ACOUSTICS AND AIR

HARDI AGED CARE MOUNTAINVIEW PENRITH NURSING HOME RENEWAL

DA ACOUSTIC ASSESSMENT

REPORT NO. 20109
VERSION A

APRIL 2020

PREPARED FOR

HARDI AGED CARE
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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

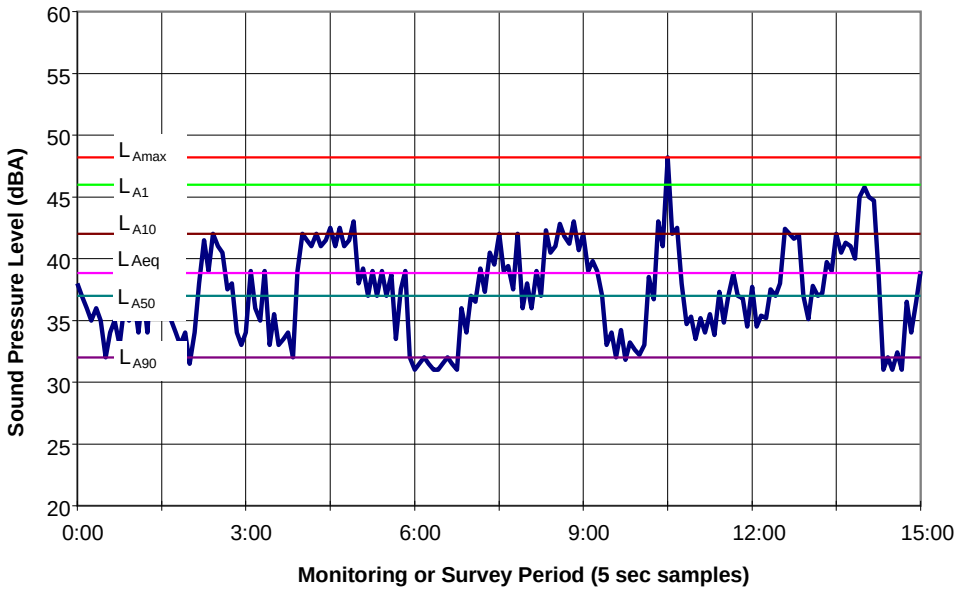
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night-time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night-time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray Pty Limited has been engaged by John W Flower Architects Pty Limited on behalf of the Hardi Aged Care, to conduct an acoustic assessment of the proposed Renewal of the existing aged care facility at 57 Mulgoa Road, Penrith. The assessment is required to accompany the Development Application (DA) submission to Penrith City Council.

This report presents an acoustic review of the proposed redevelopment with respect to operational noise emissions, external noise intrusion from road traffic and acoustical privacy. Noise and vibration from construction are also addressed.

Criteria are documented for the following:

- Acceptable ambient noise levels for operational noise emissions to the surrounding environment.
- Acceptable levels of road rail traffic noise within the various areas of occupancy; and
- Recommended acoustical isolation performance for constructions separating independent living units and aged care residential accommodation as required by the NCC 2019 Part F5 (Building Code of Australia).

In assessing noise and vibration impacts, reference has been made to the following regulatory requirements and guidelines:

- *SEPP (Infrastructure) 2007*.
- *SEPP (Housing for Seniors or People with a Disability) 2004. Clause 34 relates to Acoustic Privacy.*
- *NCC 2019 Part F5 (Building Code of Australia)*.
- *Development Near Rail Corridors and Busy Roads – Interim Guideline (DPI&E, 2008)*; and
- *Noise Policy for Industry (EPA, 2017)*.

2 PROPOSED DEVELOPMENT

2.1 Site Location

The Development site is located at 57 Mulgoa Road, Penrith as shown in Figure 2-1. The site is currently occupied by an existing single level facility. Multi-level residences are located immediately to the south of the site. In addition Mountain View Retreat retirement village is located to the north of the site.

The site is accessed from the Retreat Drive which runs north south, with one lane in each direction. Mulgoa Road is located on the eastern side of the site. The distance between the road and the nearest point on the site building is approximately 14 m.

2.2 Project Description

The proposal seeks consent for alterations and additions to the existing Residential Aged Care Facility (RACF) located at No. 57 Mulgoa Road, Penrith. More specifically, the proposal involves the construction of an additional level (to take the development to a 2-storey building) and the substantial renovation of its interior to significantly improve the amenity provided for its occupants, improved functionality and operational efficiency.

The proposal will convert existing 2, 3 and 4 bedrooms to single or double rooms with independent bathroom ensuite facilities provided. The proposal will result in an increase of only 1 bed (from 99 existing to 100 proposed) with 96 being single bedrooms and 2 being double rooms. The development is a permissible land use in the zone.

The proposed floor plans are included in **Appendix A**.

The residential aged care facility is Class 9c according to the NCC 2019 Building Code of Australia.

Site and carpark entry will be accessed directly from the Retreat Road. Mechanical plant and equipment serving the residential care building will be located on the roof level. Mechanical plant could largely be expected to operate on a continuous basis.

Figure 2-1 Site Location

3 EXISTING NOISE ENVIRONMENT

3.1 Ambient Noise Monitoring

In order to quantify the existing ambient noise environment of the area, noise monitoring was conducted at the site, near the eastern façade, approximately 12 m from the edge of the nearside traffic lane (refer Figure 2-1).

Unattended environmental noise monitoring was conducted between Wednesday 19 March 2020 and Wednesday 26 March 2020.

Instrumentation for the survey comprised an ARL Environmental Noise Logger Type 215 fitted with microphone and windshield and set to A-weighted and fast response. Calibration of the logger was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The logger continuously sampled noise levels over the entire survey period and calculated relevant statistical indices for each 15-minute interval. All measurements were undertaken in general accordance with AS 1055:2018: *Acoustics – Description and Measurement of Environmental Noise* and the NSW EPA's *Noise Policy for Industry* (*NPfI*). Data measured during periods of adverse weather, established through consultation with historical weather reports provided by the Bureau of Meteorology (BOM), has been excluded.

3.2 Ambient Noise Monitoring Results

The results of the unattended noise logging have been processed in accordance with the NSW SEPP *(Infrastructure)* 2007 time periods to determine the daytime and night-time levels of road traffic noise. Table 3-1 details the $L_{Aeq,15hr}$ daytime and the $L_{Aeq,9hr}$ night-time noise levels recorded during the survey.

Table 3-1 Measured Road Traffic Noise Levels

Measurement Location	Noise Level – dBA re 20 µPa	
	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$
57 Mulgoa Road ,Penrith 12 m from nearside lane	65	60

To determine the project specific criteria for operational noise emissions from future plant and equipment associated with the development, the measured data was processed according to the *Noise Policy for Industry (NPfI)* assessment time periods. Table 3-2 details the RBL (background) noise levels and the L_{Aeq} noise levels recorded during the daytime, evening and night-time periods.

Table 3-2 Measured Ambient Noise Levels - NSW *NPfI*

Noise Level – dBA re 20 µPa					
Daytime 7am – 6pm		**Evening 6pm – 10pm**		**Night-time 10pm – 7am**	
RBL [1]	**L_{Aeq} [2]**	**RBL**	**L_{Aeq}**	**RBL**	**L_{Aeq}**
53	66	47	63	43	60

Note 1: The RBL 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 2: The L_{Aeq} is essentially the 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.

4 ASSESSMENT CRITERIA

4.1 Operational Noise – Mechanical Services

The NSW *NPfI* provides a framework and process for deriving noise criteria for consents and licences that enable the EPA and others to regulate premises that are scheduled under the *Protection of the Environment Operations Act 1997*. Whilst specifically aimed at assessment and control of noise from industrial premises regulated by the EPA, the policy is also appropriate for use by the DPI&E when assessing major development proposals.

Having been designed for large industrial and agricultural sources, the monitoring and assessment procedures may not be applicable to the smaller developments and noise sources regulated by local government. It is recognised however, that Councils may find the policy to be of assistance in noise assessment and land-use planning.

The *NPfI* documents a procedure for assessment and management of industrial noise which involves the following steps:

- Determining the project noise trigger levels for a development. The project noise trigger level is a benchmark level above which noise management measured are required to be considered. They are derived by considering short-term intrusiveness due to changes in the existing noise environment (applicable to residential receivers only) and maintaining noise level amenity for particular land uses for residents and other sensitive receivers.
- Predicting or measuring noise produced by the development (having regard to any associated annoying characteristics and prevailing meteorological effects).
- Comparing the predicted or measured noise level with the project noise trigger level and assessing impacts and the need for noise mitigation and management measures.
- Considering any residual noise impacts following the application of feasible and reasonable noise mitigation measures.
- Setting statutory compliance levels that reflect the best achievable and agreed noise limits for development; and
- Monitoring and reporting environmental noise levels from the development.

The project noise trigger level represents the level that, if exceeded, may indicate a potential noise impact upon a community. It is a benchmark or objective and is not intended for use as a mandatory requirement.

Intrusiveness Noise Level

For assessing intrusiveness, the background noise level (L_{A90}) is measured and the Rating Background Level (RBL) determined. The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous noise level (L_{Aeq}) of the source (measured over a 15-minute period) does not exceed the background noise level (RBL) by more than 5dBA.

Amenity Noise Level

The amenity assessment is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include transportation noise (when on public transport corridors), noise from motor sport, construction noise, community noise, blasting, shooting ranges, occupational workplace noise, wind farms, amplified music/patron noise.

The amenity noise level aims to limit continuing increases in noise levels which may occur if the intrusiveness level alone is applied to successive development within an area.

The recommended amenity noise level represents the objective for total industrial noise at a receiver location. The project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To prevent increases in industrial noise due to the cumulative effect of several developments, the project amenity noise level for each new source of industrial noise is set at 5dBA below the recommended amenity nose level.

The following exceptions apply to determining the project amenity noise level:

- For high-traffic areas the amenity criterion for industrial noise becomes the $L_{Aeq,period(traffic)}$ minus 15dBA.
- In proposed developments in major industrial clusters.
- If the resulting project amenity noise level is 10dB or more lower than the existing industrial noise level, the project amenity noise level can be set at 10dB below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time.
- Where cumulative industrial noise is not a consideration because no other industries are present in, or likely to be introduced into the area, the relevant amenity noise level is assigned as the project amenity noise level for the development.

Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess mitigation options and determine achievable noise requirements.

An extract from the NSW NPfI that relates to the amenity noise levels for surrounding receivers is given in Table 4-1.

Table 4-1 Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day[1]	Recommended Amenity Noise Level L_{Aeq} (dBA)
Residence	Suburban	Day	55
		Evening	45
		Night	40

Note 1: Daytime 7.00am–6.00pm; Evening 6.00pm–10.00pm; Night 10.00pm-7.00am.

4.1.1 Project Noise Trigger Levels

The amenity and intrusiveness noise levels and resulting project trigger levels (shown in bold) applicable to sources of continuous operational noise associated with the project are shown in Table 4-2. At this location, existing L_{Aeq} noise levels are reflective of transportation, localised community-type noises and environmental sources such as birds and insects. The existing level of "industrial-type" noise is more than 5dB below the relevant recommended amenity noise level. In accordance with NPfI procedures, it is appropriate in this case to base the project amenity level on the 'amenity noise level' in lieu of the 'amenity noise level – 5dBA'.

Table 4-2 Project Noise Trigger Levels

Period	Intrusiveness Noise Level[1] $L_{Aeq,15min}$ (dBA)	Project Amenity Noise Level[2] $L_{Aeq,15min}$ (dBA)
Daytime	**57**	58
Evening	52	**48**
Night-time	48	**43**

Note 1: Intrusiveness noise level is $L_{Aeq,15min} \leq$ RBL +5.
Note 2: Project amenity noise level (ANL) is suburban ANL plus 3dBA to convert from a period level to a 15-minute level.

4.2 Noise Intrusion – Road

SEPP (*Infrastructure*) 2007 (iSEPP) was introduced to assist the delivery of necessary infrastructure by improving regulatory certainty and efficiency. The iSEPP has specific planning provisions and development controls for various types of infrastructure and to development adjacent to infrastructure.

Clause 87 aims to ensure that noise sensitive development proposed adjacent to a rail corridor is not adversely affected by rail noise or vibration. Clause 102 includes provisions applicable to noise sensitive development proposed adjacent to road corridors which carry traffic volumes of greater than 20,000 vehicles per day, and that the consent authority considers likely to be adversely affected by road noise or vibration.

Where residential development is proposed adjacent to a rail line or major road, consent shall not be granted unless appropriate measures are taken to ensure that the following internal noise levels are met:

- The L_{Aeq} noise level between the hours of 10.00pm and 7.00am shall not exceed 35dBA with a bedroom, and
- The L_{Aeq} noise level within any other habitable room (excluding a garage, kitchen, bathroom or hallway) shall not exceed 40dBA at any time.

Given the site's proximity to Mulgoa Road the development is required to achieve the internal design criteria of iSEPP.

The NSW Department of Planning, Industry & Environment (DPI&E) "*Development Near Rail*

Corridors and Busy Roads – Interim Guideline" provides guidance as to the level of assessment required for noise sensitive development in the vicinity of existing rail lines.

4.3 Sound Insulation – BCA

Criteria for airborne (and impact) sound transmission between independent living units (Class 2) and aged care accommodation (Class 9c) are documented in the National Construction Code Series Building Code of Australia (NCC 2019).

Residential accommodation in Class 2 and 9c buildings are required to comply with the provisions relating to sound transmission and insulation under Part F5 of the BCA.

5 ASSESSMENT & DESIGN RECOMMENDATIONS

5.1 Operational Noise – Mechanical Services

Mechanical plant serving the aged care accommodation building will principally comprise of exhaust fans, ventilation systems and condenser units serving bedroom fan coil units. The exhaust fans and bedroom condenser units will be located at roof level.

Detailed specifications of mechanical services equipment that would otherwise allow an acoustic assessment of noise emissions from the site are not available at this stage of the project as selection and design is conducted after project approval.

Preliminary selection of major plant to be located centrally on the roof is likely to consist of:

- Rooftop air conditioning condensers with a sound pressure level of 56 dBA at 1 metre.
- Toilet Exhaust Fan with a sound pressure level of 43dBA at 1 metre.

Based on the above plant, a preliminary calculation at nearby residences to the north and south is that noise levels will be:

- Northern Residences 36 dBA; and
- Southern Residences 40 dBA.

A review of the result indicates that compliance is likely without the need for any noise mitigation plant. However, a detailed assessment of operational noise emission will be conducted at detailed design stage to confirm these findings.

Should it be determined at detail design stage that some mitigation to noise from mechanical plant is required, the following measures can be adopted where necessary:

- Noise barriers; and
- Night speed controls on condenser fans.

5.2 Noise Intrusion – Road

Standard glazing will typically attenuate noise levels by between 18 to 20dBA with external windows and doors closed and 10dBA with external windows and doors open (allowing for area of opening being equivalent to 5% of the floor area for natural ventilation).

Upgraded glazing will generally be required for windows and doors to habitable and sleeping spaces on the eastern facade to achieve the design sound levels for airborne noise intrusion.

The sound insulation requirements (windows closed) for iSEPP 2007 will be achieved within habitable and sleeping spaces with the in-principle glazing performances outlined in Table 5-1. The predictions are based upon an interior reverberation time of 0.5 seconds.

Table 5-1 Acoustic Performance Requirements of Glazing of New Rooms

Facade	Minimum Acoustic Rating	Comfort Ventilation
Aged Care Building		
Northern (east end)	R_W 24	No
Southern (east end)	R_W 27	No
Eastern	R_W 30	Yes

Indicatively, and as a minimum guide only, acoustical sound insulation performances can generally be achieved by the following glazing systems using heavy duty frames with full perimeter acoustic seals (e.g. Q-Lon seals – felt / brush weather seals are unsuitable for window or door openings requiring an acoustical performance above R_W 20):

R_W 24 Standard 4mm monolithic.

R_W 25 / 26 6mm monolithic; and

R_W 27-32 6.38mm laminate.

5.2.1 Comfort Ventilation

Where the internal noise criteria are exceeded by more than 10dBA when the windows (or doors) are open, an alternative means of providing ventilation is required to allow glazing to remain closed during noisier periods. This requirement will therefore apply to habitable rooms where the facade noise level **exceeds 60dBA** and to bedrooms where the facade noise level **exceeds 55dBA**.

Where glazing to habitable and sleeping spaces is required to be fully closed during noisy periods in order to achieve acceptable internal noise levels, an alternative means of achieving the requirement for "comfort ventilation" will need to be considered. Ventilation to the requirements of the **Building Code of Australia F 4.5 (b)** and **Australian Standard 1668.2 Table 4.2** must be provided. This means, as a minimum, providing fresh air at a rate of 5 litres/second per person in habitable rooms, to meet the requirements of AS 1668.

Alternative ventilation systems include:

- Fully ducted air-conditioning with the provision of outside air.
- Proprietary acoustically treated wall-mounted ventilation system, such as *AeroPac SN* (Contact Acoustica Pty Ltd 9550 2900).
- Attenuated air inlet such as a *Silenceair* unit (Silenceair Pty Ltd 9555 7215) in combination with internal exhaust system.
- Attenuated air inlet with internally lined bulkhead, minimum 1.2m in length to internal outlet.

Design input should be sought from an appropriately qualified mechanical consultant.

Facade

The proposed masonry and insulated cladding external wall construction is acceptable in terms of sound insulation.

Roof / Ceiling

The proposed insulated sheet metal roof construction is acceptable in terms of sound insulation.

5.3 Sound Insulation – BCA

The NCC 2019 requirements in relation to sound insulation are reproduced in Table 5-2.

Table 5-2 NCC 2019 Sound Insulation Requirements Class 9c

Construction	NCC 2019	
	Laboratory Rating	Verification
Walls between sole occupancy units	R_W not < 45	n/a
Walls between a sole occupancy unit and a kitchen or laundry	R_W not < 45 and Must have an impact insulation rating [1]	n/a
Walls between a sole occupancy unit and a bathroom, sanitary compartment (not being an associated ensuite), kitchen, laundry, plant room or utilities room	R_W not < 45	n/a
Floors separating sole-occupancy units	R_W not < 45	n/a
Soil, waste, water supply and stormwater pipes and ductwork to habitable rooms	$R_W + C_{tr}$ not < 40	n/a
Soil, waste, water supply and stormwater pipes and ductwork to kitchens and other rooms	$R_W + C_{tr}$ not < 25	n/a

Note 1: In a Class 9c building, a wall required to have an impact insulation rating must, for other than masonry, be constructed of two or more separate leaves without rigid mechanical connection except at the periphery or be identical with a prototype that is no less resistant to the transmission of impact sound when tested in accordance with Specification F5.5 than a wall listed in Table 2 of Specification F5.2.

At this stage of the design process, the Laboratory rating is the most important in determining construction details.

7 CONCLUSION

Wilkinson Murray Pty Limited has conducted an assessment to review the requirements of a proposed residential aged care accommodation at 57 Mulgoa Road, Penrith in regard to noise intrusion from road traffic, operational noise emissions and the sound insulation of the future residential accommodation. The assessment involved a survey of the existing noise environment, derivation and establishment of assessment criteria for noise emissions in accordance with Penrith Council, EPA and DPI&E guidelines, a noise impact assessment relative to appropriate criteria, and, where required, recommendations for noise control measures. This assessment has been carried out in accordance with NSW regulatory requirements and this report is to form part of a Development Application in support of the proposed development.

The findings are as follows:

Façade Sound Isolation

Recommendations of glazing have been provided for the eastern end of the development adjacent to the road. Other areas of the development do not require any additional measures for acoustics.

Sound Insulation

Provided the sound insulation performance recommendations and the statutory BCA requirements, as documented in this report are implemented satisfactorily, the proposed development will satisfy all statutory requirements in relation to acoustical amenity and design.

Mechanical Noise Sources

The preliminary issue mechanical services design has been reviewed. Preliminary review indicates that project-specific criteria for continuous operational noise can be achieved with the design as documented.

Mechanical services design will require review by an appropriately qualified acoustic consultant at the Construction Certificate/Detailed Design stage, when final plant selections have been made and final layout and operation confirmed. The noise goals documented within this report are to be achieved for day, evening and night-time operations.

APPENDIX A

Proposed Plans

White Shades
Translucent Glass Panel Balustrades

Timber Look
Fibrous Cement Panels

Clear Anodised
Aluminium Windows

White Powder Coated
Aluminium Frames

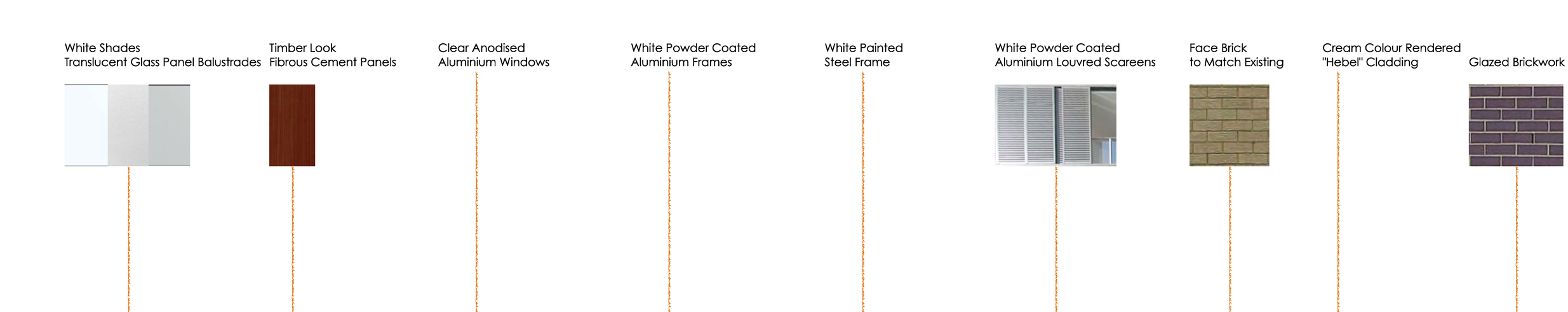
White Painted
Steel Frame

White Powder Coated
Aluminium Louvred Scareens

Face Brick
to Match Existing

Cream Colour Rendered
"Hebel" Cladding

Glazed Brickwork



JOHN W FLOWER ARCHITECT

HARDI AGEDCARE

Mountainview 57 Mulgoa Road Penrith
Nursing Home Renewal

Date	Revision	Rev	Issue
24/04/2020	Development Application	A	

Project No
1903192

Drawing Title
External Materials

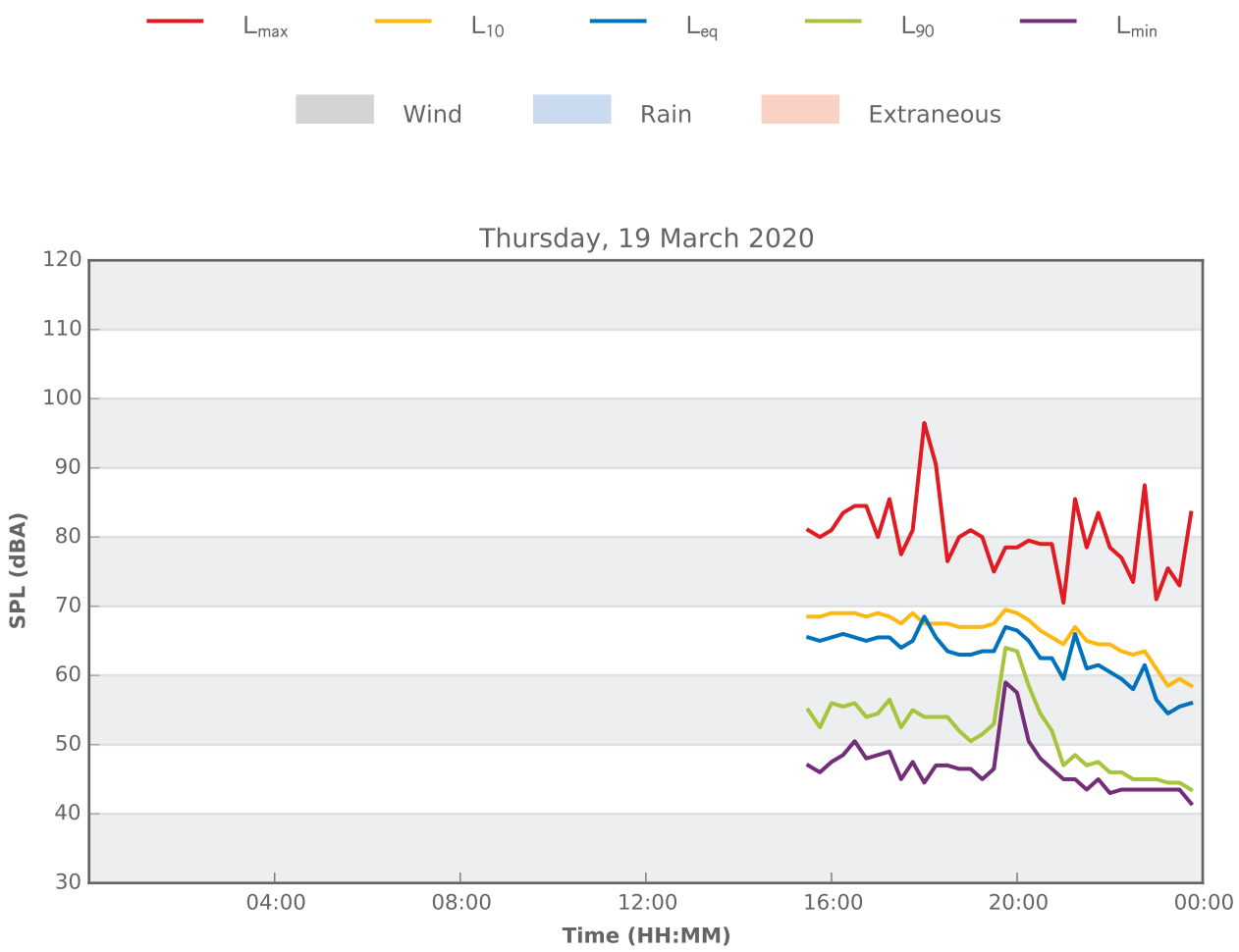
DA 15

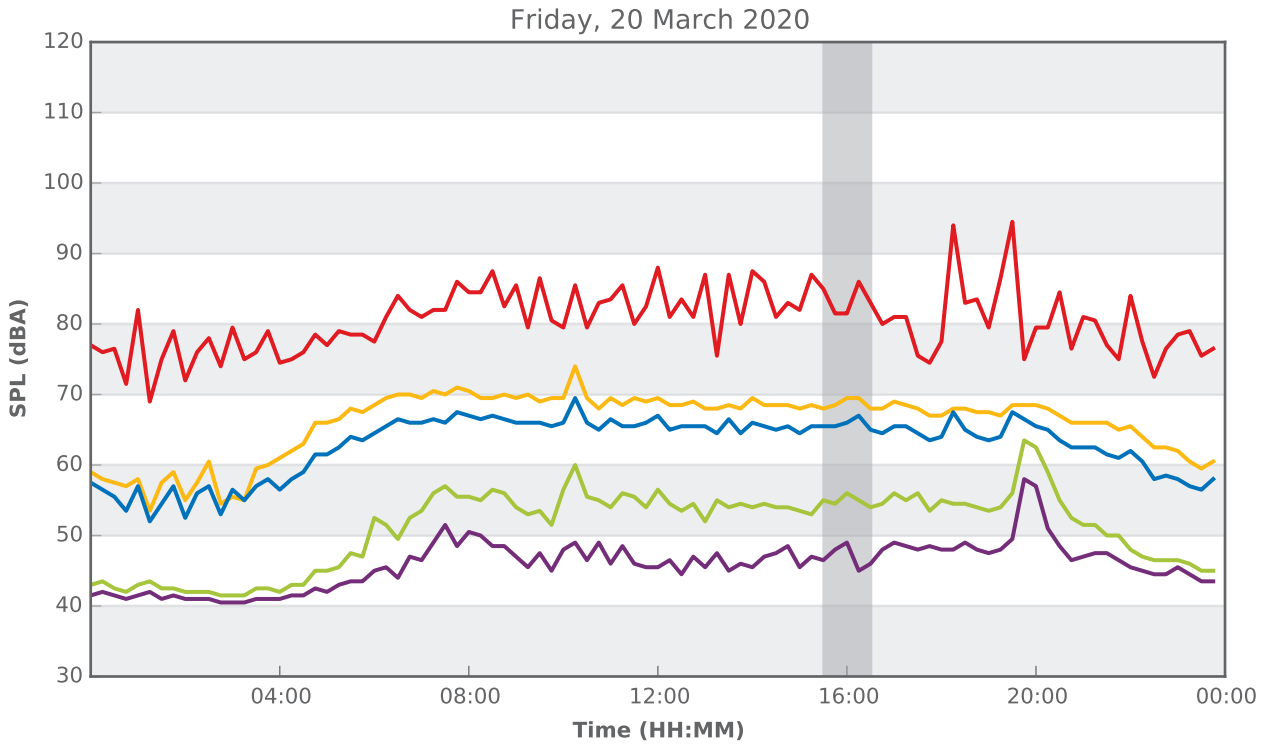
Issue
A

APPENDIX B

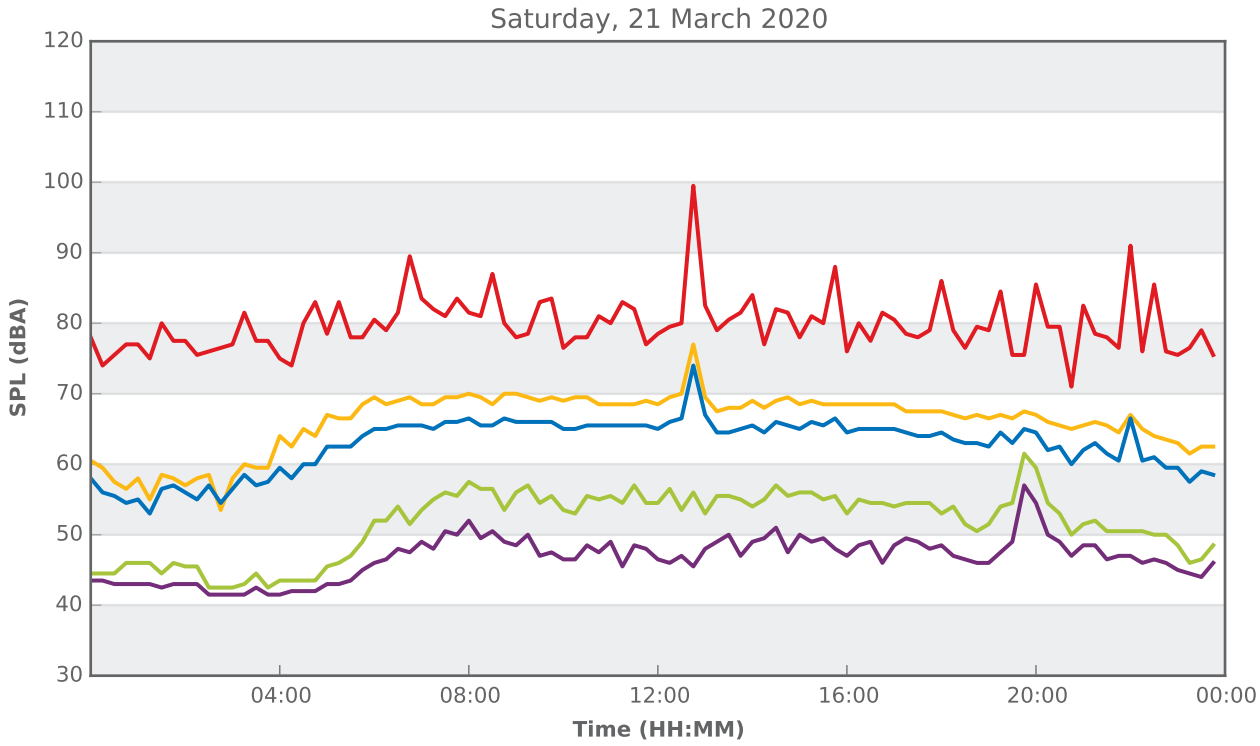
Ambient Noise Survey Results

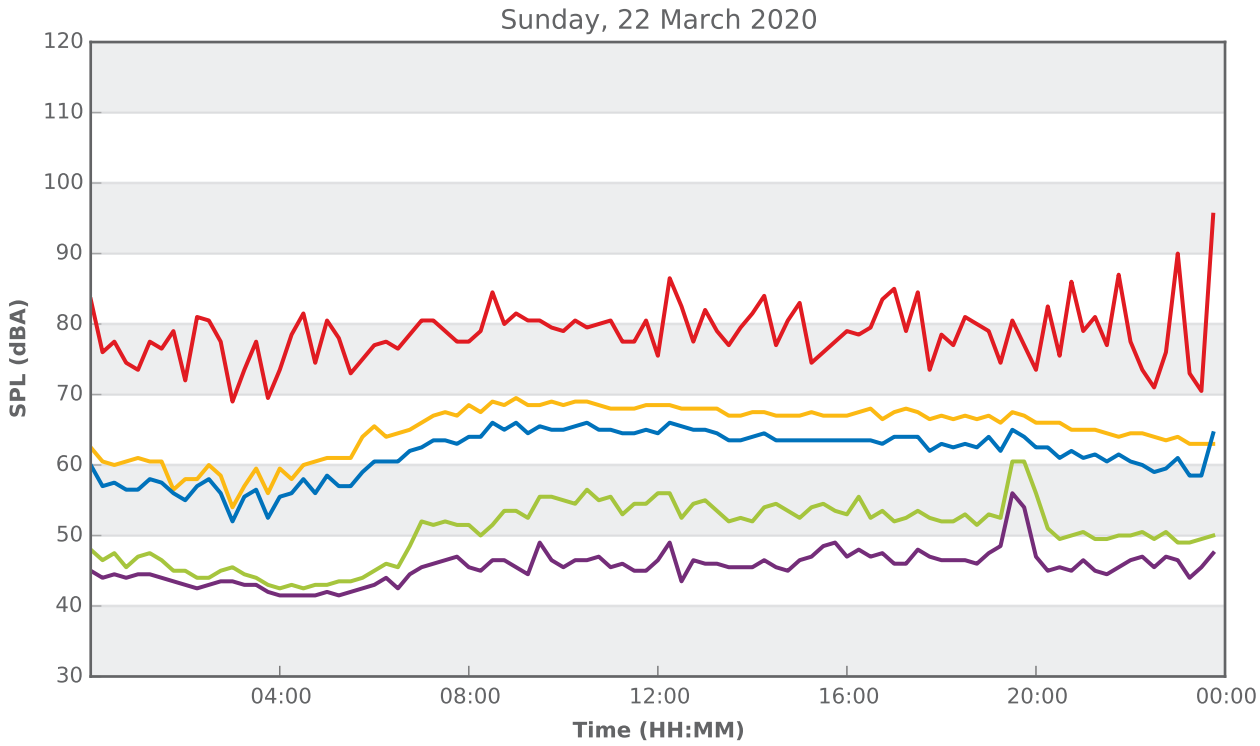
57 Mulgoa Road Penrith



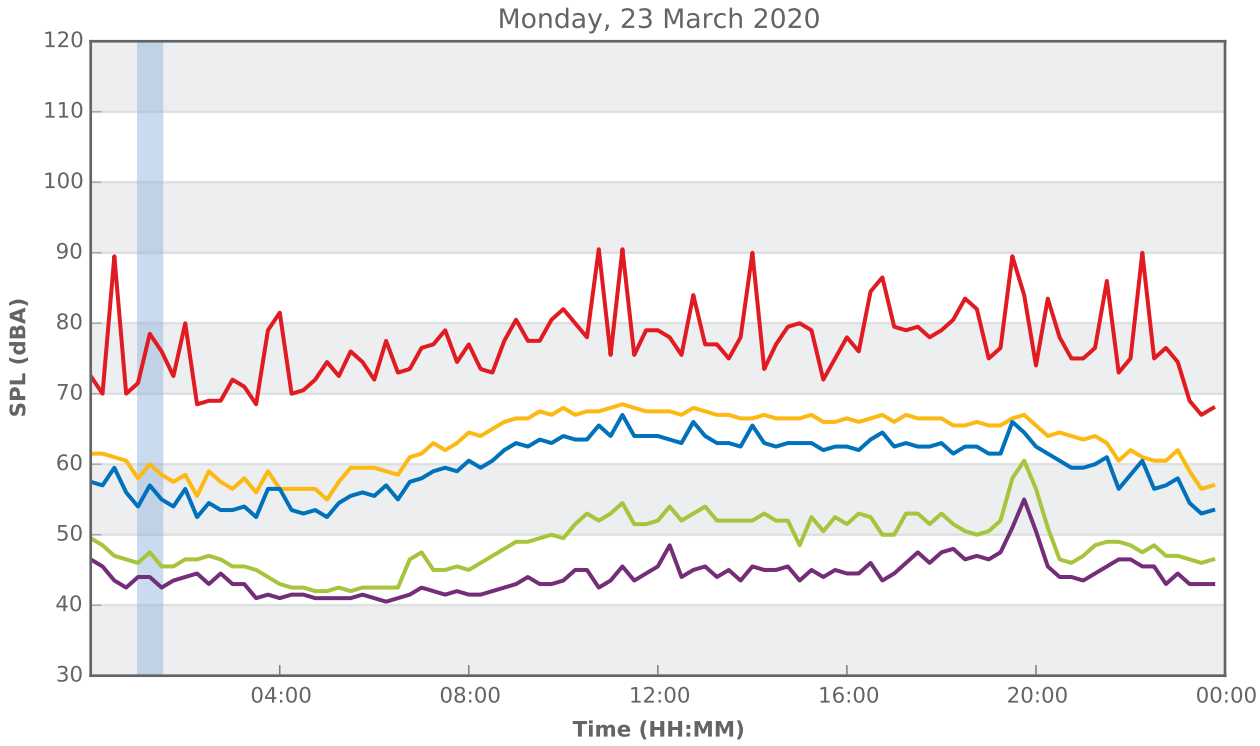


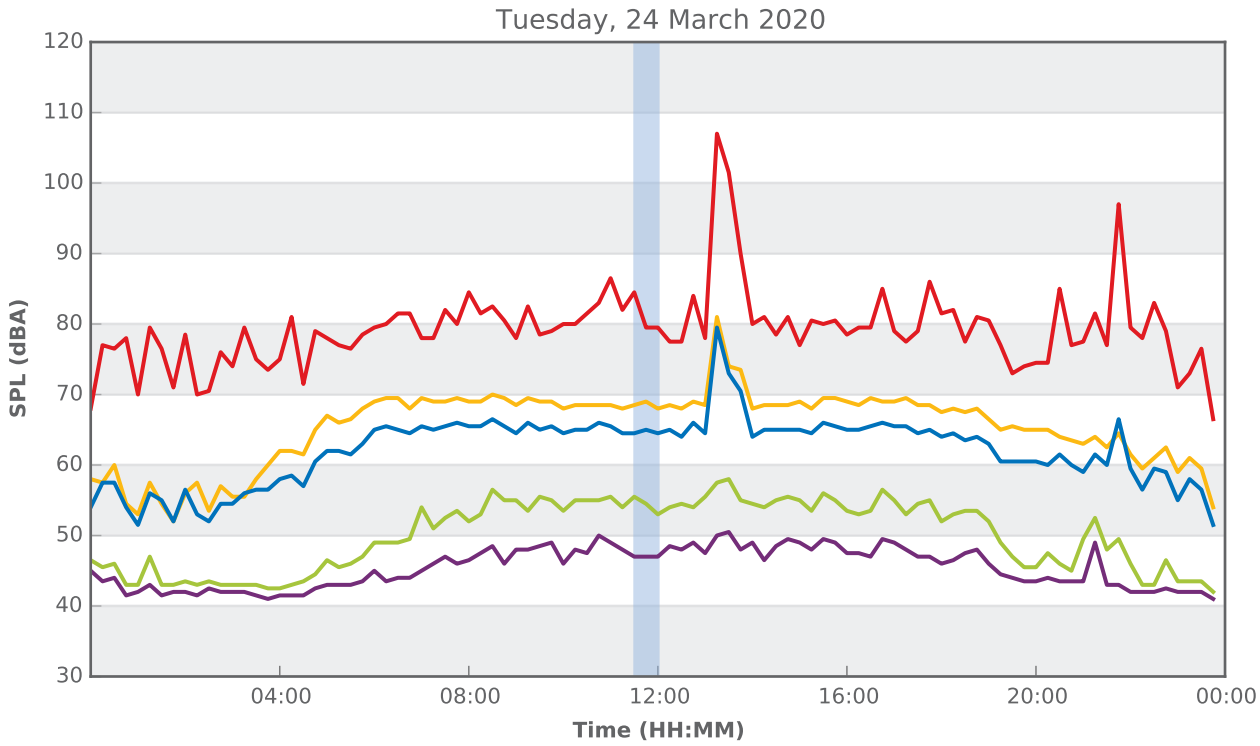
57 Mulgoa Road Penrith





57 Mulgoa Road Penrith





57 Mulgoa Road Penrith