



MARSHALL DAY
Acoustics



**LOT 1 RAILWAY STREET GRIFFITH
ACOUSTIC REPORT FOR DEVELOPMENT
APPLICATION**

Rp 001 20230868 | 1 December 2023

Project: **LOT 1 RAILWAY STREET GRIFFITH**

Prepared for: **Joss Group
PO Box 7079
Albury NSW 2640**

Attention: **Martin Reid**

Report No.: **Rp 001 20230868**

Disclaimer

Reports produced by Marshall Day Acoustics Pty Ltd are based on a specific scope, conditions and limitations, as agreed between Marshall Day Acoustics and the Client. Information and/or report(s) prepared by Marshall Day Acoustics may not be suitable for uses other than the specific project. No parties other than the Client should use any information and/or report(s) without first conferring with Marshall Day Acoustics.

The advice given herein is for acoustic purposes only. Relevant authorities and experts should be consulted with regard to compliance with regulations or requirements governing areas other than acoustics.

Copyright

The concepts and information contained in this document are the property of Marshall Day Acoustics Pty Ltd. Use or copying of this document in whole or in part without the written permission of Marshall Day Acoustics constitutes an infringement of copyright. Information shall not be assigned to a third party without prior consent.

Document Control

Status:	Rev:	Comments	Date:	Author:	Reviewer:
Final	-	Issued for information	1 Dec 2023	S.Connolly	A.Bavage

TABLE OF CONTENTS

1.0	INTRODUCTION	4
2.0	PROJECT DESCRIPTION.....	4
2.1	Project proposal.....	4
2.2	Site and surrounding area.....	5
2.3	Noise sources associated with proposed development.....	6
2.3.1	Air conditioning	6
2.3.2	Turntable.....	6
2.3.3	Trucks	6
2.3.4	Automatic Carpark access doors.....	6
2.4	Noise exposure	6
3.0	CRITERIA	7
3.1	External noise intrusion criteria.....	7
3.2	Noise emission criteria	7
4.0	RAILWAY NOISE AND VIBRATION.....	8
4.1	Predicted noise levels.....	9
4.2	Recommendations	11
4.3	Ground Borne Noise.....	14
4.4	Vibration.....	15
5.0	MECHANICAL PLANT OPERATION	15
6.0	CONCLUSIONS.....	17
6.1	Railway Noise and Vibration Impacts.....	17
6.2	Mechanical Plant Noise Emissions	17
6.3	Turntable / Truck Noise.....	17
6.4	Automatic Carpark doors	17

APPENDIX A GLOSSARY OF TERMINOLOGY

APPENDIX B NOISE POLICY FOR INDUSTRY CRITERIA DERIVATION

1.0 INTRODUCTION

A residential development is proposed at Lot 1 Railway Street Griffith. The proposed development includes four levels of residential apartments above enclosed parking.

Marshall Day Acoustics has been engaged by Joss Group to prepare an acoustic report for submission with the proposed Development Application for the project.

This assessment addresses the following:

- The likely noise emission from proposed air-conditioning units
- Noise impact onto the development from the adjacent existing rail corridor.

Acoustic terminology used throughout this report is described in Appendix A.

2.0 PROJECT DESCRIPTION

2.1 Project proposal

The proposed development includes four levels of residential apartments principally including two bedroom apartments, with a single three bedroom apartment per floor.

The ground floor layout will comprise enclosed parking for up to 38 vehicles together with external open landscape areas and a truck turntable.

There is allowance on the roof top for air conditioning condenser units although mechanical services designs for the building have not yet been finalised.

At this stage of the design it is proposed that the building will comprise a concrete frame structure, with precast panels to the external facades. Apartments will include balconies with access via glazed sliding door suites. At this stage, the roof structure is to consist of a concrete slab although there may be scope to incorporate a light weight frame system and metal deck.

The assessment is based on the architectural drawings set out in Table 1 and prepared by GRA Design / Leffler Simes Architects for Joss Group (the Client).

Table 1: Drawing references for Lot 1 Railway Street Griffith

Drawing	Title	Rev	Date
SK00	Cover/View 1	-	11-9-2023
SK01	Location Plan	-	11-9-2023
SK02	Context Plan	-	11-9-2023
SK03	Ground Floor Plan	-	11-9-2023
SK04	Typical Floor Plan	-	11-9-2023
SK05	Level 1 Plan	-	11-9-2023
SK06	Levels 2,3,4 Plan	-	11-9-2023
SK07	Roof Plan	-	11-9-2023
SK08	Elevations 1	-	11-9-2023
SK09	Elevations 2	-	11-9-2023
SK10	Section AA	-	11-9-2023
SK11	Aerial View	-	11-9-2023

2.2 Site and surrounding area

The proposed apartment development is to be located at Lot 1 Railway Street Griffith. The site is located immediately to the west of an existing Quest Serviced Apartments Building. The remaining locale comprises the Griffith Local court and parkland to the south, and commercial premises and Olympic Street further to the west of the site.

A residential property is located across Ulong Street to the west, however this is located within the same zone as the surrounding commercial locale. The closest purely residential area zone R3 is located to the north, across the railway, on the opposite side of Wakaden Street. The position of the site in the context of the immediate locale is shown in Figure 1

Figure 1: Site locale



Table 2: Identified nearest receivers

Receiver ID	Location and description
R1 - Residential	34 Ulong Street single storey residential dwelling
R2 - Residential	281 Wakaden Street 2 storey residential apartments
R3 - Residential	268 Wakaden Street single storey residential dwellings
R4 - Residential	258 Wakaden Street single storey residential dwellings
R5 - Residential	Quest Serviced Apartments
C1 - Commercial	2 Storey commercial building
C2 - Commercial	Law Courts Building
C3 - Commercial	Griffith Telephone Exchange

2.3 Noise sources associated with proposed development

The residential nature of the development is such that there is limited scope for noise impacts likely to be generated by the normal residential use. Other than the Quest Apartments, the surrounding boundaries are adjacent commercial areas with distant residential area concentration to the North across the rail line

2.3.1 Air conditioning

Split system air-conditioning units are proposed for residential units with condensing units to be located on the roof top. While mechanical services design has not yet been finalised, a preliminary assessment has been based on a nominal sound power allowance of 70 dB L_{WA} for each condenser. We have assumed there would be one condenser provided for each apartment (total 28).

There may also be ancillary ventilation fans, however it will be feasible to specify any necessary acoustic controls during the design stages of the project.

2.3.2 Turntable

There is a turntable located toward to the north of the site for the purposes of truck turning on the site. Turntables typically generate low noise levels, however the selection should be reviewed during the design stages of the project in to ensure a unit having the a sufficiently low noise is specified. A nominal operating noise criteria of 40 dB L_{Amax} at 1 metre is recommended as a basis for selection.

2.3.3 Trucks

Any trucks accessing the site and turntable (for example during rubbish collection) should be limited to the daytime hours of 0700-1800hrs (7am to 6pm), in order to minimise possible disturbance future resident of the building and occupants within the adjacent Quest Apartments building.

2.3.4 Automatic Carpark access doors

Automatically operating access doors to the carpark should be selected on the basis of a low operating noise level such that they do not cause disturbance to future residents of the building nor occupants of the Quest apartments. The door and mechanism should be vibration isolated from the building to limit the transmission of structure borne noise.

2.4 Noise exposure

The Project site is located at Lot 1 Railway Street, Griffith, NSW. The sites are bounded by Railway Street to the south and the railway to the north.

A railway line is located approximately 20m to the north of the site. Train movements are infrequent however.

The UGL Regional Linx Standard working time, commencing 10th June 2022, indicates that freight train movements at Griffith during the night-time period of 2200-0700hrs (10pm to 7am) would consist of up to two (2) trains departing at 0329hrs and 0504hrs on a Wednesday night, with movements on other nights limited to one only.

The timetable indicates that during the daytime hours of 0700-2200hrs (7am to 10pm) there would be up to two train movements (passenger or freight).

It is also understood that some shunting activity occurs at the nearby station.

3.0 CRITERIA

3.1 External noise intrusion criteria

The relevant noise criteria are included within the *NSW Department of Planning Document Development near rail corridors and busy roads - interim guideline*.

The noise criteria in the guideline for residential buildings is as follows:

Table 3: Guideline noise criteria

Type of occupancy	Noise level dBA	Applicable time period
Sleeping areas (bedroom)	35	Night 10pm to 7am)
Other habitable rooms (excl. garages, kitchens, bathrooms and hallways)	40	At any time

Note: airborne noise is calculated as L_{eq} (9h) (night) and L_{eq} (15h)(day). Groundborne noise is calculated as L_{max} (slow) for 95% of rail pass-by events

We also recommend that Sleep Disturbance criteria should be considered for individual noise events such as truck pass-bys and railway movements.

The Environment Protection Authority document the NSW Road Noise Policy which compares a number of sleep disturbance criteria and states the following:

- *Maximum internal noise levels below 50–55dBA are unlikely to awaken people from sleep*
- *One or two noise events per night, with maximum internal noise level of 65-70 dBA are not likely to affect health and wellbeing significantly.*

An open window provides an outside to inside noise reduction of approximately 10dB. A standard closed window provides a noise reduction of 20-25dB. Based on the NSW EPA findings, a noise level of L_{Amax} 60-65dB outside an open bedroom window would be unlikely to cause awakening reactions.

3.2 Noise emission criteria

Noise emissions from the mechanical plant are typically limited to an allowable margin above the existing background noise levels. Surveys of existing noise levels at the site have not yet been carried out however the EPA Noise Policy for Industry (NPfI) provides information on minimum assumed Rating Background noise levels. These set out minimum existing background noise levels for use with the NPfI and provide an expectation of the minimum existing noise levels that would be used when establishing an intrusive noise criteria.

Project specific noise criteria have been derived based these minimum criteria in the NPfI. A full derivation of the project specific noise criteria is provided in Appendix B.

Table 1: NPfI Project Noise Trigger Levels

Receiver	Period	Time of day	Project Noise Trigger Level, $L_{Aeq, 15min}$, dB
Residential	Day	0700 ¹ -1800hrs	40
	Evening	1800-2200hrs	35
	Night	2200-0700 ¹ hrs	35
Commercial	When in use		63

¹0800 hrs Sundays and public holidays

The above criteria would apply for the emission of mechanical services noise on site to surrounding neighbours.

4.0 RAILWAY NOISE AND VIBRATION

At this stage, a detailed noise and vibration assessment has not been conducted at the site. We have based our assessment on previous measurements at similar sites. As noted previously, train movements are infrequent and event noise is likely to vary dependant on train type and movement. For the purposes of this assessment, we have assumed that the scheduled train movements would extend past the site.

The following sound power levels have been used in our assessment.

Table 4: Train sound power levels used in calculations

Description	Sound Power Level dB re 10^{-12} W								
	Octave band mid frequency								
	dBA	63	125	250	500	1k	2k	4k	Hz
Diesel locomotives, moving slowly (log average of file samples) L_{eq}	108	116	108	108	104	100	100	101	dB
Diesel locomotives, idling (log average of file samples) L_{eq}	101	110	104	102	99	95	90	88	dB
Wagons/Carriages (excluding locomotive) L_w dB/m L_{eq}	89	99	93	89	86	82	82	78	dB/m

There is a rail crossing nearby Lot 1 Railway Street and it would be expected that a train may sound its horn on approach. Noise from the horn is difficult to predict as it will depend on the individual train, location when sounding and the directivity between the horn and the reception point. It would be necessary to establish this level on site, however the limited number of train movements would indicate that overall L_{Aeq} 9hr and 15hr noise levels are unlikely to be impacted. The sounding of horns during night-time hours would require consideration with a comparison with sleep disturbance criteria.

As a guide, data held by this office includes a sample horn level of 83dB L_{Amax} at 30 metres. Based on this a level the facade position would be of the order 83 – 86dB L_{Amax} .

Based on the above sound power data we have carried out estimates of noise levels at the expected facade position of the apartment buildings (excluding any facade reflection component). These are shown in Table 5 below.

Table 5: Calculated noise levels at facade position

Calculated noise level at future north facade position (approximately 20 metres)	Sound Pressure level dB re 2x10 ⁻⁵ Pa								
	Octave band mid frequency								
	dBA	63	125	250	500	1k	2k	4k	Hz
Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by	77	85	79	76	73	69	69	68	dB
Locomotive idling L_{eq}	67	76	70	68	65	61	56	54	dB
Calculated night L_{eq9hr} including 2 train movements)	56	57	61	53	50	49	49	45	dB
Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by									
Calculated day L_{eq15hr} including 2 train movements)	53	55	59	51	48	47	47	43	dB
Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by									
Calculated L_{max} noise levels (for use night time period)	84	84	87	79	76	78	78	75	dB
Train horns guidance level, L_{Amax}	86								

4.1 Predicted noise levels

Noise levels have been predicted within the apartments based on the sound data detailed in Table 4 assuming that the glazing will be standard 6 mm glass, (i.e. not specifically acoustic rated) or thermal double glazing with configuration of 6/8/4. Predicted noise levels are detailed in Table 6 (windows closed) and Table 7 (windows open).

Table 6: Train noise level calculated within north facing apartments – standard glazing systems windows closed.

Description	Predicted noise level, dB (range dependent on standard glazing selection)	Guideline Criteria dB windows closed	Complies
Calculated night L_{eq9hr} including 2 train movements) Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by Allowance for 30 minute loco idle	North Bedroom 35-40 $L_{Aeq(9hr)}$	35 $L_{Aeq(9hr)}$	No
Calculated day L_{eq15r} including 2 train movements) Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by Allowance for 30 minute loco idle	North Living room 35-40 $L_{Aeq(9hr)}$	40 $L_{Aeq(15hr)}$	Yes
Calculated L_{max} noise levels (for use night time period)	North Bedroom 58-63 L_{Amax} Train horns may exceed this level, to be determined on site	Refer EPA RNP 50-55 maximum for awakening unlikely. 65-70 maximum 1-2 times per night for health and well being	No

Table 7: Train noise level calculated within north facing apartments – standard glazing systems windows open

Description	Predicted noise level, dB, allowing 10 dB windows open	Guideline Criteria dB – windows open	Complies
Calculated night L_{eq9hr} (including 2 train movements) Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by Allowance for 30 minute loco idle	Bedroom 48 $L_{Aeq(9hr)}$	45 L_{Aeq} (9hr)	No
Calculated day L_{eq15r} (including 2 train movements) Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by (2 train movements in 9 hour period) Allowance for 30 minute loco idle	Living room 46 $L_{Aeq(9hr)}$	50 L_{ea} (15hr)	Yes
Calculated L_{max} noise levels (for use night time period)	Bedroom 74 L_{Amax} Train horns may exceed this level, to be determined on site	Refer EPA RNP 50-55 maximum for awakening unlikely 65-70 maximum 1-2 times per night for health and well being	No

The predicted noise levels in terms of L_{eq} are expected to exceed the specified criteria for bedrooms, when considered over the required time period event, although this depends on the sound reduction offered by the standard glazing systems.

The proximity of shunting activity and the possible short term maximum noise levels is also a concern on the basis that it may occur over an extended period of time. Noise levels are expected to comply with the open window criteria within living areas, during the daytime hours of 0700-2000hrs (7am to 10pm). The open window criteria in the bedrooms are however expected to be exceeded. It would be necessary to close the windows in the bedrooms to minimise disturbance from train noise during the night-time hours. This may have implications achieving necessary ventilation.

4.2 Recommendations

Given the above, it is recommended that the glazing be provided with a specific acoustic performance requirement in order to reduce internal noise to within the recommended range.

The proposed glazing acoustic ratings at each location are shown in Figure 2 below.

It is understood from current drawings that external walls are to consist of pre-cast concrete. On this basis, no special acoustic treatment is required to fixed (solid non glazed) facade sections. The roof has been assumed to be a concrete slab or upgraded light-weight construction. The minimum required acoustic rating for the roof and ceiling is generally R_w 45, except for bedrooms as noted in Figure 2 which would require R_w 50.

The recommended ratings are preliminary and may vary depending on the results of site noise measurements and window sizing based around a dimensioned glazing schedule.

[illegible]

Table 8 provides a minimum acoustic performance requirement for each glazing configuration. The R_w will also depend on the other components such as the frame, sash and seals and it would be necessary for a supplier to provide an acoustically tested systems meeting the required R_w rating.

Table 8 also details nominal sliding door systems with complying acoustic rating provided by example suppliers.

Table 8: Minimum and example glazing systems

Required acoustic rating	Minimum Glazing configuration for fixed glazing ¹	Sliding door suites	Example sliding door suite (all acoustic ratings to be confirmed by supplier)
R_w 33	6.38mm single or 6.38mm laminated-12mm-6mm IGU	R_w 33	Alspec Altitude 6.38mm-6mm-6.38mm IGU Capral AGS 900 Sliding door 10.38mm Laminated or 6.38mm-12mm-6.38mm IGU
R_w 35	10.38mm laminated or 6.5mm Acoustic laminated glass (single) or 10mm-12mm-6mm IGU	R_w 35	Alspec Altitude 10.38mm-12mm-6.38mm IGU Capral AGS 900 Sliding door 6.5mm Hush Laminated

¹ this is a minimum glazing configuration only and subject to manufacturers configuration requirements to achieve the R_w specification. The manufacturers specification many require additional glass thickness or different configurations to achieve the R_w specification.

With windows closed, the internal noise level criteria is predicted to be achieved as shown in Table 9. The noise levels predicted in Table 7 for the windows open would not change

Table 9: Train noise level calculated within north facing apartments with glazing per Figure 2

Description	Predicted noise level, dB with glazing as per Figure 2	Criteria dB windows closed	Complies
Calculated night L_{eq9hr} (including 2 train movements) Diesel locomotives and carriages/wagons , moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by	Bedroom 30 $L_{Aeq(9hr)}$	35 L_{Aeq} (9hr)	Yes
Calculated day L_{eq15r} (including 2 train movements) Diesel locomotives and carriages/wagons, moving slowly at 20 km/hr allowance for 1000m length train, 180 second pass-by	Living room <30 $L_{Aeq(15hr)}$	40 L_{Aeq} (15hr)	Yes
Calculated L_{max} noise levels (for use night time period)	Bedroom 55 L_{Amax} Train horns may exceed this level, to be determined on site	Refer EPA RNP 50-55 maximum for awakening unlikely 65-70 maximum 1- 2 times per night for health and well being	Yes, Train horns may exceed this level, to be determined on site. Compliance with health and well-being criteria expected provided not more that 1-2 occasions per night

4.3 Ground Borne Noise

The NSW Department of Planning Document Development near rail corridors and busy roads - interim guideline provides the following comments for ground borne noise

Generally, ground borne noise is associated more closely with rail operations than roads. Where buildings are constructed over or adjacent to land over tunnels, ground-borne noise may be present without the normal masking effect of airborne noise. In such cases, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne L_{Amax} noise limit of 40dBA (daytime) or 35dBA (night-time) measured using the “slow” response time setting on a sound level meter.

We would generally expect that, for apartments directly exposed to noise from the railway, the airborne noise intrusion through the facade would be the dominant factor, rather than ground borne noise impacts. Further there are few trains during the day or night-time period. Where ground borne noise is audible in apartment facing away from the railway (i.e. without noise exposure via windows) disturbance is unlikely. Nevertheless, this must be confirmed by suitable ground vibration measurements during detailed design.

4.4 Vibration

A desk-top noise and vibration review of the adjacent Quest site has been previously prepared by EMM in their letter dated 22 November 2012. The assessment concluded that vibration levels will be below recognised criteria for the effects of vibration on structures, occupant annoyance and vibration dose criteria.

We have previously undertaken a desk-top assessment of potential vibration impacts for the adjacent Quest site which confirmed that the criteria recommended by the following codes should be achieved at the site:

- Department of Transportation United States of America – Transit Noise and Vibration Impact Assessment, dated May 2006 (ground-borne noise and vibration criteria)
- Australian Standard 2670.3-1990 Vibration and Shock – Guide to the evaluation of human exposure to whole body vibration

Our predictions were based on train speeds of 60km/h, which are considered unlikely given the proximity of the station.

Compliance may become marginal if there are any track cross-overs nearby or if train suspension is particularly stiff. Given the relatively low number of train movements per day, it is expected that marginal compliance would still be considered acceptable and low risk. As for ground borne noise, this must be confirmed by suitable ground vibration measurements during detailed design.

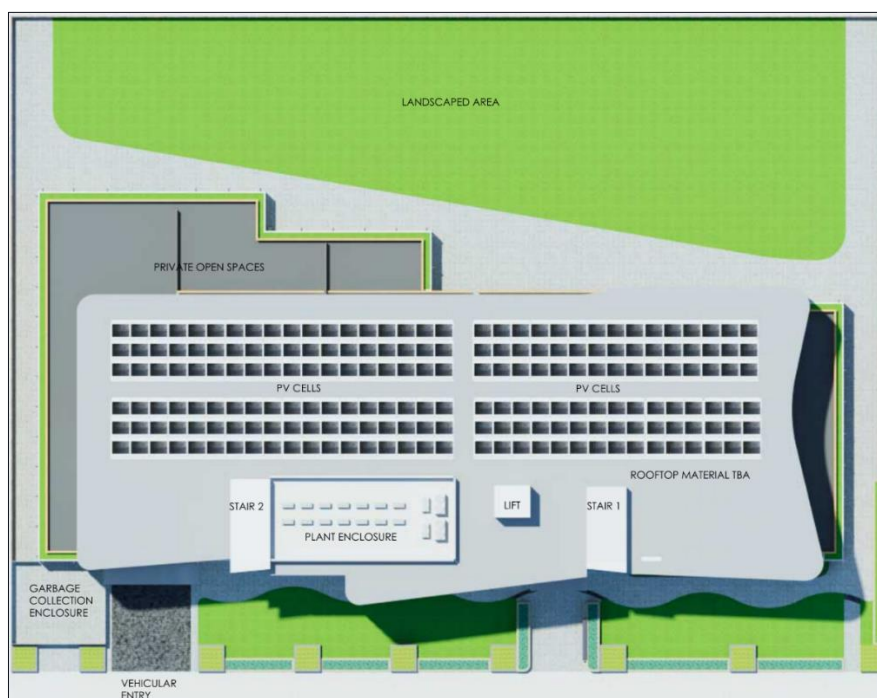
5.0 MECHANICAL PLANT OPERATION

While the plant and equipment selections are not known at this stage, a preliminary review has been undertaken to assess the possible noise impact to the surrounding locale allowing for the proposed roof top condenser location.

A nominal allowance for a sound power level of 70 dB L_{WA} has been made for each condenser, and assuming one condenser for each of the 28 units.

The approximate location for the condensers is shown in Figure 3.

Figure 3: Roof plan



Noise levels at receiver locations from operation of roof top condensers have been calculated and compared to derived project noise trigger levels for compliance and are provided in Table 10. Allowance is made for the screening effect from proposed building parapet at RL 16.8.

No specific screening allowance is made for the surrounding plant enclosure shown on the drawings. It is assumed that all 28 condensers would operate simultaneously although this is an unlikely scenario, particularly during the night time hours.

The results are compared to the worst case night-time noise criteria.

Table 10: Noise impact assessment Results, $L_{Aeq, 15min}$

Receiver ID	Location and description	Criteria (Night)	Predicted Noise level dB $L_{Aeq(15min)}$	Complies
R1 - Residential	34 Ulong Street single storey residential dwelling	35	31	Yes
R2 - Residential	281 Wakaden Street 2 storey residential apartments	35	31	Yes
R3 - Residential	268 Wakaden Street single storey residential dwellings	35	25	Yes
R4 - Residential	258 Wakaden Street single storey residential dwellings	35	21	Yes
R5 - Residential	Quest Serviced Apartments	35	37	No ¹
C1 - Commercial	2 Storey commercial building	63	31	Yes
C2 - Commercial	Law Courts Building	63	40	Yes
C3 - Commercial	Griffith Telephone Exchange	63.	24	Yes

¹ The possible minor exceedance would be mitigated by the likelihood that not all the condenser units would operate during the night-time hours. Further, any residual exceedance could be easily accommodated by an acoustic screen around some of the plant area.

The calculated noise levels indicate that it would be feasible to locate air conditioning condensers on the roof top, while complying with relevant consent authority criteria pertaining to noise emissions from plant and equipment.

It will be necessary to carry out a more detailed assessment during project design stage based on scheduled plant and equipment and assess for compliance with Development Approval Conditions pertaining to noise emissions. Where exceedances are anticipated it will be necessary to document any acoustic screens or other controls required to reduce noise to within Consent Authority requirements.

6.0 CONCLUSIONS

A desktop acoustic assessment has been carried out by MDA of the proposed residential development at Lot 1 Railway Street Griffith. The assessment has concluded that the following:

6.1 Railway Noise and Vibration Impacts

The site is not exposed to a large number of train movements and at this stage appears to be limited to two possible movements during a day, evening or night period.

Noise impacts from the railway to the apartments can be addressed by conventional and readily available glazing, doors and facade elements. In some instance windows may need to be closed at night and this may impact ventilation requirements.

Previous studies of the site have indicated that vibration from the railway is likely to be within acceptable criteria. Ground borne noise is unlikely to exceed airborne noise transmission via glazed elements. It is expected however that on site noise measurements would be required during the project design stages in order to further quantify possible noise and vibration impacts from the railway.

6.2 Mechanical Plant Noise Emissions

Specific design proposals for air conditioning and mechanical plant have not yet been developed. MDA have however carried out preliminary investigations based on the likelihood of air conditioning condensers located on the roof top of the building.

Based on the results of the assessment, it is expected to be feasible to locate air conditioning and ventilation plant and equipment on the roof top and comply with Consent Authority noise criteria.

It will however be necessary to carry out a detailed acoustic analysis based on the final equipment selections. It is expected that noise levels can comply with the Consent Authority Noise criteria. Minor acoustic screening may be required.

6.3 Turntable / Truck Noise

In order to minimise noise emissions to future residents of the building and the adjacent Quest Apartments noise from the turntable should be limited to a maximum level of 40dB L_{max} at 1 metre. Additionally, the turntable should incorporate vibration isolation where practicable.

Truck movements such as that for rubbish collections should be limited to the daytime hours of 0700-1800hrs (7am to 6pm).

6.4 Automatic Carpark doors

Automatically operating access door to the carpark should be selected on the basis of a low operating noise level such that they do not cause disturbance to future residents of the building nor occupants of the Quest apartments. The door mechanism should be vibration isolated from the building to limit the transmission of structure borne noise.

APPENDIX A GLOSSARY OF TERMINOLOGY

SPL or L_p	<p><u>Sound Pressure Level</u></p> <p>A logarithmic ratio of a sound pressure measured at distance, relative to the threshold of hearing (20 μPa RMS) and expressed in decibels.</p>
SWL or L_w	<p><u>Sound Power Level</u></p> <p>A logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.</p>
dB	<p><u>Decibel</u></p> <p>The unit of sound level.</p> <p>Expressed as a logarithmic ratio of sound pressure P relative to a reference pressure of $P_r=20 \mu\text{Pa}$ i.e. $\text{dB} = 20 \times \log(P/P_r)$</p>
dBA	<p>The unit of sound level which has its frequency characteristics modified by a filter (A-weighted) so as to more closely approximate the frequency bias of the human ear.</p>
A-weighting	<p>The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.</p>
C-weighting	<p>The process by which noise levels are corrected to account for non-linear frequency response of the human ear at high noise levels (typically greater than 100 decibels).</p>
$L_{Aeq}(t)$	<p>The equivalent continuous (time-averaged) A-weighted sound level. This is commonly referred to as the average noise level.</p> <p>The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.</p>
$L_{A90}(t)$	<p>The A-weighted noise level equalled or exceeded for 90% of the measurement period. This is commonly referred to as the background noise level.</p> <p>The suffix "t" represents the time period to which the noise level relates, e.g. (8 h) would represent a period of 8 hours, (15 min) would represent a period of 15 minutes and (2200-0700) would represent a measurement time between 10 pm and 7 am.</p>

APPENDIX B NOISE POLICY FOR INDUSTRY CRITERIA DERIVATION

In NSW, the NPfI is the guideline for assessing noise emissions from industrial facilities and other developments with noise sources that may be considered to be industrial in nature.

The NPfI sets out a procedure where a noise source can be evaluated against a series of noise assessment levels. In the NPfI, these project specific noise levels are derived from an analysis of the ambient noise environment and zoning information.

The ambient noise levels for this project are summarised in Table C 2. In the NPfI, the background noise level is called the Rating Background Level (RBL). As the site is proposed to be used on a 24hr basis, Day, Evening and Night-time periods have been considered.

Table C 2: NPfI time periods and minimum background noise levels

Period	Time of day	RBL LA90, 15min dB	LAeq, 15min dB
Day	0700 ¹ -1800hrs	35	59
Evening	1800-2200hrs	30	59
Night	2200-0700 ¹ hrs	30	53

¹0800 hrs Sundays and public holidays

Intrusiveness noise levels

The intrusiveness noise assessment is applicable to residential receivers and is based on knowledge of the background noise level at the receiver location. The intrusiveness level is the background noise level at the nearest noise sensitive location plus 5dB. Therefore, the noise emissions from the premises are considered to be intrusive if the A-weighted source noise level (LAeq, 15min) is greater than the background noise level (LA90) plus 5dB.

Based on the background noise data summarised in Table C 2, noise limits for Intrusiveness have been calculated in accordance with the NPfI and are presented in Table C 3.

Table C 3: NPfI derived Intrusiveness noise levels

Period	Rating Background Level, LA90, 15min dB	Intrusiveness Noise Level (RBL + 5 dB), LAeq, 15 min dB
Day	35	40
Evening	30	35
Night	30	35

Amenity noise levels

The project amenity noise levels are designed to prevent industrial noise continually increasing above an acceptable level. The initial stage in determining the project amenity level is to determine the recommended amenity noise levels for the appropriate amenity area and time of day.

A review of the site indicates that the development area would be classified by the EPA as Urban, given the B3 zoning, high density residential use and adjacency to the commercial district. As such, the recommended amenity noise levels for an Suburban residential receiver as described in Table 2.2 of the NPfI have been selected.

The appropriate recommended amenity noise levels are then modified to convert an LAeq period time descriptor to an LAeq 15 min descriptor (as detailed in Section 2.2 of the NPfI), with further adjustment made to determine the project amenity noise level for the development (as detailed in Section 2.4 of the NPfI).

The NPfl project amenity noise levels applicable to the development are detailed in Table C 4.

Table C 4: NPfl derived project amenity noise levels

Receiver	Period	Recommended Amenity Noise Level L _{Aeq, period} dB	Project Amenity Noise Level L _{Aeq, 15min} dB
Residential - Suburban	Day	55	53
	Evening	45	43
	Night	40	38
Commercial	When in use	65	63

Determination of Project Noise Trigger Levels

The final process in determining the operational noise limits according to the NPfl is to derive the Project Noise Trigger Levels. The Project Noise Trigger Levels are levels that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response; for example, further investigation of mitigation measures.

The Project Noise Trigger Levels are derived by selecting the more stringent of either the intrusiveness or project amenity noise levels. For residential receivers each assessment time period is evaluated individually. For non-residential receivers, only the Amenity noise level applies. The NPfl Project Noise Trigger Levels applicable to the site are shown in Table C 5.

Table C 5: NPfl Project Noise Trigger Levels

Receiver	Period	Project Noise Trigger Level, L _{Aeq, 15min} , dB
Residential	Day	40
	Evening	35
	Night	35
Commercial	When in use	63