Abel Tasman Village 222 Waldron Rd Chester Hill

Noise Impact Assessment

Abel Tasman Village Association Ltd

Report Reference: 240475 – Abel Tasman Village 222 Waldron Rd Chester Hill – Noise Impact Assessment – LT - R2

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1 INTRODUCTION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake an acoustic assessment for the proposed development to be located at 222 Waldron Road, Chester Hill.

The proposed development by The Abel Tasman Village Association Limited located at 222 Waldron Road, Chester Hill is for a new aged care facility with independent living units on the subject site. The masterplan scheme includes four new buildings on site.

This report has been prepared to address the Planning Secretary's Environmental Assessment Requirements (SEARs) for application number SSD-49937206 dated 28 November 2022. In particular this addresses Requirement 12 of the SEARs as follows.

12. Noise and Vibration

- *Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.*

This assessment includes the acoustic investigation into the potential for noise impacts from the operation of the completed project as well as potential noise impacts on the site from existing noise sources within the vicinity of the site which predominantly includes traffic noise from surrounding roadways and the train line located to the south of the site.

1.1 Project Details

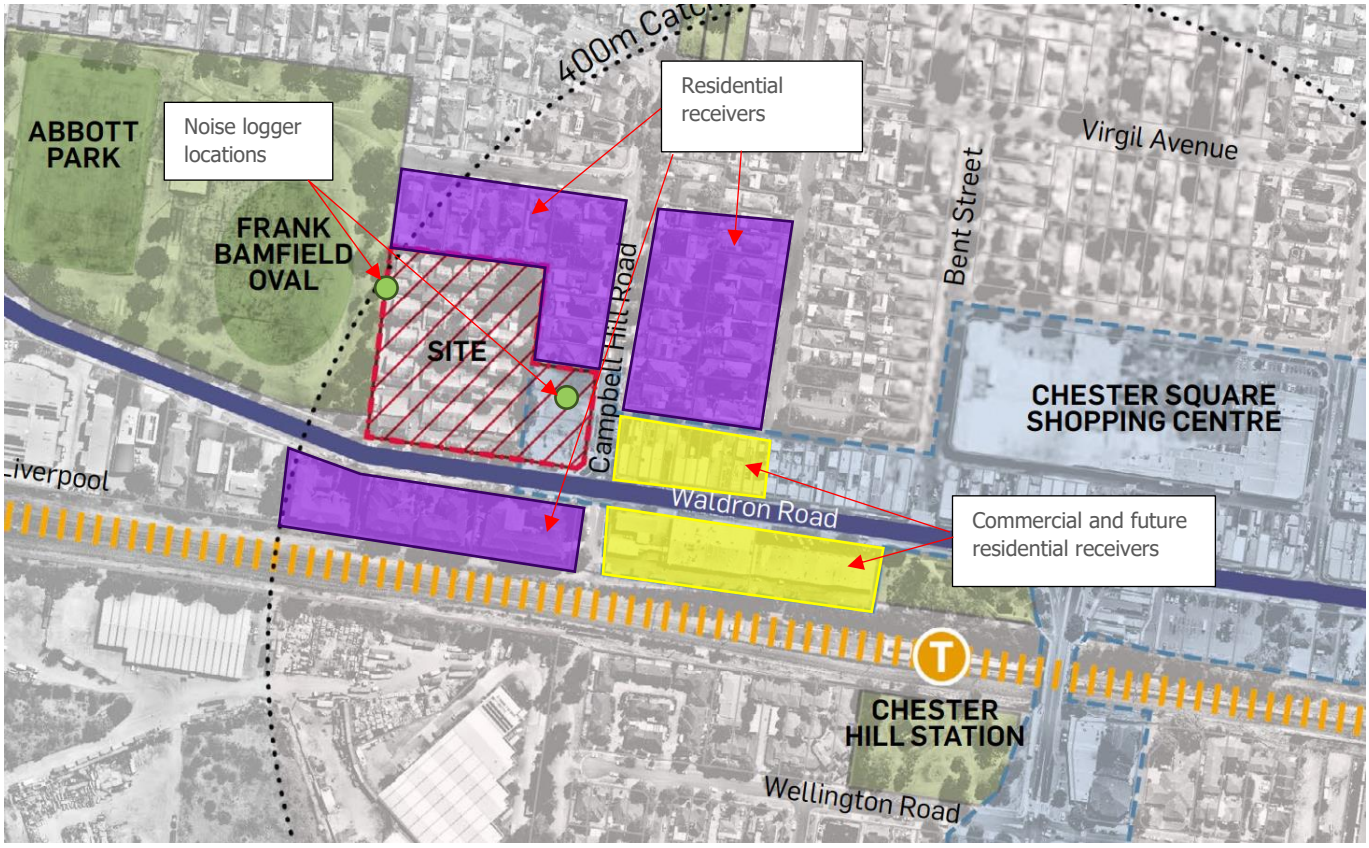
The proposed development is located at 222 Waldron Road, Chester Hill.

The surrounding noise and vibration sensitive receivers to the site include the following:

1. Existing commercial properties located to the east of the site.
2. Existing residential properties located to the north, east, and south of the site.
3. Future residential properties located to the east of the site.
4. Existing active recreational land located to the west of the site.

The site location is presented in Figure 1 below.

Figure 1 Site Location and Noise Measurement Locations



1.2 Project Description

The proposed project by The Abel Tasman Village Association Limited located at 222 Waldron Road, Chester Hill is for a new aged care facility with independent living units on the subject site. The site is located within a suburban area of the Canterbury Bankstown Council local government area.

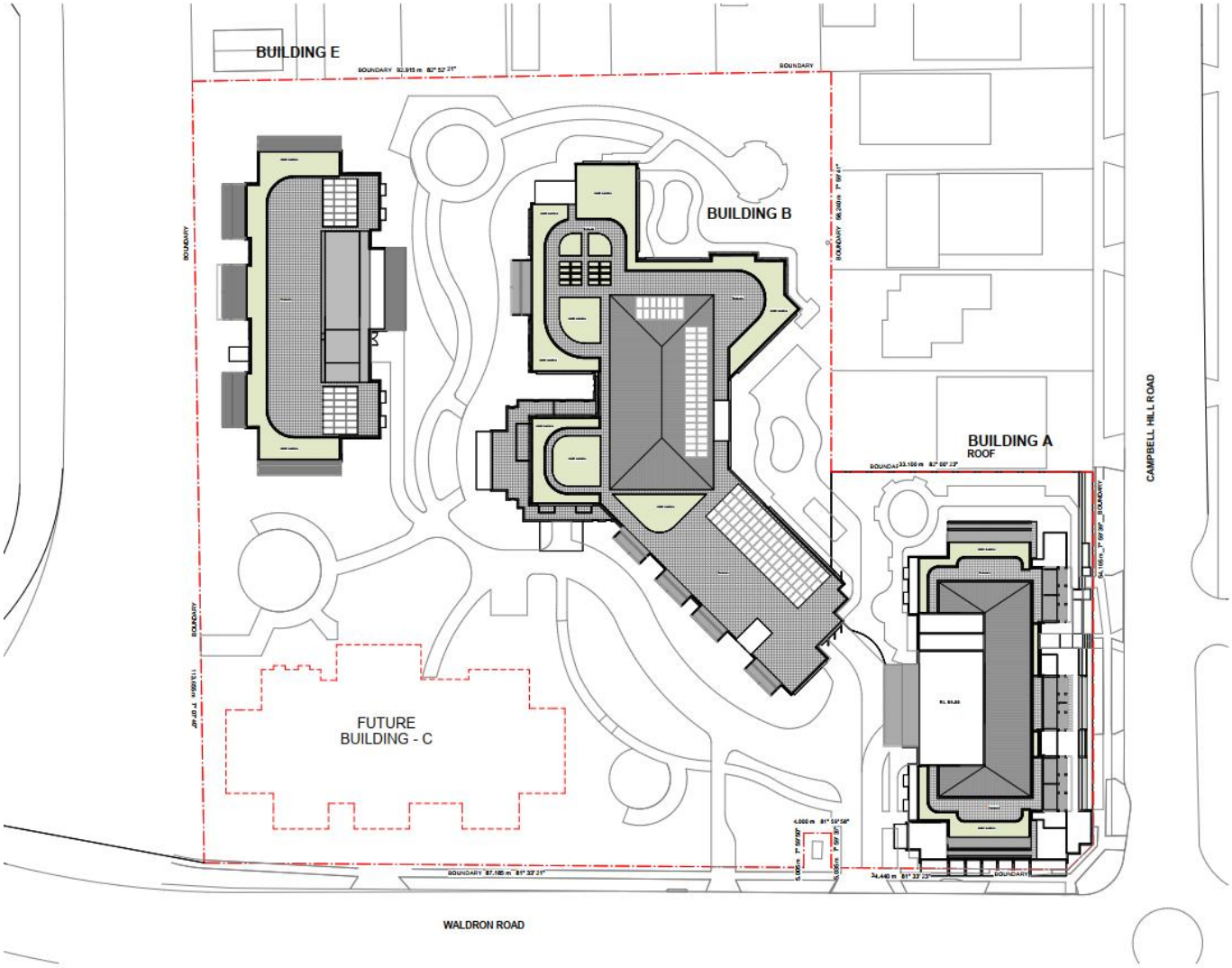
The proposed project overview is as follows:

Data	Concept Plan	Project - Stage 1
Site Area	12,730sq.m	9,805.9sq.m
Use	Seniors Housing. Building A – Retail and ground level; Building C – Neighbourhood shops at ground level.	
GFA	18,990.6sq.m	14,635.4sq.m
Retail GFA	353.3sq.m	159sq.m

Height (max/no of stories)	Building C - 26m - 6 storeys	Building A - 27.3m – 7-8 storeys Building B - 18.4m - 4-5 storeys Building E - 17.8m - 4 storeys
Landscaped area	8,073.2sq.m	RCF - 20.9sq.m/bed RCF - 40% deep soil ILUs - 68% landscaped area ILUs - 35.7% deep soil
No. of RCF rooms	110	110
No of RCF beds	120	120
No of ILU units	TBC	64
No. of car spaces	TBC	92

Proposed locations of the buildings and site masterplan is presented in Figure 2.

Figure 2 Proposed locations of buildings and site masterplan



2 EXISTING ACOUSTIC ENVIRONMENT

This section of the report details the acoustic survey which has been undertaken at the site for the purpose of obtaining existing background noise levels, as well as noise levels incident to the future building façades.

2.1 Unattended Noise Monitoring

As part of this assessment an acoustic survey of the existing acoustic environment at the site and surrounding receivers was undertaken. The survey included long-term unattended noise logging between 26 July and 2 August 2024. Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the results, and also excluded from the data used to determine the noise emission criteria. Meteorological information has been obtained from the Bankstown Airport AWS (ID 066137).

Noise logging was undertaken at two locations on the site using SVAN-971 monitor with serial numbers 74365 and Norsonic NL-42 monitor with serial number 00998079. Calibration of the loggers were checked prior to and following the measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The unattended noise monitor was located at 136 Campbell Hill Road boundary (SVAN-971) and western boundary of the site (NL-42), at the boundary adjoining Frank Bamfield Oval respectively. This monitor was used to determine the background noise to establish the maximum allowable noise for residential receivers.

The locations of the noise loggers are shown in Figure 1. The noise loggers were positioned such that it did not require façade corrections.

Graphs presenting summaries of the measured daily noise data are attached to this report in Appendix B. The graphs present each 24-hour period and show the LA1, LA10, LAeq and LA90 noise levels for the corresponding 15-minute periods. This data has been filtered to remove periods affected by adverse weather conditions based on weather information.

2.2 Noise Descriptors & Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure environmental noise in terms of quantifiable time periods and statistical descriptors. Typically, environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dBA, the "A" indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' arithmetic does not apply, e.g., adding two sound sources of equal values result in an increase of 3dB (i.e., 60 dBA plus 60 dBA results in 63 dBA). A change of 1 dB or 2 dB in the sound level is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the LAeq, LA1, LA10 and LA90 noise levels. The LAeq noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period. It represents the level that the fluctuating noise with the same acoustic energy would be if it were constant over the measured time period.

The LA1, LA10 and LA90 levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels can be considered as the maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included as Appendix A.

2.3 Unattended Noise Monitoring Results

2.3.1 Results in accordance with the NSW *EPA Noise Policy for Industry (NPI) 2017* (RBL's)

In order to assess the potential noise impacts of the development on nearby sensitive receivers the measured background noise data was processed in accordance with the Environmental Protection Authority (EPA) Noise Policy for Industry (NPI).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. RBL levels LA90 (15minute) and LAeq noise levels are presented in Table 1.

Table 1 Measured Ambient Noise Levels corresponding to the NPI's Assessment Time Periods

Measurement Location See Figure 1	Daytime[1] 7:00 am to 6:00 pm		Evening[1] 6:00 pm to 10:00 pm		Night-time[1] 10:00 pm to 7:00 am	
	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)	L_{A90}[2] (dBA)	L_{Aeq}[3] (dBA)
Abel Tasman Village Western Boundary (NL-42)	52	58	50	54	44	52
136 Campbell Hill Road (SVAN 971)	51	59	50	58	42	54

Note 1 For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2 The L_{A90} noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.

Note 3 The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

2.3.2 Results in accordance with the NSW EPA *Road Noise Policy (RNP) 2011*

The measured ambient noise level in accordance with the NSW EPA Road Noise Policy (RNP) 2011 are provided in Table 2.

Table 2 Measured Ambient Noise Levels corresponding to the EPA Road Noise Policy (RNP) 2011 Time Periods

Measurement Location	Measured Noise Level			
	Daytime[1] 7:00 am to 10:00 pm		Night-time[1] 10:00 pm to 7:00 am	
	$L_{Aeq\ (15hour)}$[1] (dBA)	$L_{Aeq\ (1hour)}$[1] (dBA)	$L_{Aeq\ (9hour)}$[1] (dBA)	$L_{Aeq\ (1hour)}$[1] (dBA)
Abel Tasman Village Western Boundary (NL-42)	57	66	53	62
136 Campbell Hill Road (SVAN 971)	59	67	54	63

Note 1 The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

3 INTERNAL NOISE LEVEL ASSESSMENT

3.1 Canterbury Bankstown Council DCP

Review of The Canterbury Bankstown Council Development Control Plan (DCP) 2023 indicates that no specific acoustic related requirements have been stipulated or applicable to the site and development.

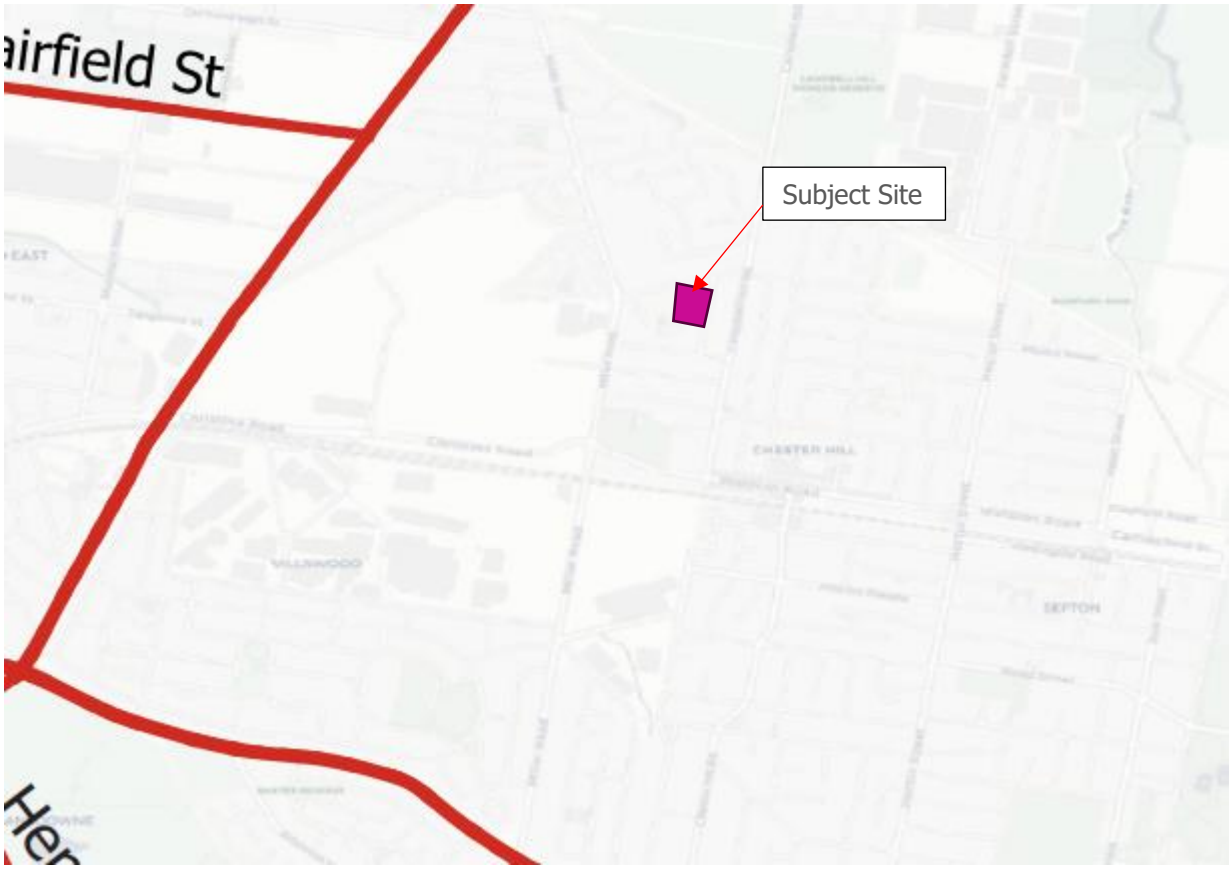
3.2 The State Environmental Planning Policy (Infrastructure) 2021

The 222 Waldron Road, Chester Hill site is located with an area which is classified as Suburban residential area as defined by the NSW EPA *Noise Policy for Industry*. The exiting noise levels at the site are predominantly as a result from traffic noise within the vicinity of the site on surrounding roadways and the train line which is located to the south of the site.

The site is located on the corner of Waldron Road and Campbell Hill Road which are not defined as a busy road carrying over 20,000 Annual Average Daily Traffic (AADT) number as defined in Map 11D of the RTA's Traffic Volume Maps for Noise Assessment for Buildings on Land Adjacent to Busy Roads. Therefore, road traffic noise assessment in accordance with the *Development Near Rail Corridors and Busy Roads – Interim Guideline* is not required.

See the Figure below which includes the site location included on Map 11D of the RTA.

Figure 3 Site Location of Map 11D of the RTA's *Traffic Volume Maps for Noise Assessment for Buildings on Land Adjacent to Busy Roads*

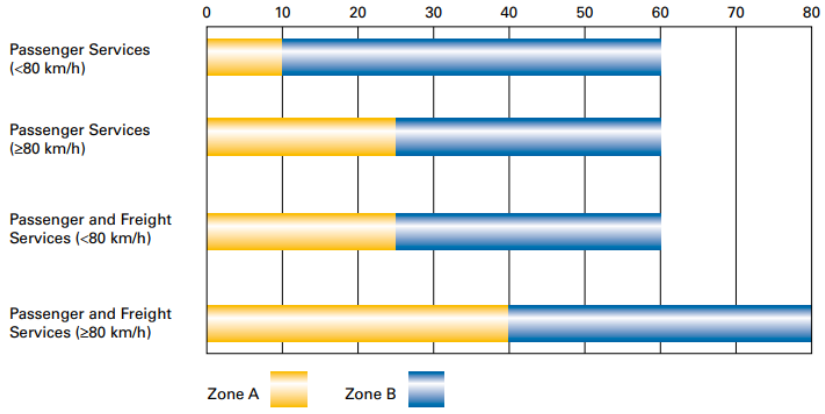


3.3 Development Near Rail Corridors and Busy Roads – Interim Guideline

Section 3.5.1 of the Development Near Rail Corridors and Busy Roads – Interim Guideline includes a guidance for the requirement of an acoustic assessment for noise based on the distance of the site from the railway line as shown in Figure 4.

As the proposed development's nearest location to the railway lines south of the subject site is greater than 80m, acoustic assessments of rail induced noise and vibration in accordance with the *Development Near Rail Corridors and Busy Roads – Interim Guideline* are not required.

Figure 4 Noise Assessment Zones based on Distance (m) of Noise – Sensitive Development from Operational Track (Not Corridor)



3.4 Australian Standards 2107:2016

As mentioned above, assessments of road and rail traffic noise and vibration in accordance with the Department of Planning *Development Near Rail Corridor and Busy Roads – Interim Guideline* (DNRCBR) are not required. Internal noise levels within the future residential occupancies have been based on the relevant noise levels as detailed within the Australian Standard AS2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors*.

The recommended levels for various areas of the project are detailed in the following table. The recommended noise levels for residential dwellings near major roadways detailed within AS2107:2016 have been used as the basis of this assessment.

Table 3 Project Internal Environmental Noise Level Criteria

Type of Occupancy/Activity	Design sound level maximum ($L_{Aeq,t}$)
Common areas (e.g. foyer, lift lobby)	55 $L_{Aeq\ 24\ min}$
Residential[1] - Living areas	40 $L_{Aeq\ 24\ hour}$
Residential[1] - Sleeping areas (night time)	35 $L_{Aeq\ 9\ hour}$[1]
Retail/Commercial Tenancies	45 $L_{Aeq\ 24\ hour}$
Toilets	55 $L_{Aeq\ 24\ min}$

Note 1 The criteria for residential dwellings included within the Australian Standard have been used for the assessment.

4 ENVIRONMENTAL NOISE INTRUSION ASSESSMENT

This section of the report details the assessment of environmental noise intrusion into the proposed development and the recommended acoustic treatments to ensure the recommended internal noise levels detailed in the Sections above (including environmental noise intrusion) are achieved. Internal noise levels within the future areas of the development will result from the noise intrusion into the building through the external façade including glass, masonry and other façade elements. Typically, the acoustic performance of building elements including the relatively light weight elements of the building façade, including glass and/or plasterboard constructions, will be the determining factors in the resulting internal noise levels.

Calculations of internal noise levels have been undertaken based on the measured traffic and calculated environmental noise levels at the site and the characteristics of the building, including window openings, buildings constructions and the like.

4.1 External Glass Elements

The recommended acoustic constructions to the buildings external façade glass elements are detailed in the table below to ensure the recommended internal noise levels detailed above are achieved, with the façade building openings closed.

Table 4 External Glass Acoustic Requirements

Building	Façade Orientation	Room Type	Recommended Glass Construction	Minimum Façade Acoustic Performance[1]
Buildings A and C	**Facing south towards the Waldon Road and railway line**	Bedrooms	10.38mm Laminated	Rw 35
		Living Rooms	10.38mm Laminated	Rw 35
		Wet areas	6.38mm Laminated	Rw 30
		Commercial areas	6.38mm Laminated	Rw 30
	Facing West towards Campbell Hill Road	Bedrooms	10.38mm Laminated	Rw 35
		Living Rooms	10.38mm Laminated	Rw 35
		Wet areas	6.38mm Laminated	Rw 30
		Commercial areas	6.38mm Laminated	Rw 30
	All Other Façade orientation	Bedrooms	6.38mm Laminated	Rw 30
		Living Rooms	6.38mm Laminated	Rw 30
		Wet areas	6.38mm Laminated	Rw 30
		Commercial areas	6.38mm Laminated	Rw 30
Buildings D and E	**All Façade orientations**	Bedrooms	6.38mm Laminated	Rw 30
		Living Rooms	6.38mm Laminated	Rw 30
		Wet areas	6.38mm Laminated	Rw 30
		Commercial areas	6.38mm Laminated	Rw 30

Note 1 The acoustic performance of the external façade includes the installed glazing and frame including (but not limited to) the façade systems seals and frame. All external glazing systems are required to be installed using acoustic bulb seals.

The recommended glass constructions detailed in the table above include those required to ensure the acoustic requirements of the project are achieved. Thicker glazing may be required to achieve other project requirements such as structural, thermal, safety or other requirements and is to be advised by others.

4.2 External Building Elements

The proposed external building elements including masonry or concrete external walls and roof are acoustically acceptable without additional acoustic treatment.

Any lightweight external plasterboard walls should be constructed from a construction with a minimum acoustic performance of Rw 50.

4.3 External Roof

The required external roof and ceiling constructions for the project are required to include the following:

- Concrete external roof construction – no additional acoustic treatments required.
- Metal Deck or tiled roof construction:
  - Bedrooms – external roof, 1x 13mm plasterboard ceilings and insulation in the ceiling cavity.
  - Living Rooms – external roof, 1x 13mm plasterboard ceilings and insulation in the ceiling cavity.

4.4 External Opening and Penetrations

All openings and penetrations are required to be acoustically treated such that the performance of the building construction is not compromised. This may require lining of duck work behind mechanical service openings/grills, treatments to ventilation opening and the like.

5 EXTERNAL NOISE EMISSION ASSESSMENT

This section of the report details the relevant noise level criteria for noise emissions generated on the site once completed.

The relevant authority which provides the required noise level criteria for noise levels generated on the site includes the NSW Environmental Protection Authority's (EPA) Noise Policy for Industry (NPI).

For the assessment of the predicted operational noise emissions by the proposed development, the criteria have been derived in accordance with the Noise Policy for Industry (EPA, 2017), details are included in the following sections of this report.

Note that the proposed masterplan comprises of multiple buildings on-site. The established NPI noise emission criteria are applicable to the cumulative noise impacts from the entirety of the proposed development to the nearby sensitive receivers.

5.1 NSW Noise Policy for Industry

In NSW, the control of noise emissions is the responsibility of Local Government and the NSW Environment Protection Authority (NSW EPA). In October 2017, the NSW EPA released the Noise Policy for Industry (NSW NPI). The purpose of the policy is to ensure that noise impacts associated with particular industrial developments are evaluated and managed in a consistent and transparent manner. The policy aims to ensure that noise is kept to acceptable levels in balance with the social and economic value of industry in NSW.

The NSW NPI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residential receivers in the short-term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

The project noise trigger level is derived from the more stringent value out of the project intrusiveness noise level and the project amenity noise level.

5.1.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (LAeq), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

5.1.2 Protecting Noise Amenity (All Receivers)

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient LAeq noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

5.1.3 Area Classification

The NSW NPI characterises the "Suburban Residential" as an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.

For the considered receptors in the rural area, the recommended amenity noise level is shown in Table 5 below. When the existing noise level from industrial noise sources is close to the recommended "Amenity Noise Level" (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

Table 5 NSW NPI – Recommended L_{Aeq} Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level ($L_{Aeq, period}$)[2]
Residence	Suburban	Day	55
		Evening	45
		Night	40
Commercial Receiver	-	When in use	65

Note 1 : For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2 : The L_{Aeq} is the energy average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

5.1.4 Project Trigger Noise Levels

The intrusive and amenity criteria for industrial noise emissions derived from the measured data are presented in Table 6The amenity and intrusive criterion are nominated for the purpose of determining the operational noise limits for noise sources associated with the development which can potentially affect noise sensitive receivers.

For each assessment period, the project trigger noise levels are the lower (i.e. the more stringent) of the amenity or intrusive criteria. The project trigger noise levels are shown in bold text in Table 6.

Table 6 External noise level criteria in accordance with the NSW NPI

Location	Time of Day	Project Amenity Noise Level, $L_{Aeq, period}$ [1] (dBA)	Representative Background Noise level $L_{A90, 15\ min}$ (RBL) [2] (dBA)	Measured $L_{Aeq, period}$ Noise Level (dBA)	Intrusive $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA) [3]	Amenity $L_{Aeq, 15\ min}$ Criterion for New Sources (dBA) [3, 4]
Residence (Suburban)	Day	50	52	58	57	**53**
	Evening	40	50	54	55	**44**
	Night	35	44	52	49	**42**
Commercial Receiver	When in Use	60	-	-	-	**63**
Active Recreation area	When in use	55	-	-	-	**58**

Note 1 Project Amenity Noise Levels corresponding to "suburban" areas, equivalent to the Recommended Amenity Noise Levels minus 5 dBA

Note 2 L_{A90} Background Noise or Rating Background Level, including L_{A90} Background Noise or Rating Background Level based on the assumed minimum rating of the EPA NPfI.

Note 3 Project Noise Trigger Levels are shown in bold

Note 4 According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB

6 OPERATIONAL ACOUSTIC ASSESSMENT

This section of the report details the assessment of potential noise generated as part of the proposed development.

The assessment of potential noise impacts from various sources of noise on the site are detailed in the following sections.

6.1 Mechanical Services Equipment

The project proposes to have rooftop plant at locations highlighted, we assume to be individual condensers at the ILU buildings, and a centralised plant / heat recovery system on the RCF.

Detailed selections of the proposed mechanical plant and equipment to be used on the site are not available at this time. All future plant and equipment are to be acoustically treated to ensure the noise levels at all surrounding receivers comply with noise emission criteria detailed within this report. Experience with similar projects indicated that it is both possible and practical to treat all mechanical equipment such that the relevant noise levels are achieved. Examples of the possible acoustic treatments to mechanical equipment includes the following:

- Based on the distance attenuation to the nearest residential receivers, as well as the barrier attenuation due to the elevational height differences between the potential rooftop plant locations and the nearest residential receivers to the north and north-east, it is predicted and recommended that the combined sound pressure level of the rooftop mechanical plant and equipment when measured the edge of the building roof to up to 80 dBA, will ensure that the relevant noise emission criteria will be achieved.
- Supply and Exhaust Fans – location of fans within the building and treated using internally lined ductwork or acoustic silencers.
- General supply and exhaust fans – general exhaust and supply fans such as toilet, kitchen, lobby and other small mechanical fans can be acoustically treated using acoustic flex ducting or internal lined ducting.

Details of the required mechanical services equipment and acoustic treatments to ensure the relevant noise level criteria is achieved will be provided as part of the CC submission of the project.

Experience with similar projects indicates that the acoustic treatment of the proposed mechanical equipment to be installed on the project is both possible and practical.

As part of this assessment a preliminary review of the proposed equipment which may be included as part of the project has been undertaken including the following:

1. Mechanical services to be included as part of the project will include equipment such as the following:
    a. External condenser equipment on balconies, basement or roof top plat areas with a expected noise level of up to 80 dB(A) SWL.
    b. General supply and exhaust equipment with include fans with a noise level of up to 85 dB(A) SWL.
    c. Carpark supply and exhaust equipment including fans located within the basements or roof top including inline fans with a noise level of up to 105 dB(A) SWL.
    d. General dwelling fans (such a toilet and kitchen exhaust fans) located within the ceilings with a noise level of up to 60 dB(A) SWL.

2. Based on the expected equipment to be included as part of the project acoustic mitigation will be included as part of the building services design such that the relevant project requirements (including project trigger noise levels detailed is Section 5.1.4) will be achieved.
    a. Acoustic mitigations will be undertaken as part of the detailed design of the project once mechanical services design has been undertaken, including selected and layouts of plant and

equipment. The expected acoustic mitigations will include the following possible options (where required):

i. Internal lining of metal ductwork.
ii. Acoustic silencers.
iii. The use of variable speed devices for equipment such as carpark supply and exhaust fans.
iv. Acoustic screening to plant areas.
v. Vibration isolation of all equipment.
vi. Other acoustic mitigations as required to ensure noise emissions comply with project trigger noise levels.

b. Details of the required acoustic mitigations would be assessed part of the normal detailed design of the project once plant selections have been completed and noise levels of the equipment are known. Details of the required acoustic treatments will be included within the projects detailed design documentation and included as *Construction Certificate* of the project.

Experience with other similar projects has confirmed that it is both possible and practical for noise from the operation from mechanical services to be acoustically mitigated such that compliance with the project trigger noise levels will be achieved.

6.2 Onsite Vehicle and Car Parking Noise

The proposed vehicular movement is restricted to the southern end of the development. There are two proposed vehicular entries and exits that connect to the basement car parking, both from Waldron Road. As such it is anticipated that operational noise impacts to nearby receivers associated with onsite vehicular movements and car parking activities will be minimal as any noise will be sufficiently contained within basement.

Noise associated with the operations of the entry/exit doors such as roller doors or motorised gates must be designed and controlled to comply with the established NPI project noise trigger levels. Installation of the entry/exit doors must also be controlled such that any structure-borne noise within residential areas of the development does not exceed the established internal noise levels.

6.3 Waste and Garbage Collections

Noise resulting from the removal of waste and garbage from the site, including garbage trucks and the like will be undertaken in accordance with council's waste management requirements.

Noise resulting from the collection of waste from the site will include intermittent collection using approved waste collection vehicles. The resulting noise impact resulting from the site will be similar to noise levels currently experienced by exiting receivers from exiting waste collection services, train noise and vehicle movements on surrounding roadways.

The recommended acoustic treatments to the building facade detailed in this report include those required to ensure internal noise levels within the future dwellings of the project from the collection of waste will be acoustically acceptable and compliant with the recommended internal noise levels.

7 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

This section of the report details the construction noise and vibration impacts and the required mitigations and management controls required to be implemented as part of the construction of the building. The assessment of construction noise and vibration has been undertaken in accordance with the EPA's *Interim Construction Noise Guideline*.

7.1 Construction Noise

This section of the report details the assessment of noise associated with the proposed construction activities associated with the development. The assessment has been undertaken to assess the potential noise impacts from construction and demolition on surrounding receivers to the site.

The proposed construction and demolition activities to be undertaken on the site include the strip out of the existing areas of the existing building and limited external demolition of the existing building on the site. The development will then be constructed using normal construction processes.

The assessment of construction noise impacts generated from the site has been undertaken in accordance with the requirements of the EPA Interim Construction Noise Guideline.

The EPA's Interim Construction Noise Guideline defines normal day time hours as the following:

2.2 Recommended standard hours

The recommended standard hours for construction work are shown in Table 1; however, they are not mandatory. There are some situations, as described below, where construction work may need to be undertaken outside of these hours. The likely noise impacts and the ability to undertake works during the recommended standard hours should be considered when scheduling work.

Table 1: Recommended standard hours for construction work

Work type	Recommended standard hours of work*
Normal construction	Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays
Blasting	Monday to Friday 9 am to 5 pm Saturday 9 am to 1 pm No blasting on Sundays or public holidays

* The relevant authority (consent, determining or regulatory) may impose more or less stringent construction hours.

7.1.1 Proposed Appliances

The typical construction appliances which will likely be used as part of the demolition and construction of the project are detailed in the table below.

Table 7 Noise Level from Expected Demotion Appliances

Tasks	Equipment	Sound Power Levels per task dB(A) L_{10}	Aggregate Sound Power Level per Task dB(A) L_{10}
Site Demolition works	Jack hammer mounted on excavator	118	122
	Excavators and bulldozers	115	
	Hand held jack hammer	111	
	Concrete saw	119	
	Skid steer	110	
	Power hand tools	109	
	Materials Movements	105	
Site Ground Works	Jack hammer mounted on excavator	118	122
	Saw cutting	119	
	Excavators and bulldozers	115	
	Materials Movements	105	
	Bulldozers	115	
	Trucks	109	
Construction Works	Piling	115	120
	Welder	101	
	Saw cutter	109	
	Dump truck	109	
	Concrete saw	119	
	Power hand tools	109	
	Cranes	110	

Note 1 Noise levels of proposed equipment to be used on the site based on the Australian Standard AS2436-2010 and noise level measurements previously undertaken of similar equipment on construction sites.

7.1.2 Construction Noise Criteria

This section of the report details the relevant construction noise criteria which is applicable to the site including the EPA's *Interim Construction Noise Guideline* (ICNG).

7.1.2.1.1 Interim Construction Noise Guideline

Noise criteria for construction and demolition activities are discussed in the Interim Construction Noise Guideline (ICNG). The ICNG also recommends procedures to address potential impacts of construction noise on residences and other sensitive land uses. The main objectives of the ICNG are summarised as follows:

- Promote a clear understanding of ways to identify and minimise noise from construction works;
- Focus on applying all "feasible" and "reasonable" work practices to minimise construction noise impacts;
- Encourage construction to be undertaken only during the recommended standard hours unless approval is given for works that cannot be undertaken during these hours;
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage; and
- Provide flexibility in selecting site-specific feasible and reasonable work practices in order to minimise noise impacts.

The ICNG contains a quantitative assessment method which is applicable to this project. Guidance levels are given for airborne noise at residences and other sensitive land uses.

The quantitative assessment method involves predicting noise levels at sensitive receivers and comparing them with the Noise Management Levels (NMLs). The NML affectation categories for receivers have been reproduced from the guideline and are listed in the table below.

Table 8 Noise Management Levels from Construction

Receiver Type	Time of Day	Noise Management Level $L_{Aeq(15minute)}$[1,2]	How to Apply
Residential	Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15minute)}$ 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 dBA	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.
	Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.
offices, retail outlets: external	When is use	$L_{Aeq\ (15\ min)}$ 70 dB(A)	During construction, the proponent should regularly update the occupants of the commercial and industrial premises regarding noise levels and hours of work.

Note 1 Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Note 2 The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA 2000).

Based on the table above the suitable construction noise management levels for works undertaken on the site is detailed in Table 6 below.

Table 9 Site Construction Noise Management Levels

Noise Source	Time Period	Receiver Type	Construction Noise Management Level[1]	'High Noise Affected' Level[1]
Construction Noise	During period of approved hours of works	Residential Receivers	61 dB(A) L_{Aeq} (15min)	75 dB(A) L_{Aeq} (15min)

Note 1 Construction noise management levels based on the Interim Construction Noise Guideline

7.1.3 Construction Noise Management – Qualitative Assessment

Based on the assessment conducted of the expected construction noise levels generated from the site, levels are generally expected to require the building contractor to engage in management of activities on the site and engagement with the local community.

Notwithstanding, the following management controls are recommended to mitigate construction noise levels on the site:

1. Construction to be undertaken within the approved hours detailed within the projects *Conditions of Consent.*
2. All plant and equipment are to be maintained such that they are in good working order.
3. A register of complaints is to be recorded in the event of complaints being received, including location, time of complaint, nature of the complaint and actions resulting from the complaint.
4. If required a noise level measurement of the offending plant item generating complaints is to be conducted and noise mitigations undertaken to reduce noise levels to within Noise Management levels in the event magnitude of noise levels is found to be above suitable levels.
5. The use of percussive and concrete sawing should be undertaken behind a closed façade when possible.
6. The use of percussive equipment including hydraulic hammering should be limited such that they are not undertaken prior to 7.30am on weekdays and prior to 8.30am on Saturdays.
7. Where possible any excavation to be undertaken on the site is to include ripping of material where possible.

In addition to the recommended mitigations above details of the proposed construction (including demolition) works to be conducted on the site, including type of activities to be conducted as well as the expected duration of activities should be provided to the neighbouring receivers.

In the event noise levels are found to required additional noise reduction then all possible and practical mitigations are required to be included in the construction of the project. Possible acoustic treatments and controls may include the following:

1. Use of alternative appliances to complete the required works which result in reduced noise impacts on surrounding neighbours.
2. Period when noisy appliances are undertaken, such as undertaking noisy works on locations with the greatest distance to residential receivers during morning periods if possible.
3. Construction of acoustic screening to permanently located high noise generating equipment such as pumps and generators.
4. Scheduling of high noise generating works outside of noise sensitive periods if possible.
5. Other site specific treatments and controls which may become possible once works commence.

7.1.4 Construction Noise Assessment – Quantitative Assessment

A quantitative assessment of the construction noise levels resulting from the proposed works to be undertaken as part of the project on surrounding receivers has been undertaken.

The assessment has been based on the expected noise levels to be generated on the site including those detailed in Section 7.1.1 above. Calculations of the resulting construction noise levels of the receivers within proximity to the site is detailed in the table below.

Table 10 Quantitative Assessment of Construction Noise to Neighboring Residence

Source Noise	Equipment	Sound Power Levels dB(A) L_{10}	Site Cumulative Sound Power Level dB(A) L_{10}	Calculated Construction Noise Level – Residential Receivers
Site Demolition works	Jack hammer mounted on excavator	118	122	Up to 75 dB(A) when items used externally
	Excavators and bulldozers	115		
	Hand held jack hammer	111		
	Concrete saw	119		
	Skid steer	110		
	Power hand tools	109		
	Materials Movements	105		
Site Excavations	Jack hammer mounted on excavator	118	122	Up to 75 dB(A) when items used externally
	Saw cutting	119		
	Excavators and bulldozers	115		
	Materials Movements	105		
	Bulldozers	115		
	Trucks	109		
Construction Works	Piling	115	120	Up to 75 dB(A) when items used externally Up to 61 dB(A) once items used internally within the building structure
	Welder	101		
	Saw cutter	109		
	Dump truck	109		
	Concrete saw	119		
	Power hand tools	109		
	Cranes	110		

Note 1 Calculated qualitative noise levels are based on the overall Aggregate Sound Power Level for the expected demolition and construction works to be undertaken in the site.

Based on the qualitative assessment of construction noise suitable management controls and community notifications are required to be conducted.

The required management of construction noise impacts are included in Section 7.1.3 above and the Community Consultation included in Section 7.4 of this report.

7.2 Construction Vibration Assessment

This section of the report details the assessment of construction vibration impacts on surrounding receivers.

Effects of ground borne vibration on buildings may be segregated into the following three categories:

- Human comfort – vibration in which the occupants or users of the building are inconvenienced or possibly disturbed. Refer to further discussion in Section 7.2.1.
- Effects on building contents – where vibration can cause damage to fixtures, fittings and other non-building related objects. Refer to further discussion in Section 7.2.2.
- Effects on building structures – where vibration can compromise the integrity of the building or structure itself. Refer to further discussion in Section 5.3.

7.2.1 Vibration Criteria – Human Comfort

Vibration effects relating specifically to the human comfort aspects of the project are taken from the guideline titled "Assessing Vibration – A Technical Guideline". (AVTG) This type of impact can be further categorised and assessed using the appropriate criterion as follows:

- Continuous vibration – from uninterrupted sources (refer to Table 11).
- Impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (refer to Table 12).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (refer to Table 13).

Table 11 Continuous vibration acceleration criteria (m/s^2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
		0.04	0.029	0.080	0.058
Workshops	Day or night-time	0.04	0.029	0.080	0.058

Table 12 Impulsive vibration acceleration criteria (m/s^2) 1 Hz-80 Hz

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

Table 13 Intermittent vibration impacts criteria (m/s$^{1.75}$) 1 Hz-80 Hz

Location	Daytime		Night-time	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

7.2.2 Vibration Criteria – Building Contents and Structure

The vibration effects on the building itself are assessed against international standards as follows:

- For transient vibration: British Standard BS 7385: Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration" (BSI 1993); and
- For continuous or repetitive vibration: German DIN 4150: Part 3 – 1999 "Effects of Vibration on Structure" (DIN 1999).

7.2.3 Standard BS 7385 Part 2 - 1993

For transient vibration, as discussed in standard BS 7385 Part 2-1993, the criteria are based on peak particle velocity (mm/s) which is to be measured at the base of the building. These are summarised in Table 14 and illustrated in Figure 5 below.

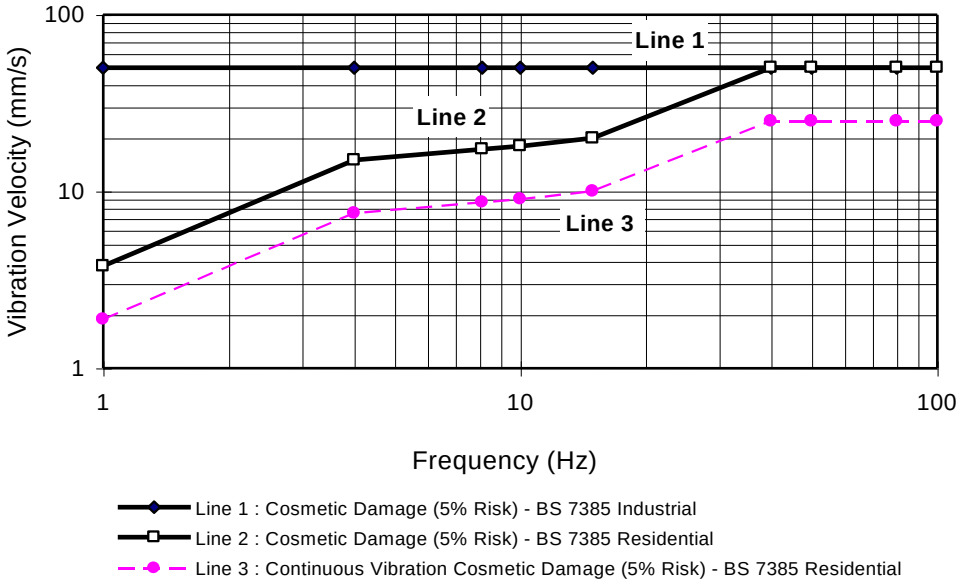
Table 14 Transient vibration criteria as per standard BS 7385 Part 2 - 1993

Line in Figure 5	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	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

Standard BS 7385 Part 2 – 1993 states that the values in Table 14 relate to transient vibration which does not cause resonant responses in buildings.

Where the dynamic loading caused by continuous vibration events is such as that results in dynamic magnification due to resonance (especially at the lower frequencies where lower guide values apply), then the values in Table 14 may need to be reduced by up to 50% (refer to Line 3 in the Figure below).

Figure 5 BS 7385 Part 2 – 1993, graph of transient vibration values for cosmetic damage



In the lower frequency region where strains associated with a given vibration velocity magnitude are higher, the recommended values corresponding to Line 2 are reduced. Below a frequency of 4 Hz where a high displacement is associated with the relatively low peak component particle velocity value, a maximum displacement of 0.6 mm (zero to peak) is recommended. This displacement is equivalent to a vibration velocity of 3.7 mm/s at 1 Hz.

The standard also states that minor damage is possible at vibration magnitudes which are greater than twice those given in Table 8, and major damage to a building structure may occur at values greater than four times the tabulated values.

7.2.4 Standard DIN 4150 Part 3 - 1999

For continuous or repetitive vibration, standard DIN 4150 Part 3-1999 provides criteria based on values for peak particle velocity (mm/s) measured at the foundation of the building; these are summarised in 10. The criteria are frequency dependent and specific to particular categories of structures.

Table 15 Structural damage criteria as per standard DIN 4150 Part 3 - 1999

Type of Structure	Peak Component Particle Velocity, mm/s			
	Vibration at the foundation at a frequency of			Vibration of horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[1]	
Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note 1 For frequencies above 100Hz, at least the values specified in this column shall be applied.

7.2.5 Project Vibration Criteria

Based on the details included in the sections above the project specific vibration criteria to protect the surrounding residential receivers from structural or architectural damage includes the following:

- Project construction vibration criteria at all surrounding building structures – 7 mm/s

7.2.6 Construction Vibration Impacts

An assessment of the potential for vibration generated as part of the required construction activities on the project (including excavation, demolition and construction) has been undertaken.

The proposed development does not required demolition as there are currently no structures on the site.

Based on the proximity of the surrounding receivers to the site ground works and construction activities on the site are expected to comply with all vibration criteria detailed in this report.

In the event excavation is required on the site including removal of stone, the following management technique should be included in the excavation methodology:

- A saw cut at the perimeter of any excavation within rock on the excavation boundary adjacent neighbouring residential properties are required to include a saw cut to the rock prior to use of any excavation or ripping.

7.3 Noise and Vibration Measurements and Monitoring

As part of the management of noise from the proposed demolition, excavation and construction activities to be undertaken on the site the following noise and vibration measurements are recommended to be undertaken:

1. Noise – Attended noise level measurements of typical demolition, excavation and construction activities should be undertaken at site.

   Attended construction noise surveys of the site and surrounding impacts on neighbours should be undertaken during the following as a minimum:

   a. Commencement of any rock breaking or sawing on the site.
   b. In response to any ongoing complaints received from neighbours.

2. Vibration – Based on the proximity of the surrounding receivers to the works attended vibration measurements of typical demolition, excavation and construction activities should be undertaken at site.

   Attended construction vibration measurements at representative locations to the neighbouring building structures should be undertaken at the following times as a minimum:

   a. Commencement of any hydraulic hammering required for demolition of construction on the site and required to be conducted within 30m of neighbouring buildings.
   b. Commencement of any rock breaking or sawing on the site required to be conducted within rock during the excavation stage of the project and required to be conducted within 30m of neighbouring buildings.
   c. In response to any ongoing complaints received from neighbours.

7.4 Community Engagement

During the proposed construction of the project (including excavation and construction) the building contractor is required to engage in community interaction. The community interaction and notification is required to include the following:

1. Notification of the proposed works to be undertaken on the site and the periods when works will be conducted, including information regarding the programme of works such as demolition and excavation. This should include the expected period when activities such as hydraulic hammering, rock breaking, concrete or rock sawing is required to be undertaken.

2. Details of the relevant site representative where complaints can be registered.

3. Details of the methodology to respond to complaints raised from the surrounding receivers.

4. A register of complaints, to be kept on site including record of time and nature of the complaint as well as the outcomes and comments regarding investigations resulting from the complaint.

8 CONCLUSION

Pulse White Noise Acoustics Consultancy Pty Ltd (Pulse White Noise Acoustics) has been engaged to undertake the Noise and Vibration Impact Assessment of the proposed aged care development located at 222 Waldron Road, Chester Hill.

This report details the required acoustic constructions of the building's façade, including external windows, to ensure that the future internal noise levels comply with the relevant noise levels of the Australian Standard AS2107:2016 for environmental noise. Providing the recommended constructions detailed in this report are included in the construction of the project the required internal noise levels will be achieved.

Screening assessments of the potential for rail noise and vibration impact from the operation of the railway line located to the south of the site, and road traffic noise from nearby roads have deemed that detailed acoustic assessment in accordance with the Department of Planning *Development Near Rail Corridors and Busy Roads – Interim Guideline* and the *Infrastructure SEPP* are not required.

External noise emissions from the site have been assessed and detailed in accordance with the NSW Environmental Protection Authorities *Noise Policy for Industry*. The future design and treatment of all building services and on-site car parking associated with the development are to be mitigated to ensure the cumulative noise emissions from the site comply with the EPA NPfI criteria including the following:

- Operation of mechanical services for all different buildings on the site
- Operation of on-site car parking and car parking activities

A preliminary assessment of construction noise and vibration has also been undertaken and recommendations for a detailed construction noise and vibration management plan and controls as well as community consultation required as part of the construction of the project, including those required to ensure works are undertaken in accordance with the EPA's Interim Construction Noise Guideline have been provided.

Regards

Leo Tsui
Principal Acoustic Consultant

Pulse White Noise Acoustics

9 APPENDIX A: ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

Sound power level	The total sound emitted by a source
Sound pressure level	The amount of sound at a specified point
Decibel [dB]	The measurement unit of sound
A Weighted decibels [dB(A])	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)

Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music
Impact sound	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.
Air-borne sound isolation	The reduction of airborne sound between two rooms.
Sound Reduction Index [R] *(Sound Transmission Loss)*	The ratio the sound incident on a partition to the sound transmitted by the partition.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
Level difference [D]	The difference in sound pressure level between two rooms.
Normalised level difference [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
Standardised level difference [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
Weighted standardised level difference [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
Impact sound isolation	The resistance of a floor or wall to transmit impact sound.
Impact sound pressure level [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
Normalised impact sound pressure level [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
Weighted normalised impact sound pressure level [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
Weighted standardised impact sound pressure level [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_I	A value added to an L_{nW} or $L'_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 *"Acoustics – Glossary of terms and related symbol"*

10 APPENDIX B: UNATTENDED NOISE LOGGING

136 Campbell Hill Road, Chester Hill

Ambient noise monitoring report

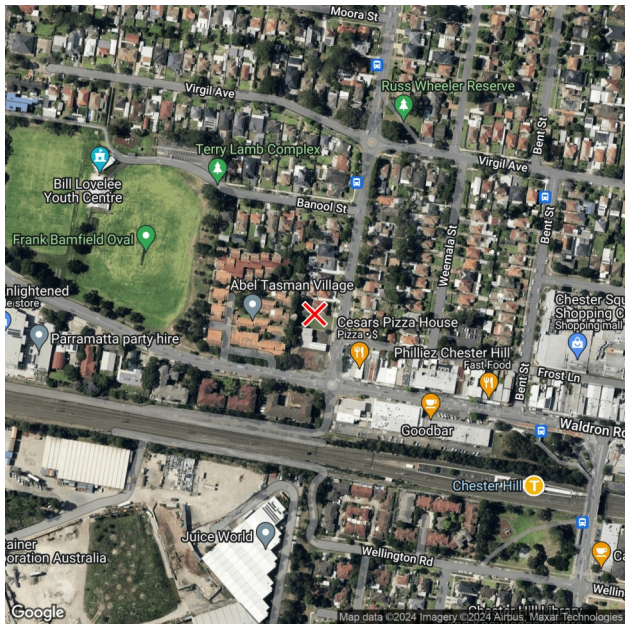
Item	Information
Logger Type	SVAN 971
Serial number	
Address	136 Campbell Hill Road, Chester Hill
Location	136 Campbell Hill Road, Chester Hill
Facade / free field	Free field
Environment	

Measured noise levels

Logging date	Rating Background Level			$L_{Aeq,period}$		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Fri 26 Jul 2024	-	-	-	-	-	56
Sat 27 Jul 2024	49	50	41	58	59	54
Sun 28 Jul 2024	48	51	42	59	58	55
Mon 29 Jul 2024	53	50	41	59	57	54
Tue 30 Jul 2024	53	50	42	59	58	53
Wed 31 Jul 2024	-	51	42	59	57	52
Summary	**51**	**50**	**42**	**59**	**58**	**54**

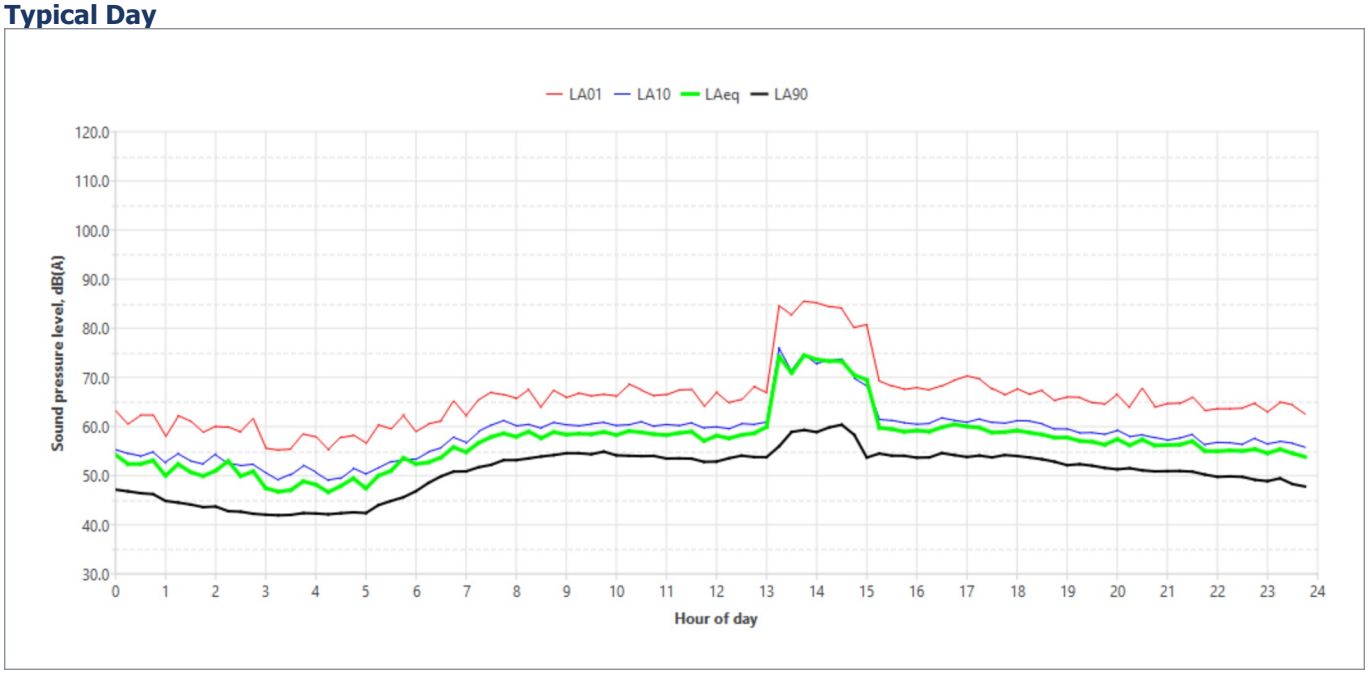
Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

Logger location

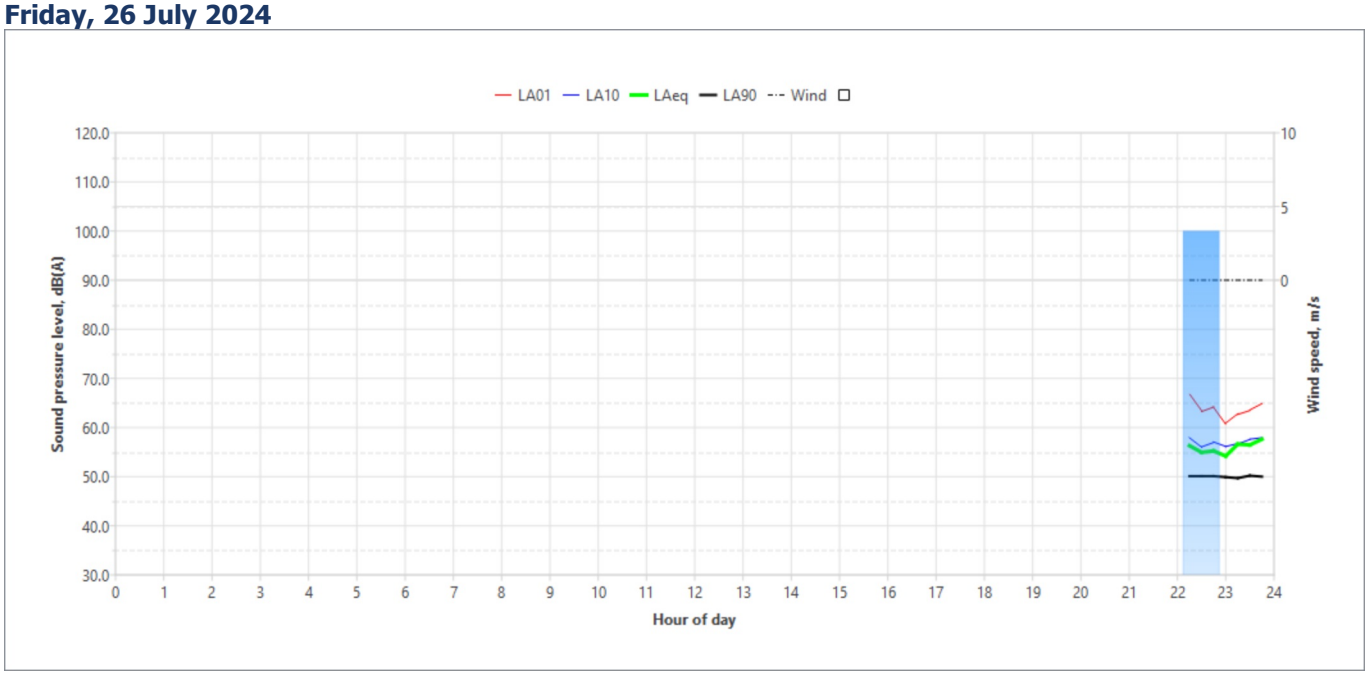


Logger deployment photo

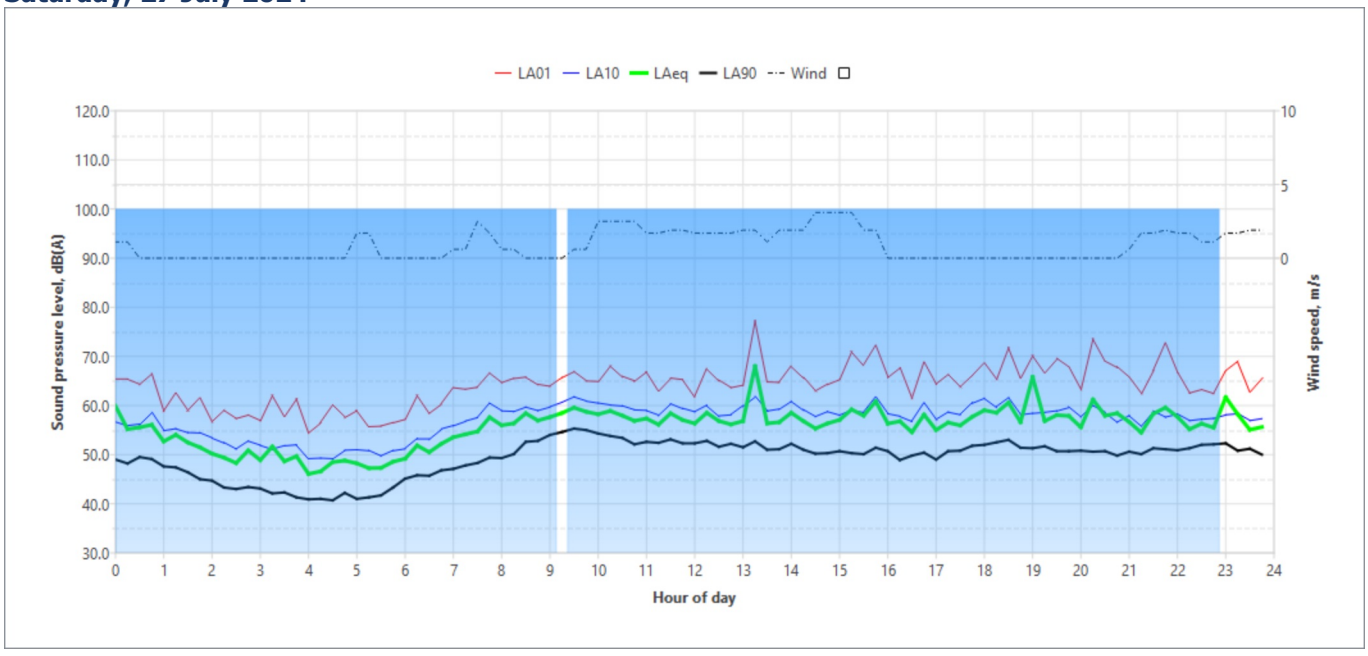
Typical Day



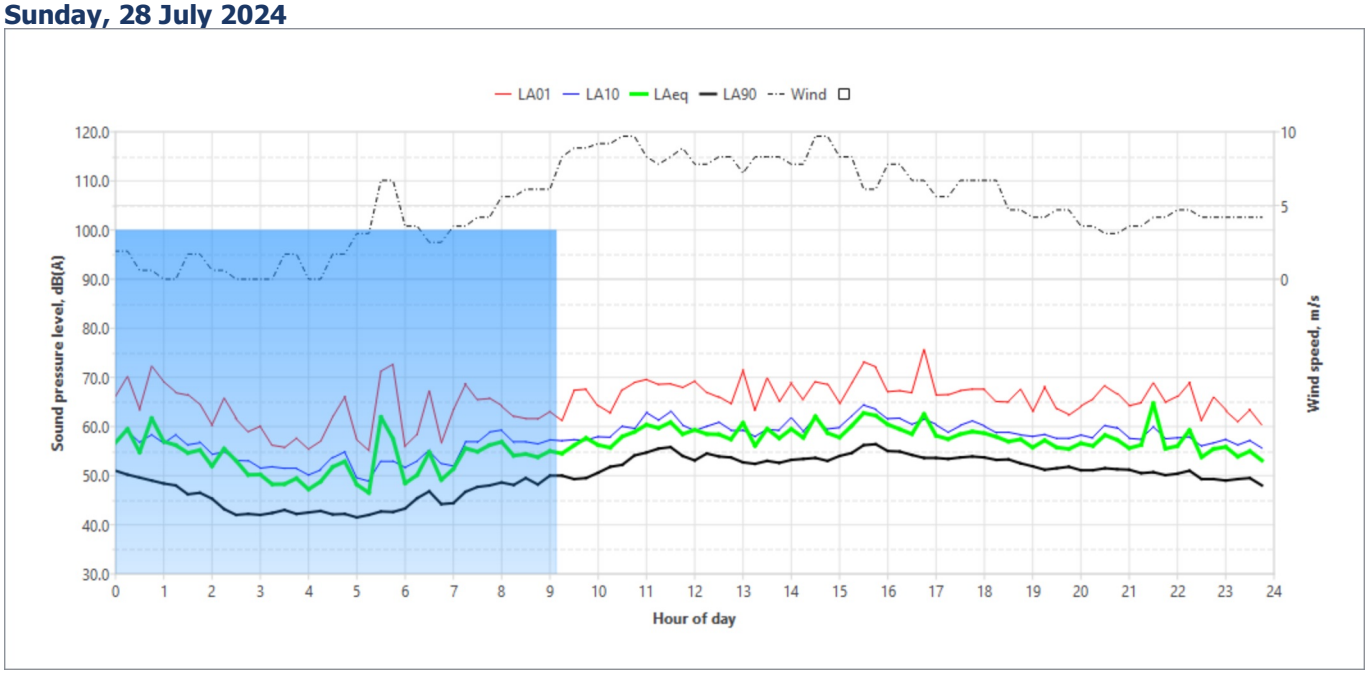
Friday, 26 July 2024



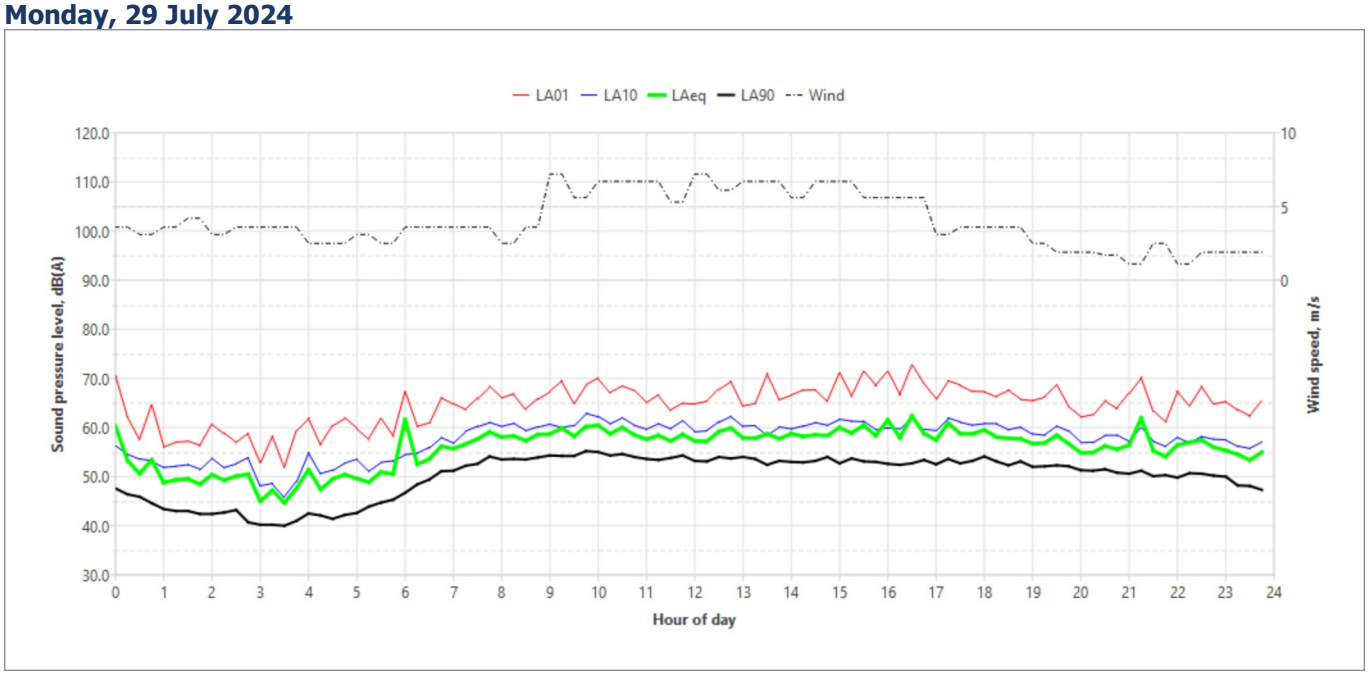
Saturday, 27 July 2024



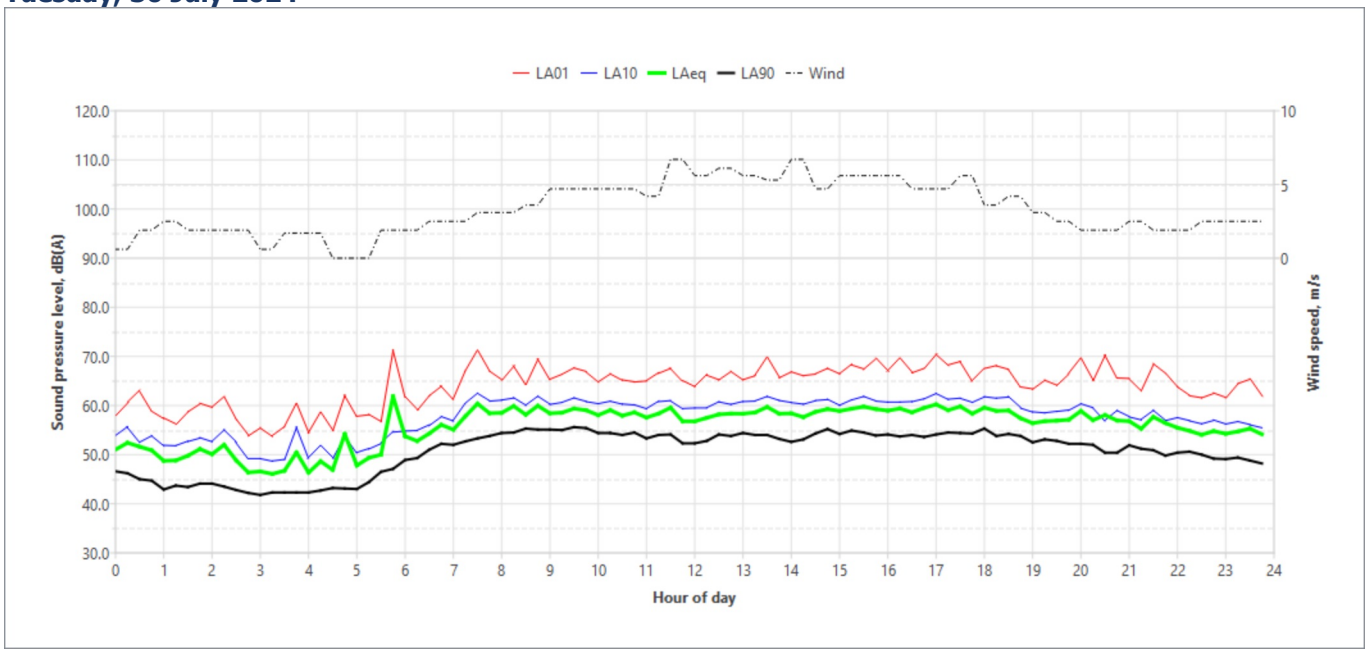
Sunday, 28 July 2024



Monday, 29 July 2024



Tuesday, 30 July 2024



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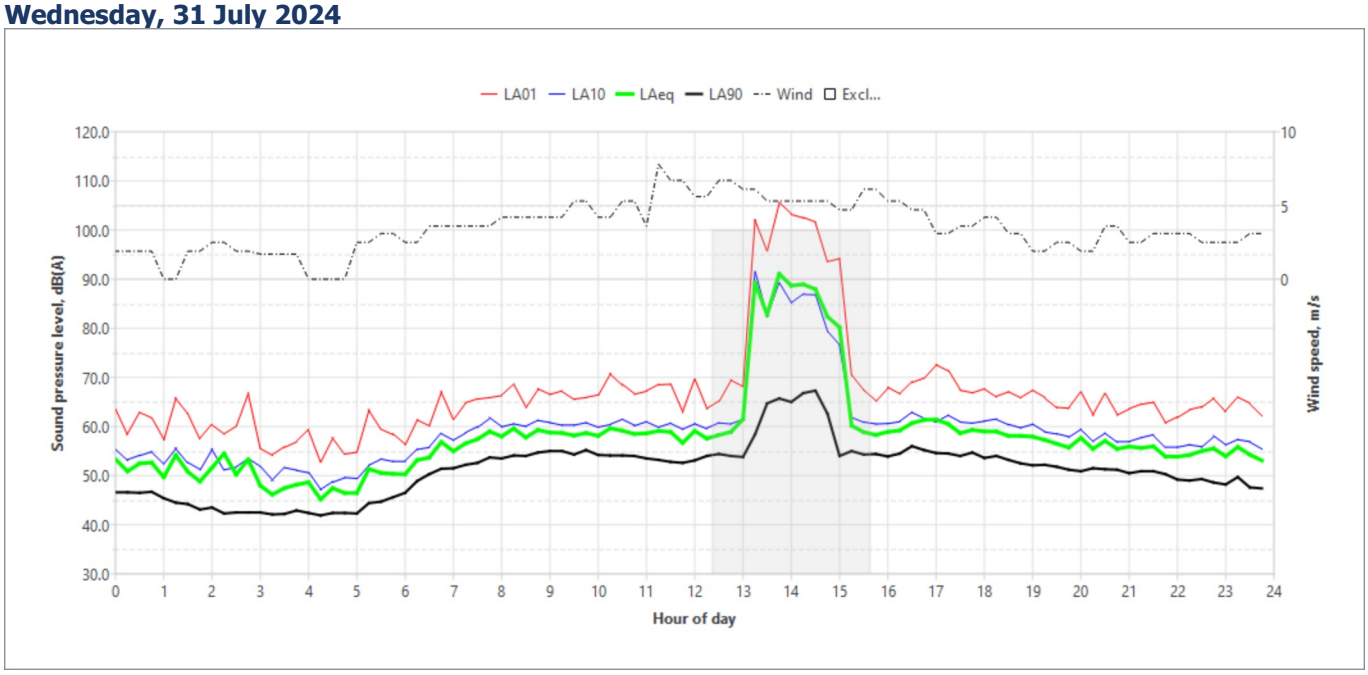


Abel Tasman Village, 222 Waldron Rd, Chester Hill

Ambient noise monitoring report

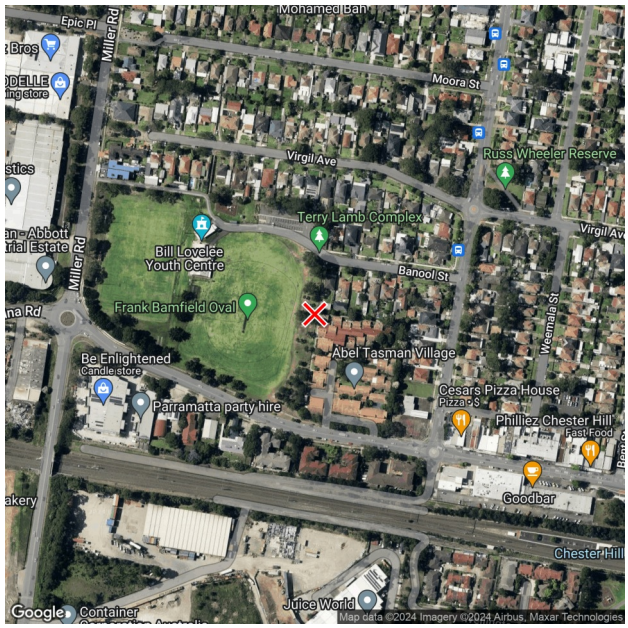
Item	Information
Logger Type	NL-42
Serial number	00998079
Address	Abel Tasman Village, 222 Waldron Rd, Chester Hill
Location	Abel Tasman Village, 222 Waldron Rd, Chester Hill
Facade / free field	Free field
Environment	

Measured noise levels

Logging date	Rating Background Level			$L_{Aeq,period}$		
	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am	Daytime 7am-6pm	Evening 6pm-10pm	Night-time 10pm-7am
Fri 26 Jul 2024	33	48	-	57	53	53
Sat 27 Jul 2024	49	51	45	55	55	52
Sun 28 Jul 2024	51	50	45	61	54	53
Mon 29 Jul 2024	52	50	44	57	54	52
Tue 30 Jul 2024	52	50	44	57	54	52
Wed 31 Jul 2024	52	49	44	57	54	52
Thu 01 Aug 2024	52	49	44	57	54	52
Fri 02 Aug 2024	-	-	-	58	-	52
Summary	**52**	**50**	**44**	**58**	**54**	**52**

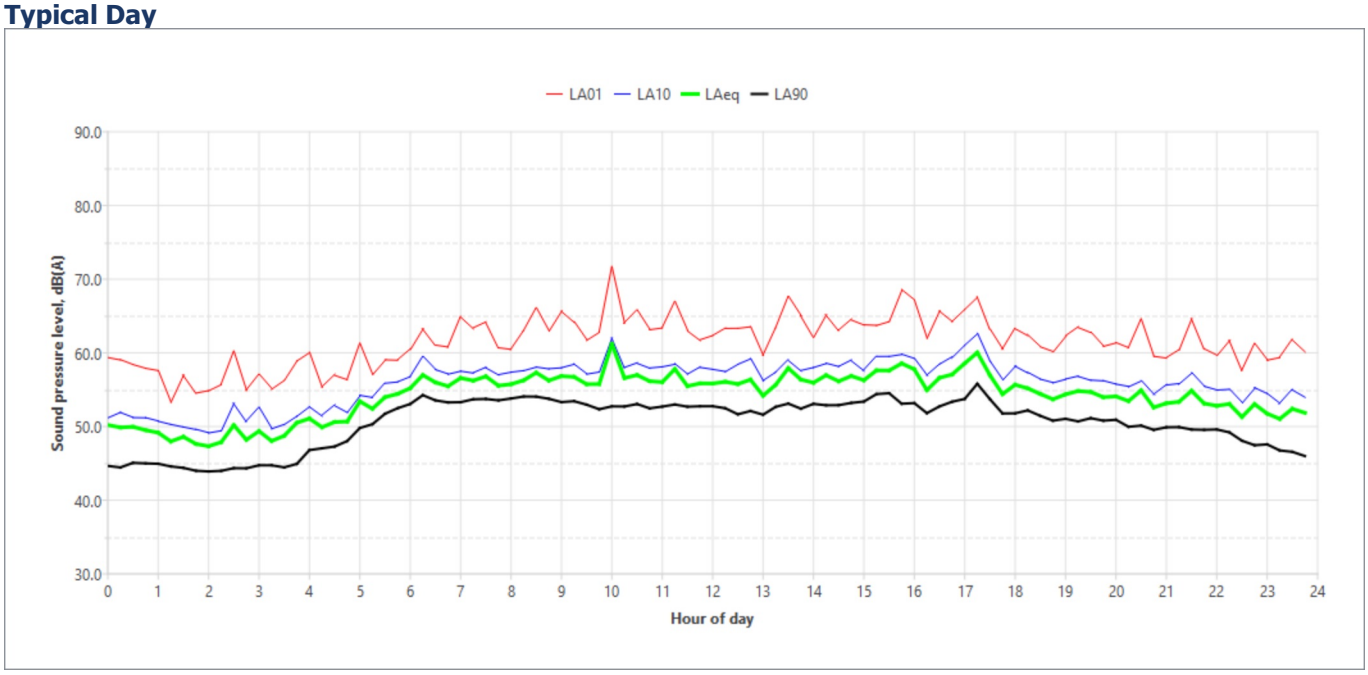
Note: Results with a '-' identify that there were not enough measurements available to correctly calculate the level, in accordance with the Noise Policy for Industry. The data has been excluded either from weather or manual exclusions. See the charts for more information

Logger location

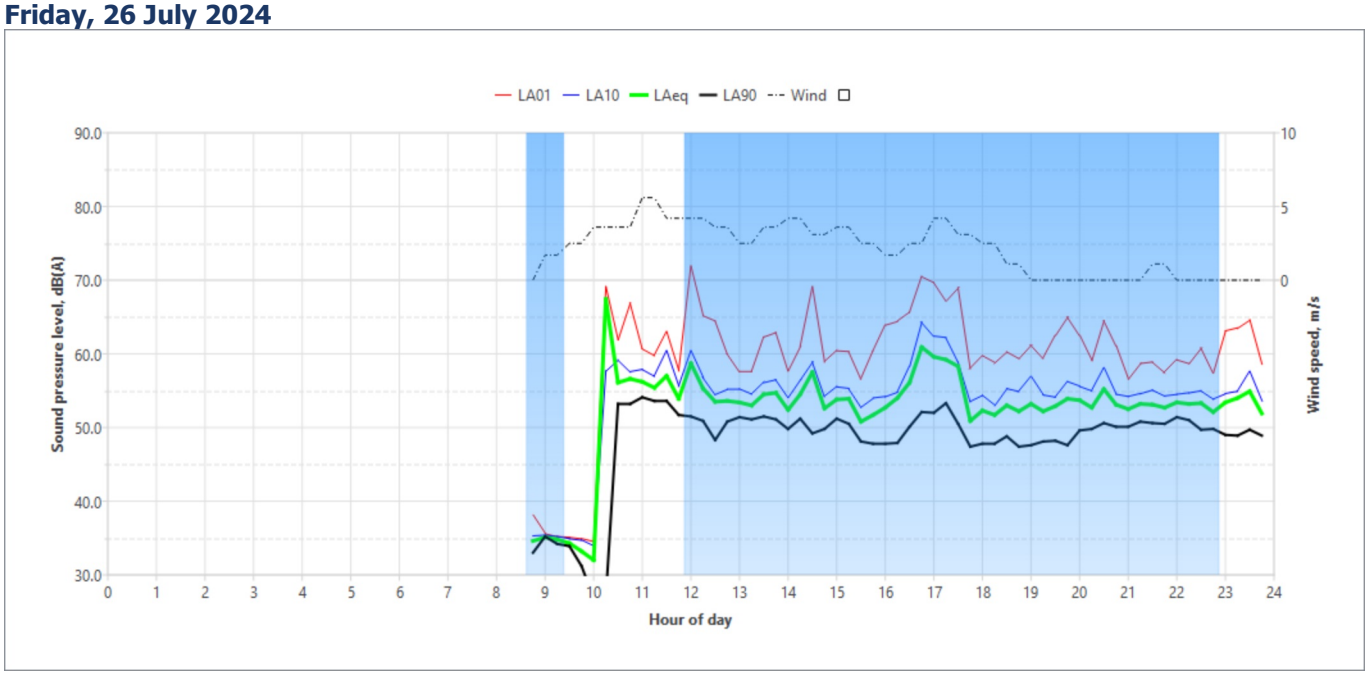


Logger deployment photo

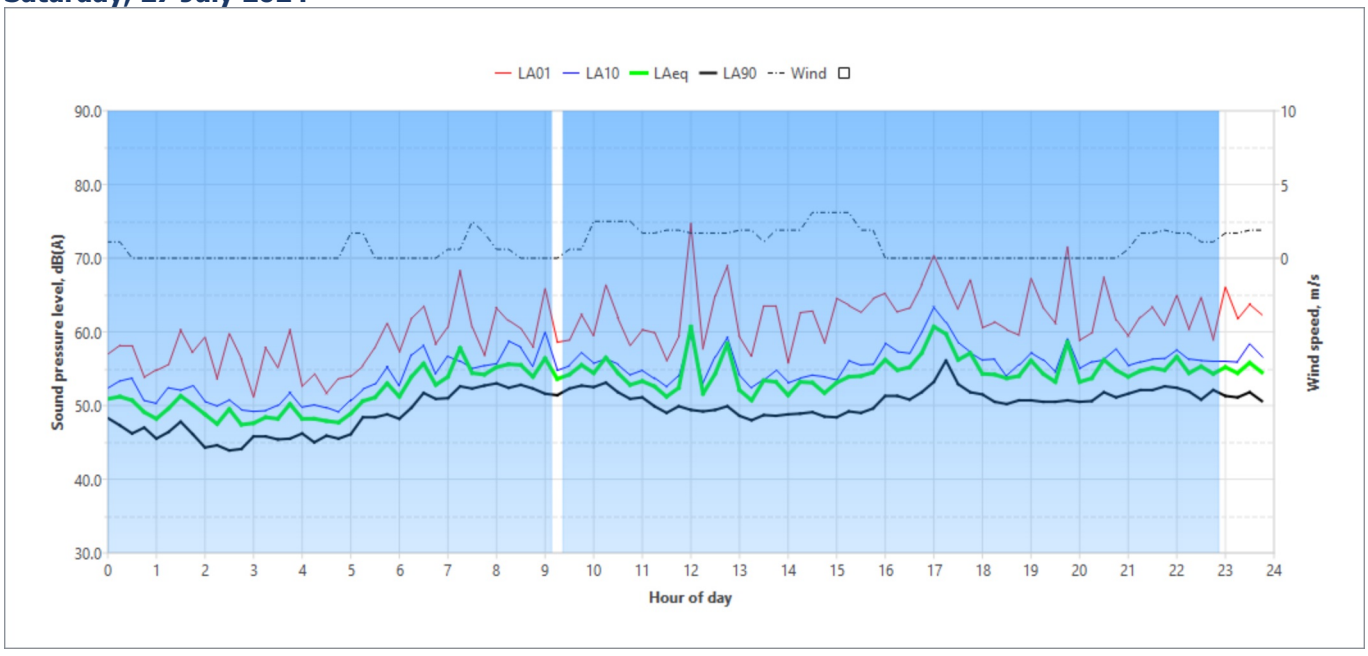
Typical Day



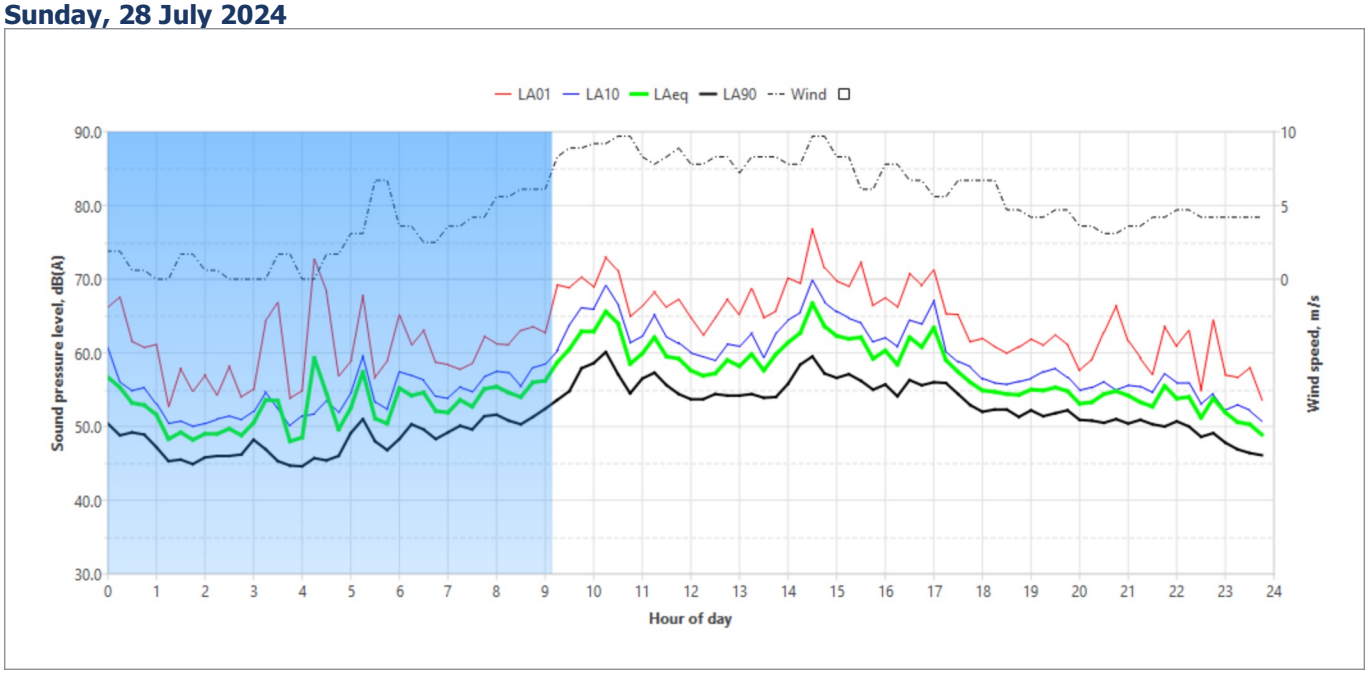
Friday, 26 July 2024



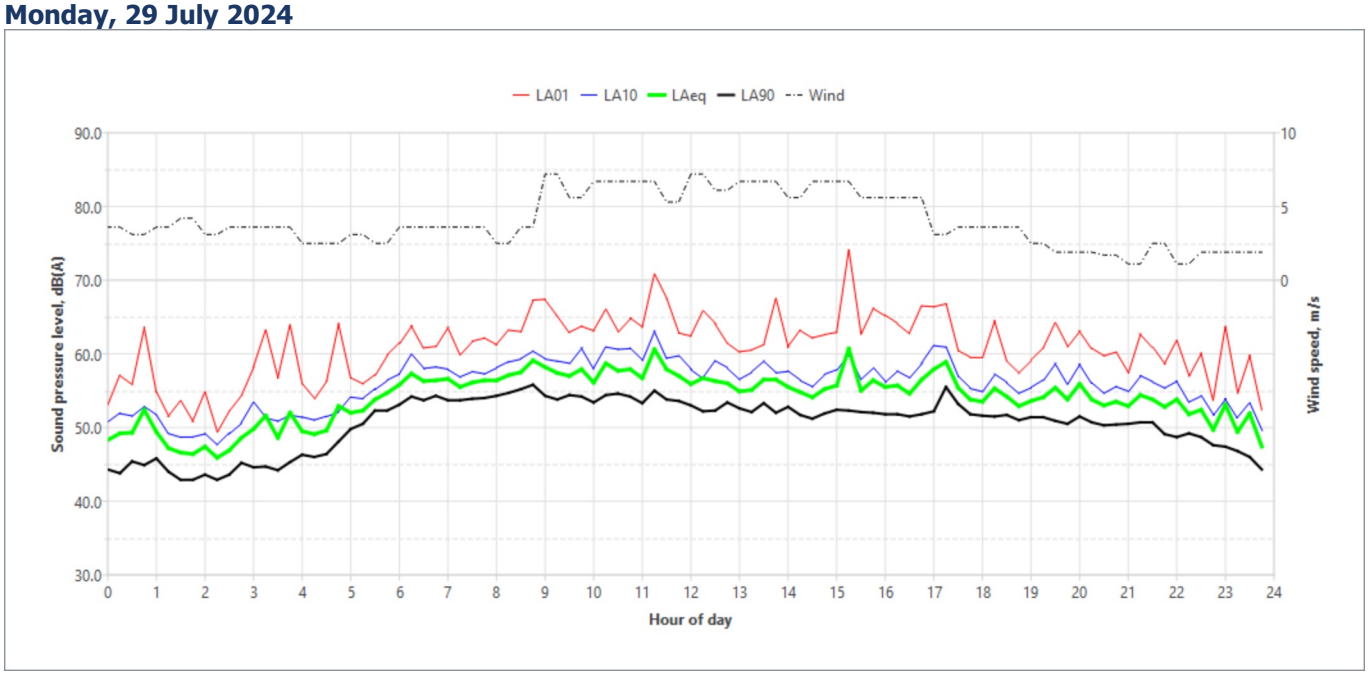
Saturday, 27 July 2024



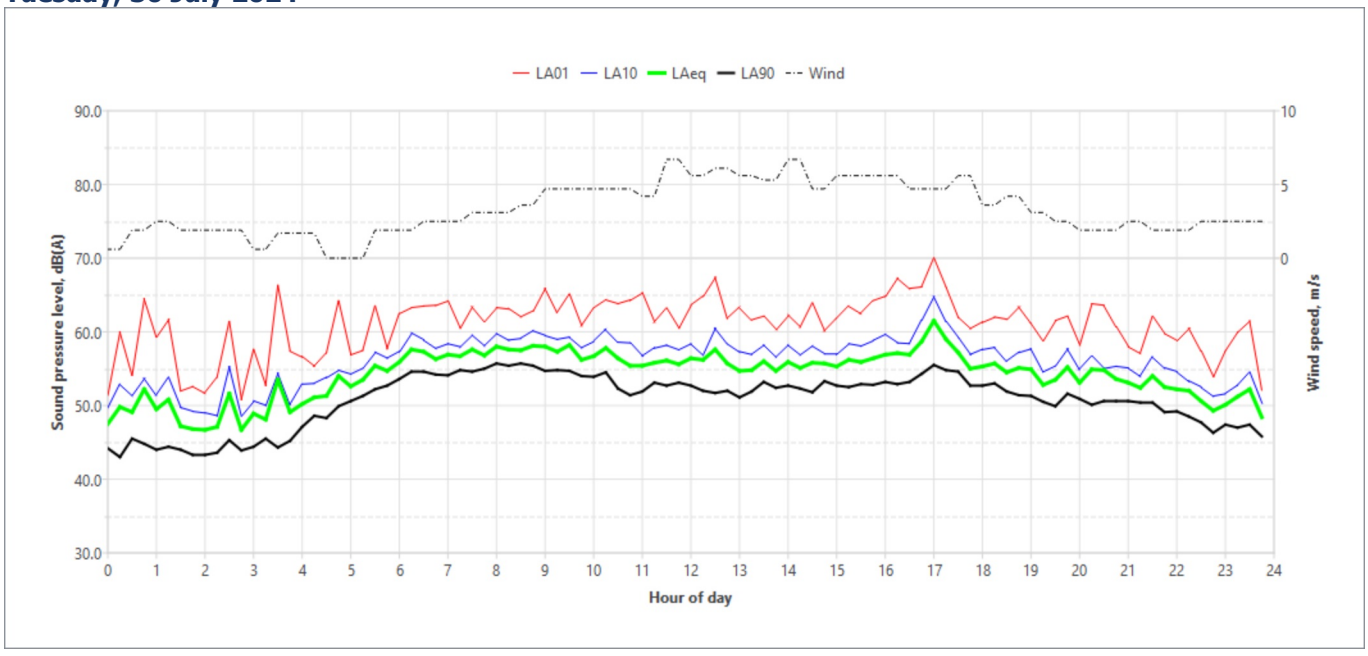
Sunday, 28 July 2024



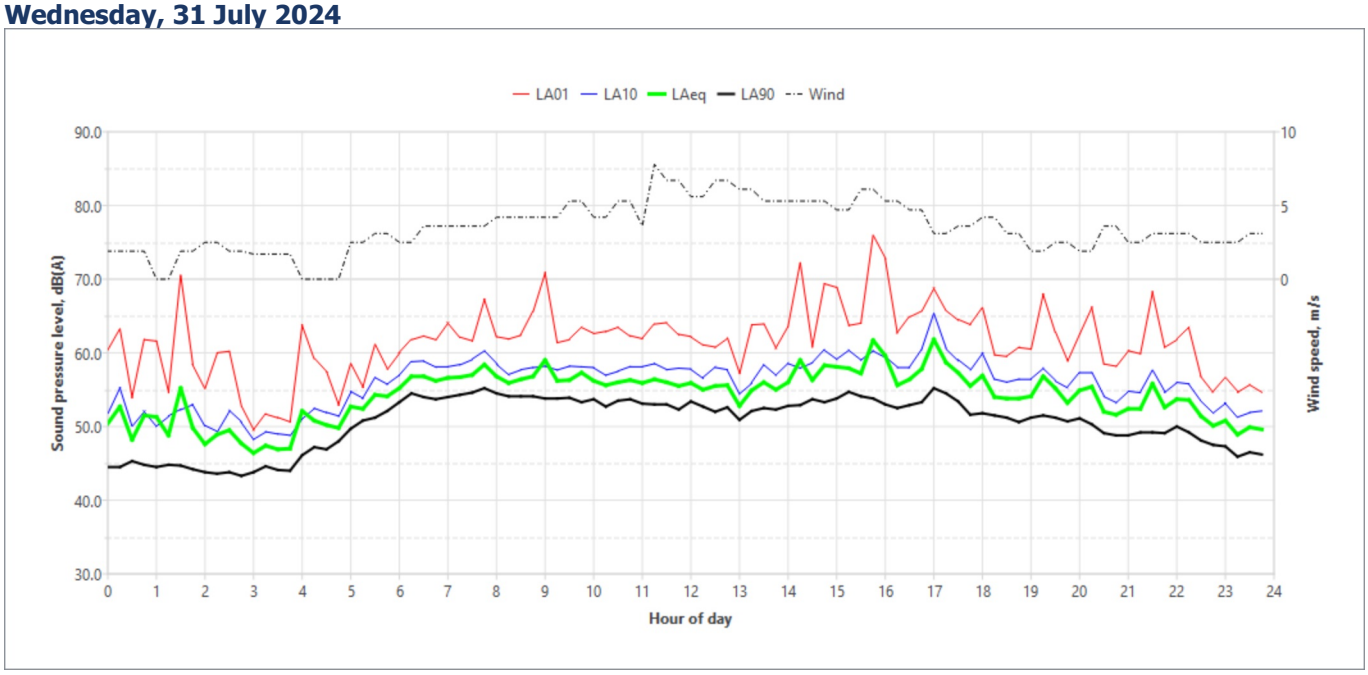
Monday, 29 July 2024



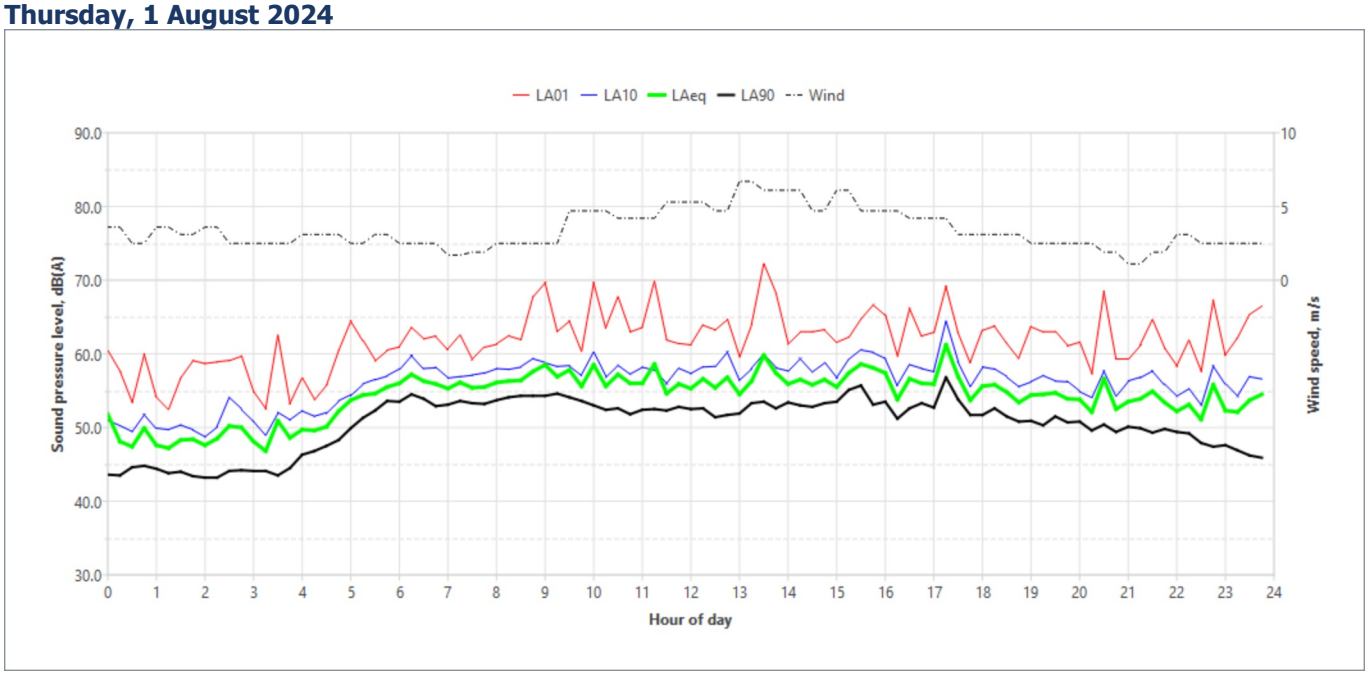
Tuesday, 30 July 2024



Wednesday, 31 July 2024



Thursday, 1 August 2024



Friday, 2 August 2024