off; and
- Glass recycling trucks should not crush the bottles on premises but rather at a less noise sensitive location.

4.5.2 Emptying of Bins

The emptying of bins, especially when filled with glass bottles, can be an occupational peak noise hazard to the operator, as well as significant source of environmental noise.

The follow administrative measures are recommended:

- Venue staff should take care to reduce the drop height of glass onto glass when filling bins; and
- The handling of bins full of glass bottles should occur during daytime hours where possible to minimise disruption to the community.

4.6 Playground

Playground noise emissions due to children playing were predicted via a desktop study.

The cumulative Sound Power Level of groups of children playing has been sourced from the '*Guideline for Child Care Acoustic Assessment', Association of Australian Acoustical Consultants, 2013*.

Mixed ages were used, with the mid-point of the stated Sound Power Level range selected for each age group. The resultant Sound Power Level for a group of 25 children aged between 0 – 6 years is 89 dBA. As this is approximately 10 dB below predicted patron Sound Power Levels, noise emissions from the playground are not expected to contribute significantly to overall noise levels.

5. Conclusion

Stantec were commissioned by Queenrise Corporation Pty Ltd to undertake an acoustic assessment for the proposed refurbishment of the Bassendean Hotel, located on Old Perth Road in Bassendean WA.

The Development Application proposes the refurbishment of the interior of the existing building and the introduction of new outdoor bars, alfresco courtyard areas and a playground. The venue will trade day and night 7 days a week.

A 3D noise model was developed using the software package SoundPLAN 8.2, with noise emissions assessed for maximum patronage in the new alfresco areas. Noise emissions from patrons have been assessed to comply with the EPNR criteria and not have a significant impact on acoustic amenity. Any increase in area noise levels due to the refurbishment shall be assessed by measurement and controlled using the provided management measures.

Noise management measures have been provided and are particularly relevant for “night-time”. The venue operator must ensure that noise emissions from the proposed development do not increase noise levels at the nearest noise sensitive receivers.

Appendix A Glossary of Acoustic Terms

NOISE	
Acceptable Noise Level:	The acceptable LAeq noise level from industrial sources, recommended by the EPA (Table 2.1, INP). Note that this noise level refers to all industrial sources at the receiver location, and not only noise due to a specific project under consideration.
Adverse Weather:	Weather conditions that affect noise (wind and temperature inversions) that occur at a particular site for a significant period of time. The previous conditions are for wind occurring more than 30% of the time in any assessment period in any season and/or for temperature inversions occurring more than 30% of the nights in winter).
Acoustic Barrier:	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ambient Noise:	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment Period:	The period in a day over which assessments are made.
Assessment Location	The position at which noise measurements are undertaken or estimated.
Background Noise:	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level.
Decibel [dB]:	The units of sound pressure level.
dB(A):	A-weighted decibels. Noise measured using the A filter.
Extraneous Noise:	Noise resulting from activities that are not typical of the area. Atypical activities include construction, and traffic generated by holidays period and by special events such as concert or sporting events. Normal daily traffic is not considered to be extraneous.
Free Field:	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground
Frequency:	Frequency is synonymous to pitch. Frequency or pitch can be measured on a scale in units of Hertz (Hz).
Impulsive Noise:	Noise having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent Noise:	Level that drops to the background noise level several times during the period of observation.
LAmax	The maximum A-weighted sound pressure level measured over a period.
LAmin	The minimum A-weighted sound pressure level measured over a period.
LA1	The A-weighted sound pressure level that is exceeded for 1% of the time for which the sound is measured.
LA10	The A-weighted sound pressure level that is exceeded for 10% of the time for which the sound is measured.
LA90	The A-weighted level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq	The A-weighted “equivalent noise level” is the summation of noise events and integrated over a selected period of time.

LAeqT	The constant A-weighted sound which has the same energy as the fluctuating sound of the traffic, averaged over time T.
Reflection:	Sound wave changed in direction of propagation due to a solid object met on its path.
R-w:	The Sound Insulation Rating R-w is a measure of the noise reduction performance of the partition.
SEL:	Sound Exposure Level is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound Absorption:	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound Level Meter:	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Pressure Level:	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level:	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise:	Containing a prominent frequency and characterised by a definite pitch.

Appendix B Noise Contours

Bassendean Hotel Refurbishment

301248343
2/12/2020
BEM

COURTYARD 1 & 2
MAXIMUM PATRONAGE

NOISE CONTOUR AT
1.5m RECIEVER HEIGHT

Noise level
in dB(A)

	< 39.0
39.0 <=	< 42.0
42.0 <=	< 45.0
45.0 <=	< 48.0
48.0 <=	< 51.0
51.0 <=	< 54.0
54.0 <=	< 57.0
57.0 <=	< 60.0
60.0 <=	< 63.0
63.0 <=	< 66.0
66.0 <=	< 69.0
69.0 <=	< 72.0
72.0 <=	< 75.0
75.0 <=	< 78.0
78.0 <=	

0 7 14 21 28 35 m

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Appendix C AAS Technical Meeting Note Mar '16

Australian Acoustical Society

A.C.N. 000 712 658

WESTERN AUSTRALIAN DIVISION

CROWD NOISE SOUND POWER LEVEL FOR ALFRESCO AREAS / BEER GARDENS

The following Sound Power Levels (L_{eq}) were provided by members for a crowd of 100 patrons within an external area of a licenced venue:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	dB(A)
Consultant 1	-	76.3	83.5	87.0	83.7	79.7	74.2	68.8	**88.2**
Consultant 2	73.4	79.9	84.6	88.7	85.2	80	74.4	69.1	**89.5**
Consultant 3	-	-	-	-	-	-	-	-	**90.0**
Consultant 4	72.6	73.6	83.6	90.6	88.6	82.6	78.6	73.6	**92.1**
Consultant 5	-	-	-	-	-	-	-	-	**98.0**
Log average of all									**93**
Log average, excluding highest and lowest values									**91**
Hayne et all (draft AAAC Guideline)[1]									**94**

[1] Hayne, MJ, Taylor, JC, Rumble RH & ME, DJ 2011, "Prediction of Noise from Small to Medium Sized Crowds", *Proceedings of Acoustics 2011*, Conference Gold Coast Australia, pp. 133-140

Tonality

Generally not evident with high patron numbers, but potentially evident with small numbers (eg < 20)?

Modelling

Modelled as a plane source, or a point source? Modelled at average height between seated and standing patrons?

Technical meeting – March 10 2016

Design with
community in mind

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For more information please visit
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