

# HEARTLAND MOTORS, CASTLE HILL

## DA Acoustic Assessment

9 May 2022

Heartland Motors C/- Brompton Group

TL443-01F02 DA Acoustic Assessment (r8)

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# 1 Introduction

Renzo Tonin & Associates was engaged to conduct an operational noise assessment to support the Development Application (DA) for a new pub/hotel (licensed premises) on existing car yard site of Heartland Motors Castle Hill, corner of Windsor Road and Victoria Avenue, Castle Hill.

The proposed pub/hotel consists of a new basement car parking, a new ground floor pub with bistro/lounge bar, outdoor dining and kids' play area, gaming room, sports/public bar and associated outdoor area, and dedicated on grade parking.

The licensed premises seeks to operate between 10:00 to 24:00 Monday to Saturday and 10:00 to 22:00 on Sundays with a total patron capacity of 850 patrons. It is understood that due to car parking constraints, the total patron capacity is limited to 550 patrons up to 5:30pm, Monday to Saturday, from when more car parking spaces will become available for the hotel's patrons. The primary aspects of noise emission will be from patrons in the Beer Garden, Outdoor Dining and Terrace Bar areas, noise breakout from the internal areas and carpark activities. No live entertainment is to be provided.

This report quantifies noise emission from activities associated with the proposal and assesses operational noise on nearby sensitive receivers in accordance with the noise requirements of The Hills Shire Council (Council) and the NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPfI).

APPENDIX A contains a glossary of acoustic terms used in this report.



## 2 Project description

### 2.1 Site description and development overview

The site is bound by a busy major road and within an industrial precinct with the nearest residential dwellings identified along Nola Place on the opposite side of Windsor Road to the south and Washington Place and White Cedar Drive to the far east. Figure 1 presents the subject site location.

Figure 1: Site location



### 2.2 Acoustic aspects

Based on the proposed design and operational parameters, the following aspects are deemed to require acoustic assessment:

- Outdoor patrons in the Beer Garden, Outdoor Dining and Terrace Bar areas;
- Consideration of noise breakout from internal areas;
- Carpark activities; and
- Mechanical services and refrigeration system plant and equipment.

At this early stage of the DA process, mechanical plant and refrigeration system plant and equipment specification is not available and therefore, in-principal recommendations have been included in Section 6.4. Most plant and equipment can also be acoustically treated to ensure their noise emissions do not contribute to the overall noise levels if necessary.

## 2.3 Acoustic assessment methodology

In order to assess the potential noise impact from subject proposal the following methodology was used:

- Identify nearest most potentially affected receiver locations to the subject site
- Determine existing background noise levels at the nearest most potentially affected receiver locations
- Use measured background noise levels to establish noise goals in accordance with the relevant noise criteria
- Using predictive noise modelling, determine the extent of noise impact from the proposal at nearby residential premises
- Identify if noise emission from the area under investigation may exceed the relevant criteria, and
- Where noise emission from the area under investigation may exceed the relevant criteria, provide recommendations to reduce noise impacts from the site.

## 2.4 Reference material

The following documentation has been referenced for this report:

- Architectural site plan prepared by H&E Architects [ref: 2554\_DA1-9050\_Rev03\_Site Plan Indicating an Alternative Siting with Increased Setbacks] dated 04/03/2022
- An email from Ben Shaw (Brompton Group) dated 14/05/2020 confirming proposed operational hours and patron numbers [ref: RE: Heartland Motors Castle Hill and Chullora - New Pub/Hotel]
- A letter for Application No. 923/2021/HA from The Hills Shire Council dated 1 April 2021 requesting for additional information to be provided [ref: 2021 04 06 Council RFI marked up]
- The Hills Shire Council's (filed) Statement of Facts and Contentions (SOFAC) for the Land and Environment Court (LEC) of NSW case number 2021/00334635 [ref: SOFAC filed 31 January 2022] dated 31 January 2022. The particulars raised with respect to *Acoustic Impacts (Contention 6)* have been addressed in Section 3.2 with the addition of Assessment Locations A2 and A3.



- Council's email list dated 24 February [ref: Post-s.34 conference timetable and action items | Boyded Industries v The Hills Shire Council | LEC No. 2021/334635 | 1 Packard Ave, Castle Hill] received on 24 February 2022. The item raised with respect to acoustic has been addressed in Sections 3.1.1.1 and 6.5.

### 3 Project noise goals

#### 3.1 Applicable noise criteria

##### 3.1.1 The Hills Shire Council

Part B Section 6 *Business* of The Hills Development Control Plan (DCP) 2012 sets out the following:

###### 2.9. Hours of Operation

###### *Development Controls*

- d. *Justification is required to be submitted for the hours of operation and which address noise or other operational issues arising from particular developments. Conditions may be imposed to ameliorate any impact on the adjoining land uses.*

###### *Submission Requirements*

- *A statement of compliance from an acoustical consultant may be required to demonstrate that the noise generated by development generally does not exceed 5dB (A) above the background noise levels, where measured at any boundary adjoining or adjacent to a residential property.*

In accordance with the Council's Request for Information (RFI)<sup>1</sup>, the acoustic report must confirm that the use of the hotel can comply with Council's DCP requirement of 5 dB(A) above background.

##### 3.1.1.1 Post-s.34 conference

Following the Section 34 (s.34) conference with Council and the Court on Thursday, 24 February 2022, Council has requested additional information on how acoustic criteria are going to be achieved and monitored.

The concern with identifying a location and associated criteria at an easily accessible location such as on the grass verge on the corner of Victoria Ave and Windsor Road and being prescriptive is that it will not be in accordance with any policy or documentation referred to in this document. Ultimately, technical compliance should be achieved within the boundary of the residential receivers.

However, Renzo Tonin & Associates agrees if noise complaints are received in the future, noise measurements can be undertaken on both the grass verge on the northern side of Windsor Road and also publicly accessible footpath along the southern side of Windsor Road for receivers on Nola Place, and on the grass verge to the west of 10A Washington Place for receivers along Washington Place and White Cedar Drive to validate the noise complaints. The details are set out in Section 6.5.

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<sup>1</sup> Council's letter dated 1 April 2021

### 3.1.2 NSW Noise Policy for Industry

The assessment procedure in terms of the NPfI has two components:

- Controlling intrusive noise impacts in the short-term for residences; and
- Maintaining noise level amenity for residences and other land uses.

In accordance with the NPfI, noise impact should be assessed against the project noise trigger level which is the lower value of the project intrusiveness noise level and project amenity noise level.

### 3.2 Assessment locations

The identified assessment locations are outlined in Table 3-1 below and shown in Figure 2.

**Table 3-1: Assessment locations**

ID	Address	Description
A1	7, 8 and 9 Nola Place	Single and double-storey residential dwellings located on the opposite side of Windsor Road approximately 80m to the south of the subject site.
A2	9, 10A, 14 and 16 Washington Place	Single-storey residential dwellings located approximately 240m to the east of the subject site.
A3	41, 43, 45 and 47 White Cedar Drive	Single and double-storey residential dwellings located approximately 240m to the east of the subject site.

### 3.3 Existing noise environment

Criteria for the assessment of operational noise are usually derived from the existing noise environment of an area, excluding noise from the subject development. Appendix B of the NPfI outlines two methods for determining the background noise level of an area, being 'B1 - Long-term background noise method' and 'B2 - Short-term background noise method'. This assessment has used long-term noise monitoring.

As the noise environment of an area almost always varies over time, background and ambient noise levels need to be determined for the operational times of the proposed development. For example, in a suburban or urban area the noise environment is typically at its minimum at 3:00am in the morning and at its maximum during the morning and afternoon traffic peak hours. The NPfI outlines the following standard time periods over which the background and ambient noise levels are to be determined:

- Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays
- Evening: 18:00-22:00 Monday to Sunday & Public Holidays
- Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

### 3.3.1 Noise measurement location

Noise measurements are ideally carried out at the nearest or most potentially affected locations surrounding a development. An alternative, representative location should be established in the case of access restrictions or where a safe and secure location cannot be identified. Furthermore, representative locations may be established in the case of multiple receivers as it is usually impractical to carry out measurements at all locations surrounding a site.

The measurement location is outlined in Table 3-2 and shown in Figure 2.

**Table 3-2: Noise monitoring location**

ID	Address	Description
<b>Long-term noise monitoring</b>		
L1	Heartland Motors, corner of Windsor Road and Victoria Avenue, Castle Hill	<p>The noise monitor was located on the southern boundary of the site. The noise monitoring location was exposed to road traffic along Windsor Road.</p> <p>The measured background noise levels are deemed representative for Assessment Location A1.</p>

**Figure 2: Assessment and noise monitoring locations**





### 3.3.2 Long-term noise measurement results

Long-term noise monitoring at L1 was carried out from Friday, 11 to Saturday, 19 September 2020. The long-term noise monitoring methodology is detailed in APPENDIX B, and noise level-vs-time graphs of the data are included in APPENDIX C.

Table 3-3 presents the representative background  $L_{90}$  and ambient  $L_{eq}$  noise levels for each assessment period, determined in accordance with the NPfI.

**Table 3-3: Long-term noise monitoring results**

Monitoring location	$L_{A90}$ RBL			$L_{Aeq}$ Ambient noise levels		
	Day	Evening	Night	Day	Evening	Night
L1 - Corner of Windsor Road and Victoria Avenue, Castle Hill	54	51	33	62	61	57

Notes: Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays  
 Evening: 18:00-22:00 Monday to Sunday & Public Holidays  
 Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays  
 As required by the NPfI, the external ambient noise levels presented are free-field noise levels, ie. no facade reflection.

## 3.4 Project noise goals

### 3.4.1 NSW NPfI

#### 3.4.1.1 Project intrusiveness noise levels/Council's DCP requirement

According to the NPfI, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the  $L_{Aeq,15min}$  descriptor) does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The project intrusiveness noise level, which is only applicable to residential receivers, is determined as follows:

- $L_{Aeq,15minute}$  Intrusiveness noise level = RBL plus 5dB(A)

Based on the background noise monitoring carried out at the monitoring location and the proposed operating hours of the new licensed premises, the intrusiveness noise levels for the nearest affected residential receivers are reproduced in Table 3-4 below.

**Table 3-4: Intrusiveness noise level, dB(A)**

Receiver	Intrusiveness noise level, $L_{Aeq,15min}$		
	Day	Evening	Night
A1	54 + 5 = 59	51 + 5 = 56	33 + 5 = 38
A2*	35 + 5 = 40	30 + 5 = 35	30 + 5 = 35
A3*	35 + 5 = 40	30 + 5 = 35	30 + 5 = 35



Receiver	Intrusiveness noise level, $L_{Aeq,15min}$		
	Day	Evening	Night
Notes:	Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays Evening: 18:00-22:00 Monday to Sunday & Public Holidays Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays * Minimum assumed RBLs and project intrusiveness noise levels as set out in Table 2.1 of the NPfl.		

It is advised that the NPfl project intrusiveness noise levels are the same as Council's DCP requirement.

### 3.4.1.2 Project amenity noise levels

The project amenity noise levels for different time periods of the day are determined in accordance with Section 2.4 of the NPfl. The NPfl recommends amenity noise levels ( $L_{Aeq,period}$ ) for various receivers including residential, commercial and industrial receivers and sensitive receivers such as schools, hotels, hospitals, churches and parks. These "recommended amenity noise levels" represent the objective for total industrial noise experienced at a receiver location. However, when assessing a single industrial development and its impact on an area, "project amenity noise levels" apply.

The recommended amenity noise levels applicable for the subject area are reproduced in Table 3-5 below.

**Table 3-5: Project amenity noise levels, dB(A)**

Type of receiver	Noise amenity area	Time of day	Recommended amenity noise level, $L_{Aeq,period}$
All receivers	Residential - Urban	Day	60
		Evening	50
		Night	45
Notes:	Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays Evening: 18:00-22:00 Monday to Sunday & Public Holidays Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays The $L_{Aeq}$ index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.		

To ensure that the total industrial noise level (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level that applies for each new industrial noise source is determined as follows:

$$L_{Aeq,period} \text{ Project amenity noise level} = L_{Aeq,period} \text{ Recommended amenity noise level} - 5\text{dB(A)}$$

Given that the intrusiveness noise level is based on a 15-minute assessment period and the project amenity noise level is based on much longer periods extending over an entire day, evening and night assessment periods, the NPfl provides the following guidance on adjusting the  $L_{Aeq,period}$  level to a representative  $L_{Aeq,15min}$  level in order to standardise the time periods for the purpose of conducting a noise impact assessment. The adjustment or conversion from  $L_{Aeq,period}$  to  $L_{Aeq,15min}$  is:

$$L_{Aeq,15min} = L_{Aeq,period} + 3\text{dB(A)}$$

Therefore, from the monitored  $L_{Aeq}$  ambient noise levels presented in Table 3-3, the 'project amenity noise levels' applicable for this project are presented in Table 3-6 below.

**Table 3-6: Adopted project amenity noise levels, dB(A)**

Type of receiver	Noise amenity area	Time of day	Recommended noise level	
			$L_{Aeq,period}$	$L_{Aeq, 15min}$
All receivers	Residential - Urban	Day	$60 - 5 = 55$	$55 + 3 = 58$
		Evening	$50 - 5 = 45$	$45 + 3 = 48$
		Night	$45 - 5 = 40$	$40 + 3 = 43$

Notes: Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays  
 Evening: 18:00-22:00 Monday to Sunday & Public Holidays  
 Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays  
 The  $L_{Aeq}$  index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

### 3.4.1.3 Project specific noise goals

In accordance with the Council's DCP requirement, the project specific noise goals are as shown in Table 3-7 below.

**Table 3-7: Project specific noise goals, dB(A)**

Receiver location	$L_{Aeq, 15min}$ Project noise trigger levels, dB(A)		
	Day	Evening	Night
A1	58	48	38
A2	40	35	35
A3	40	35	35

## 4 Noise emission assessment

### 4.1 Licensed premises noise emission assessment

Noise emission from the premises, as is assessable against the established noise goals, includes:

- 200 outdoor patrons in the Beer Garden area;
- 180 outdoor patrons in the Terrace Bar area;
- 130 outdoor patrons in the Outdoor Dining area;
- 45 patrons in the Gaming Room; and
- Noise breakout from internal areas.

As discussed earlier in the *Introduction*, the total patron capacity is limited to 550 patrons up to 5:30pm, Monday to Saturday, from when more car parking spaces will become available for the hotel's patrons; however, this report has maintained the full capacity of 850 patrons at all times for a conservative assessment.

The source noise levels used for the predictions, presented in Table 4-1, were obtained from measurements of similar types of developments.

**Table 4-1: Source noise levels for licensed premises assessment**

Area	Applicable noise source	Overall dB(A)	Octave band centre frequency - Hz (dBZ)								
			31.5	63	125	250	500	1k	2k	4k	8k
Terrace Bar, Beer Garden and Outdoor Dining	Outdoor patrons with low background music ( $L_w$ $L_{eq}$ per person)	82	-	79	78	77	82	81	77	70	56
Internal areas	Internal patrons with low background music (Reverberant $L_p$ $L_{eq}$ )*	81	70	72	72	73	81	81	77	70	68
Gaming Room	Internal patrons with gaming machine noise (Reverberant $L_p$ $L_{eq}$ )*	68	61	61	64	66	71	66	62	57	50

Notes:      \* Spatial  $L_p$  considered occurring at each facade element for the purpose of external noise predictions.  
              The overall  $L_{eq}$  noise level is based on the calculation of  $L_{eq} = L_{10} - 3dB(A)$ .

Low background music means music played through an in-house system to provide an ambience to the premises. It is not intended for live music and/or bands. Our library database collects data from various venues across Sydney and low background music generally means an environment dominated by patron noise not highly influenced by the music played in the background.

## 4.2 Prediction methodology

The noise predictions were based upon the architectural drawing set out in Section 2.4, and carried out in accordance with ISO9613 as implemented by CadnaA computer modelling program. The software takes into account sound radiation patterns, acoustic shielding and potential reflections from intervening building elements, and noise attenuation due to distance.

The following assumptions regarding the acoustic performance of the building envelope design have been made for the acoustic assessment.

**Table 4-2: Building envelope acoustic performance**

Construction element	Assumed acoustic rating $R_w$	Indicative construction
Glazed doors/windows/openings (operable)/skylight	25	6mm thick glass in aluminium frame with acoustic seals

For the purpose of the noise assessment, it is assumed that doors and windows on the west and south sides of the Bistro and Lounge Bar areas are open, as well as the doors and windows on the south side of the Sports Bar area.

## 4.3 Licensed premises noise prediction results & assessment

Table 4-3 summarises the results of the noise assessment, presenting the predicted noise emission levels at the identified assessment location against the established council noise goals, without any acoustic mitigation measures. Noise predictions were undertaken for all identified receivers; however, only the highest predicted noise levels are presented below.

**Table 4-3: Predicted noise level assessment,  $L_{eq}$  against Council's noise criteria without acoustic mitigation measure**

Assessment ID	Noise aspect	Predicted noise levels, dB(A)	$L_{Aeq, 15min}$ Project noise trigger levels, dB(A)		
			Day	Evening	Night
A1 - Rear of 7 Nola Place	Patron and music	44	58	48	<b>38</b>
	Carpark	24	58	48	38
	Total	44	58	48	<b>38</b>
A2 - Rear of 10A Washington Place	Patron and music	27	40	35	35
	Carpark	17	40	35	35
	Total	28	40	35	35
A3 - Rear of 43 White Cedar Drive	Patron and music	23	40	35	35
	Carpark	24	40	35	35
	Total	27	40	35	35

Notes:

**Bold noise level** indicates exceedance when compared against the project trigger noise level.

The predicted  $L_{eq}$  noise level for patron and music is based on the calculation of  $L_{eq} = L_{10} - 3dB(A)$ .

Table 4-3 shows that the proposed use of the development is predicted to comply with the established Council's noise criteria for the day and evening time periods. However, the predictions also reveal potential non-compliances for the night-time period without any acoustic mitigation measure.

Table 4-4 summaries the results of the noise assessment, presenting the predicted noise emission levels at the identified assessment locations against the established Council's noise criteria, with the doors and windows on the west and south sides of the Bistro and Lounge Bar areas closed for the night-time period, as well as the doors and windows on the south side of the Sports Bar area. Furthermore, the total number of external patrons have been reduced to 170 patrons; 85 external patrons in the Beer Garden area and 85 external patrons in the Outdoor Dining and Terrace Bar area.

**Table 4-4: Predicted noise level assessment,  $L_{eq}$  against Council's noise criteria with acoustic mitigation measures**

Assessment ID	Noise aspect	Predicted noise levels, dB(A)	$L_{Aeq, 15min}$ Project noise trigger levels, dB(A)
			Night
A1 - Rear of 7 Nola Place	Patron and music	38	38
	Carpark	24	38
	Total	38	38
A2 - Rear of 10A Washington Place	Patron and music	23	35
	Carpark	17	35
	Total	24	35
A3 - Rear of 43 White Cedar Drive	Patron and music	19	35
	Carpark	24	35
	Total	26	35

Note: The predicted  $L_{eq}$  noise level for patron and music is based on the calculation of  $L_{eq} = L_{10} - 3dB(A)$ .

Table 4-4 shows that the proposed use of the development can comply with the established Council's noise criteria for the night-time period, by limiting the total of outdoor patrons to 170 and closing all the doors and windows detailed above at 10:00pm.

## 4.4 Discussion

As shown in Table 4-3, the proposed use of the development is predicted to comply with the established noise criteria for the day and evening time periods. However, the predictions also reveal potential non-compliances for the night-time period without any acoustic mitigation measure. By limiting the total of outdoor patrons to 170 and closing all the doors and windows on the west and south sides of the Bistro and Lounge Bar areas at 10:00pm as well as the doors and windows on the south side of the Sports Bar area, the proposed use of the development is predicted to comply with the established Council's noise criteria for the night-time period. The predicted noise levels from the carpark activities are shown to be significantly lower than the predicted noise levels from patrons and music at Assessment Locations A1 and A2. As a result, the carpark activities have negligible contribution to the cumulative overall predicted noise level.



By implementing all of the acoustic mitigation measures described above, the proposed development can comply with the established noise criteria for the proposed operating hours.

## 5 Sleep disturbance

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. In accordance with NPfI, a detailed maximum noise level event assessment should be undertaken where the subject development night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$  40dB(A) or the prevailing RBL plus 5dB, whichever is the greater, and/or
- $L_{AFmax}$  52dB(A) or the prevailing RBL plus 15dB, whichever is the greater.

Where there are noise events found to exceed the initial screening level, further analysis is undertaken to identify:

- The likely number of events that might occur during the night assessment period,
- The extent to which the maximum noise level exceeds the rating background noise level.

The sleep disturbance noise levels for the project are presented in Table 5-1.

**Table 5-1: Sleep disturbance assessment levels**

Receiver type	Assessment Level $L_{Aeq,15min}$	Assessment Level $L_{AFMax}$
A1 - Rear of 7 Nola Place	40	52
A2 - Rear of 10A Washington Place	40	52
A3 - Rear of 43 White Cedar Drive	40	52

Sleep disturbance would most potentially be caused by a single event of a door slam or engine start in the carpark area, or patron shouting while on the at-grade carpark or in the Terrace area, Beer Garden area or Outdoor Dining areas, where there is a limited degree of acoustic shielding (compared with internal activities) and due to the relatively high  $L_1$  noise levels that can be generated. A reference sound power level of a male shouting was used for the purpose of this assessment and is presented in Table 5-2 below.

**Table 5-2: Sound power levels**

Activity	Sound power level, dB(A) re 1pW
Door slam	96 $L_{AMax}$
Engine start	97 $L_{AMax}$
Male shouting*	96 $L_1$ (1-minute)

Note: \* Source reference - Handbook of Acoustical Measurements and Noise Control, Third Edition, Cyril M. Harris

The predicted noise level at the identified receiver locations from a single event of male shouting in the Beer Garden Area or carpark area is  $L_{AFMax}$  40dB(A), 31dB(A) and 24dB(A) at A1, A2 and A3, respectively, ie. easily complying with the sleep disturbance criteria.

## 6 Recommendations

### 6.1 Building envelope

The building envelopes as set out in Table 4-2 are to be provided as a minimum.

At 10:00pm, all the doors and windows on the west and south sides of the Bistro and Lounge Bar areas as well as the doors and windows on the south side of the Sports Bar area are to be closed.

### 6.2 Reduction in external patrons

At 10:00pm, the number of external patrons must be limited to 170 patrons; 85 patrons in the Beer Garden area and 85 external patrons in the Outdoor Dining and Terrace Bar area.

### 6.3 Awnings

Awnings with soft materials are proposed on the outdoor areas and although these have not been included in the acoustic modelling, these are expected to provide minor potential benefit by absorption, which will further reduce the noise level at the receivers.

### 6.4 Mechanical plant

Mechanical plant associated with the development has the potential to impact on nearby noise sensitive properties. In order to carry out a quantitative assessment of mechanical equipment, a complete specification of equipment is required. At this early stage of the development, appropriate detail for mechanical plant is not typically available. A qualitative assessment has therefore been carried out and in-principle noise management measures outlined:

- Acoustic assessment of mechanical services equipment should be undertaken during the detailed design phase of the development to ensure that the cumulative noise of all equipment does not exceed the applicable noise criteria. Development Consent Conditions typically require detailed assessment of mechanical plant and equipment prior to issue of the Construction Certificate.
- Noise control treatment can affect the operation of the mechanical services system. An acoustic engineer should be consulted during the initial design phase of mechanical services system to reduce potential redesign of the mechanical system.
- Mechanical plant noise emission can be controlled by appropriate mechanical system design and implementation of common engineering methods, which may include:
  - procurement of 'quiet' plant
  - strategic positioning of plant away from sensitive neighbouring premises to maximise intervening acoustic shielding between the plant and sensitive neighbouring premises

- commercially available acoustic attenuators for air discharge and air intakes of plant
- acoustically lined and lagged ductwork
- acoustic barriers between plant and sensitive neighbouring premises
- partial or complete acoustic enclosures over plant
- The specification and location of mechanical plant should be confirmed prior to installation on site, and
- Fans shall be mounted on vibration isolators and balanced in accordance with Australian Standard 2625 '*Rotating and Reciprocating Machinery - Mechanical Vibration*'.

## 6.5 Post-s.34 conference - Council's email list dated 24 February 2022

Council has requested a simplified way to assess how acoustic criteria are going to be achieved and monitored in a safe manner and from a publicly accessible location.

Some suggested locations are outlined in Table 6-1 below and shown in Figure 3 for Council's consideration.

**Table 6-1: Validation locations for patron and music**

ID	Address	Predicted noise levels for patron and music, dB(A)	
		Day & Evening	Night
V1	Grass verge (northern side of Windsor Road)	63	57
V2	9 Nola Place (in front of the boundary fence)	55	48
V3	Grass verge (adjoining 10A Washington Place)	36	32
V4	47 White Cedar Drive (in front of the boundary fence)	29	24
V5	43 White Cedar Drive (in front of the boundary fence)	24	19

Note: The predicted  $L_{eq}$  noise level for patron and music is based on the calculation of  $L_{eq} = L_{10} - 3dB(A)$ .



**Figure 3: Assessment and noise monitoring locations**

## 6.6 Music noise level limits in the outdoor areas

The acoustic assessment considered outdoor patrons with low background music. As mentioned in Section 4.1, low background music means music played through an in-house system to provide an ambience to the premises. It is not intended for live music and/or bands. Our library database collects data from various venues across Sydney and low background music generally means an environment dominated by patron noise not highly influenced by the music played in the background.

Noise levels measured at 3m from each speaker within the outdoor areas are to be restricted to  $L_{eq}$  80dB(A). They are limited to be no more than 10dB less than patron noise levels, so as not to contribute.



## 7 Acoustic risk assessment

Risk management is an integral part of good management practice. Australian/New Zealand Standard AS/NZS 4360:2004 "Risk management" has become part of our company's culture and as a consequence it permeates all aspects of the company's work and is actively promoted to our clients.

The risk management process can be applied to any situation where an undesired or unexpected outcome could be significant or where opportunities are identified. Our clients need to know about possible outcomes and the steps that can be taken to control any adverse impact.

There is an opportunity in the design process for the client to actively participate in risk management by providing input into risk reduction strategy. For example, the client may need to know that some aspects of risk reduction could involve passing those risks on to other entities in a better position to treat those risks. Some aspects of risk reduction may involve additional cost or time consequences. On the other hand, there may also be opportunities to avoid or avert risk at no cost to the client by rescheduling processes so that key information becomes available at a critical time.

When the client is properly informed, this supports better decision making by contributing a greater insight into risks and their impacts. It is recommended that the client seek to understand the potential risk during the detailed design phase of the development.

## 8 Conclusion

Renzo Tonin & Associates has completed an assessment of operational noise for the proposed new pub/hotel on existing car yard site of Heartland Motors Castle Hill, corner of Windsor Road and Victoria Avenue, Castle Hill. The primary aspects of noise emission will be from patrons in the Beer Garden, Outdoor Dining and Terrace Bar areas, noise breakout from the internal areas and carpark activities.

The proposed works have been assessed against all relevant noise criteria with project specific noise goals established from the long-term noise monitoring at the nearest most potentially affected receiver locations. With the acoustic assessment as shown in Section 4, which is in line with Council's DCP requirement, and the adoption of the recommended measures set out in Section 6, the licensed premises is predicted to comply with the established noise criteria during the proposed operational hours with the proposed patron capacity (limited patron capacity during the night-time period).

## APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
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 point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken 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 $L_{90}$ noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive 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	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
$L_{Max}$	The maximum sound pressure level measured over a given period.
$L_{Min}$	The minimum sound pressure level measured over a given period.

L <sub>1</sub>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L <sub>10</sub>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L <sub>90</sub>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L <sub>90</sub> noise level expressed in units of dB(A).
L <sub>eq</sub>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) 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 L <sub>eq</sub> sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
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 Long-term noise monitoring methodology

### B.1 Noise monitoring equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave band data	Logger location
RTA-06 (NTi Audio XL2, with low noise microphone)	Type 1	1/1	L1

Note: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table and are suitable for field use.

The equipment was calibrated prior and subsequent to the measurement period using a Brüel & Kjær Type 4230 calibrator. No significant drift in calibration was observed.

### B.2 Meteorology during monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the NSW NPfL. Determination of extraneous meteorological conditions was based on data provided by the Bureau of Meteorology (BOM), for a location considered representative of the noise monitoring location(s). However, the data was adjusted to account for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data is based on Table C.1 of ISO 4354:2009 '*Wind actions on structures*'.

### B.3 Noise vs time graphs

Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the  $L_{10}$ ,  $L_{90}$ , and  $L_{eq}$  levels. The statistical descriptors  $L_{10}$  and  $L_{90}$  measure the noise level exceeded for 10% and 90% of the sample measurement time. The  $L_{eq}$  level is the equivalent continuous noise level or the level averaged on an equal energy basis. Measurement sample periods are usually ten to fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.



## APPENDIX C      Long-term noise monitoring results

## Heartland Castlehill

### Background & Ambient Noise Monitoring Results - NSW 'Noise Policy for Industry', 2017

Date	L <sub>A90</sub> Background Noise Levels <sup>4</sup>			L <sub>Aeq</sub> Ambient Noise Levels		
	Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>	Day <sup>1</sup>	Evening <sup>2</sup>	Night <sup>3</sup>
Friday-11-September-2020	-	51	34	-	61	56
Saturday-12-September-2020	54	49	35	61	59	55
Sunday-13-September-2020	53	50	33	61	59	59
Monday-14-September-2020	54	50	28	62	61	57
Tuesday-15-September-2020	53	51	33	62	60	58
Wednesday-16-September-2020	54	53	35	63	61	58
Thursday-17-September-2020	54	52	30	62	63	58
Friday-18-September-2020	57	51	-	63	61	-
Saturday-19-September-2020	54	50	-	61	59	-
Sunday-20-September-2020	-	-	-	-	-	-
<b>Representative Weekday<sup>5</sup></b>	<b>54</b>	<b>51</b>	<b>33</b>	<b>63</b>	<b>61</b>	<b>57</b>
<b>Representative Weekend<sup>5</sup></b>	<b>54</b>	<b>50</b>	<b>34</b>	<b>61</b>	<b>59</b>	<b>57</b>
<b>Representative Week<sup>5</sup></b>	<b>54</b>	<b>51</b>	<b>33</b>	<b>62</b>	<b>61</b>	<b>57</b>

#### Notes:

1. Day is 8:00am to 6:00pm on Sunday and 7:00am to 6:00pm at other times

2. Evening is 6:00pm to 10:00pm

3. Night is the remaining periods

4. Assessment Background Level (ABL) for individual days

5. Rating Background Level (RBL) for LA90 and logarithmic average for LAeq

6. Leq is calculated in the

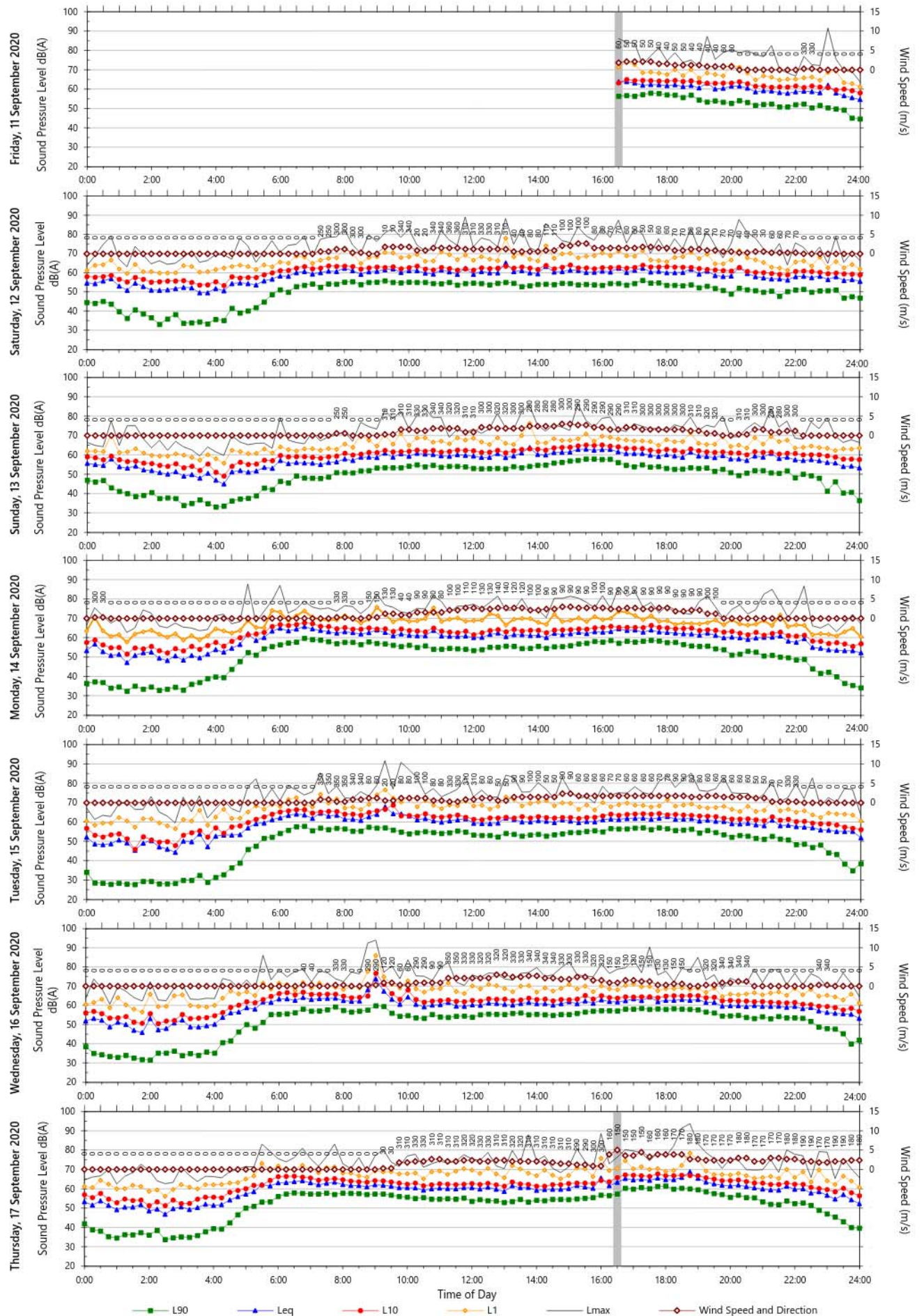
free field. 2.5dB is subtracted from results if logger is placed at façade

7. Number in brackets represents the measured (actual) RBL value, which is below the

minimum policy value of 30 dB(A) during the evening or night period or 35 dB(A) during the day period.

# Unattended Monitoring Results

Location: Heartland Castlehill



Data File: 2020-09-11\_SLM\_000\_123\_Rpt\_Report.txt

Template: QTE-26 Logger Graphs Program (r33)



