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Environmental Noise Assessment
Proposed Alterations
Dapto Leagues Club

At:-

Cnr Station Street & Bong Bong Road

Dapto, NSW 2530

Prepared for:-

Integrated Projects Pty. Ltd.
55/2-4 Picrite Close
Pemulwuy NSW 2319

Attention: Mr Scott McGregor

Reference: 2303022E-R Rev A

Prepared by:-

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Integrated Projects Pty. Ltd. on behalf of the Dapto Leagues Club commissioned Harwood Acoustics Pty. Ltd. to carry out an environmental noise assessment for the proposed alterations and additions to the Dapto Leagues Club at Cnr Station Street and Bong Bong Road, Dapto, NSW.

Accordingly, Harwood Acoustics Pty Ltd has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics Pty Ltd and may not be suitable for use beyond that scope.

Harwood Acoustics Pty Ltd undertake no duty nor accept any responsibility to any third party who may rely upon this report.

Advice and recommendations provided in this report are in relation to acoustical issues only. No claims of expertise are made, and no liability is accepted, in relation to issues falling outside the field of acoustical consulting. These may include, but are not limited to, structural and waterproofing considerations, fire rating or thermal rating. Relevant authorities and / or experts should be consulted regarding areas other than acoustics.

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1. INTRODUCTION AND SUMMARY

Integrated Projects Pty. Ltd. on behalf of the Dapto Leagues Club commissioned Harwood Acoustics Pty. Ltd. to carry out an environmental noise assessment for the proposed alterations and additions to the Dapto Leagues Club at Cnr Station Street and Bong Bong Road, Dapto, NSW (the Club).

The Club is located on the northern side of Bong Bong Road between Station Street, to the west and Osborne Street to the east, on land zoned E1 Local Centre under Wollongong City Council's Local Environment Plan 2009 (LEP).

There are commercial premises across Osborne Street to the east and across Bong Bong Road to the South. Across Station Street to the west and north west is Harington Park and the Dapto Railway Station with industrial premises in Hamilton Street beyond. There are some isolated dwellings in Hamilton Street and some dwellings that are associated with commercial or industrial undertakings. Each of these are located in an E4 General Industrial Zone and are considered as such in establishing noise design goals in accordance with the NSW Environment Protections Authority's (EPA) *Noise Policy for Industry* 2017.

The closest residential receptors to the Site are located to the north and north east in Baan Baan Street and Osborne Street and to the south west in Bong Bong Road and Burringbar Street. A location plan is shown in Figure 1.

It is proposed to carry out alterations and additions to the Club including the refurbishment of the ground floor to create a new food and beverage venue, open and covered terraces, a new kitchen, café, loading dock and recycling store as well as in increase to the children's play area, a renovated reception and the construction of a two level car park. A ground floor plan is shown in Figure 2 and full details can be seen in Altis Architecture Pty. Ltd.'s architectural drawings for Project No. 2219.03, dated 01/11/2024.

It is a requirement of Wollongong City Council that an Environmental Noise Assessment be prepared to be submitted with the development application. The assessment is to address the potential for noise emission arising from the alterations and additions to impact existing residences in proximity of the Site. Noise sources associated with the proposal include patron noise, children noise, and noise emission from any proposed new mechanical plant as well as motor vehicle and car park noise.

Significantly however, regulation around noise, planning and liquor licensing has recently been updated through the NSW Government's 24-Hour Economy Legislation (Vibrancy Reforms) Amendment Act 2023.

The aim of the Act is to ensure that venues in NSW will have the opportunity to reach their full entertainment, economic and creative potential – especially at night.

From 1 July 2024, the Vibrancy Reforms designate Liquor & Gaming NSW as the lead regulator for entertainment sound coming from licensed premises.

To help Liquor & Gaming NSW effectively carry out this role, amendments have been made to relevant pieces of legislation. These amendments ensure that entertainment sound emanating from licensed premises is solely managed under the disturbance complaint framework of the Liquor Act 2007.

This means that noise-related conditions of development consent and 'offensive noise pollution' laws no longer apply when such matters are regulated by the Liquor Act 2007. This is discussed in greater detail in Section 3 of this Report.

Notwithstanding the changes and reforms, in our view, Council must still be satisfied that noise emission arising from licensed will not cause significant impacts, in order to grant consent.

In the first instance at least, this noise assessment therefore provides predictions of the level of noise emission arising from the proposed new areas and compares those predictions to the noise limits that would previously typically apply to this development.

As such, acceptable noise limits are derived from Liquor and Gaming NSW's standard noise conditions for patrons and background music or television noise and the NSW *Noise Guide for Local Government* (2023) for any new mechanical plant servicing the buildings. Noise goals for the isolated and care taker dwellings located in the E4 General Industrial Zone to the east in Hamiton Street are derived from the NSW EPA's *Noise Policy for Industry* 2017.

Recommendations are made in Section 6 of this Report to reduce the level of noise emission to within the noise design goals at all receptors. Recommendations include closing all external terraces at 12 am, limiting the level of background music or television screens after 10 pm, advice on minimising the reverberant build-up of sound within the terrace areas and carrying out a final assessment of mechanical plant noise prior to the issue of a Construction Certificate. This will include consideration of the cumulative impacts of existing plant.

Providing these recommendations are implemented and continue to be adhered to Liquor and Gaming NSW and the EPA's noise goals will be met at all receptor locations as required by Wollongong City Council.

Section 8 provides an assessment of the potential noise and vibration impacts on surrounding neighbours during the construction phase in accordance with the NSW EPA's *Interim Construction Noise Guideline 2009* and Australian Standard AS2436:2010. In preparing this assessment consideration was also given to the NSW Government's *Sydney Metro Construction Environmental Management Framework* and *Sydney Metro Construction Noise and Vibration Standard*.

A noise model was developed to predict the potential levels of noise emission during each of the various construction phases based on a selection of typical plant and equipment. There is potential for the construction noise goals to be exceeded at the neighbours surrounding the Site on some occasions, during some activities.

Notwithstanding this, feasible and reasonable methods to reduce noise emissions and minimise the noise impact on all residential premises are provided in Section 6 of this report. These include limiting construction activity to within the prescribed hours where practicable, selecting quiet equipment where practicable, incorporating periods of respite, maintaining community consultation and relations, managing noise complaints, and conducting ground-borne vibration monitoring during piling or rock breaking.

Provided the recommendations in Section 9 of this report are implemented and adhered to, the level of noise and vibration from the construction works will be satisfactorily minimised in accordance with the NSW EPA's *Interim Construction Noise Guideline 2009* and Australian Standard AS2436:2010, so far as is reasonably practicable.

Section 9 of this Report serves as a CNVMP and may be incorporated into an overall Construction Management Plan if and as required.

2. SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The Club is between Baan Baan Street and Bong Bong Road on the north and south and between Osborne Street and Station Street on the east and west. The Club is located on land zoned E1 Local Centre under Wollongong City Council's Local Environment Plan 2009 (LEP).

There are commercial premises across Osborne Street to the east and across Bong Bong Road to the South. Across Station Street to the west and north west is Harington Park and the Dapto Railway Station with industrial premises in Hamilton Street beyond. There are some isolated dwellings in Hamilton Street and some dwellings that are associated with commercial or industrial undertakings.

The nearest residential receptors are located to the north and north east in Baan Baan Street and Osborne Street and to the south west in Bong Bong Road and Burringbar Street.

The closest receptors to the Site are shown in Figure 1 below and as follows:-

R1 – 28 Station St, 25 & 34 Osborne St
R2 – 65 to 67 Bong Bong Road
R3 – 20 to 22 Bong Bong Road (church)
R4 – Industrial premises in Hamilton St
R5 – Commercial Premises in Hamilton St
R6 – Caretaker/Isolated dwellings in Hamilton St

Figure 1. Location Plan – Dapto Leagues Club, Dapto, NSW

(Source: www.metromap.com.au ©)

Receptors:-

- R1 – represents the closest residential dwellings to the north and north east in Station Street and Osborne Street respectively and those beyond,
- R2 – represents the closest residential dwelling/s to the south west in Bong Bong Road and Burringbar Street and those beyond
- R3 – represents the Illawarra Community Baptist Church,
- R4 – represents all industrial premises located within the Industrial Zone to the west,
- R5 – represents all commercial premises located within the Industrial Zone to the west,
- R6 – represents all caretaker and isolated dwellings located within the Industrial Zone to the west (discussed in detail in Section 3.4).

Compliance with the noise goals at the receptors identified in Figure 1 will ensure compliance at all receptors in proximity of the Club.

2.2 Description of Proposal

It is proposed to carry out alterations and additions to the Club including the refurbishment of the ground floor to create a new food and beverage venue, open and covered terraces, a new kitchen, café, loading dock and recycling store as well as in increase to the children's play area, a renovated reception and the construction of a two level car park.

A proposed site plan is shown in Figure 2 and a ground floor plan is shown in Figure 3. Full details can be seen in Altis Architecture Pty. Ltd.'s architectural drawings for Project No. 2219.03, dated 01/11/2024.

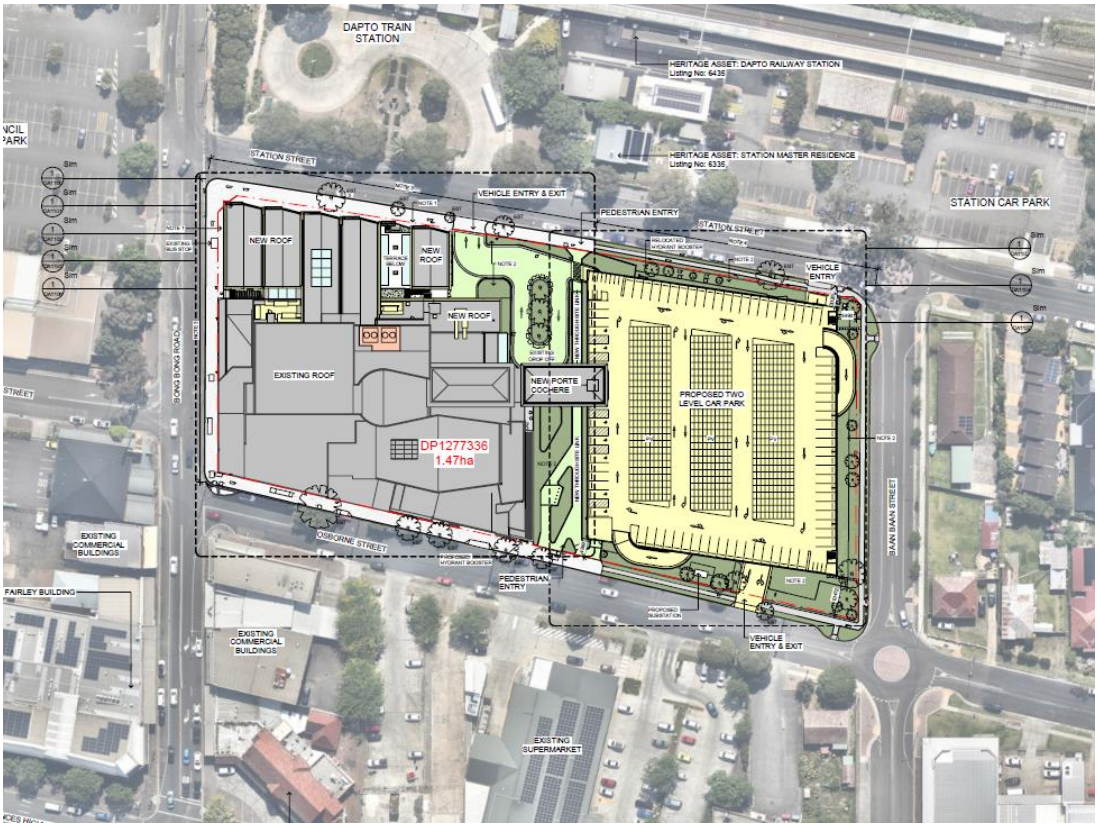

Figure 2. Proposed Site Plan

(source: Altis Architecture Pty. Ltd.'s architectural drawing DA0001 for Project No. 2219.03, dated 01/11/2024)

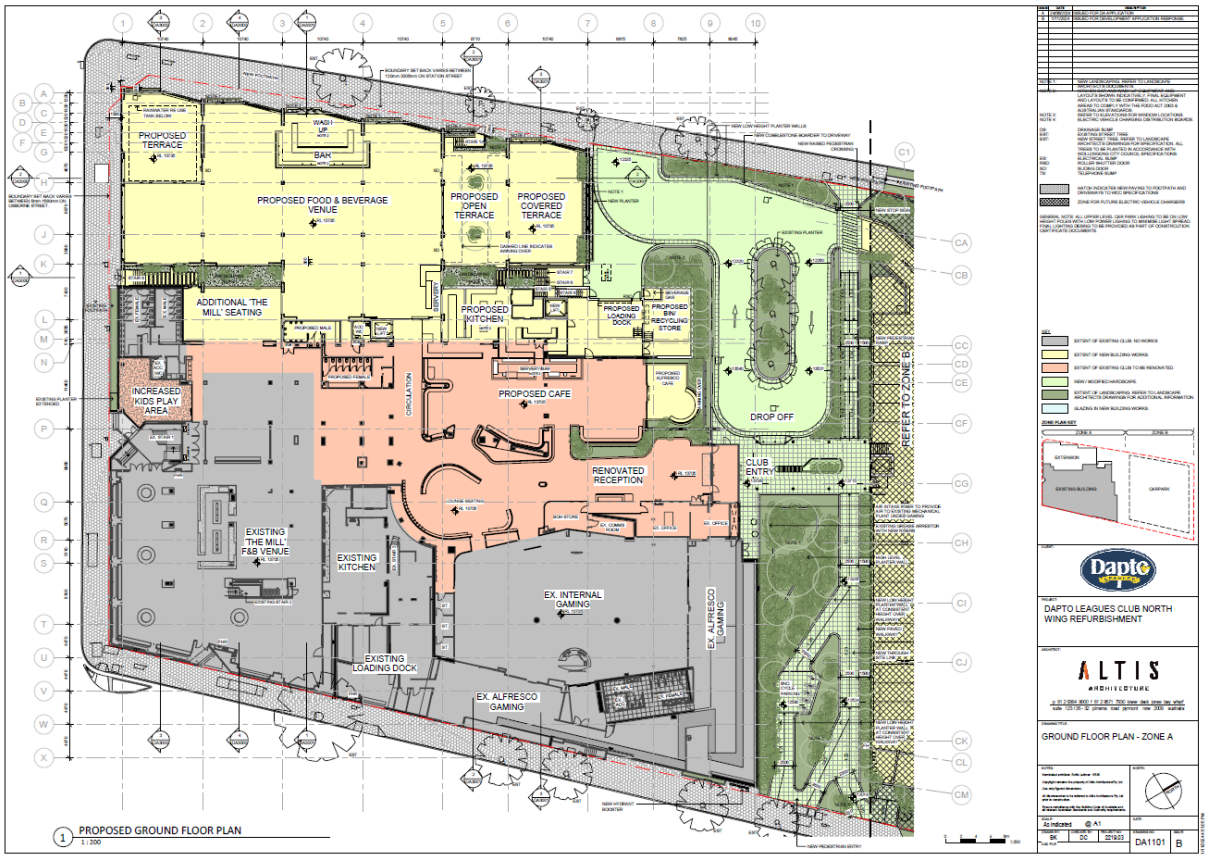

Figure 3. Proposed Ground Floor Plan

(source: Altis Architecture Pty. Ltd.'s architectural drawing DA1101 for Project No. 2219.03, dated 01/11/2024)

Figure 4 below shows a 3D perspective of the proposed alterations looking from the south west corner of Station Street and Bong Bong Road and identifies the main noise source areas considered in noise modelling.

Figure 4. 3D Model

(source: Altis Architecture Pty. Ltd.'s architectural 3D model for Project No. 2219.03, dated 14/06/2024)

3. NOISE CRITERIA

This section outlines the noise guidelines applicable to this proposal and establishes the project specific noise goals.

3.1 NSW Liquor and Gaming

As mentioned in the introduction, regulation around noise, planning and liquor licensing has recently been updated through the NSW Government's 24-Hour Economy Legislation (Vibrancy Reforms) Amendment Act 2023.

The aim of the Act is to ensure that venues in NSW will have the opportunity to reach their full entertainment, economic and creative potential – especially at night.

From 1 July 2024, the Vibrancy Reforms designate Liquor & Gaming NSW as the lead regulator for entertainment sound coming from licensed premises.

To help Liquor & Gaming NSW effectively carry out this role, amendments have been made to relevant pieces of legislation. These amendments ensure that entertainment sound emanating from licensed premises is solely managed under the disturbance complaint framework of the Liquor Act 2007.

This means that noise-related conditions of development consent and 'offensive noise pollution' laws no longer apply when such matters are regulated by the Liquor Act 2007. This is discussed in greater detail in Section 3 of this Report.

Specifically, From 1 July 2024 the following consent conditions no longer have effect.

- Conditions related to noise from the way the business of the licensed premises is conducted.
- They are:
    - decibel limit-based sound controls, such as the L_{A10} noise criteria
    - the provision or cessation of live/amplified music or sound entertainment at specific times
    - the use of a noise limiter
    - the placement and use of speakers.
- Conditions related to the behaviour of patrons after they leave the licensed premises. This includes anti-social behaviour or alcohol-related violence.

In essence this means that local Councils can no longer impose prescriptive noise limits on approvals or development consents for licensed premises.

If, however, the current liquor license includes Liquor and Gaming NSW's standard noise limits for licensed premises, then these are still applicable. In this instance the SS & A Club Albury's liquor license does not contain prescriptive noise limits.

Notwithstanding the new Vibrancy Reforms, Council must be satisfied that the level of noise emission from licensed premises will not cause unacceptable noise impacts in order to approve development applications.

Therefore, to determine whether the level of noise emission from the proposal is likely to cause unacceptable noise impacts, predicted noise levels are compared to the standard Liquor and Gaming NSW Limits. These are as follows:-

"The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8 kHz inclusive) by more than 5 dB between 07:00 am and 12:00 midnight at the boundary of any affected residence.

The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5 Hz – 8 kHz inclusive) between 12:00 midnight and 07:00 am at the boundary of any affected residence.

Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am".

3.2 NSW Environment Protection Authority's Noise Guide for Local Government

The Environment Protection Authority (EPA) published the *Noise Guide for Local Government* in June 2023 (the Guide). The Guide replaced the former 2013 version in January 2023 and provides practical guidance to council officers on day-to-day management of common neighbourhood noise problems.

The Guide focuses on the regulation, assessment and management of neighbourhood noise issues, which generally are managed by councils. The Guide is not a statutory document but may help councils determine how to respond to noise issues in their area.

Part 2 of the Guide provides an overview of the legal framework for noise control in NSW and includes advice in relation to the assessment and management of a variety of specific noise sources and noise related issues that Council may encounter. These include, for example, agricultural noise, music venues, outdoor entertainment activities, air conditioners, heat pump hot water heaters and pool / spa pumps, shooting ranges, etc.

It is generally accepted that a noise source is generally considered to be intrusive if the noise from the source when measured over a 15-minute period ($L_{eq,\ 15\ minute}$), exceeds the background noise ($L_{90,\ 15\ minute}$) by more than 5 dB.

The noise from the source is measured or assessed at the most affected point within the residential property boundary, or if that is more than 30 metres from the residence, at the most affected point within 30 metres of the residence.

3.3 Measured Background Noise Levels

In order to establish the Intrusiveness noise goals, it is necessary to determine the background noise levels in the vicinity of all potentially affected residential receptors.

The background noise level is defined by the EPA as 'the underlying level of noise present in ambient noise when all unusual extraneous noise is removed' and is considered to be represented by the $L_{A90,\ 15\ minute}$ descriptor. This is a statistical measure of the sound pressure level that is exceeded for 90 % of the time.

The Rating Background Level is the single-figure background noise level derived from monitoring $L_{A90,\ 15\ minutes}$ over a representative period of time. The Rating Background Level is established for the day, evening and night time periods and is used for assessment purposes.

The EPA's *Noise Policy for Industry* 2017 provides a method for establishing a rating background noise level for each of three periods being the day time period (7 am to 6 pm), the evening time period (6 pm to 10 pm) and the night time period (10 pm to 7 am).

This is done by deriving a single figure background noise level from monitoring $L_{90,\ 15\ minute}$ noise levels over a representative period of time, typically one week.

The noise criteria set by Liquor and Gaming NSW applies during the two periods of 7 am to 12 am and 12 am to 7 am, where the noise goal is derived from the background noise level at any given time under consideration.

It is often useful, particularly at the planning stage of a proposal to use the EPA's rating background noise levels for each period of the day, evening and night periods (or shoulder periods thereof) to establish realistic noise goals for licensed premises during the times of operation.

Background noise surveys were undertaken between Thursday 11 and Thursday 18 May 2023 at the following locations:-

- 14 Urana Road, near the intersection with Osborne Street to the north of the Site, and
- 8 Burringbar Street to the south west of the Site

The results of the background noise survey are summarised in Table 1 below.

Details of instrumentation used during the noise survey can be seen in the attached Appendix A.

Table 1 Rating Background Levels – Dapto, NSW

Period / Time of Day	Rating Background Level dBA	Ambient Noise Levels ($L_{eq,\ 15\ minute}$, dBA)
Location 1 – North (Receptor Area R1 – Station St and Osborne St)		
Day Time Period (7 am to 6 pm)	**47**	**60**
Evening Time Period (6 pm to 10 pm)	**45**	**57**
Early Night (10 pm to 12 am)	**39**	**57**
Night Time Period (10 pm to 7 am)	**34**	**53**
Location 2 – South West (Receptors Area R2 – Bong Bong Road and Burringbar Street)		
Day Time Period (7 am to 6 pm)	**43**	**59**
Evening Time Period (6 pm to 10 pm)	**43**	**57**
Early Night (10 pm to 12 am)	**37**	**57**
Night Time Period (10 pm to 7 am)	**33**	**55**

Short-term attended background noise measurements were also taken at the site to establish the octave band centre frequency noise levels for the establishment of noise limits for licensed premises.

The measured octave band background noise levels have been adjusted to match the rating background noise levels shown in Table 1 and the resulting levels are shown in Table 2 below for each period.

Table 2 Octave Band and Overall L_{90} Background Noise Levels

Time Period	Overall dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Receptor Area R1										
Day time period	**47**	52	53	46	39	39	44	40	31	23
Evening time period	**45**	50	51	44	37	37	42	38	29	21
Early night time period	**39**	44	45	38	31	31	36	32	23	15
Night period	**34**	39	40	33	26	26	31	27	18	10
Receptor Area R2										
Day time period	**43**	48	49	42	35	35	40	36	27	19
Evening time period	**43**	48	49	42	35	35	40	36	27	19
Early night time period	**37**	42	43	36	29	29	34	30	21	13
Night period	**33**	38	39	32	25	25	30	26	17	9

3.4 NSW EPA's Noise policy for industry 2017 (Amenity Noise Levels)

There are a number of commercial and industrial premises to the west in Hamilton Street including, for example:-

- Church (place of public worship)
- Disability trust
- Electrical contractors
- Building contractors
- Steel fabrication workshops
- Removals and storage facility
- Metal recycling (cars)
- Smash repairs

In addition to the existing commercial and industrial premises in Hamilton Street are some dwellings.

The entire street is zoned E4 General Industrial and the majority of the dwellings are associated with the commercial or industrial activities undertaken on the premises. The remainder are considered sporadic or isolated residences in an industrial zone.

The EPA in the glossary of the *Noise Policy for Industry* 2017 defines a residence as:-

> *'A lawful and permanent structure erected in a land-use zone that permits residential use (or for which existing use rights under the EP&A Act apply) where a person/s permanently reside and is not, nor associated with, a commercial undertaking such as caretakers' quarters, hotel, motel, transient holiday accommodation or caravan park.'*

In order to establish appropriate design noise goals for the various receptors in Hamilton Street, consideration is given to the NSW EPA's *Noise Policy for Industry* 2027 Amenity Noise Levels. These are shown in Table 3 below.

Table 3 Amenity Noise Levels (EPA Table 2.2)

Receiver	Noise Amenity Area	Time of Day	L_{Aeq}, dBA
(see Table 2.3 to determine which residential receiver category applies)			**Recommended amenity noise level**
Residential	Rural	Day Evening Night	50 45 40
	Suburban	Day Evening Night	55 45 40
	Urban	Day Evening Night	60 50 45
Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB(A) above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35 (see notes for table)
Hospital ward internal external	All	 Noisiest 1-hour Noisiest 1-hour	 35 50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (e.g. national park)	All	When in use	50
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB(A) to recommended noise amenity area

Relevant Notes:

Time of day is defined as follows:

- day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays
- evening – the period from 6 pm to 10 pm
- night – the remaining periods
- **for isolated residences in an industrial zone, the industrial amenity level would usually apply.**

The noise level for Places of Public Worship of 40 dBA is an internal noise level and consequently a noise design goal of 50 dBA is established in this assessment to ensure the internal noise level is met.

3.5 Sleep Disturbance

Best practice noise design goals for the assessment of the potential for sleep disturbance may be found in the following documents and guidelines.

3.5.1 NSW EPA's Noise Policy for Industry (2017)

NSW EPA's *Noise Policy for Industry* (2017), Section 2.5 'Maximum noise level event assessment' states: -

"The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed:

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

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the NSW Road Noise Policy."

3.5.2 NSW EPA's Road Noise Policy (2011) (Sleep disturbance)

Section 5.4 of the NSW EPA's *Road Noise Policy* states: -

"Further studies by the enHealth Council (2004) and the guidelines published by the World Health Organisation (1999) were reviewed and analysed in terms of the guidance on noise exposure and sleep disturbance. The enHealth report states that:

'as a rule, for planning for short-term or transient noise events, for good sleep over 8 hours the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45 dB(A) L_{Max} *more than 10 or 15 times per night'."*

3.5.3 NSW EPA's Environmental Criteria for Road Traffic Noise (2009)

Appendix B5 of the NSW EPA's *Environmental Criteria for Road Traffic Noise* (ECRTN) reviews the current level of knowledge and concludes that maximum internal noise levels below 50–55 dBA are unlikely to cause awakening reactions, and that one or two noise events per night with maximum internal noise levels of 65–70 dBA are not likely to affect health and wellbeing significantly.

3.6 Construction Noise and Vibration Design Goals

3.6.1 Australian Standard AS2436:2010

The Australian Standard AS2436:2010 *'Guide to noise and vibration control on construction, demolition and maintenance sites'* provides guidance on noise control in respect to construction, demolition and maintenance sites. The Standard also provides guidance for the preparation of noise and vibration management plans.

Section 1.5 'Regulatory Requirements' of the Standard states:-

"Legislation associated with the control of noise and vibration on and from construction, demolition and maintenance sites in Australia is generally the responsibility of the relevant State or Territory government, local council or a designated statutory authority."

Consequently, the Standard does not provide specific noise criterion rather sets out practical methods for determining the potential for noise and vibration impact on the community from construction, demolition and maintenance sites.

A qualitative method is described in Section 3.3 of the standard, which is designed to avoid the need for complex noise predictions by following a series of questions relating to, for example, whether the noise is likely to be loud, have annoying characteristics or affect sleep.

In the event that any of these outcomes are likely, a more detailed and quantitative approach should be adopted.

In relation to carrying out detailed noise impact assessments, Section 4 'General' of the standard states:-

> *"Regulatory authorities may have relevant polices and/or guidelines for the control of noise and vibration on construction sites. These should also be referred to when developing noise and vibration management plans for such projects."*

In NSW this is the NSW EPA's *Interim Construction Noise Guideline* 2009 as outlined in Section 3.6.2 below.

The Standard further states, in Section 4.6.1, that if noisy processes cannot be avoided, then the amount of noise reaching the receiver should be minimised and goes on to provide advice and recommendations to reduce noise and vibration impacts as far as reasonably practicable.

This report has been prepared in accordance with the guidance provided in AS2436:2010.

3.6.2 NSW EPA Interim Construction Noise Guideline 2009

The NSW EPA published the *Interim Construction Noise Guideline* in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

The Guideline presents two ways of assessing construction noise impacts; the quantitative method and the qualitative method.

The quantitative method is generally suited to longer term construction projects and involves predicting noise levels from the construction phase and comparing them with noise management levels given in the guideline.

The qualitative method for assessing construction noise is a simplified way to identify the cause of potential noise impacts and may be used for short-term works, such as repair and maintenance projects of short duration.

In this instance the entire construction phase may take several months with varying noise producing aspects at varying locations. Consideration is given to the potential for noise impact from construction activities on residential receptors in Section 5 of this report.

Table 2 in Section 4 of the Guideline sets out noise management levels at affected residences and how they are to be applied during normal construction hours. The noise management

level is derived from the rating background level (RBL) plus 10 dB in accordance with the Guideline. This level is considered to be the 'noise affected level' which represents the point above which there may be some community reaction to noise. Construction noise management levels are shown in Table 4 below.

Table 4 L_{eq} Noise Management Levels from Construction Activities

Receptor Location	Noise Management Level	How to Apply
Nearest receptors	**57 dBA** (47 + 10) Location 1 **53 dBA** (43 + 10) Location 2	The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured $L_{Aeq\ (15\ min)}$ noise level is greater than the noise affected level, the proponent should apply all feasible and reasonable* work practices to meet the noise affected level. ▪ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences) 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

* Section 6, "work practices" of The *Interim Construction Noise Guideline*, states:-

"there are no prescribed noise controls for construction works. Instead, all feasible and reasonable work practices should be implemented to minimise noise impacts.

This approach gives construction site managers and construction workers the greatest flexibility to manage noise".

Definitions of the terms feasible and reasonable are given in Section 1.4 of the Guideline.

The 'highly noise affected' level of 75 dBA represents the point above which there may be strong community reaction to noise. This level is provided in the Guideline and is not based on the RBL.

Noise management levels for other sensitive receivers are provided in Table 5 below.

Table 5 Noise at sensitive land uses (other than residences) using quantitative assessment

Land use	Management level, $L_{Aeq\ (15\ min)}$ (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to (external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

3.6.3 Ground Borne Vibration

3.6.3.1 Human Comfort

The NSW EPA published the *'Assessing Vibration: a technical guideline*' in February 2006. This guideline is based on the British Standard BS 6472:1992 *'Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).'*

The guideline presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. The guideline considers vibration from construction activities as Intermittent Vibration.

Table 2.4 of the guideline sets out limits for Vibration Dose Values to assess intermittent vibration and is replicated in Table 6 below for residential receptor locations.

Table 6 Vibration Dose Values (VDV) from Construction Activities

Receptor Location	Daytime	
	Preferred value (m/s1.75)	Maximum value (m/s1.75)
Residences	0.20	0.40

3.6.3.2 Structural Damage

Most commonly specified 'safe' structural vibration limits are designed to minimise the risk of threshold or cosmetic surface cracks, and are set well below the levels that have potential to cause damage to the main structure.

In terms of the most recent relevant vibration damage goals, Australian Standard AS 2187: Part 2-2006 'Explosives - Storage and Use - Part 2: Use of Explosives' recommends the

frequency dependent guideline values and assessment methods given in BS 7385 Part 2-1993 'Evaluation and measurement for vibration in buildings Part 2' as they "are applicable to Australian conditions".

The Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (e.g. compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

3.6.3.3 Cosmetic Damage

The British Standard BS 7385-2:1993 *'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration'* provides guide values for transient vibration relating to cosmetic damage, replicated in Table 7 below for residential buildings. The values are presented in graphical format in Figure 5 below.

Table 7 Transient vibration guide values for cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Residential	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

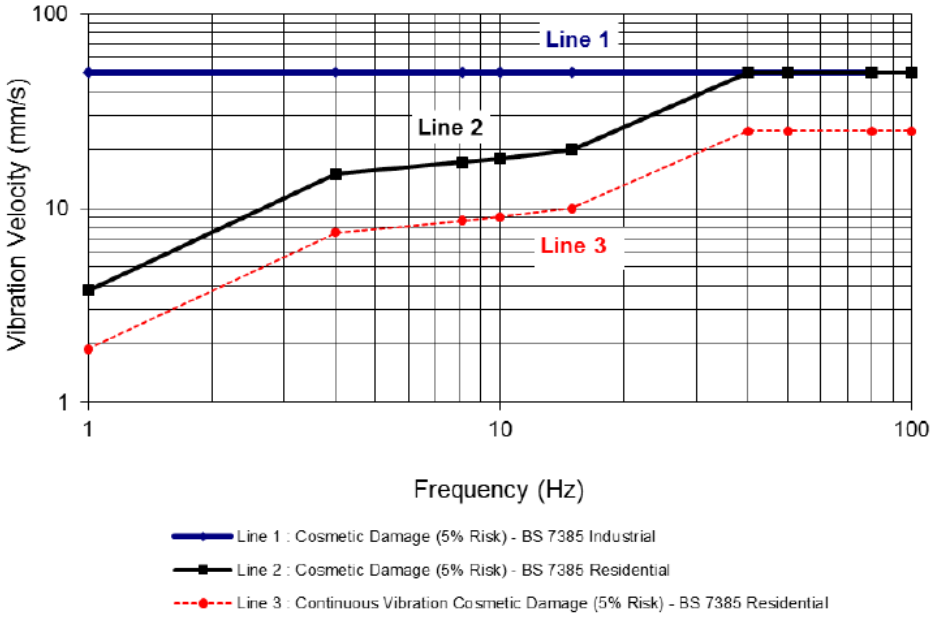

Figure 5. Graph of Transient Vibration Guide Values for Cosmetic Damage

(source: NSW Government – Sydney Metro & BS7385-2:1993)

The Standard goes on to state that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 5, and major damage to a building structure may occur at values greater than four times the tabulated values.

Fatigue considerations are also addressed in the Standard, and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table 5 would not be reduced for fatigue considerations.

In order to assess the likelihood of cosmetic damage due to vibration, AS2187 specifies that vibration measured would be undertaken at the base of the building and the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) would be compared with the guidance curves presented in Figure 2.

It is noteworthy that extra to the guide values nominated in Table 5, the standard states that:

> *"Some data suggests that the probability of damage tends towards zero at 12.5 mm/s peak component particle velocity. This is not inconsistent with an extensive review of the case history information available in the UK."*

Also that:

> *"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."*

3.6.3.4 Vibration Screening Conditions for Cosmetic Damage

The Standard states that the guide values in Table 5 above relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 7 may need to be reduced by up to 50%.

Note: rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it may therefore be appropriate to reduce the transient values by 50%.

Therefore, for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range).

On this basis, a conservative vibration damage screening level per receiver type is given below:

- Reinforced or framed structures: **25.0 mm/s**
- Unreinforced or light framed structures: **7.5 mm/s**

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity), a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable safe vibration level.

In the event of complaints from neighbouring receptors, or as required during piling or rock hammering, the above stated values should be used as a screening test for the potential for cosmetic damage. If exceeded further investigation is to be undertaken.

3.7 Project Specific Noise Goals

Noise emission from patrons as well as background music / audio visual equipment is assessed against the Liquor and Gaming NSW criteria for licensed premises. Noise emission from any mechanical plant servicing the building is assessed against the *Noise Guide for Local Government* (2023) criteria.

Based on the measured and adjusted background noise levels, the most stringent project specific noise goals are as follows: -

Residential Receptors (R1 & R3)

Liquor and Gaming NSW Noise Limits – Restaurant Patrons and Music

The Liquor and Gaming NSW octave band criteria are shown in Tables 8 & 9 below.

Table 8 L_{10} Design Noise Goals at nearest residence – Residential Location 1

Description	Overall dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Receptor Area R1										
Day time period (7 am to 6 pm)	**52**	57	58	51	44	44	49	45	36	28
Evening time period (6 pm to 10 pm)	**50**	55	56	49	42	42	47	43	34	26
Night time period (10 pm to 12 am)	**44**	49	50	43	36	36	41	37	28	20
Night time period (after 12 am)	**39**	44	45	38	31	31	36	32	23	15
After midnight design goal	**29**	34	35	28	21	21	26	22	13	5

Table 9 L_{10} Design Noise Goals at nearest residence – Residential Location 2

Description	Overall dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Receptor Area R2										
Day time period (7 am to 6 pm)	**48**	53	54	47	40	41	46	41	32	24
Evening time period (6 pm to 10 pm)	**48**	53	54	47	40	41	46	41	32	24
Night time period (10 pm to 12 am)	**42**	47	48	41	34	35	40	35	26	18
Night time period (after 12 am)	**38**	43	44	37	30	31	36	31	22	14
After midnight design goal	**28**	33	34	26	20	21	26	21	12	4

Notwithstanding compliance with the acceptable noise limit after midnight, the noise from licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am.

In addition to the night time criteria of 39 and 38 dBA after midnight, the noise from the Club shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 07:00 am.

In order to determine the potential for the inaudibility requirement of Liquor and Gaming NSW to be met, we have established an external noise design goal of background noise level less 10 dB (i.e. 39 – 10 =) 29 dBA outside any residential habitable room in Area 1 and (38 – 10 =) 28 dBA in Area 3. This will result in an internal noise level within any neighbouring dwellings of approximately 28 – 29 dB with their windows open.

NSW EPA Noise Limits – Mechanical Plant & Car Park Activity

The measured background noise levels are also used to establish noise design goals in accordance with the EPA's *Noise Guide for Local Government* 2023 and Council's standard noise conditions for commercial premises, as follows:-

Receptor Area 1 (R1)

- (47 + 5 =) **52 dBA** $L_{eq,\ 15\ minute}$ during the day time period,
- (45 + 5 =) **40 dBA** $L_{eq,\ 15\ minute}$ during the evening time periods,
- (34 + 5 =) **39 dBA** $L_{eq,\ 15\ minute}$ during the night time period,
- **52 dBA dBA** L_{max} outside bedroom windows as an initial assessment of the potential for sleep disturbance, and
- **45 – 55 dBA** L_{max} inside bedrooms as a further assessment of the potential for sleep disturbance if required.

Receptor Area 2 (R2)

- (43 + 5 =) 48 dBA $L_{eq,\ 15\ minute}$ during the day time period,
- (43 + 5 =) 48 dBA $L_{eq,\ 15\ minute}$ during the evening time periods,
- (33 + 5 =) 38 dBA $L_{eq,\ 15\ minute}$ during the night time period,
- **52 dBA dBA** L_{max} outside bedroom windows as an initial assessment of the potential for sleep disturbance, and
- **45 – 55 dBA** L_{max} inside bedrooms as a further assessment of the potential for sleep disturbance if required.

Discussion

For clarification, the reason the 'night time' noise limit for mechanical plant is lower than the 'night time period' noise limit for patron and music noise in Table 4, is because the night time noise limit in Table 3 is based on the background noise level between the hours of 10 pm and 12 midnight when the newly proposed areas are operating. The noise limit for mechanical plant is based on the rating background noise level for the entire night time period (10 pm to 7 am), which is lower, as the mechanical plant may operate at any given time throughout the night period, especially refrigeration equipment for the bottle shop.

Non-Residential Receptors (R3, R4, R5 & R6)

Illawarra Community Baptist Church (when in use) – R3

- **53 dBA $L_{eq,\ 15\ minute}$** [1]

Dwellings in the E4 Industrial Zone – R4

- **63 dBA $L_{eq,\ 15\ minute}$** during the day time period, [2]
- **53 dBA $L_{eq,\ 15\ minute}$** during the day evening time period, [2]
- **48 dBA $L_{eq,\ 15\ minute}$** during the night time period [2]

Commercial Premises – R5

- **63 dBA $L_{eq,\ 15\ minute}$** during the day time period, [3]

Industrial Premises – R6

- **68 dBA $L_{eq,\ 15\ minute}$** during the day time period. [4]

1. From the external noise goal of 50 dBA $L_{eq,\ 1\ hour}$ + 3 dB for conversion to a 15 minute energy average sound pressure level,
2. From the amenity level for urban receptors plus 5 dB (applicable to caretaker residences or residences associated with a commercial undertaking) minus 5 dB to accommodate future noise sources plus 3 dB for conversion to a 15 minute energy average sound pressure level for each period (i.e. day time, 60 + 5 - 5 + 3 = 63 or night time 45 + 5 – 5 + 3 = 48),
    a. The amenity noise level appropriate for 'caretaker' dwellings or those associated with a commercial undertaking are applied to each of the dwellings in Hamilton St within the Industrial Zone. This is a more stringent criterion that would be applied if these dwellings were to be treated as 'isolated residences in an industrial zone.
3. From the amenity level for commercial receptors of 65 dBA minus 5 dB to accommodate cumulative future noise sources plus 3 dB for conversion to a 15 minute energy average sound pressure level.
4. From the amenity level for industrial receptors of 70 dBA minus 5 dB to accommodate cumulative future noise sources plus 3 dB for conversion to a 15 minute energy average sound pressure level.

Construction Noise and Vibration Design Goals

- **53 to 57 dBA** $L_{eq,\ 15\ minute}$ noise management goal at nearest receptors,
- **75 dBA** $L_{eq,\ 15\ minute}$ highly affected noise level
- **7.5 mm/s** (ppv) for light weight structures, and
- **25 mm/s** (ppv) for reinforced structures.

4. DAPTO LEAGUES CLUB NOISE EMISSION

4.1 Patron & Music Noise

A noise model has been developed for the calculation of noise generated by people indoors or outdoors. This is based on sound pressure level data for one person as given in Kryter[1], Harris[2] and from the author's database compiled over many years of similar assessments.

Table 10 below shows the calculated sound power levels for human voice noise and background music which was used in the noise modelling.

[1] *'The Effects of Noise on Man'* by Karl Kryter, Academic Press (1985)

[2] *'Handbook of Acoustical Measurements and Noise Control'* 3rd Edition by Cyril M. Harris, McGraw-Hill Inc (1991)

Table 10 L_{10} Sound Power Levels – Patrons Talking and Music Noise

Description	dBA	L_{10} Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
One man talking loudly	**83**	50	55	65	73	87	79	74	68	60
One man talking with raised voice	**72**	46	51	61	67	72	67	62	58	51
One man talking normally	**65**	42	47	57	63	66	58	54	51	46
Background Music / TV	**83**	74	79	84	82	83	77	70	66	58

The noise emissions of people talking was modelled based on measurements and data from other sites as well as the following:-

- Alfresco Dining (café): patrons talking with raised voice (30%), patrons talking normally (20%) with the remainder not talking / listening (50%).
- Outdoor dining and drinking (beer garden style): patrons talking loudly (10%), patrons talking with raised voice (20%), patrons talking normally (20%) with the remainder not talking / listening (50%).

Whilst the outdoor dining and drinking areas (terraces) may be used for dining during meal times it is likely that they will be used more like a pub style beer garden, at least on occasion.

As such noise levels in this assessment are modelled based on the vocal efforts of a pub style beer garden for all new areas as a worst-case scenario in each terrace are and as an alfresco dining area in the café .

4.2 Children at Play Noise Levels

A noise model has been developed to establish the noise level of children at play. This model is based on measurements taken of children at play in groups undertaken during previous assessments of childcare centres by the author as well as sound pressure level data for children given in Kryter[3].

This data was used to establish the sound power level for individual children as shown in Table11 below. These levels are in line with the sound power levels provided in the AAAC '*Guideline for Child Care Centre Acoustic Assessment*'.

Table 11 Children at Play - L_{eq} Sound Power Levels

Description	Overall dBA	Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10 children - 0 to 2 years	**78**	54	60	66	72	74	71	67	64
10 children - 2 to 3 years	**85**	61	67	73	79	81	78	74	70
10 children - 3 to 5 years	**87**	64	70	75	81	83	80	76	72

[3] *'The Effects of Noise on Man'* by Karl Kryter, Academic Press (1985)

4.4 Mechanical Plant Noise

Mechanical plant will be located on the new roof of the building as indicated in Figure 3 in this Report. Selections of plant and equipment are not finalised at the time of writing this Report, though will include:-

- Air handling units (3 or 4),
- Kitchen exhaust fan,
- Kitchen supply air fan,
- Toilet exhaust and garbage rooms exhaust fans.

Recommendations are made in Section 6 of this report to ensure that noise emission from any new mechanical plant servicing the eatery, does not exceed the acceptable noise limits at receptor locations.

4.5 Motor Vehicle Noise Levels (Car Park)

The 'A' frequency weighted 15 minute sound power levels for various customer and delivery vehicle types are shown in Table 12 below.

All noise levels are derived from a database of sound pressure measurements of trucks and cars undertaken at various locations throughout NSW and compiled by the author over the past 20 years.

Table 12 $L_{eq,\ 15\ minute}$ Sound Power Levels – Various Vehicle Movements

Vehicle Activity / Description	Individual Sound Power Level $L_{eq,\ 15\ minute}$ (dBA)
Car / 4WD movement < 30 kph through car park	**54 per metre one car**
Car / 4WD carparking manoeuvre (door open / close + engine start and move)	**69**

Table 13 below shows the $L_{1,\ 1\ minute}$ sound power levels of 'one-off' instantaneous potential noise sources that may occur during night time hours from vehicles prior to 7 am or after 10 pm.

Table 13 $L_{1,\ 1\ minute}$ Sound Power Level – One Off Noise Sources

Vehicle Activity / Description	$L_{1,\ 1\ minute}$ Sound Power Level (dBA)
Car door closing / slamming / car accelerating	**84 / 98**
People shouting	**89 / 98**

A Traffic and Parking Impact Assessment was prepared by McLaren Traffic Engineering and Road Safety Consultants Pty. Ltd., reference 230206.01FB, dated 27 June 2024 (the TIA).

Table 6 in Section 4.1 of the TIA 'Traffic Generation' provides a prediction of the peak hour vehicle trips associated with the Club after the proposed alterations and additions. Table 6 concludes that there will be 167 vehicular trips (133 in and 34 out) in the two hour peak period between 4 pm and 6 pm.

For the purpose of predicting typical worst-case noise emission from customer vehicles attendant to the Site, the following number of vehicle movements are considered:-

- 84 trips in the peak one hour,
- 25 trips in the busiest 15 minute period during the day time period,
- 12 trips in the busiest 15 minute period during the evening time period,
- 6 trips in the busiest 15 minute period during the night time period,

5. NOISE LEVEL PREDICTIONS

5.1 Modelling Equations

For noise sources located within enclosed areas, the level of noise emission has been calculated from the formula:-

$$Lp_2 = Lp_1 - R_w + 10\,Log_{10}\,S - 20\,Log_{10}\,r - 14 + DI\ dBA$$

Where:

- Lp_2 is the predicted noise level at the receiver,
- Lp_1 is the internal noise level,
- R_w is the weighted sound reduction index of the building element (wall, roof, windows, openings, etc),
- S is the area of the building element (m^2),
- r is the distance between the receiver and the building element,
- DI is the directivity index of the façade.

For patrons, background music and TV screens or audiovisual displays located outside open roof terrace and mechanical plant, the level of noise emission at each receptor was calculated from the formula: -

$$L_{eq} = L_w + Dc - A$$

Where:

- L_w is the sound power level of the noise source,
- Dc is directivity correction, and
- A is the attenuation that occurs during the propagation from source to receiver.

The term A in the equation includes attenuation from geometric divergence (distance loss), atmospheric absorption, ground absorption, barrier effects and other miscellaneous effects.

This model derives from the International Standard ISO 9613-2 (1996(E)) *'Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation'*. The method described in the Standard is general in the sense that it may be applied to a wide variety of noise sources and covers the major mechanism of sound attenuation. The method allows for propagation conditions with the wind blowing from the source to the receiver.

5.2 Predicted Noise Levels

The predicted noise levels at the various receptors are shown in Tables 14 to 18 inclusive below, where:-

- Table 14 shows an assessment of the predicted noise levels at residential Receptor area **R1** for comparison against the Liquor and Gaming NSW noise limits
- Table 15 shows an assessment of the predicted noise levels at residential Receptor area **R2** for comparison against the Liquor and Gaming NSW noise limits

- Table 16 shows an assessment of the predicted noise levels at all non-residential receptors (**R3, R4, R5 & R6**) for comparison against the relevant noise goals.
- Table 17 shows an assessment of the predicted noise levels at residential Receptors (**R1 & R2**)for car park activity for assessment against the $L_{eq,\ 15\ minute}$ intrusiveness noise goals, and
- Table 18 shows an assessment of the predicted noise levels at residential Receptors (**R1 & R2**) for car park activity for assessment against the L_{max} sleep disturbance noise trigger level

Table 14 Predicted L_{10} Noise Levels – at Residential Area R1

Description	Overall dBA	Predicted L_{10} Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Noise Goal – 7 am to 6 pm	**52**	57	58	51	44	44	49	45	36	28
Noise Goal – 6 am to 10 pm	**50**	55	56	49	42	42	47	43	34	26
Noise Goal – 10 am to 12 am	**44**	49	50	43	36	36	41	37	28	20
Operation to 12 am	36	13	18	25	30	35	32	27	20	12
Complies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Noise Goal – 12 am to 7 am *	29	34	35	28	21	21	26	22	13	5
Operation after 12 am	20	9	14	17	15	17	14	13	12	12
Complies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Current operating hours are 3 am, however the criterion after midnight is applicable until 7 am.

Table 15 Predicted L_{10} Noise Levels – at Residential Area R2

Description	Overall dBA	Predicted L_{10} Sound Pressure Levels (dB) at Octave Band Centre Frequencies (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Noise Goal – 7 am to 6 pm	**48**	53	54	47	40	41	46	41	32	24
Noise Goal – 6 am to 10 pm	**48**	53	54	47	40	41	46	41	32	24
Noise Goal – 10 am to 12 am	**42**	47	48	41	34	35	40	35	26	18
Operation to 12 am	35	12	17	24	29	34	31	25	18	12
Complies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Noise Goal – 12 am to 7 am *	**28**	33	34	26	20	21	26	21	12	4
Operation after 12 am	19	8	13	15	13	14	12	12	12	12
Complies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Current operating hours are 3 am, however the criterion after midnight is applicable until 7 am.

Table 16 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Non-Residential Receptors

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Location					
	R3	R4	R5	R6		
				Day	Evening	Night
Noise Design Goal – When in Use	**53**	**68**	**63**	**63**	**53**	**48**
Operation to 12 am	46	45	40	37 – 40	37 – 40	37 – 40
Complies	Yes	Yes	Yes	Yes	Yes	Yes
Operation after 12 am	**-**	**-**	**-**	**-**	**-**	**24 – 29**
Complies	-	-	-	-	-	Yes

Predictions in Tables 14, 15 and 16 assume the following:-

- Approximately 170 patrons located in the open and covered terraces on the western side of the new area,
- Approximately 100 patrons located in the open sided proposed terrace on the south western corner of the building,
- Approximately 40 patrons located in the alfresco café,
- Approximately 40 children located in the children's play area,
- All new internal areas at full capacity
- Recommendations made in Section 6 of this Report are implemented and continue to be adhered to.

Table 17 Predicted L_{eq} Noise Levels – Car Park

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Locations	
	R1	R2
Design Noise Goal 7 am to 6 pm	**52**	**48**
Car park activity day time	35	<30
Complies	Yes	Yes
Design Noise Goal 6 pm to 10 pm	**50**	**48**
Car park activity evening time	<30	<25
Complies	Yes	Yes
Design Noise Goal 10 pm to 7 am	**44**	**42**
Car park activity night time	<30	<25
Complies	Yes	Yes

NB – Predictions consider that the permitter crash barrier (masonry wall) along the entire northern and eastern permitter of the upper level of the car park is constructed to a minimum height of 1 metre above the finished floor level (ffl) of the upper level.

Table 18 Predicted L_{max} Noise Levels – Car Park (Sleep Disturbance)

Description	Predicted Noise Level $L_{eq,\ 15\ minute}$ (dBA) at Receptor Locations	
	R1	R2
Initial External Trigger Level	**52**	**52**
Doors closing, people noise, engine noise, etc	46	<35
At or below initial trigger level	Yes	Yes

6. RECOMMENDED NOISE CONTROLS

The predictions made in Section 5 of this report assume the following noise controls have been implemented and adhered to.

6.1 Building Construction and Reverberation Control

Walls

- The external walls of the new areas should achieve a minimum weighted sound reduction index (R_w) rating of 35, for example:-
    - Masonry, brick veneer or timber or cement composite cladding with a minimum mass of 12.5 kg/m^2 on the external side of steel or timber frame (e.g. *Hardies Newport* or CSR *Cemintel*),
    - One layer of 13 mm thick standard plasterboard, and
    - Minimum 50 mm glasswool or polyester insulation in the wall cavity (with a minimum density of 10 kg/m^3).

Ceilings

- The roof above may be of either concrete tile or corrugated sheet steel construction (or approved equivalent),
- Vapour barrier is to be laid below the roof,
- Ceilings under the roof should comprise one layer of 13 mm thick standard plasterboard (or 10 mm sound rated plasterboard, or approved equivalent),
- Minimum 50 mm thick glasswool or polyester insulation should be laid between the ceiling joists above all rooms, (min. density 10 kg/m^3).

Reverberant Build up of Sound

In order to minimise the reverberant build-up of sound within the terrace areas, acoustical absorptive material should be applied to as much of the surface area in each space as is practicable.

This may be done by, for example:-

- Install acoustic ceilings below the covered roof section,
    - Fit 50 mm thick glasswool or polyester insulation (minimum density 32 kg/ m^3) between the ceiling joists,

- Fix perforated plasterboard, or hardwood timber slats (minimum 16 % open area) to the underside of the ceiling joists or battens,
- the acoustical ceiling (if selected) should be installed below a set ceiling constructed with minimum 13 mm thick plasterboard,
- In addition, or alternatively, consideration may be given to adhering or fixing acoustical absorptive material directly to the ceilings and / or around the walls,
- Any acoustical absorptive material should achieve a minimum Noise Reduction Coefficient (NRC) rating of 0.75,

NB

A number of alternative wall and ceiling systems may be acoustically acceptable and the final design can be confirmed at the Construction Certificate stage.

Glazing

- Any and all external glazing in the external facades of the new areas should achieve a minimum weighted sound reduction index (R_w) rating of **30** (e.g. 6 mm float glass or 6.38 mm thick laminated glazing),

6.2 Operational Noise Management Plan

General

- All external openings of the new terraces must be closed at 12 am (midnight),
- If this is not practicable, these terraces must not be used after 12 am (midnight),
- Any amplified speech (e.g. meal or raffle ticket announcements), TV screens showing sport or speakers for background music located in the new terraces must be either muted or switched to a low level **at 10 pm**.
    - This is a level where conversation can be held without the need for raised voices which typically equates to a sound pressure level of 65 dBA when measured at 3 metres from the acoustic centres of any speakers or TV screens.
- Management procedures should be put in place to prevent excessive shouting, or other unsociable behaviour occurring in the terraces or when patrons are leaving the venue, so far as is reasonably practicable (including whilst in the car park).

6.3 Mechanical Plant

Any mechanical plant associated with the proposal must not exceed the Intrusiveness Noise goals established in Section 3.5 of this report when measured at the nearest receptor locations over a period of 15 minutes.

The predicted level of mechanical plant noise will depend upon the final selections, sound power level and times of operation and whether any items of plant are intermittent after 10 pm.

As an example, the sound power level of various items of mechanical plant should not exceed the sound power levels (L_w) shown below:-

- Kitchen Exhaust Fan – 84 dBA
- Make up air fan – 84 dBA,

- Air Handling Units (AHU) – 80 – 86 dBA
- Toilet Exhaust Fan – 79 dBA, and
- Garbage Room Exhaust Fan – 79 dBA.

In any event, a final assessment will be required once mechanical plant selections have been made. However, the acceptable noise limits can easily be achieved from mechanical plant noise for this proposal without significantly onerous noise controls. Any assessment must include consideration of the cumulative impacts of existing plant.

7. CONSTRUCTION NOISE ASSESSMENT

7.1 Construction Equipment Source Noise Levels

The works will be carried out over stages and the entire construction phase will last a total of approximately 17 months and include:-

- Demolition of existing structures and Site clearing – approximately 4 weeks,
- Earth Works and Excavation (including rock hammering to remove existing car park surface) – approximately 2 months,
- Construction of the development – approximately 14 months.

Demolition

The use of an excavator will be employed to demolish the existing building sections required to be refurbished.

A rock hammering attachment will be used in conjunction with jack hammering to break up the existing car park surface.

Main equipment:-

- Excavator/s with hydraulic pulveriser and or hammering attachments
- Truck movements

Earth Works

Screw (auger) piling will be required for the foundations if the new car park.

Main equipment:-

- Excavator
- Auger piling rig for foundations
- Front end loader and truck movements

Construction

Total time approximately 14 months

- Crane use
- Semi-trailer to deliver material for construction
- Truck and Trailer to be used during early works stage

The main sources of noise on the Site during construction will be during the excavation works, civil works, transportation of materials, concrete pouring concrete / asphalt hammering, rock sawing works and later the use of power tools.

The equipment used on Site during these phases will vary throughout each phase as well as from day to day.

Table 19 below show examples of the type of plant and equipment that is likely to be used in each of the major construction phases along with indicative overall sound power levels (L_w) in decibels re: 1 pW (10-12 Watts).

Schedules of the sound power levels for the main construction equipment were extracted from our data base of Sound Power Levels established over many years of carrying out similar assessments and the Australian Standard AS2436:2010*, 'Guide to Noise Control on Construction, Maintenance and Demolition Sites'*.

Table 19 Typical Construction Equipment – L_{eq} Sound Power Levels

Description	L_{eq} Sound Power Level (dBA)
Demolition, Piling and Excavation Phase	
Concrete / Asphalt Hammering	118
Auger Piling	107
30 Tonne Excavator	110
10 Tonne Excavator	100
Backhoe	94
Concrete Truck / Pump	105
Dump Truck / Semi Trailer	110
Building Construction Phase	
Mobile Crane (Diesel)	110
Grinder	105
Power Saw	101

The plant and equipment shown in Table 12 is indicative of the type of plant and equipment typically used on similar projects and is not meant to imply that each item, or all items will be used. The Construction Noise and Vibration Management Plan (CNVMP) can be amended and tailored in greater detail prior to the commencement of construction works once equipment and processes are finalised.

7.2 Predicted Noise Levels

Noise modelling was undertaken for various scenarios in order to predict likely noise levels as received at each of the residential receptor areas. Predicted construction noise levels are shown in Table 20 below.

3D noise models are provided in Appendices E to H which show the predicted levels of noise emission from various scenarios at all surrounding receptors.

Table 20 below shows the predicted noise levels at the following receptor areas:-

- R1 – nearest residences to the north and north east (Receptor Location R1)
- R2 – nearest residence to the south west (Receptor Location R2)
- R3 – Church (R3)

Table 20 Predicted $L_{eq,\ 15\ minute}$ Construction Noise Levels

Description	Predicted $L_{eq,\ 15\ minute}$ Sound Pressure Level (dBA)		
	R1	**R2**	**R3**
Construction Noise Goal	**57**	**53**	**55**
Building demolition (Excavator)	42 – 59	53	58 – 59
General – Excavator, Loader and Dump Truck in car park area	59 – 61	45	51 – 52
Concrete / Asphalt Hammering / Sawing	52 – 69	51	56 – 58

- Diagrammatical representations of the predicted noise levels (*SoundPLAN* models) are provided in Appendices I to P.

Predictions assume:-

- Excavators are 30 tonne excavators,
- Use of a loader loading trucks, excavator and truck movements occurring simultaneously at full sound power levels shown in Table 19 continuously for a minimum 15 minute period at any given time during approved construction hours
- There is a 2.2 metre high timber hoarding erected around the northern and eastern perimeter of the car park to minimise noise and for privacy and safety,

The following recommendations should form part of the CNVMP for inclusion in the overall Construction Management Plan.

7.3 Construction Noise Assessment

It can be seen that based on modelling of indicative activities at indicative locations on the Site, the noise management levels will be exceeded on occasion, particularly at the residential neighbours to the north during works in the car park.

It is unlikely that the level of 75 dBA $L_{eq,\ 15\ minute}$ will be exceeded at any receptors during normal construction activities, including when rock breaking occurs in the car park.

The 3D Noise Models in Appendices I to P show the location where the noise management levels are likely to be met for the majority of activities throughout the construction period. It can be seen that there are limited number of localised residential properties within proximity of the Site where the management level may be exceeded.

The following recommendations are made to reduce noise impacts on all receptors so far as is reasonably practicable. Consideration in preparing the recommendations was given to Australian Standard AS2436:2010 and the EPA's '*Interim Construction Noise Guideline'* 2019 and the NSW Government's *Sydney Metro Construction Noise and Vibration Standard*.

8. CONSTRUCTION NOISE RECOMMENDATIONS (CNVMP)

8.1 Engineering and Practical Controls

Australian Standard AS2436:2010, Appendix C, Table C3 provides the relative effectiveness of various forms of noise control that may be applicable and implemented on various construction sites and projects. Table C3 is replicated in Table 21 below.

Table 21 Relative Effectiveness of Various Forms of Noise Control

Control by	Nominal Noise Reduction Possible, dB
Distance	Approximately 6 dB for each doubling of distance
Screening	Normally 5 dB to 10 dB maximum 15 dB
Enclosure	Normally 5 dB to 25 dB maximum 50 dB
Silencing	Normally 5 dB to 10 dB maximum 20 dB

Distance

It is difficult to carry out the majority of tasks at alternative locations to where they will be required in this instance for obvious reasons.

Screening

- During the demolition phase of the existing car park (i.e. during hammering / breaking up of the current surface), temporary sound barrier screens should be erected to a minimum height of **2.4 metres** above the finished ground level of the existing car park along the entire length of northern and eastern car park boundaries with the exception of the eastern access and egress point (refer Figure 6).
- Barriers should be constructed from, for example 19 mm plywood on steel posts or attached to temporary construction fencing,

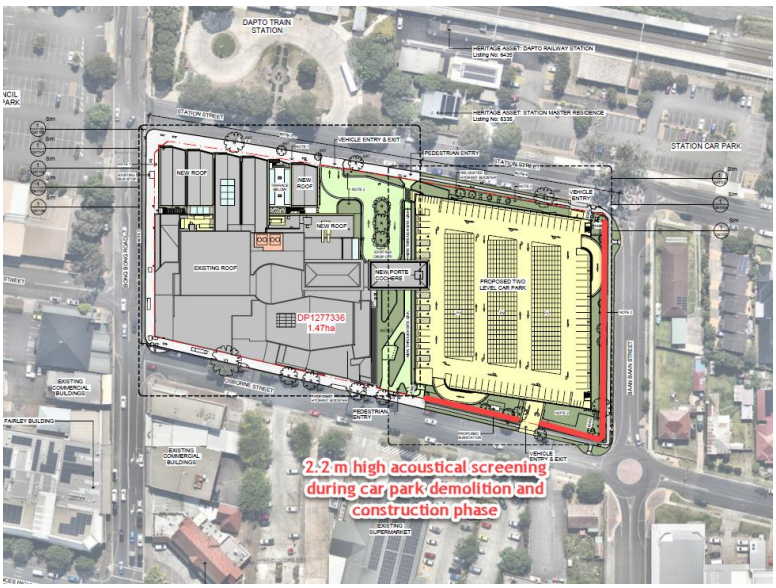

Figure 6. Recommended Temporary Screening

Enclosure

In this instance it is unlikely that constructing acoustical enclosures around items of plant is a practical option. However, once the final selection of plant and equipment is known consideration may be given to this option. Mechanical fixed plant if required, such as water pumps or diesel generators may be enclosed.

Silencing

Consideration should be given to any mobile plant already acoustically treated when assessing tenders.

8.2 Noise Management Controls

The following noise management controls are derived from, or are in accordance with, recommendations given in Australian Standard AS2436:2010 and the EPA's '*Interim Construction Noise Guideline'* 2019.

Allowable Hours

Normal construction hours, as defined by the EPA are as follows:-

- Monday to Friday 7 am to 6 pm,
- Saturday 8 am to 1 pm,
- No work on Sundays or Public Holidays.

In this instance, given the access to the Site is via a narrow residential street, the site management is to ensure there is no parking or gathering in the street prior to 7 am, to mitigate any noise disturbances. The construction hours for this project should be:-

- Monday to Friday 7 am to 6 pm,
- Saturday 8 am to 1 pm,
- No work on Sundays or Public Holidays.

Low Noise Plant and Equipment and Practices

All plant and machinery should be selected with consideration to low noise options where available.

For example:-

If piling is required then auger piling is the preferred option acoustically.

If a 10 tonne excavator may be used to carry out a task rather than a 30 tonne excavator, this should be the preferred method.

Care should be taken to ensure that not more than one item of plant is operating simultaneously within close proximity of any given residence as far as reasonably practicable, to minimise cumulative noise impacts.

Periods of Respite

Noisy construction activities such as rock breaking should only operate for 2 to 3 hours at a time.

Ensure activities in any one location are staggered, for instance, if rock hammering is occurring near to a residential receptor, all other construction activities will cease in the same location so as to minimise cumulative noise impacts.

Work Practices

Workers and contractors should be trained in work practices to minimise noise emission such as the following:-

- Employ the use of broadband audible reversing alarms on all mobile plant – no tonal alarms should be used on this Site,
- Avoid dropping materials from a height,
- Avoid shouting and talking loudly outdoors,
- Avoid the use of radios outdoors that can be heard at the boundary of residences,
- Turn off equipment when not being used,
- Carry out work only within the recommended hours of operation,

- No vehicles including staff vehicles or delivery trucks should arrive at the Site prior to the operating hours.

Plant and equipment maintenance

- ensuring all bolts are tightened and no parts are loose
- cleaning and/or lubricating moving parts
- replacing old or worn parts
- implementing additional or upgrading existing muffling devices
- building enclosures around items of stationary plant (e.g. pumps or generators).

Heavy Vehicles and Staff Vehicles

- Keep truck drivers informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling),
- Locate site vehicle entrances away from residences where practicable (options here will be limited, however care can be taken to ensure that trucks are not parked outside neighbouring dwellings where practicable),
- Establish the site office and staff parking area as far from the residences as possible,
- Optimise the number of vehicle trips to and from the site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads,
- No vehicles are to park in Osborne Street, Baan Baan Street or Bong Bong Road waiting for the Site to open prior to 7 am with engines running.

Community Relations

- A Community Liaison Officer is to be appointed by the contractor prior to the commencement of any works,
- The officer will approach all potentially affected residents prior to the commencement of any works as an initial introduction and provide his or her contact details – this may done during the preparation of dilapidation reports,
- Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.
- The officer will explain the project, duration of works, potentially noisy periods as well as determine any particularly sensitive receivers or sensitive time periods and schedule works accordingly, as far as reasonably practicable,
- A contact number will be provided for any residents to call with complaints or queries.

Once works commence, communication with the community should be maintained by the officer. Communication should be maintained via a range of media including, for example, continued individual contact, social media or a clearly visible notice board at the entrance to the site.

Consultation and cooperation between the contractor and the neighbours and the removal of uncertainty and rumour can help to reduce adverse reaction to noise.

Managing a Noise Complaint

The Liaison Officer should receive and manage noise complaints.

All complaints should be treated promptly and with courtesy.

Should a justified noise complaint not be resolved, noise monitoring may be carried out at the affected receptor location and appropriate measures be taken to reduce the noise emission as far as reasonably practicable.

Where it is not practicable to stop the noise, or reduce the noise, a full explanation of the event taking place, the reason for the noise and times when it will stop should be given to the complainant.

The following guidelines are recommended in Section 6 of the '*Interim Construction Noise Guideline'* to manage a noise complaint:

- Provide a readily accessible contact point, for example, through a 24 hour toll-free information and complaints line,
- Give complaints a fair hearing,
- Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow,
- Call back as soon as possible to keep people informed of action to be taken to address noise problems,
- Provide a quick response to complaints, with complaint handling staff having both a good knowledge of the project and ready access to information,
- Implement all feasible and reasonable measures to address the source of complaint,
- Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant's contact number, person referred to, description of the complaint, work area (for larger projects), time of verbal response and timeframe for written response where appropriate.

Vibration Monitoring

We recommend that the level of vibration be measured during any rock hammering in the car park or if complaints arise from any nearby residences regarding vibration during any construction process (including demolition).

The vibration measurements can be carried out using either an attended or an unattended vibration monitor. An unattended vibration monitor should be fitted with an alarm in the form of a strobe light or siren to make the plant operator aware immediately when the vibration limit is exceeded. The vibration monitor should be set to trigger the alarm when the overall Peak Particle Velocity (PPV) exceeds **7.5 mm/s** at the nearest residential building.

Dilapidation will be commissioned for potentially affected residential premises bounding the Site, prior to any rock hammering being undertaken, or as a good practice guide even if rock hammering or piling is not required.

In the event that levels of ground-borne vibration exceed the recommended acceptable levels for cosmetic damage, vibration causing works should cease immediately and alternative methods such as rock sawing be considered.

9. CONCLUSION

An assessment of the potential noise impact arising from alterations and additions to the Dapto Leagues Club at Cnr Station Streets and Bong Bong Road, Dapto, NSW was undertaken.

Provided recommendations made in Section 6 of this report are implemented and adhered to, the level of noise emission from the operation of the extensions and alterations to the Club can meet the design noise goals derived from Liquor and Gaming NSW and the NSW EPA as established in Section 3 of the Report.

Matthew Harwood, MAAS

Harwood Acoustics Pty Ltd

Director & Principal Consultant

Attachments:-
Important Note & Disclaimer

Appendix A – Noise Survey Instrumentation
Appendix B – Background noise survey results
Appendix C – *SoundPLAN Noise Model – Patron Noise up to 12 am*
Appendix D – *SoundPLAN Noise Model – Patron Noise after 12 am*
Appendix E – *SoundPLAN Noise Model – Mechanical Plant Noise (Example Equipment) – Day*
Appendix F – *SoundPLAN Noise Model – Mechanical Plant Noise (Example Equipment) - Night*
Appendix G – *SoundPLAN Noise Model – Car Park Activity $L_{eq,\ 15\ minute}$ – All Periods*
Appendix H – *SoundPLAN Noise Model – Car Park Activity L_{max} – Night Time*
Appendix I to P – *SoundPLAN Noise Model – Construction Activities*

Important Note

All products and materials suggested by Harwood Acoustics Pty Ltd are selected for their acoustical properties only. Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, ventilation etc. are outside Harwood Acoustic's field of expertise and ***must*** *be checked with the supplier or suitably qualified specialist before purchase.*

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Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

Noise Survey Instrumentation	Appendix A

The instrumentation used during the noise surveys consisted of the following:-

Description	Model No.	Serial No.
SVANTEK Sound Level Meter	957	15395
SVANTEK Sound Level Meter	971	74362
B&K Acoustical Calibrator	4321	1839108
Infobyte Noise Logger	Im4	104

The sound level meters conform to Australian Standard AS IEC 61672.1-2004: 'Electroacoustics - Sound level meters – Specifications' as Class 1 precision sound level meters. The noise logger conforms to Australian Standards AS 1259 as a Type 2 precision sound level meter.

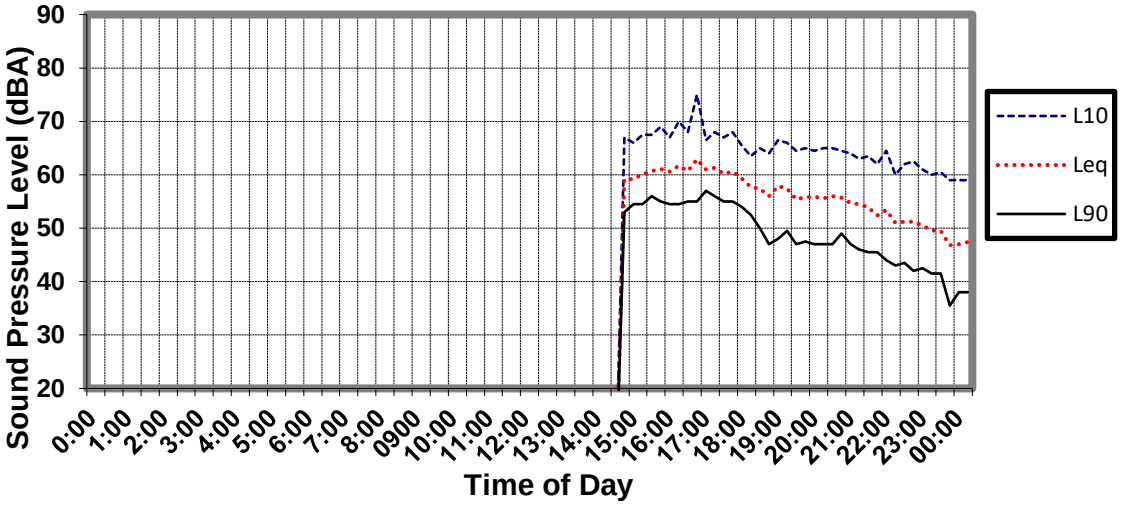
The calibration of the meters and noise logger was checked before and after the measurement periods. No significant system drift occurred over the measurement periods.

The sound level meters and calibrator have been checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates as required by the regulations.

Noise Survey Results	Appendix B

Burringbar Street

Thursday May 11th 2023



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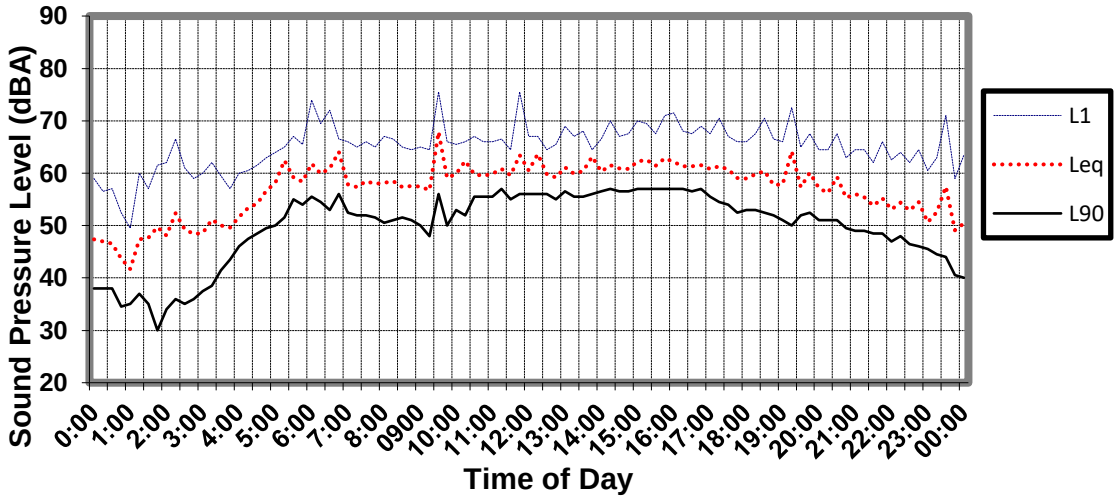

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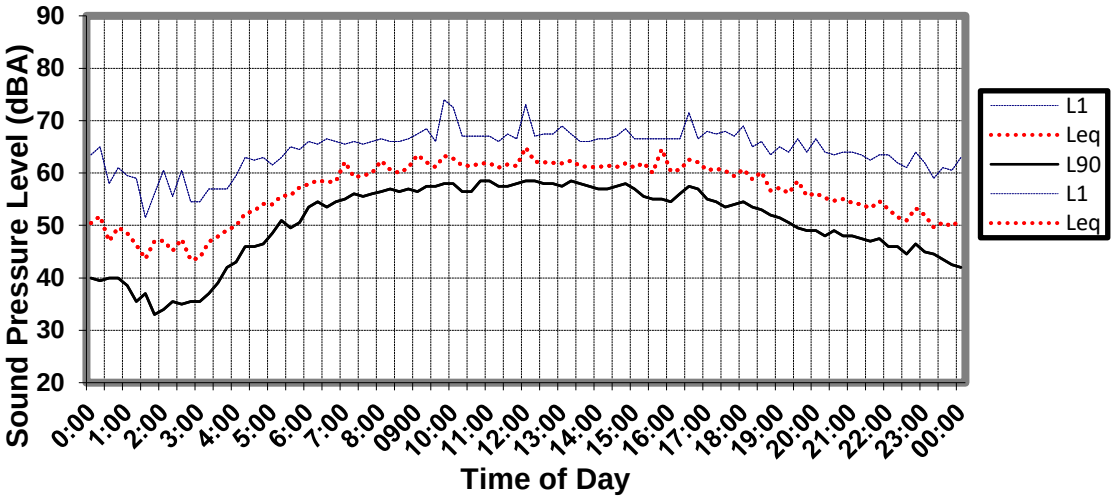
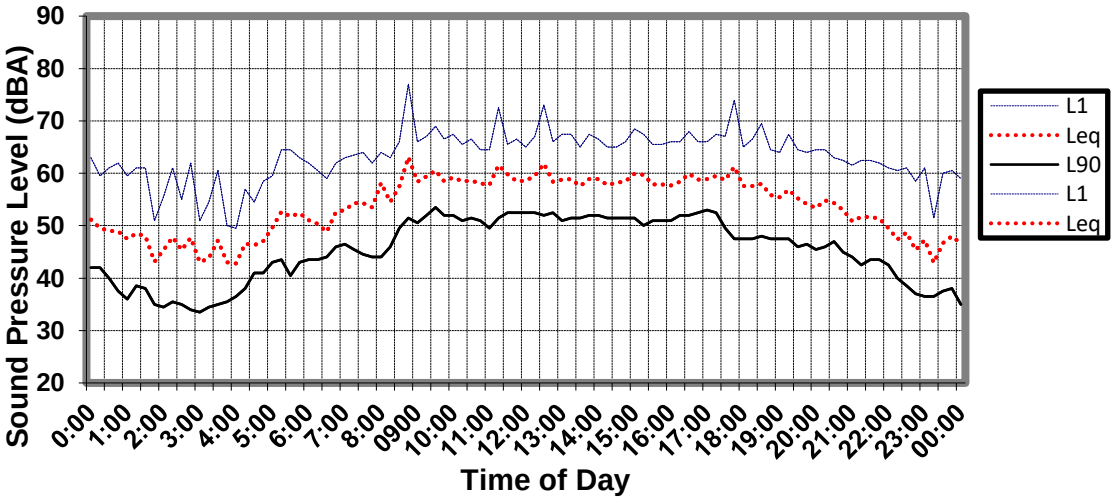


Sunday May 14th 2023



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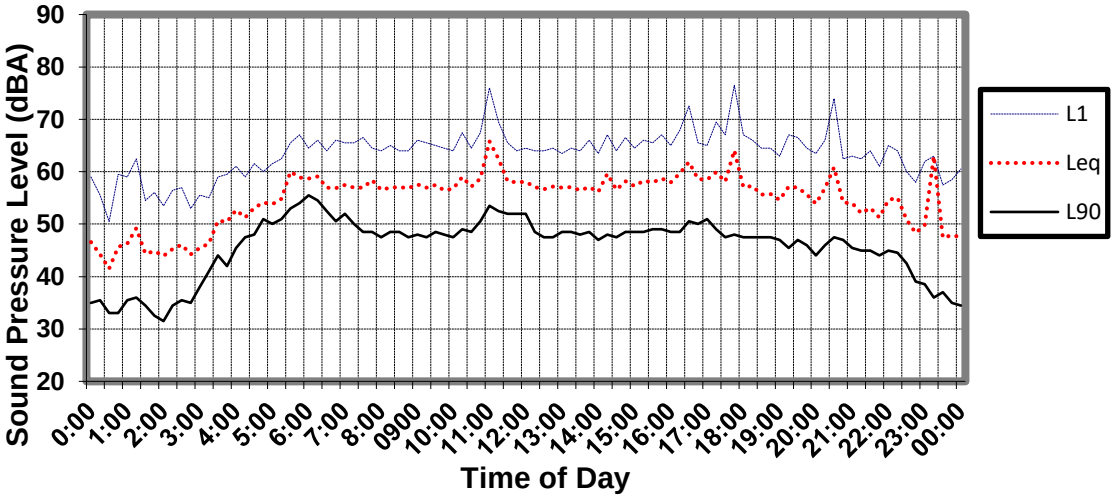
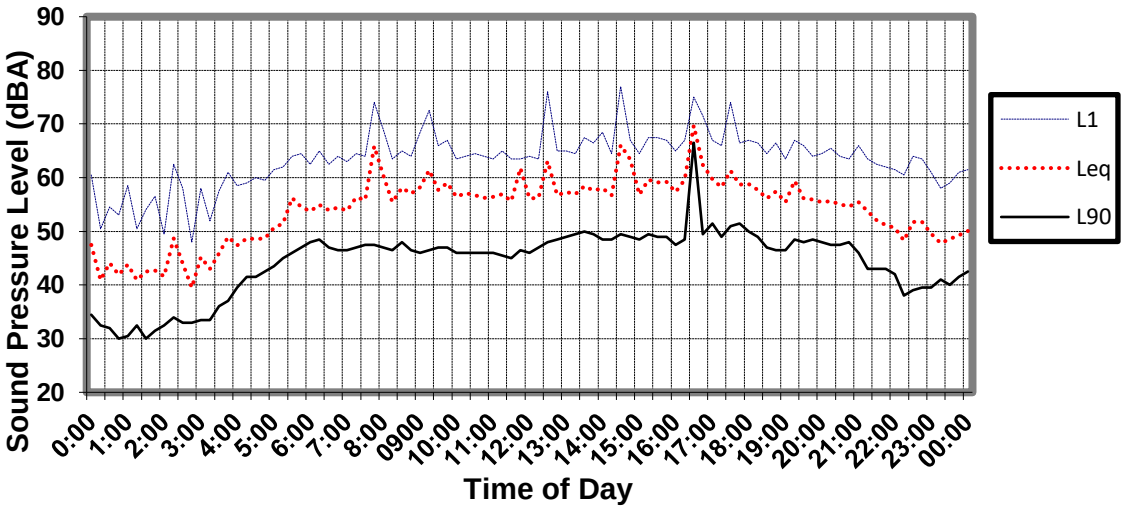


Tuesday May 16th 2023



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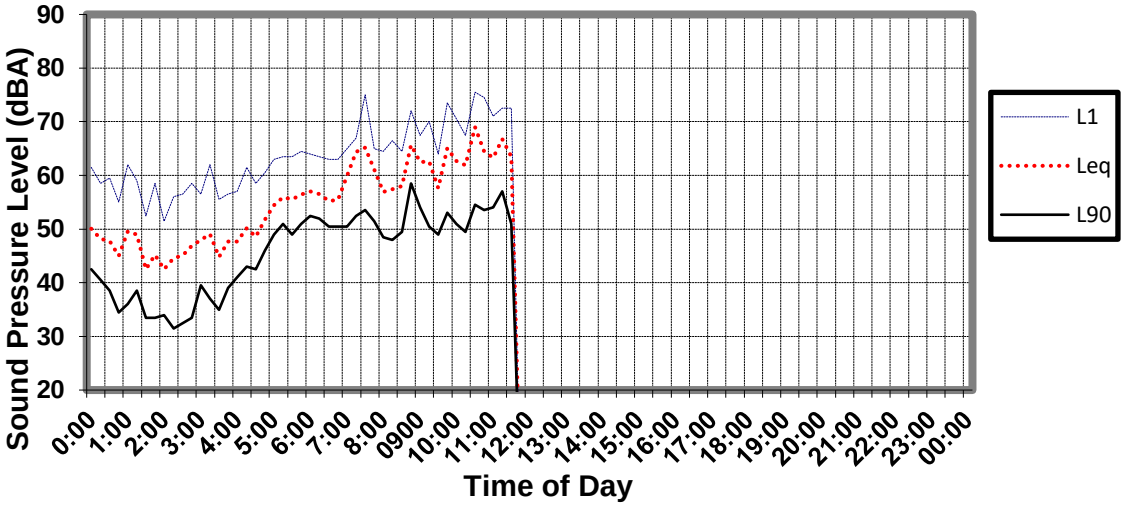

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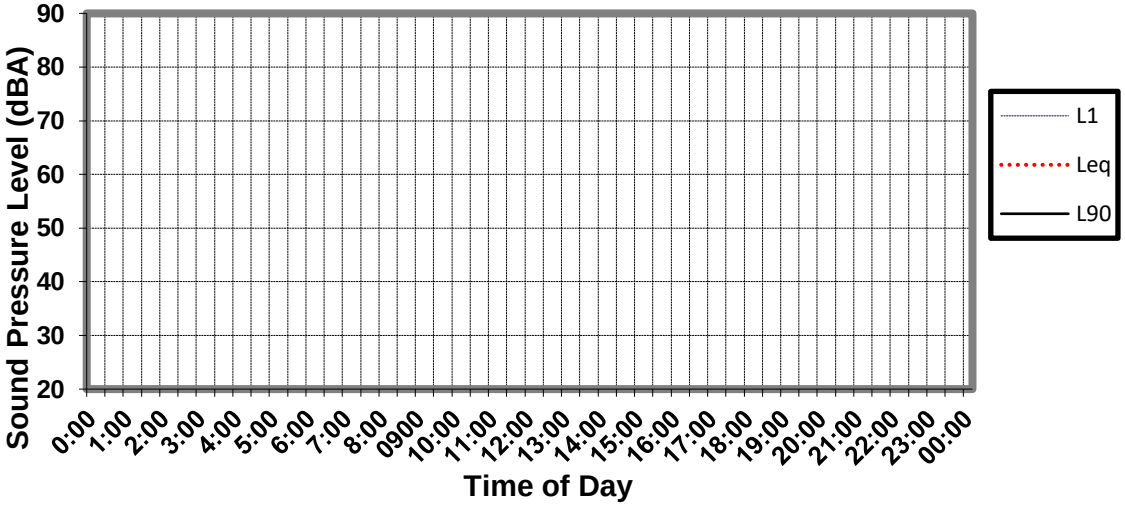
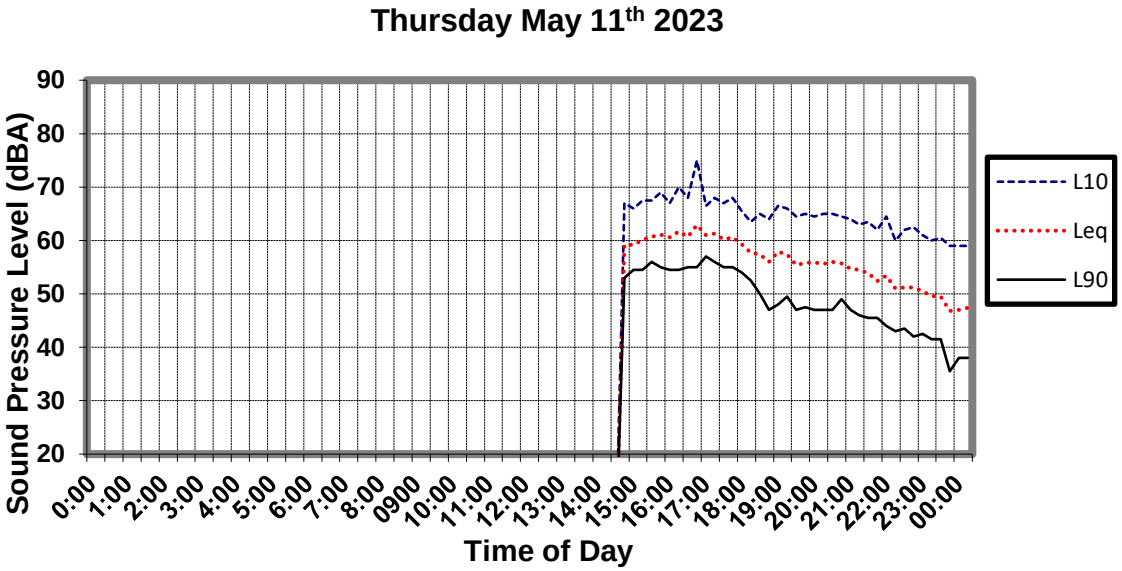
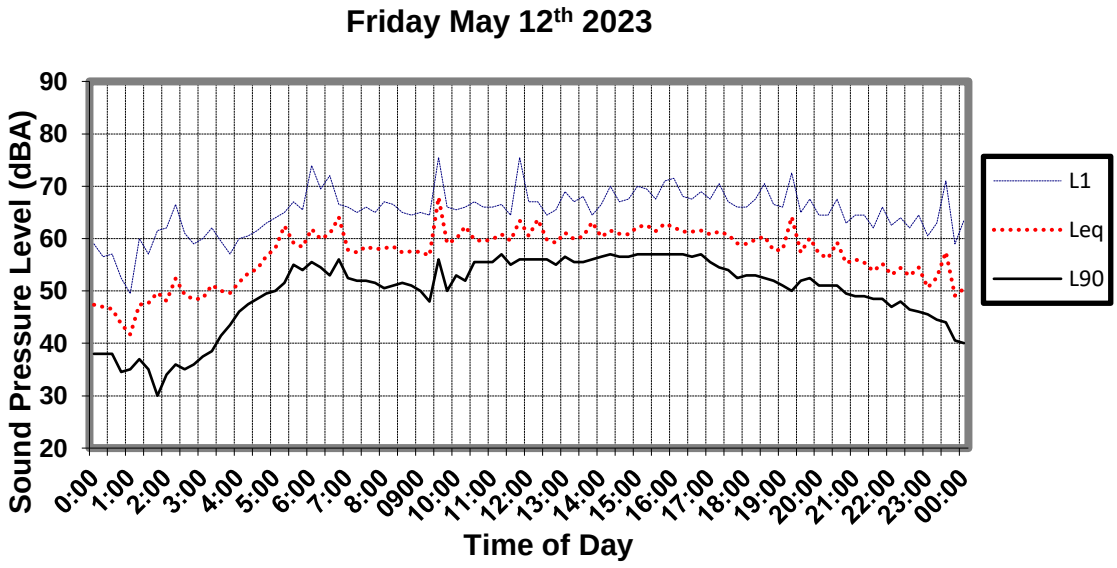
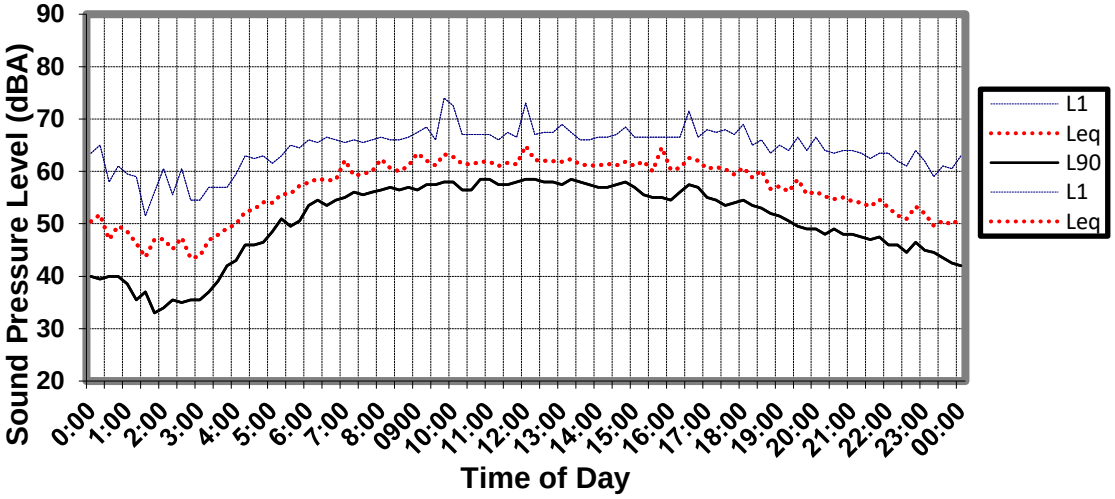


Urana Road


Thursday May 11th 2023
Sound Pressure Level (dBA)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
0900
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
L10
Leq
L90


Friday May 12th 2023
Sound Pressure Level (dBA)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
0900
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
L1
Leq
L90

Saturday May 13th 2023



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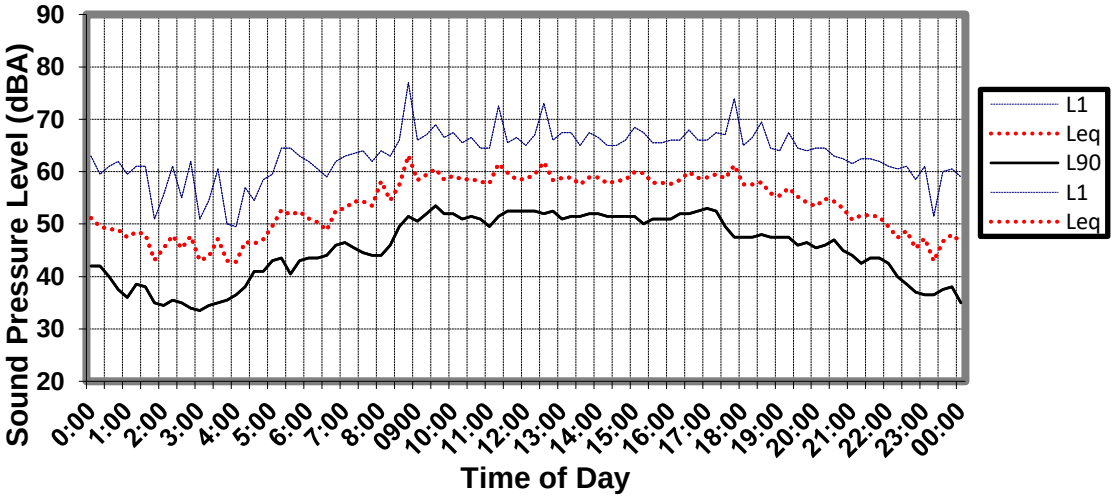
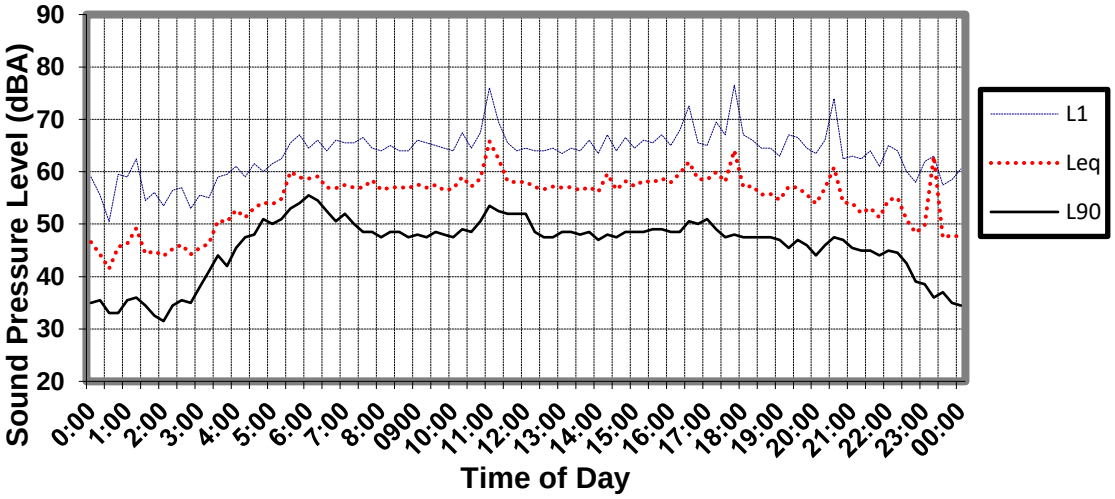


Monday May 15th 2023



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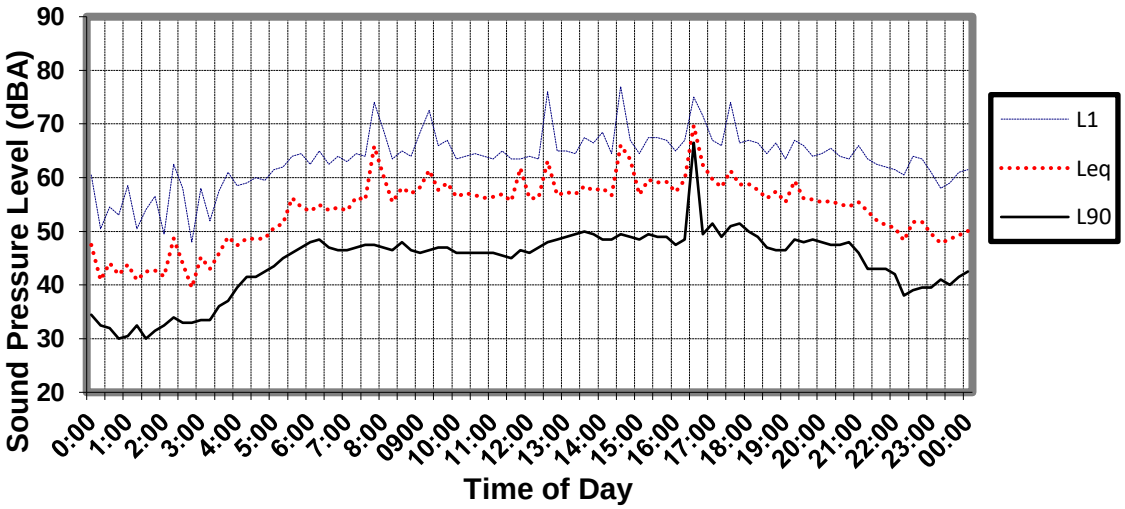
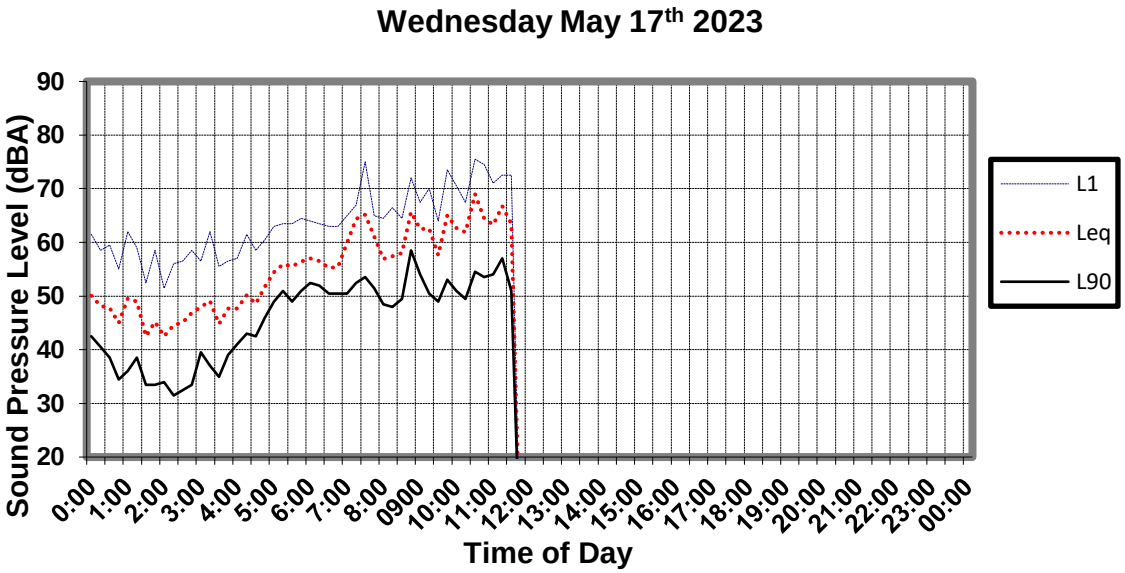



Wednesday May 17th 2023
Sound Pressure Level (dBA)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
0900
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Time of Day
L1
Leq
L90

Dapto Leagues Club
Porposed Alterations and Additions
Predcited L10 Noise Levels
Patron and background music noise
Terraces and internal areas

Signs and symbols

Paron noise including background music
TV screens, etc

Levels in dB(A)

= 30
= 32
= 34
= 36
= 38
= 40
= 42
= 44
= 46
= 48
= 50
= 52
= 54
= 56
= 58

1 : 2920

0 15 30 60 90 120 m

N

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Predcited L10 Noise Levels
Patron and background music noise
After 12 am

Signs and symbols

Paron noise including background music
TV screens, etc

Levels in dB(A)

= 30
= 32
= 34
= 36
= 38
= 40
= 42
= 44
= 46
= 48
= 50
= 52
= 54
= 56
= 58

1 : 2920

0 15 30 60 90 120 m

N

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Predcited Leq, 15 minute Noise Levels
Mechanical Plant - Day & Evening

Signs and symbols

Mechanical plant items
Air conditioning, ventilation fans, etc

Levels in dB(A)

= 28
= 30
= 32
= 34
= 36
= 38
= 40
= 42
= 44
= 46
= 48
= 50
= 52
= 54
= 56

1 : 2920

0 15 30 60 90 120 m

N

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Predcited Leq, 15 minute Noise Levels
Mechanical Plant - Night time period

Signs and symbols

Mechanical plant items
Air conditioning, ventilation fans, etc

Levels in dB(A)

= 28
= 30
= 32
= 34
= 36
= 38
= 40
= 42
= 44
= 46
= 48
= 50
= 52
= 54
= 56

1 : 2920

0 15 30 60 90 120 m

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

N

Dapto Leagues Club
Porposed Alterations and Additions
Predicted Noise Levels
Car Park Activity
Leq, 15 minute

Signs and symbols

Receiver

Car park activity

1 : 2920

0 15 30 60 90 120 m

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Predicted Noise Levels
Car Park Activity
Lmax - sleep disturbance

Signs and symbols

Receiver

Car door closing, engine rewving, people talking, etc

1 : 2920

0 15 30 60 90 120 m

N

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Construction Noise Assessment
Demolition Works
Leq, 15 minute predicted noise levels

Signs and symbols

- Receiver
- Excavator / pulveriser
- Truck movements

1 : 2920

0 15 30 60 90 120 m

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Construction Noise Assessment
Demolition Works
Leq, 15 minute predicted noise levels

Excavator / pulveriser

Truck movements

Levels in dB(A)

= 53
= 55
= 57
= 59
= 61
= 63
= 65
= 67
= 69
= 71
= 73
= 75
= 77
= 79
= 81

1 : 2920

0 15 30 60 90 120 m

N

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Construction Noise Assessment
Car Park Earthworks - Typical
Leq, 15 minute predicted noise levels

Signs and symbols

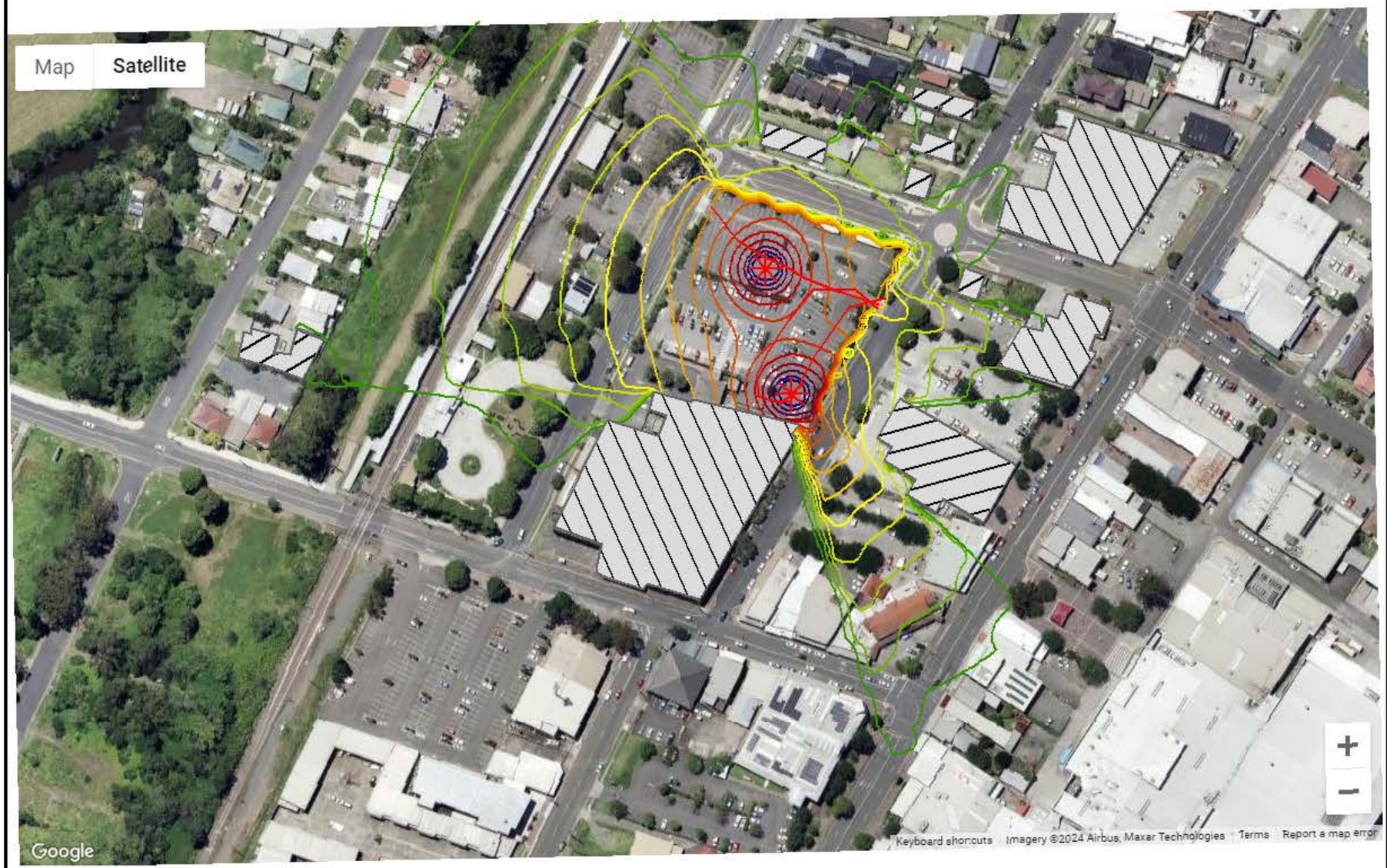
- Receiver
- Excavator / loader / screw piling
- Truck movements

1 : 2920

0 15 30 60 90 120 m

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Construction Noise Assessment
Car Park Earthworks - Typical
Leq, 15 minute predicted noise levels



Signs and symbols

Excavator / loader / screw piling

Truck movements

Levels in dB(A)

= 57
= 59
= 61
= 63
= 65
= 67
= 69
= 71
= 73
= 75
= 77
= 79
= 81
= 83
= 85

1 : 2920

0 15 30 60 90 120 m

N

HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Dapto Leagues Club
Porposed Alterations and Additions
Construction Noise Assessment
Car Park Concrete Hammering
Leq, 15 minute predicted noise levels

Signs and symbols

- 2.4 m high Timber Hoarding
- Receiver
- Excavator Hammering Attacment
- Truck movements

1 : 2920

0 15 30 60 90 120 m

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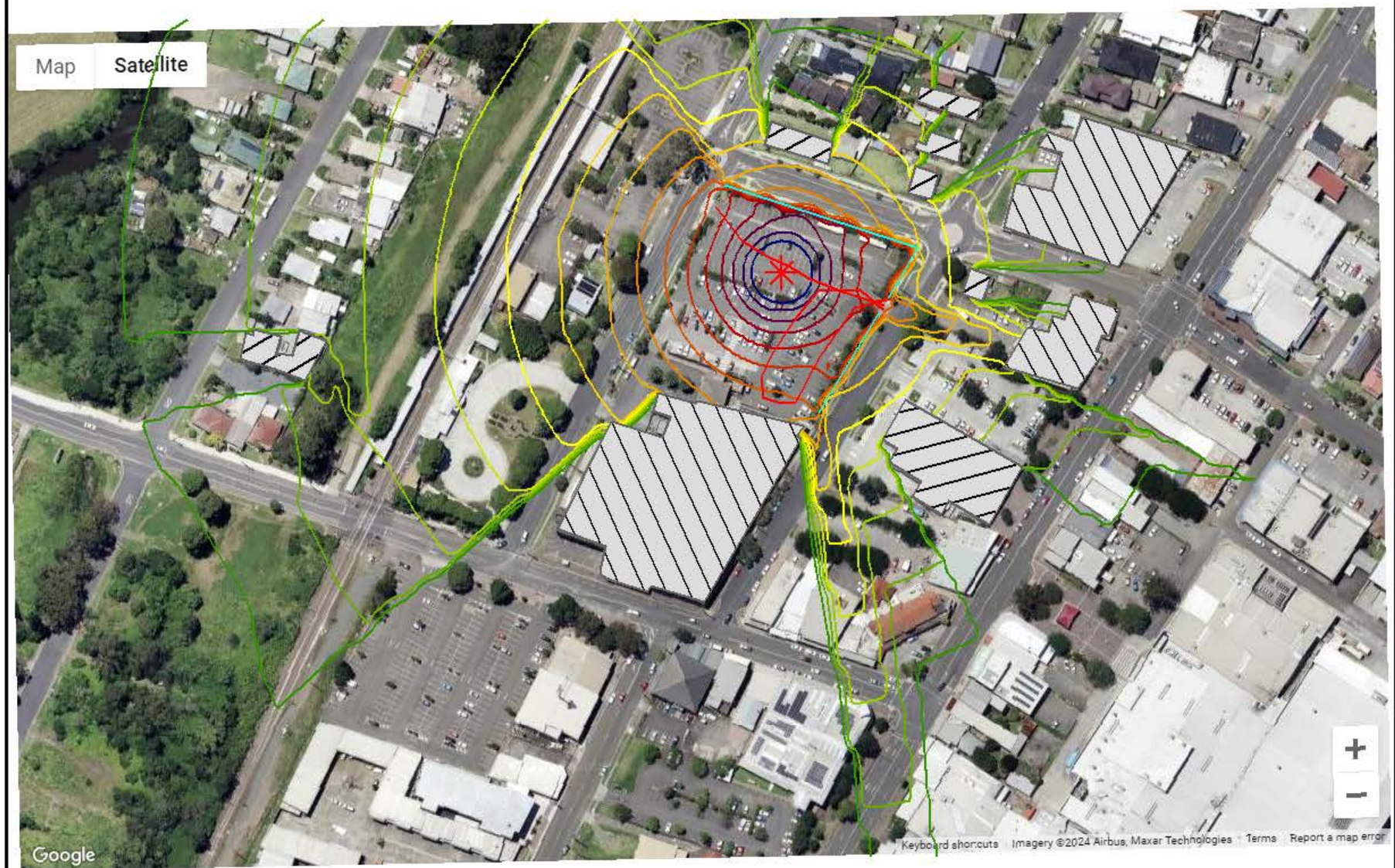

2.4 m high Timber Hoarding
Excavator Hammering Attacment
Truck movements

Levels in dB(A)

= 57
= 59
= 61
= 63
= 65
= 67
= 69
= 71
= 73
= 75
= 77
= 79
= 81
= 83
= 85

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