MARSHALL DAY Acoustics

BAYVIEW HOTEL & RESTAURANT DEVELOPMENT APPLICATION NOISE ASSESSMENT

Rp 001 20240298 | 15 April 2024

Marshall Day Acoustics Pty Ltd
ABN: 53 470 077 191
6/448 Roberts Road
Subiaco WA 6008
T: +618 9779 9700
www.marshallday.com

Project: **BAYVIEW HOTEL & RESTAURANT**

Prepared for: **Bayview Hotel & Restaurant**
275 Bayview Road
Gap Ridge WA 6714

Attention: **Neal Guilmartin**

Report No.: **Rp 001 20240298**

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Submitted	-	-	15 Apr. 2024	B. Beverley	B. Wilson

TABLE OF CONTENTS

1.0 INTRODUCTION

It is proposed to redevelop the existing Balmoral Caravan Park at Lot 2654 (No. 275) Bayview Road, Gap Ridge, Karratha. The proposed development includes new licensed premises, as well as upgrades to the accommodation and facilities across the site.

Marshall Day Acoustics (MDA) has been engaged by Bayview Hotel Karratha Pty Ltd to undertake a noise assessment as part of the Development Application (DA) to the City of Karratha.

This report provides an overview of the acoustic considerations associated with the project, including potential noise impacts from the licensed premises to the surrounding area. Acoustic treatment design advice and guidance is provided to demonstrate that compliance with the *Environmental Protection (Noise) Regulations 1997* can be achieved.

A glossary of acoustic terminology used throughout this report is included in Appendix A.

2.0 DEVELOPMENT DESCRIPTION

2.1 Site location and surrounds

The proposed development is for Lot 2654 (No. 275) Bayview Road, Gap Ridge, which is located approximately 3 km west of the Karratha town centre.

An aerial image of the site and surrounds is provided in Figure 1.

Figure 1: Aerial image of site location (Image: Nearmap)

The site is zoned Tourism and is surrounded by land zoned Parks, Recreation and Drainage to the north, east and south. Land to the west across Bayview Road is zoned Residential.

An extract from the Local Planning Scheme Map is included in Appendix B.

2.2 Development features

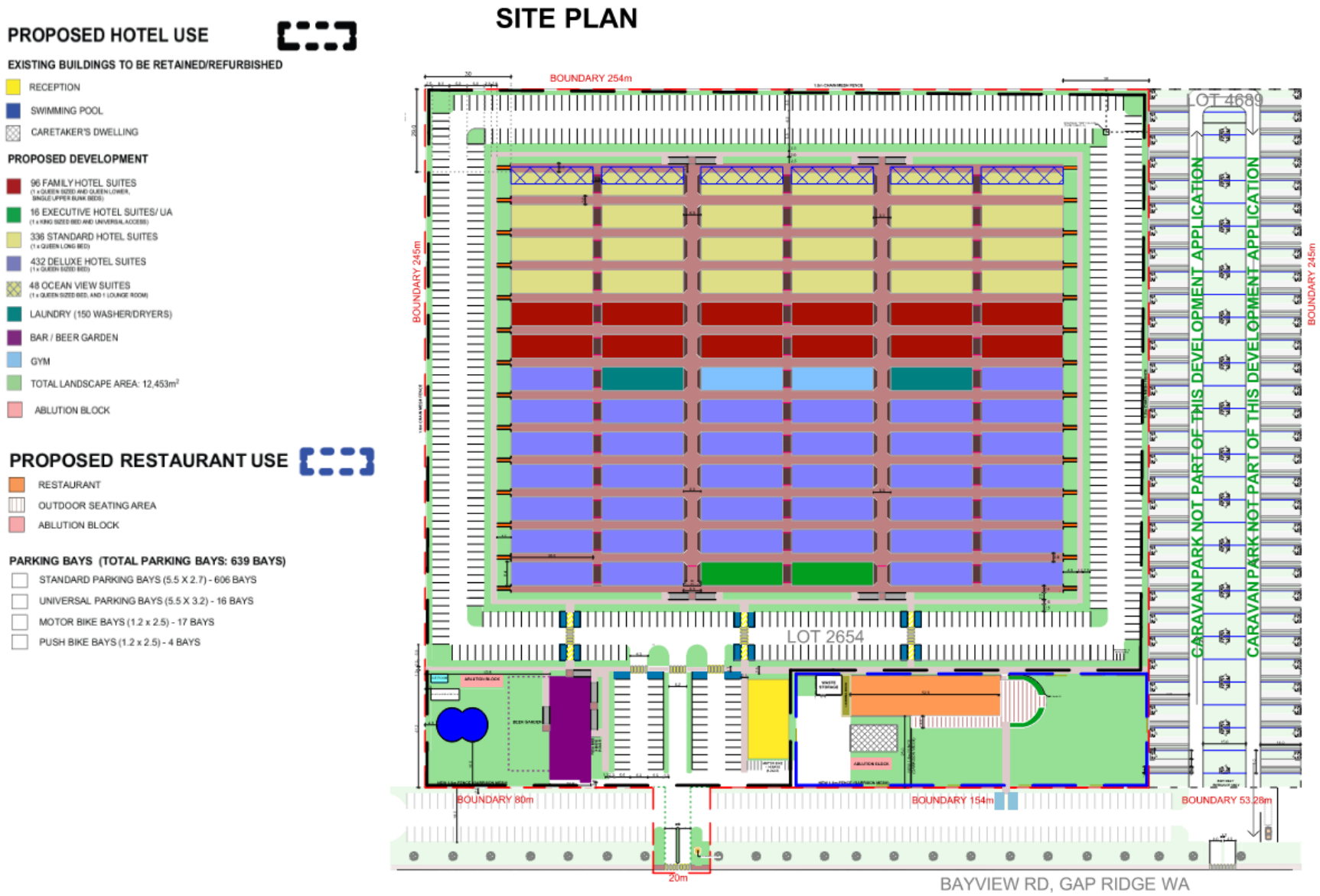
It is proposed to redevelopment the existing Balmoral Caravan Park, comprising:

- Demolition of existing park homes, ablution blocks and related amenities;
- Retention and refurbishment of existing swimming pool, reception area and caretakers dwelling;
- Guest accommodation consisting of 928 rooms, sited within 74 buildings;
- Associated resort amenities (gym, laundry);
- A new licensed bar and beer garden;
- A new restaurant; and
- The associated areas of car parking, access and landscaping.

2.2.1 Site layout and design

The proposed site plan is shown in Figure 2. Floorplans are included in Appendix D.

Figure 2: Site plan



2.3 Licensed premises operations

The bar and restaurant are proposed to be licensed premises, operating between 1100 hours and 2200 hours Monday to Sunday.

The expected capacity is approximately 400 patrons across both licensed premises. The distribution of patrons outlined in Table 1 has been assumed for noise modelling purposes.

Table 1: Venue spaces and indicative functional number of patrons

Venue	Location	Patrons
Bar and Beer Garden	Internal	50
	External	100
Restaurant	Internal	200
	External	50

2.4 Potential noise sources

Key noise aspects of the current design that are relevant from a planning perspective include:

- Patron noise from the licensed premises spaces listed in Table 1.
- Building services plant noise emissions from external plant equipment such as exhaust fans, air conditioning and refrigeration condenser units.
- Forklifts operating on site.
- Vehicles and patrons in the carpark.
- Deliveries and waste collection activities.

The above sources have been considered in this assessment and are addressed below.

2.5 Existing noise environment

A background noise measurement survey has not been carried out at the site, however, based on the aerial photographs and surrounding land uses, the noise environment is likely to be categorised predominately by traffic along Bayview Road (7,053 vehicles per day[1]), intermittent aircraft noise from the Karratha Airport, as well as natural sources including wind generated noise and bird song.

[1] Traffic data obtained from Main Roads WA. Refer to Appendix B for further details.

2.6 Nearest receivers

The nearest noise sensitive receivers considered in this assessment are described in Table 2, with reference to Figure 3.

Figure 3: Nearest receivers

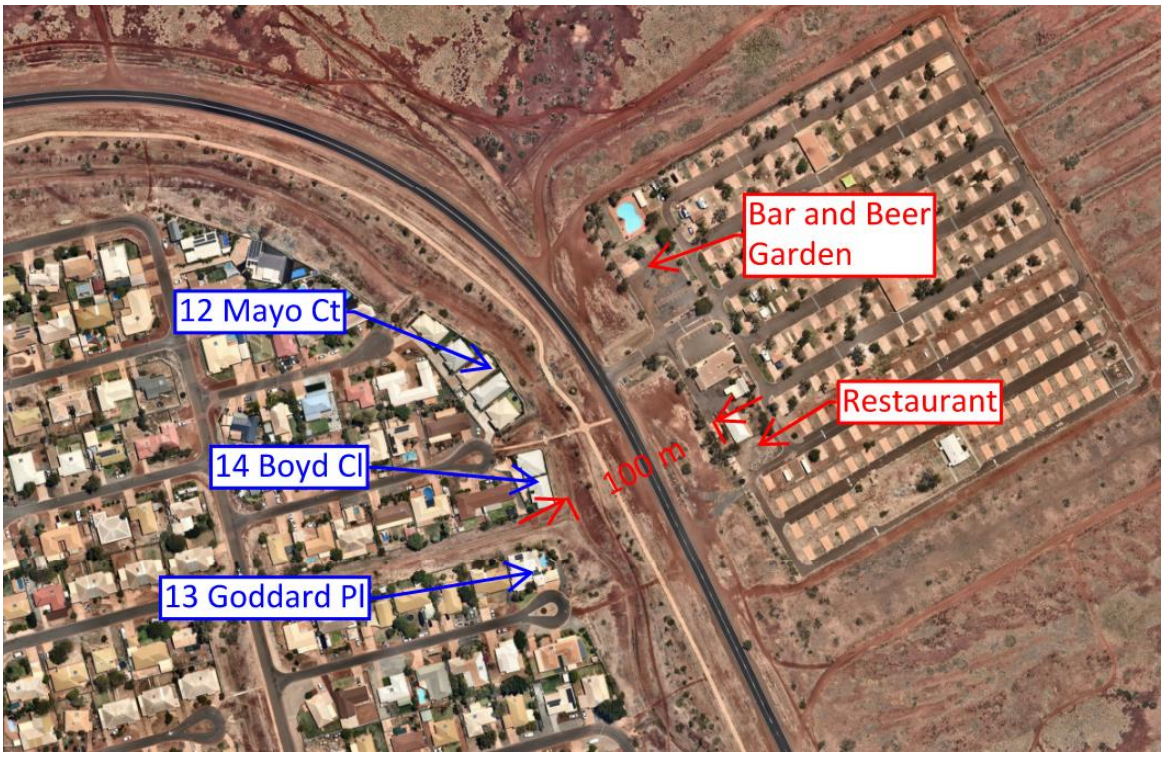


Table 2: Nearest receivers considered in assessment

Address	Description
12 Mayo Court	Single storey residential dwelling
14 Boyd Close	Single storey residential dwelling
13 Goddard Place	Single storey residential dwelling

3.0 STATUTORY AND POLICY FRAMEWORK

Table 3 presents a summary of the legislation, standards and guidelines considered applicable to the Project and sources of acoustic criteria.

Table 3: Summary of acoustic assessment framework and design criteria

Criteria source	Status	Relevance to project
Western Australian *Environmental Protection (Noise) Regulations 1997* (Noise Regulations)	Statutory requirement	Sets limits for environmental noise from the development and operating hours for certain activities. This is relevant for mechanical plant equipment but also applies to any other site activity including car parking, music and patron noise emissions, deliveries and waste collection. Further details are provided in the section below.
National Construction Code 2022 (NCC)	Statutory requirement	Defines the minimum acoustic separation performance standards of internal walls and floors between sole occupancy units within certain NCC building classes. NCC Acoustic requirements are expected to apply to the hotel suites.
Australian/New Zealand Standard AS/NZS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors* (AS/NZS 2107)	Guideline standard	Defines recommended noise levels and reverberation times for internal spaces.

The primary focus of this DA assessment is on environmental noise and in particular the potential noise impacts from the proposed licensed premises. Other design considerations such as NCC compliance are not addressed and would need to be factored in during subsequent project stages.

3.1 Environmental Protection (Noise) Regulations 1997

External noise emission from patrons, music and other noise sources is governed by the *Western Australia Environmental Protection (Noise) Regulations 1997* (the Noise Regulations). The Noise Regulations are a "prescribed standard" under the *Environmental Protection Act 1986*.

The assessment of noise emission under the Noise Regulations is based on external noise level limits that apply at a receiver position. The calculation of the noise level limits takes into account the local road network, the land use in the surrounding area and the time of day. These noise level limits are known as 'assigned noise levels'.

The noise emissions are assessed over an assessment period which can be between fifteen minutes and four hours. The assessment period must be appropriate for the assessment of the emission and depends on the type and character of the noise source(s).

The assigned noise levels are defined in terms of statistical A-weighted and Slow-weighted sound pressure levels and are:

- L_{A10}, this is the noise level not to be exceeded for more than 10% of the assessment period.
- L_{A1}, this is the noise level not to be exceeded for more than 1% of the assessment period.
- L_{Amax}, this is the noise level not to be exceeded at any time.

The assigned noise levels applicable to the nearest sensitive receivers are presented in Table 4.

Table 4: Summary of assigned noise levels

Type of premises receiving noise	Time of day	Assigned noise level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700-1900 Monday to Saturday	47	57	67
	0900-1900 Sunday and public holidays	42	52	67
	1900-2200 all days	42	52	57
	2200-0700 Monday to Saturday or 2200-0900 Sunday and public holidays	37	47	57
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

In addition, the noise emissions must be free of annoying characteristics such as: impulsiveness, modulation and tonality. Adjustments are also applicable where the noise emission is music. These adjustments are presented in Table 15.

Table 5: Adjustments for Annoying Characteristics

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

Further details regarding the assigned noise levels are provided in Appendix B.

4.0 ENVIRONMENTAL NOISE ASSESSMENT

The following section presents the findings of a noise assessment to assist the client and the relevant approval authority in understanding the key noise considerations associated with the proposed development. General options to help manage noise risks are presented; further specific recommendations are outlined in Section 5.0.

4.1 Noise sources

Table 6 describes the identified key noise sources associated with the proposed development.

Table 6: Potential noise sources – assessment summary

Source of noise	Comments and advice
Patrons and/or music	Music within the premises would be played at background levels only. Patrons are expected to be the main source of noise from the licensed premises. The proposed operating hours are until 2200 hours on any day, therefore the relevant assigned level for assessment purposes will be 42 dB L_{A10}. Detailed assessment is presented below.
Mechanical services	The development is expected to include a range of mechanical services such as exhaust fans (kitchens and toilets), air-conditioning units, and compressors (serving cool rooms). Noise from mechanical services equipment is typically controlled using design and engineering methods such as: • Plant equipment siting and selection to reduce noise impacts • Barriers/screens around plant equipment • Duct attenuators and acoustic louvres In addition, equipment will need to be appropriately vibration isolated. Specific requirements would need to be developed as the design progresses however it is expected that typical noise control measures (screening, duct attenuation, acoustic louvres) will be sufficient to demonstration compliance, noting the buffer distance to receivers is more than 100 m. In consideration of this, and the limited design information available at this stage, further assessment of the mechanical services noise has not been provided.
Deliveries	Deliveries to the site will be via the Bayview Road entrance. Deliveries are expected to be via a combination of both light and medium vehicles. Forklifts will be used for unloading. High-level assessment of delivery vehicle noise is presented below.
Waste removal	Waste removal from site will be via the Bayview Road entrance. A dedicated waste storage area will be located to the north of the restaurant. Under Regulation 14A of the Noise Regulations, noise emissions from specified works such as waste collection do not have to meet the assigned levels provided that the works are carried out: • During daytime hours • In the quietest reasonable and practicable manner, and • Using the quietest equipment reasonably available Procedures for managing noise from waste removal should be developed during detailed design and included in the waste management plan. High-level assessment of waste management vehicle noise is presented below.

Source of noise	Comments and advice
Waste management on site	The waste storage area is located approximately 130 m from the nearest noise-sensitive premises, and 30 m from the Executive Hotel Suites on the site. Noise to the hotel suites will be the primary consideration in terms of potential noise from waste management on site (e.g., transferring of glass bottles, use of any compactors, etc.). Procedures for managing this type of site noise should developed during detailed design and included in the site management plan.

4.2 Noise prediction method

A 3-dimensional digital model of the venue and surrounding built environment has been created using SoundPLAN proprietary modelling software. Further information on the modelling method is provided in Appendix C.

4.3 Licensed premises operations

Noise from patron areas associated with dining and licensed premises is highly variable according to a wide range of factors including:

- The type of venue
- The function of the space within the venue (i.e. seated areas for dining or standing areas with a focus on alcohol consumption)
- Total crowd numbers
- The composition of the total patron numbers in terms of demographics and group sizes
- Weather
- Alcohol consumption
- Background noise levels
- The acoustic properties of the space

There are many operating scenarios and various options for addressing noise that could be modelled. For the purposes of this study, we have modelled two typical scenarios, as described below.

The scenarios modelled represent a typical worst-case (at capacity) operating situation with and without recommended mitigation measures in place.

General details of the noise model input parameters are described in Table 7.

Table 7: Licensed premises inputs and assumptions

Parameter	Inputs / assumptions
Patrons	Internal and external patron source levels have been modelled as per Table 8. Data used to inform the source levels is outlined in Appendix C.
Internal finishes	The internal noise levels are based on an assumed reverberation time of 1 second. Higher noise levels typically result when reverberation increases; therefore, reverberation should be controlled using acoustically absorptive finishes where possible. While absorptive finishes should not be considered a primary means of noise control, the designers should be aware of the relationship between surface finishes and noise. Should the spaces be designed with finishes that are generally hard (non-absorptive), higher reverberation times and noise levels should be expected.
Glazing	Modelling is based on typical glazing (e.g. 6mm float) with windows open.

Parameter	Inputs / assumptions
Doors	External doors have been modelled as open, representative of a worst-case scenario.
Roofs	The model assumes a typical lightweight roof comprising a steel sheet deck with a suspended plasterboard ceiling below and ceiling insulation.

Table 8: Patron noise source levels

	No. patrons	Source category[2]	Music level	Level
Bar and Beer Garden				
Internal	50	Taverns	Background	82 dBA $L_{p,rev}$
External	100	Taverns	Background	98 dBA L_w
Restaurant				
Internal	200	Dining	Background	80 dBA $L_{p,rev}$
External	50	Dining	Background	90 dBA L_w

4.3.1 Scenario 1: Typical worst-case

This scenario is modelled to represent a typical worst-case operating situation. All areas are at capacity with patrons dining and socialising.

Calculated noise levels to the nearest receivers are provided in Table 9. The table shows the contribution from internal and external patrons, as well as the overall noise level.

Table 9: Estimated noise levels at nearest receivers (dB L_{A10})

Receiver	External patron noise	Internal patron noise	Overall noise level	Relevant assigned levels	Compliance demonstrated
12 Mayo Court	45	31	45	47 (day) 42 (evening)	Day only
14 Boyd Close	41	31	42		✓
13 Goddard Place	40	31	41		✓

The Scenario 1 modelling predictions show the following:

- Noise levels from internal patrons are predicted to be significantly lower than the assigned levels.
- Noise from external patrons could exceed the assigned levels at 12 Mayo Court by up to 3 dB during evening periods (0900-1900 Sunday and public holidays, 1900-2200 all days).

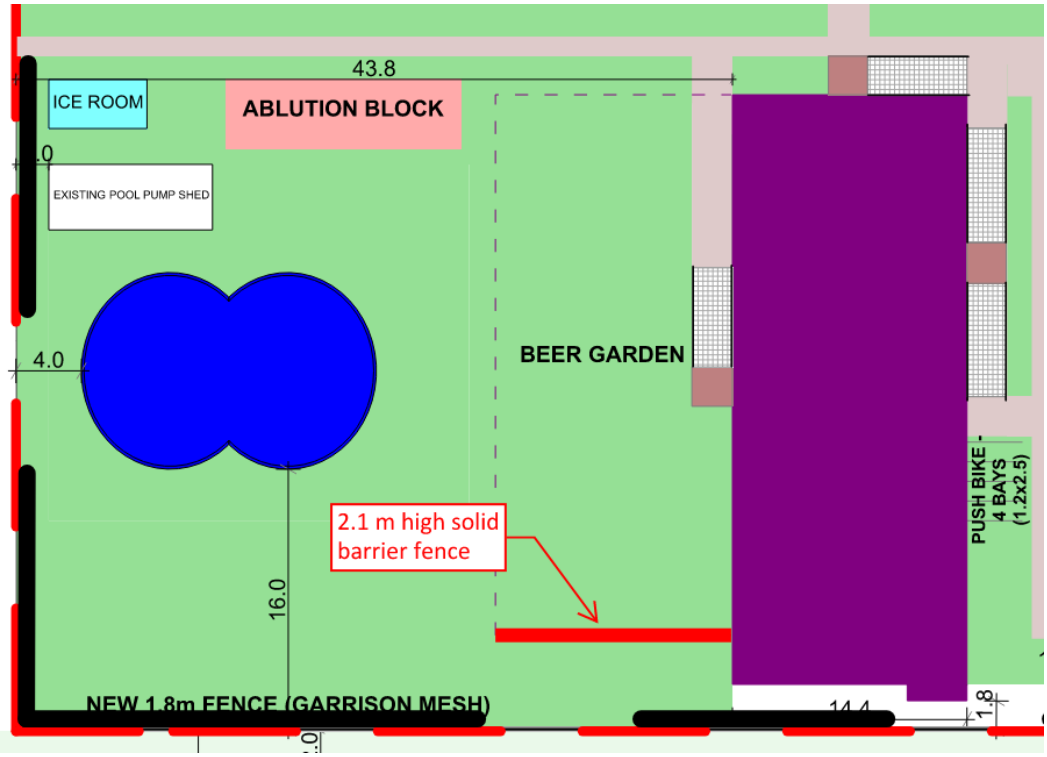
Since the modelled scenario represents a typical worst-case in terms of capacity, it is likely that lower noise levels will occur during more typical capacity operations. As an example, if the number of patrons outside were halved, a 3 dB reduction would be achieved (assuming no changes to patron behaviour and other conditions).

4.3.2 Scenario 2: Noise mitigation

This scenario includes engineering noise control on the site, in the form of a solid barrier fence to the west of the beer garden, as illustrated in Figure 4.

[2] See Appendix C3

Figure 4: Solid noise barrier fence to Beer Garden



Calculated noise levels to the nearest receivers for the noise mitigation scenario are provided in Table 10. The table shows the contribution from internal and external patrons, as well as the overall noise level. Noise contours showing the spread of noise from the site for this scenario are provided in Appendix E.

Table 10: Estimated noise levels at nearest receivers (dB L_{A10})

Receiver	External patron noise	Internal patron noise	Overall noise level	Relevant assigned levels	Compliance demonstrated
12 Mayo Court	42	27	42	47 (day) 42 (evening)	✓
14 Boyd Close	39	31	40		✓
13 Goddard Place	39	31	39		✓

The Scenario 2 modelling shows that the assigned levels can be achieved at the nearest receivers with the inclusion of a noise barrier to the west of the Beer Garden.

4.4 Vehicles on site

The following vehicles and activities have been assessed:

- Garbage trucks (Heavy Rigid Vehicles)
- Delivery vehicles (typically Medium Rigid Vehicles)
- Loading bay activity (incl. forklifts)
- Carpark activity (incl. door slams, vehicles starts, etc.)

Noise from these sources has been modelled and is compared with the L_{Amax} assigned levels in Table 11. Source levels used for the calculations are included in Appendix C5.

Table 11: Estimated noise levels at nearest receivers (dB L_{Amax})

Receiver	Garbage trucks (HRV)*	Deliveries (MRV)	Loading bay (forklift)	Carpark activity (motorbike start)	Assigned levels
12 Mayo Court	63	56	49	53	67 (day)
14 Boyd Close	64	57	53	54	57 (evening)
13 Goddard Place	61	54	53	53	57 (night)

*Noise levels from garbage trucks are presented for reference only, noting that the assigned levels do not normally apply to this type of noise (when collections are undertaken in accordance with Regulation 14A). Refer to Section 5.4.2 or further information on waste collection.

The assessment shows that the L_{Amax} assigned levels are expected to be achieved by all vehicles on site. It should also be noted that the assessment takes the highest predicted level from various potential locations on site and is therefore conservative.

Assessment against other assigned noise level parameters has not been included in this desktop review given unknowns regarding vehicle movements, and also noting that the L_{Amax} assessment suggests vehicle noise is not a significant noise risk. It is noted there are significant buffer distances between vehicle locations on site and the nearest receivers. Furthermore, traffic on Bayview Road (categorised as a 'Secondary Road' under the Noise Regulations) is likely to be the more dominant source of vehicle noise.

5.0 DISCUSSION AND RECOMMENDATIONS

The assessment shows that the proposed development can be operated so that compliance with the Noise Regulations is demonstrated, however some engineering and management controls will be required.

Noise management options and recommendations are outlined below for consideration during the detailed design, as well as for the ongoing management of the venue.

5.1 Patrons

In addition to the noise barrier described above, management procedures should be used to minimise patron noise as necessary. This will be particularly important during busy 'evening' periods. The following options will be available to the venue:

- Closing any operable building elements (windows and doors).
- Noisy patrons in outdoor areas being asked to move inside.
- Signage being displayed requesting that patrons be respectful of nearby residential neighbours.
- Limiting patron numbers in outdoor areas if necessary.

5.2 Music

Since music is proposed to be played at background levels only, music playback should be through in-house systems only. If external PA equipment is required, further analysis should be undertaken to assess the suitability of the proposed uses.

The in-house system(s) should be configured to operate at background levels only – i.e. levels that allow for conversation at normal vocal effort.

Factors that should be considered in the design and operation of the sound system include:

- Location, orientation and directivity of the loudspeakers
- Sound level and frequency output of the loudspeakers
- How levels are controlled
  - Whether it is necessary to restrict level control access from unauthorised staff
  - What sort of training/education may be required for staff

5.3 Mechanical services

At this stage of the project, the mechanical services design strategy is not yet confirmed; however, these will need to be designed so that compliance with the Noise Regulations is achieved.

As described in Section 4.1, the venue is expected to include a range of mechanical services such as exhaust fans (kitchens and toilets), air-conditioning units, and compressors (serving cool rooms).

Noise from mechanical services equipment is typically controlled using design and engineering methods such as:

- Plant equipment siting and selection to reduce noise impacts
- Barriers/screens around plant equipment
- Duct attenuators and acoustic louvres

In addition, equipment will need to be appropriately vibration isolated.

Based on the layout of the site, and buffer distances to the nearest receivers, it is expected that services noise can be adequately controlled using typical noise control approaches. Care will be

required for the siting and selection of kitchens exhaust fans since in-duct noise treatment is not typically practical.

5.4 Waste disposal

5.4.1 Waste handling on site

Noise from emptying glass bins can be a source of noise annoyance. The waste storage area is not considered to be high risk, but management procedures such as restricting the emptying of glass bins during certain hours may be necessary to include in the noise management plan, noting that hotel suites are approximately 30 m from the area.

5.4.2 Waste collection

Under Regulation 14A of the Noise Regulations, noise emissions from specified works such as waste collection do not have to meet the assigned levels provided that the works are carried out:

- During daytime hours
- In the quietest reasonable and practicable manner, and
- Using the quietest equipment reasonably available

While we understand this activity is likely to be sub-contracted to others by the owner/occupier of the development or the council, generic quiet practices to be considered include:

- Plan garbage truck route to avoid reversing. If not practicable, use self-adjusting broadband noise reversing alarms in lieu of traditional tonal reversing beepers;
- Use of impact matting under large bins to minimise impulsive noise;
- Favour use of newer equipment as they are generally quieter;
- Turn off engines when not in use; and,
- Undertake regular checks and maintenance of truck and equipment to identify/repair noisy items.

5.5 Deliveries

On the basis that deliveries to the site are made on public roads, noise from delivery vehicles is not subject to the requirements of the Noise Regulations.

Regardless, the following good practice measures should be considered:

- Limiting truck deliveries to the following hours:
  - 0700 and 1900 on any day that is not a Sunday or public holiday; or
  - 0900 and 1900 on a Sunday or public holiday.
- Carry out deliveries in the quietest reasonable and practicable manner. The following best-practice measures should be adhered to wherever practicable:
  - Avoid reversing and tonal reversing beepers;
  - Turn off engines when not in use;
  - Favour use of newer equipment as they are generally quieter; and
  - Undertake regular checks and maintenance of vehicle and equipment to identify/repair noisy items.

5.6 Community engagement

Ongoing community engagement is a key factor to the successful operation of licensed premises. Procedures for this should be documented in the noise management plan and regularly reviewed as part of the ongoing noise management.

Procedures typically include:

- Procedures for notifying residents of any upcoming special events or busy periods where noise levels may be higher than average.
- Contact details that are provided to residents so that they can address any complaints to the responsible person on site.
- Process for managing and registering noise complaints.
- Process for reviewing any complaints received and updating the noise management plan if necessary.

6.0 SUMMARY

Marshall Day Acoustics (MDA) has been engaged by Bayview Hotel Karratha Pty Ltd to undertake a noise assessment as part of the Development Application (DA) to the City of Karratha. This report provides details of the site, relevant noise criteria, and an assessment of potential noise from the development to the nearest receivers.

The assessment presented demonstrates that compliance with the assigned noise levels can be achieved, provided that patron and music noise levels are appropriately controlled, and general good practice design and management procedures are applied to noise generally.

Noise management options and recommendations have been provided for consideration during the detailed design, as well as for the ongoing management of the venue. For suitable control of patron noise, a noise barrier has been recommended.

With appropriate development of the design and implementation of management strategies, the development is expected to meet the relevant noise standards and appropriately function in the surrounding noise environment.

APPENDIX A GLOSSARY OF TERMINOLOGY

A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
Ambient	The ambient noise level is the noise level measured in the absence of the intrusive noise or the noise requiring control. Ambient noise levels are frequently measured to determine the situation prior to the addition of a new noise source.
dB or dBA	Decibel. The unit of sound level.
L_{A1}	The A-weighted noise level exceeded for only 1% of the measurement period, measured in dB. This is sometimes referred to as the typical upper maximum noise level.
L_{A10}	The A-weighted noise level exceeded for 10% of the measurement period, measured in dB. This is commonly referred to as the average maximum noise level.
L_{Aeq}	The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.
L_{Amax}	The maximum A-weighted noise level. The highest noise level which occurs during the measurement period.
L_w	Sound Power Level. The calculated level of total sound power radiated by a sound source. Usually A-weighted i.e. L_{WA}.
Reverberation time	The time (in seconds) taken for the sound pressure level generated by a particular noise incident to decay by 60 decibels following the conclusion of the noise event. Reverberation Time is used for assessing the acoustic qualities of a space, describing how quickly sound decays within a space. The reverberation time is related to the room volume and total absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to ability of a material to stop sound travelling through it.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. 'Sound absorption' refers to ability of a material to absorb sound.
SPL or L_P	Sound Pressure Level A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 µPa RMS) and expressed in decibels.
Transmission loss (TL)	The reduction in sound level resulting from sound passing through a material or construction.

APPENDIX B ASSIGNED NOISE LEVEL CRITERIA

External noise emission from building services plant and other noise sources such as music is governed by the *Western Australia Environmental Protection (Noise) Regulations 1997 (the Regulations)*. The Noise Regulations are a "prescribed standard" under the Environmental Protection Act 1986.

Under the Noise Regulations, noise emissions from one premises when assessed at another must comply with a set of noise limits. The noise limits applicable at a receiver are calculated by adding to a base noise limit an influencing factor, which takes into account the land use and number of significant roads in the surrounding area. These noise limits are known as 'assigned noise levels' and apply at the receiving premises, of which there are three kinds: noise sensitive premises (e.g. residences, hotels, schools, aged care, etc.), commercial premises (e.g. offices, retail shops, etc.) and industrial premises. The assigned noise levels depend on the type of receiving premises, the time of day and day of the week.

The noise emissions are assessed over an assessment period which is between fifteen minutes and four hours. The assessment period must be appropriate for the assessment of the emission and depends on the type and character of the noise source(s).

The assigned noise levels are defined in terms of statistical A-weighted and Slow-weighted sound pressure levels and are:

- L_{A10}, this is the noise level not to be exceeded for more than 10% of the assessment period.
- L_{A1}, this is the noise level not to be exceeded for more than 1% of the assessment period.
- L_{Amax}, this is the noise level not to be exceeded at any time.

The determination of the Influencing Factor (IF) which affects the assigned levels applicable at the nearest residential receivers is based on the following:

- The area of commercial and industrial zoned land surrounding the receiver.
- The number of major and secondary roads in proximity to the receiver.

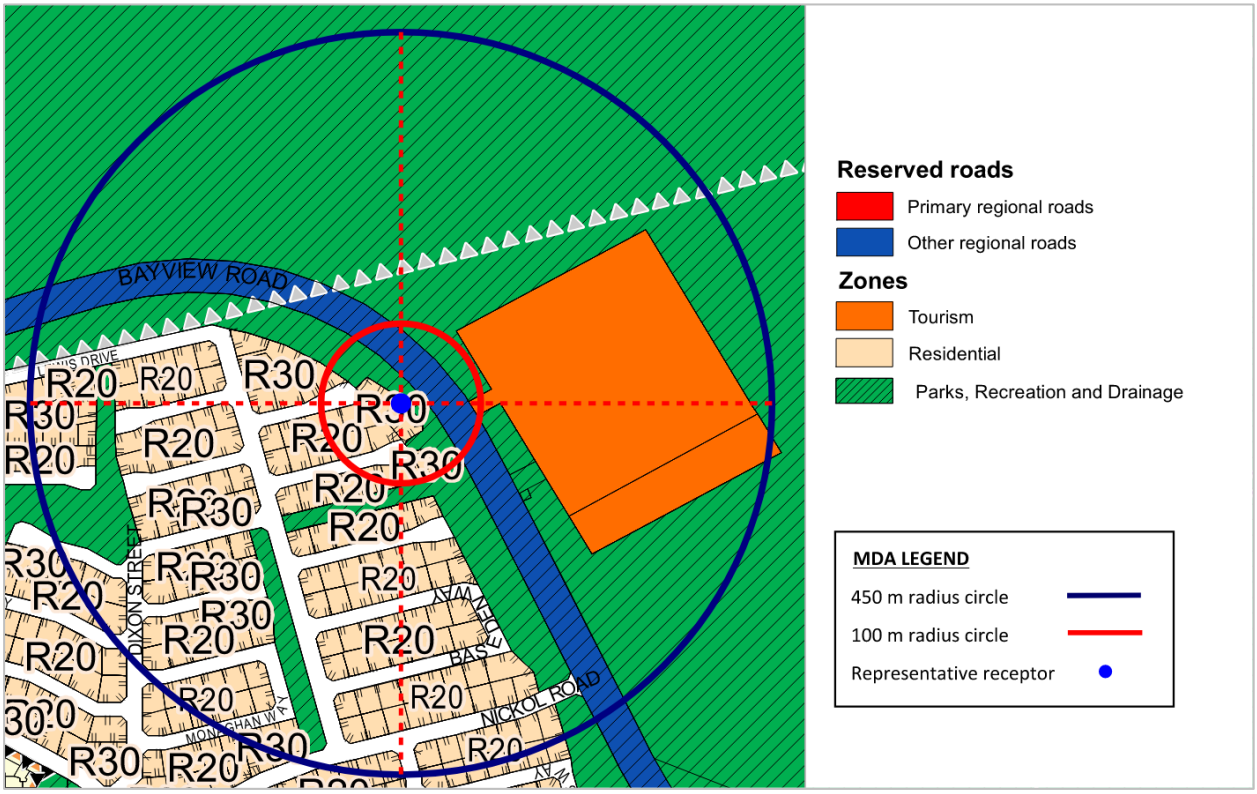
The procedure defined in the Noise Regulations considers the land use and road types with two circles centred on the receiver location, one of 450 m radius, and one of 100 m radius.

The land use has been determined from:

- City of Karratha Local Planning Scheme No. 8 (22/06/2023)

An extract from the town planning map is presented in Figure 5.

Figure 5: Local Planning Scheme Map extract



Transport Factors of 6 dB and 2 dB apply if there are any Major Roads (a road carrying in excess of 15,000 vpd) within the 100 m and 450 m circles respectively. For each Secondary Road (a road carrying in between 6,000 - 15,000 vpd) within the 100 m circle, a 2 dB transport factor applies. The total Transport Factor that is included in the Influencing Factor is limited to 6 dB.

Traffic data for the nearby roads obtained from Main Roads is presented in Table 12.

Table 12: Traffic data and classifications for nearby roads (source: Main Roads)

Road	Average weekday traffic (AADT)	Classification
Bayview Rd, East of Bathgate Rd	7,053 (2022-2023)	Secondary Road
Nickol Rd, South of Bayview Rd	2,820 (2022-2023)	-

The Influencing Factor calculation is presented in Table 13.

Table 13: Influencing Factor calculation

	100 m circle	450 m circle	IF
Land use:			
Industrial %	0%	0%	-
Commercial %	0%	0%	-
Transport Factor:			
Major road	0	0	-
Secondary roads	0	n/a	+2 dB
		Influencing Factor:	**2 dB**

The calculated assigned noise levels are presented in Table 14.

Table 14: Summary of assigned noise levels

Type of premises receiving noise	Time of day	Assigned noise level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area	0700-1900 Monday to Saturday	47	57	67
	0900-1900 Sunday and public holidays	42	52	67
	1900-2200 all days	42	52	57
	2200-0700 Monday to Saturday or 2200-0900 Sunday and public holidays	37	47	57
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80

In addition, the noise emissions must be free of annoying characteristics such as: impulsiveness, modulation and tonality. The elimination of annoying characteristics should be a priority in the design process. In cases when annoying characteristics cannot be eliminated, adjustments to measured or calculated levels are applied. These adjustments are presented in Table 15 below.

Table 15: Adjustments for annoying characteristics

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

APPENDIX C NOISE MODEL INPUTS

C1 Noise modelling method

A 3-dimensional digital model of the building and surrounding built environment has been created using SoundPLAN$_{noise}$ proprietary modelling software (version 9.0).

Geometry data for the model has been sourced from public aerial photography and terrain data, visual inspections of the area, and building heights defined on the basis of standard assumed heights per floor level. The geometries in the model are simplified representations of the built environment that have been configured to a level of detail that is appropriate for noise calculation purposes.

The SoundPLAN digital model has been used to calculate noise levels using the International Standard *ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO 9613). ISO 9613 is a general environmental noise calculation standard that has been used extensively throughout Australia, New Zealand, and Europe since its publication in 1996.

The implementation of ISO 9613 within proprietary noise modelling software enables multiple sound transmission paths, including reflected and screened paths, to be accounted for in the calculated noise levels. While atmospheric effects are expected to have a negligible effect on the transmission of sound from the venue to neighbouring sensitive receiver locations, it is noted that the ISO 9613 predicts noise levels for conditions which favour the propagation of noise.

The following ground factors have been used in the model:

- Medium (G=0.5) – grassed outdoor areas on site as shown on site plans.
- Hard (G=0.0) – remainder of the site and wider area.

For this assessment the predicted L_{eq} levels are deemed representative of the received L_{10} levels.

C2 Patron noise data

The noise of patron areas associated with dining and licensed venues is highly variable according to a wide range of factors including:

- The type of venue
- The function of the space within the venue (i.e. seated areas for dining or standing areas with a focus on alcohol consumption)
- Total crowd numbers
- The composition of the total patron numbers in terms of demographics and group sizes
- Weather
- Alcohol consumption
- Background noise levels
- The acoustic properties of the space

Based on the above considerations, total patron noise emissions will vary significantly between different venues. Further, for a given venue patron noise emissions will vary from day to day and hour to hour according to these types of factors.

C3 Outdoor patron noise levels

To provide a practical basis for assessing the noise from proposed external areas, a simplified method has been developed to characterise the noise emissions of four broad categories of venue type for different number of patrons. The method is based on a single representative vocal effort to characterise the range of emissions of all individuals within the crowd.

It is assumed that a one-third of the crowd may be speaking at any given point in time.

In practice, the vocal effort of each individual will vary across the crowd and throughout the assessment period. The portion of the crowd will also vary. The selected values are therefore not considered exact representations of a crowd's patterns. The values have been chosen to enable a simple relationship to be formulated which provides close agreement with patron noise measurements conducted at a range of venues.

Marshall Day Acoustics and other acoustic consultants have measured patron noise from several different venues. These measurements indicate a large variation in the noise levels of crowds. Variations are due to a number of factors including the situational context of the crowd.

For the purpose of predicting noise levels from a venue, external patron areas are categorised according to the descriptions outlined in Table 16. Reference sound power data for one person is detailed in the 2011 Hayne paper[3].

Table 16: Patron area use categories

Area use category	Reference sound power data per one person		Area use definition
	Equivalent	Maximum	
Vertical drinking ('worst-case' crowd)	88 dB L_{AW}	104 dB L_{AW}	Standing patrons drinking and talking Focus of activity on drinking and socialising
Taverns (typically with significant food offerings)	83 dB L_{AW}	104 dB L_{AW}	Predominantly seated patrons, drinking, dining and talking Focus of activity on drinking, whilst dining and socialising
Restaurant dining	78 dB L_{AW}	98 dB L_{AW}	Seated patrons, drinking, dining and talking Focus of activity on dining and socialising
Small smoking areas (<40 patrons)	73 dB L_{AW}	98 dB L_{AW}	Patrons using area for smoking Focus of activity on smoking rather than socialising (data also includes outdoor areas with alcohol consumption)

Based on the above reference sound power data and measurements by Marshall Day Acoustics, a simplified empirical relationship to represent the total sound power level for which crowd numbers and character were varied has been derived for determining design equivalent and maximum sound power level as follows:

- Design equivalent sound power level – derived by assuming that one third of the total crowd speaks continuously over the duration of the assessment period, and each of these speakers emit a constant total sound power level over the duration of the assessment period. In practice, the actual number of individuals speaking, the sound power emitted by each individual, and the temporal characteristics of each speaker will vary considerably over the assessment period. The derived values therefore do not

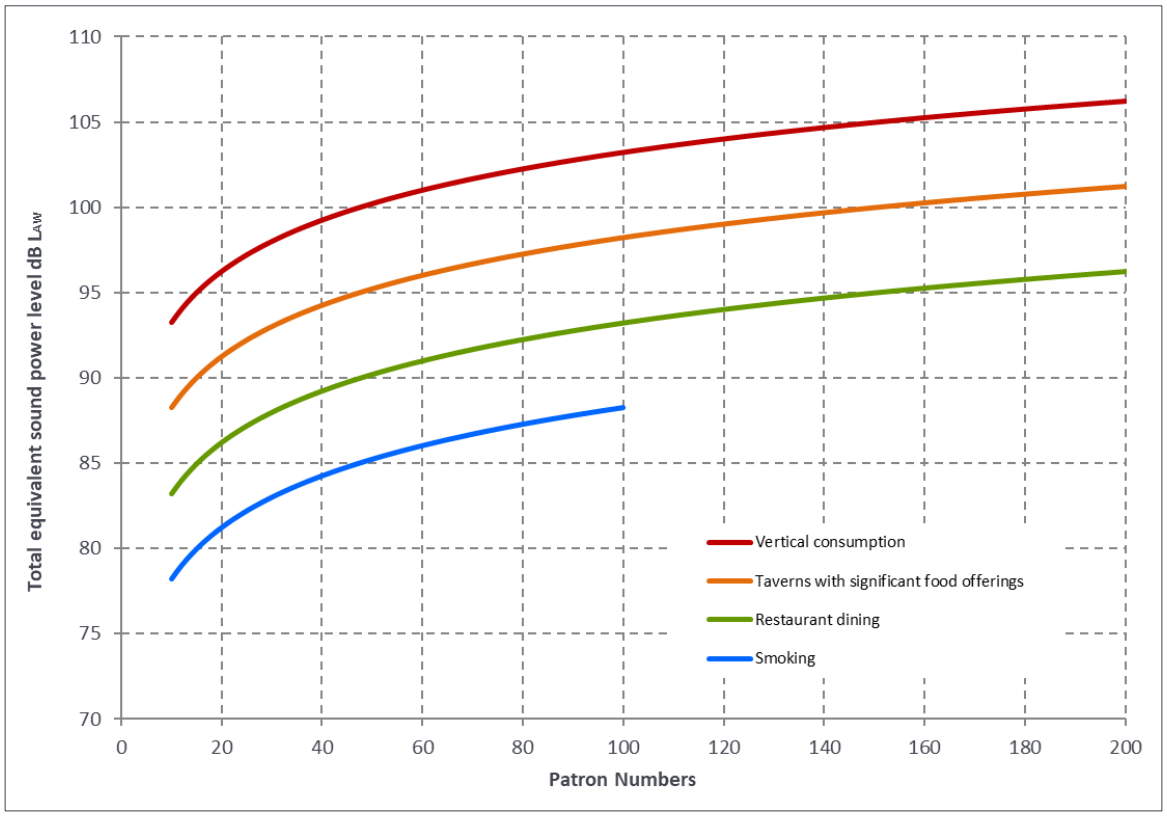
[3] Hayne et al 2011, 'Prediction of noise from small to medium sized crowds', in *Acoustics 2011: Breaking New Ground, Proceedings of the Annual Conference of the Australian Acoustical Society*, AAS Queensland Division 2011, Gold Coast, paper number 133.

represent the actual percentage of patrons speaking, or the emission of each patron, but simply represent the total sound power level for the number of patrons

- Design maximum sound power level – derived by assuming that the maximum noise level occurs as a result of two (2) individuals simultaneously producing a maximum level. Smoking areas and restaurants are considered to have the same maximum sound power level characteristics, as are taverns with significant food offerings and vertical consumption crowds.

Figure 6 provides the total equivalent sound power based on patron numbers.

Figure 6: Total equivalent sound power based on patron number



Note that patron numbers for smoking areas arbitrarily limited to 100 patrons. Smoking areas typically have less people in practice.

Table 17 provides the octave band spectral correction applied to the calculated patron sound power.

Table 17: Octave band spectral correction (dB)

	Octave band centre frequency (Hz)						
Source	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Spectral correction	-12	-10	-9	-2	-4	-8	-15

C4 Indoor patron noise levels

Indoor patron noise levels have been estimated based on the outdoor patron noise level data, factoring in the volume (m^3) and room acoustics of the proposed spaces. For modelling, a reverberation time of 1 second has been assumed for all spaces. Achieving this will require acoustically absorptive finishes. Should the spaces be designed with finishes that are generally hard (non-absorptive), higher reverberation times and internal noise levels would exist.

C5 Vehicles on site noise levels

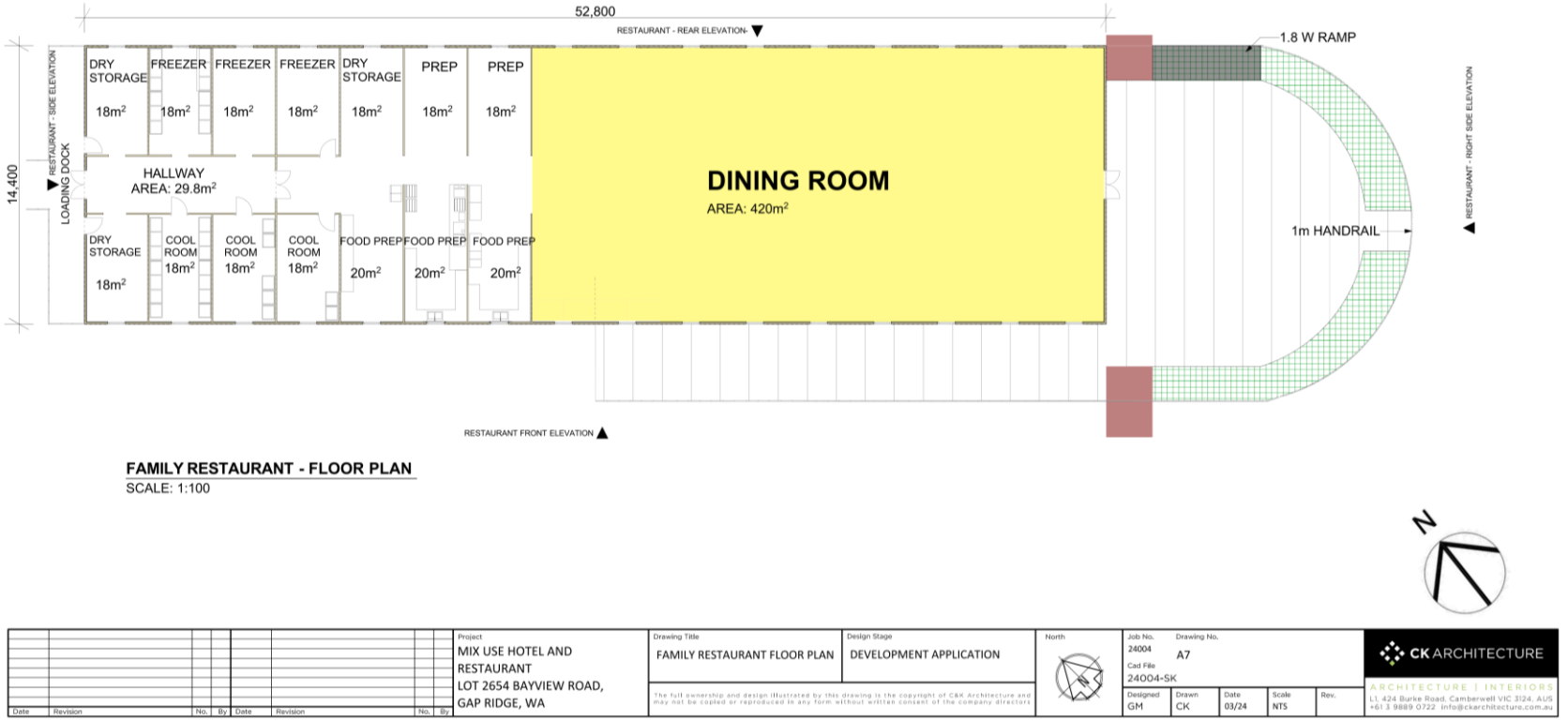
Source levels used for calculating noise from vehicles are outlined in Table 18.

Table 18: Vehicle noise source levels – sound power levels (dB L_{max})

	Octave band centre frequency (Hz)							
Source	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**dBA**
Garbage truck	114	116	111	106	104	103	102	111
Loading bay (forklift)	104	107	104	97	98	94	87	102
Carpark activity	109	107	103	97	95	91	91	101
Deliveries, MRV	107	103	97	96	97	99	97	104

APPENDIX D FLOORPLANS

D1 Dining Room



D2 Bar and Beer Garden

BAR AND BEER GARDEN - FLOOR PLAN

SCALE: 1:100

N

Project: MIX USE HOTEL AND RESTAURANT LOT 2654 BAYVIEW ROAD, GAP RIDGE, WA	Drawing Title: BAR AND BEER GARDEN FLOOR PLAN	Design Stage: DEVELOPMENT APPLICATION	North
Job No. 24004	Drawing No. A8	Cad File 24004-SK	
Designed GM	Drawn CK	Date 03/24	Scale 1:100

CK ARCHITECTURE
ARCHITECTURE | INTERIORS
L1, 424 Burke Road, Camberwell VIC 3124, AUS
+61 3 9889 0722 info@ckarchitecture.com.au

APPENDIX E NOISE CONTOURS - LICENSED PREMISES OPERATIONS (SCENARIO 2)