



# DA ACOUSTIC REPORT

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2 Kamira Avenue, Villawood (Stage 2)

**ID: 12177 R01v1**

**19 April 2022**

**Prepared For:**

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**Issue:** R01

**Version:** 1

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*This firm is a member of the Association of Australian Acoustical Consultants.*

*The work reported herein has been carried out in accordance with the terms of membership. We stress that the advice given herein is for acoustic purposes only, and that the relevant authorities should be consulted with regard to compliance with regulations governing areas other than acoustics.*

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## 1.0 INTRODUCTION

PKA Acoustic Consulting (PKA) has been commissioned to prepare a DA acoustic report for submission to the Fairfield City Council for the proposed mixed use multi-residential development (site) at 2 Kamira Avenue, Villawood.

The purpose of this DA acoustic report is to establish the following:

- Mechanical plant noise breakout goals for future detailed design.
- Childcare centres and other commercial noise breakout goals and preliminary acoustic mitigation strategies.
- Internal wall and floor/ceiling acoustic requirements to comply with sound insulation requirements of the Building Code of Australia (BCA).
- Establishment of Construction Noise & Vibration Goals.

Section 6.0 of the report details the acoustic recommendations to ensure with the relevant acoustic criteria.

The report was prepared in accordance with the following relevant acoustic standards and guidelines.

- Fairfield Citywide Development Control Plan 2013.
- The NSW Department of Planning document titled *“Development Near Rail Corridors and Busy Roads- Interim Guideline”*.
- The NSW EPA Noise Policy for Industry 2017.
- AS/NZS 2107:2016 *“Acoustics - Recommended design sound levels and reverberation times for building interiors”*.
- The Association of Australasian Acoustical Consultants (AAAC) Guideline for Child Care Centre Acoustic Assessment (v3.0).
- The NSW Department of Environment & Climate Change Document titled *“Interim Construction Noise Guideline”*.
- The NSW Department of Environment and Conservation document titled *“Assessing Vibration: A Technical Guideline”* (February 2006).

The acoustic systems assessed or shown in recommendations are ones that satisfies the acoustic requirements only. No representation is given that it is fit for any other purpose. All information must be checked and designed by others to verify that it complies with all necessary fire rating, structural, waterproofing, durability, and any other non-acoustic requirements.

## 2.0 SITE DESCRIPTION

The proposed mixed use multi-residential development is located at 2 Kamira Avenue, Villawood. The proposed Stage 2 site is adjacent to the currently developing Stage 1 site directly to the south. The site location is shown in Figure 2-1.

**Figure 2-1 Site Location**

*(Source – NSW Six Maps - April 2022. Below site boundaries are indicative and are not exact boundary lines)*



The site is bound by Villawood Road and a freight and passenger train line to the north, Stage 1 of the residential development to the south (R3), other residential receivers across Kamira Avenue to the west (R1&R2) and a mix of existing public carpark and existing residential premises to the east (R4&R5).

The development consists of two separate buildings with a mix of a childcare centre, supermarket, and retail on the ground floors with upper floors (Levels 1 to 10) used for residential apartments. All parking is within the basement and lower levels of the development.



Figure 2-2 Site Plan

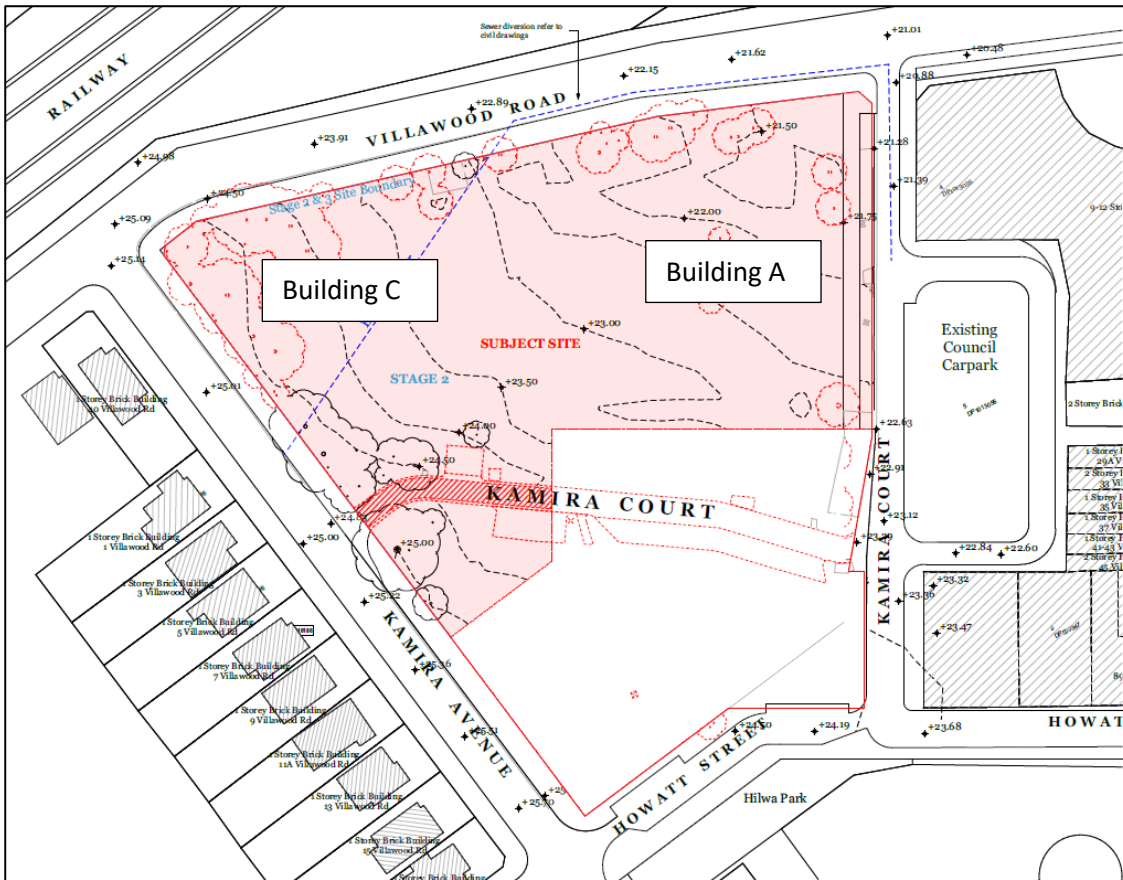
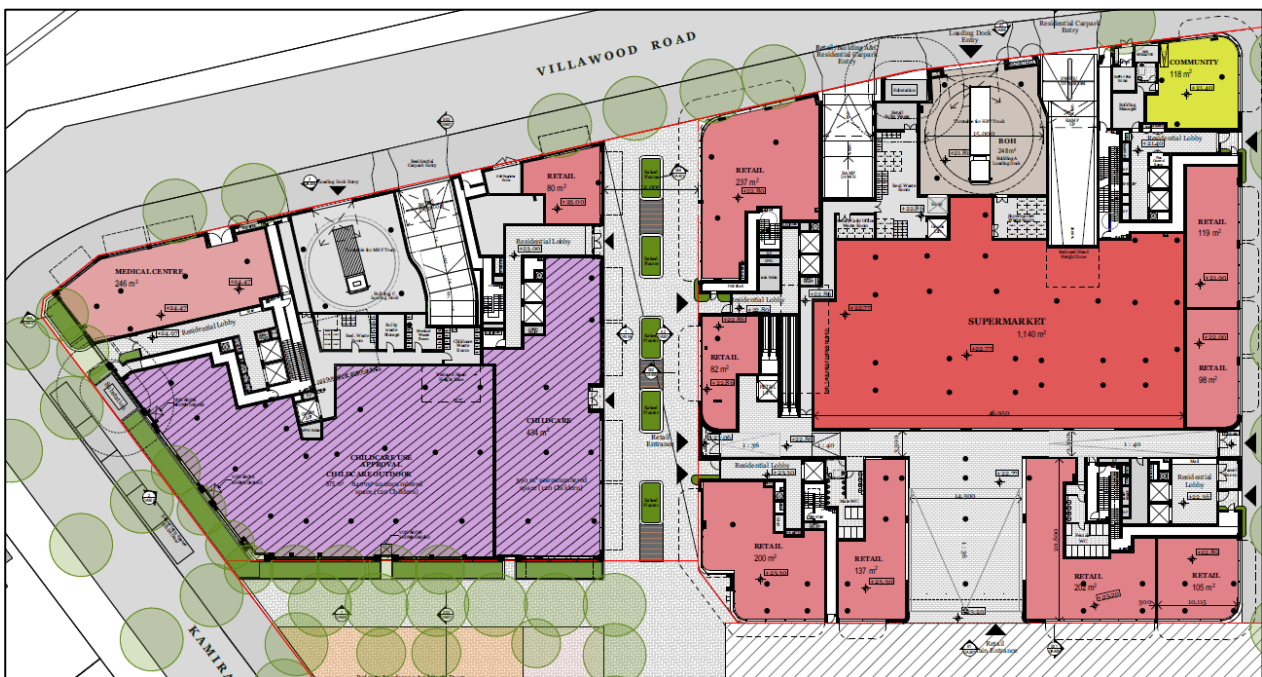


Figure 2-3 Site Layout (Ground Floor Plan – Commercial Tenancies)



### 3.0 NOISE CRITERIA

#### 3.1 Fairfield Citywide Development Control Plan

##### Chapter 7 Residential Flat Buildings and Shop Top Housing

###### 7.5.2.2 Acoustic Amenity

*a) Noise transmission BCA requirements - development must comply with the noise transmission requirements of the Building Code of Australia 2004. Noise transmission must be minimised through the design of internal layouts of apartments and the location of courtyards, terraces / balconies, and openings.*

*b) Noise impact assessments may be required. An assessment of the existing and expected future noise levels together with a mitigation strategy must be provided in the noise impact assessment.*

*c) Noise attenuation measures must be incorporated in all new developments along Classified State and Regional Roads and Unclassified Regional Roads and properties in proximity to the railway line. Developments adjacent to rail corridors, shall take into consideration the provisions within SEPP (Infrastructure) 2007 relating to impact of rail noise or vibration on non-rail development.*

*d) Land uses/activities noise conflicts minimised - In mixed-use developments, the design must minimise the transfer of noise between business and commercial activities and residential development by using measures that will address noise associated with:*

*a. Goods and service deliveries as well as waste and garbage disposal and collections, particularly if this is occurring early in the morning or late at night;*

*b. Restaurants and cafes particularly those operating at night or those with outdoor seating; and*

*c. Extraction fans and air conditioning units.*

*e) Land use conflicts between existing and new development – Noise attenuation measures must be incorporated into all new residential development proposed near an existing retail/commercial property that generates noise at times or levels not compatible with residential living. An acoustic assessment and proposed acoustic attenuation measures are to be detailed in an Acoustic Report prepared by an Acoustic Engineer or suitably qualified individual.*

*f) Air conditioning units proposed are to be detailed in the acoustic assessment.*

#### 3.2 NSW EPA Noise Policy for Industry (NPfI)

Noise from commercial and multi-storey residential developments are typically by the NSW EPA Noise Policy for Industry 2017 (NPfI). The NPfI policy sets out two separate criteria to ensure environmental noise objectives are met. The first criterion considers intrusive noise to residential properties and the second is set to ensure the amenity of the land use is protected. The lower value of both criteria is considered to be the Project noise trigger level, which is the limit of the  $L_{Aeq\ 15min}$  noise level that must not be exceeded for the corresponding period of the day.

##### 3.2.1 Intrusiveness Criterion

The intrusiveness of a stationary noise source may be considered acceptable if the average of the maximum A-weighted levels of noise,  $L_{Aeq\ 15\ minute}$  from the source do not exceed by more than 5dB



the Rating Background Level (RBL) measured in the absence of the source. This applies during all times of the day and night. There also exists an adjustment factor to be applied as per the character of the noise source. This includes factors such as tonal, fluctuating, low frequency, impulsive, intermittent etc. qualities of noise. The RBL is determined in accordance with Section 2.3 of the NSW EPA NPfI. The intrusiveness criterion is  $L_{Aeq, 15 \text{ minute}} < RBL + 5$ .

### 3.2.2 Amenity Criterion

To limit continuing increases in noise levels, the maximum ambient noise level within an area from commercial noise sources should not normally exceed the levels as specified in Table 2.2 of the policy for the specified time of the day. NSW EPA Noise Policy for Industry recommends the following Amenity Noise Levels for various receiver premises.

**Table 3-1 Noise Criteria - Amenity for receiver buildings**

Type of receiver	Time of day	Recommended Amenity Noise Level $L_{Aeq, \text{period}}$
Residential (Sub-Urban)	Day	55 dB(A)
	Evening	45 dB(A)
	Night	40 dB(A)
Commercial	When in Use	65 dB(A)

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

Project amenity noise level for development = recommended amenity noise level **minus 5 dB(A)**.

To standardise the time periods for the intrusiveness and amenity noise levels, this policy assumes that the Amenity  $L_{Aeq, 15 \text{ min}}$  will be taken to be equal to the  $L_{Aeq, \text{period}} + 3 \text{ decibels (dB)}$ .

#### Amenity noise levels in areas of high traffic noise

The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the  $L_{Aeq}$  noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the  $L_{Aeq, \text{period(traffic)}}$  minus 15 dB(A).

High traffic project amenity noise level for developments =  $L_{Aeq, \text{period(traffic)}}$  minus 15 dB(A)

The high traffic project amenity noise level may be applied only if all of the following apply:

- Traffic noise is identified as the dominant noise source at site.
- The existing traffic level is 10dB or more above the recommended amenity noise level for the area.
- It is highly unlikely traffic noise levels will decrease in the future.

The applicability of these traffic noise provisions needs to be determined for each assessment period (that is, day, evening and night).

### 3.3 State Environmental Planning Policy (Infrastructure) 2007

The developments located next to major roads or train lines are generally assessed against the acoustic requirements of Department of Planning document “*Developments near rail corridors and busy roads- Interim Guidelines*”. The acoustic requirements support specific rail and road provisions of the State Environmental Planning Policy (Infrastructure SEPP) 2007 which considers residential sites adjacent to roads with AADTs more than 40,000 and may also be applied for best practice for sites with AADTs exceeding 20,000. The DoP Interim Guidelines provide noise criteria for the buildings near the major roads and rail corridors as presented in Table 3-2.

**Table 3-2 Internal Noise Goals from DoP Guidelines / SEPP Clause 102**

Internal Space	Time Period	Internal Noise Level – Windows Closed	Measurement Descriptor
Sleeping areas (bedroom)	Night (22:00 - 07:00)	35 dB(A)	L <sub>eq</sub> (9hr) Night
Other habitable rooms (exc. garages, kitchens, bathrooms & hallways)	Day or Night	40 dB(A)	L <sub>eq</sub> (15hr) Day or L <sub>eq</sub> (9hr) Night

Section 3.6.1 of the DoP guidelines sets internal noise criteria for residences with windows closed. It also states that:

*“if internal noise levels with windows or doors open exceed the criteria by more than 10 dB(A), the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also meet the ventilation requirements of the Building Code of Australia”.*

### 3.4 AS/NZS 2107:2016 Indoor Design Levels

Australian Standard AS/NZS 2107:2016 Acoustics – *Recommended design sound levels and reverberation times for building interiors* - provides recommendations and design criteria regarding ambient sound levels for various building interiors including residential premises. These recommended design sound levels are shown in the table below:

**Table 3-3 AS2107-2016: Recommended Indoor Design Levels**

Type of occupancy – Residential Buildings	Design sound level (L <sub>Aeq,t</sub> ) range dB(A)
<b>Houses and apartments in suburban areas or near minor roads</b>	
Apartment Common Areas (e.g foyer, lift lobby)	45 to 50
Living Areas	30 to 40
Sleeping Areas (night-time)	30 to 35

The combined noise levels of the external noise intrusion and the indoor A/C units and other mechanical plant and equipment must not exceed the above levels the various habitable spaces identified above. Commercial and retail spaces must be assessed separately at later stages of the development in accordance with the AS2107:2016 recommended levels during their fit out deepening on their intended use.

### 3.5 BCA Sound Insulation Requirements – Class 2 Buildings

Although the DCP refers to BCA 2004, the document has now been updated to the latest version released in 2019. The BCA, in Volume 1 Section F5 “Sound Transmission and Insulation” states that walls and floors separating places of occupancy “*must provide insulation against the transmission of airborne and impact generated sound sufficient to prevent illness or loss of amenity to the occupants*”. The following summarises the BCA sound insulation requirements, brevity necessitates detail in the BCA taking precedence over the tables below.

**Table 3-4 Walls – Deemed-to-Satisfy Provisions**

Wall Description	BCA Reference	Airborne	Impact
Separating sole-occupancy units (SOUs) habitable areas	F5.5(a)(i)	$R_w + C_{tr} \geq 50$	
Separating SOUs wet to habitable areas	F5.5(a)(i) F5.5(a)(iii)	$R_w + C_{tr} \geq 50$	Discontinuous Construction
Separating SOUs with corridor, stairway, lobby or different classification	F5.5(a)(ii)	$R_w \geq 50$	
Separating SOUs with plantroom or lift shaft	F5.5(a)(ii) F5.5(a)(iii)	$R_w \geq 50$	Discontinuous Construction
Separating SOU habitable area with services from another SOU	F5.6(a)(i)	$R_w + C_{tr} \geq 40$	
Separating SOU wet area with services from another SOU	F5.6(a)(ii)	$R_w + C_{tr} \geq 25$	
Doors separating SOU with corridor, stairway, lobby	F5.5(b)	$R_w \geq 30$	
Wall Type	Reference	Discontinuous Construction Requirement	
Masonry	F5.3(c)(i)	Wall having a minimum 20mm cavity between the 2 separate leaves, with resilient wall ties if necessary	
Other than masonry	F5.3(c)(ii)	Wall having a minimum 20mm cavity with no mechanical linkage except at the periphery	

**Table 3-5 Floors – Deemed-to-Satisfy Provisions**

Floor Description	BCA Reference	Airborne BCA	Impact BCA	Impact PKA* (Optional)
Separating sole-occupancy units (SOUs)	F5.4(a)(i)	$R_w + C_{tr} \geq 50$	$L_{n,w} \leq 62$	$L_{n,w} \leq 55$
Separating SOUs with plantroom, lift shaft, corridor, stairway, lobby or different classification	F5.4(a)(ii)	$R_w + C_{tr} \geq 50$	$L_{n,w} \leq 62$	$L_{n,w} \leq 55$
Separating SOU habitable area with services from another SOU	F5.6(a)(i)	$R_w + C_{tr} \geq 40$		
Separating SOU wet area with services from another SOU	F5.6(a)(ii)	$R_w + C_{tr} \geq 25$		

### \* Discussion of BCA Floor Impact

PKA considers the BCA floor impact sound insulation criteria of  $L_{n,w} \leq 62$  and verification criteria of  $L_{nT,w} \leq 62$  to be of a poor standard which typically results in noise complaints from adjoining occupants.

The Association of Australian Acoustical Consultants (AAAC) in their document *"Guideline of Apartment and Townhouse Acoustic Rating 2010"* rates the BCA impact sound insulation criteria to be a 2 Star Rating.

PKA recommends achieving a AAAC 3 Star Rating of  $L_{n,w} \leq 55$  for impact sound insulation of floors separating SOUs which provides at least an additional 7dB of improvement over the BCA criteria. This upgrade is **not mandatory** but is a consideration for the client to provide a higher acoustic quality development.

### Other BCA Acoustic Issues

The builder must also ensure that the project complies with following BCA acoustic requirements:

#### Chasing of Masonry Elements

The BCA specifically precludes chasing of services into concrete or masonry elements. (Clause 2. (e)(i)).

#### Fixing of Water Supply Pipework

Note Clause 2. (iii) (A) and (B).

A water supply pipe must:

- (A) Only be installed in the cavity of discontinuous construction; and
- (B) In the case of a pipe that serves only one sole occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10mm to the other wall leaf.  
(i.e. the cavity must not be bridged by any pipework)

#### Electrical Outlets

The BCA requires that any electrical outlets must be offset from each other:

- (A) in masonry walling, not less than 100 mm; and
- (B) in timber or steel framed walling, not less than 300 mm

#### Ducts

Ducts serving or passing through more than one SOU per F5.6(a) must be separated from another SOU by masonry or plasterboard construction having a minimum  $R_w + C_{tr}$  of 40 for habitable rooms and  $R_w + C_{tr}$  of 25 for non-habitable rooms.

### 3.6 EPA NSW Interim Construction Noise Guidelines (ICNG)

The *NSW EPA Interim Construction Noise Guideline (ICNG)* is used for the assessment. The document aims at managing noise from construction works regulated by the EPA. Details of noise limits are presented in the following Table 3-6.

**Table 3-6 Noise Levels Residential Receivers (Extract from EPA ICNG)**

Time of day	Management level $L_{Aeq}(15 \text{ min})$	Application
Recommended standard hours:  Monday to Friday 7 am to 6 pm	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 $L_{Aeq}(15 \text{ min})$ 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.
Saturday 8 am to 1 pm  No work on Sundays or public holidays	Highly noise affected 75 dB	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 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 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.

### 3.7 Construction Vibration Criteria

As demolition and excavation are proposed, there is the potential for vibration impact on the neighbouring buildings' amenity and on structures. The EPA ICNG states that human comfort (amenity) vibration is to be measured and assessed in accordance with *Assessing Vibration – a technical guideline* (DECC 2006).

In general, structural damage due to vibration can be of concern when hammering, blasting, vibration rolling, crushing, piling and other vibration inducing construction works are carried out. The EPA ICNG does not have specific structural vibration damage criteria however the RTA Environmental Noise Management Manual (2001) recommends the use of the following Standards:

- British Standard BS 7385: Part 2: Evaluation and Measurement for Vibrations in Buildings – Part 2 Guide to Damage Levels from Ground-Borne Vibration
- AS 2187.2 Explosives-Storage, transport and use, Part 2: Use of Explosives
- German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures



### 3.8 Liquor & Gambling NSW

The development includes the provision of liquor licensing. As such, noise from licensed premises is governed by criteria defined by the Liquor & Gambling NSW. The standard conditions are as follows:

*The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz - 8kHz inclusive) by more than 5dB between 7:00am and 12:00midnight at the boundary of any affected residence.*

*The LA10 noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz - 8kHz inclusive) between 12:00 midnight and 7:00am at the boundary of any affected residence.*

*Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12:00 midnight and 7:00am.*

*Interior noise levels which still exceed safe hearing levels are in no way supported or condoned by the Office of Liquor Gaming and Racing.*

*This is a minimum standard. In some instances, the Board may specify a time earlier than midnight in respect of the above condition.*

*For the purposes of this condition, the LA10 can be taken as the average maximum deflection of the noise emission from the premises.*

### 3.9 Childcare Centres

#### 3.9.1 AAAC Guideline for Child Care Centre Acoustic Assessment – Noise Breakout

##### **Outdoor Play Areas**

**Base Criteria** – With the development of childcare centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed  $L_{eq,15min}$  45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).

**Background Greater Than 40 dB(A)** – The contributed  $L_{eq,15min}$  noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon period should allow an emergence above the background of 10 dB (ie background +10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).

**Up to 4 hours (total) per day** – If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed  $L_{eq,15 minute}$  noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.

**More than 4 hours (total) per day** – If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed  $L_{eq,15 minute}$  noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

### 3.9.2 Traffic Noise Intrusion (Childcare Centres) – EPA Road Noise Policy

The EPA's Road Noise Policy (RNP) provides internal and external noise criteria for childcare facilities due to traffic noise intrusion as follows:

**Figure 3-1 Noise Criteria from the EPA Road Noise Policy**

Existing Sensitive Land Use	Assessment Criteria dB(A)	Additional Consideration
Childcare facilities	<p><b>Sleeping rooms</b>  <math>L_{Aeq,(1\text{ hour})}</math> 35 (internal)</p> <p><b>Indoor play areas</b>  <math>L_{Aeq,(1\text{ hour})}</math> 40 (internal)</p> <p><b>Outdoor play areas</b>  <math>L_{Aeq,(1\text{ hour})}</math> 55 (external)</p>	<p>Multi-purpose spaces, e.g. shared indoor play/sleeping rooms should meet the lower of the respective criteria.</p> <p>Measurements for sleeping rooms should be taken during designated sleeping times of the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.</p>

## 4.0 NOISE SURVEY & PROJECT NOISE GOALS

PKA reviewed the Acoustic Logic prepared report titled “*Stage 1 Kamira Avenue, Villawood*”, (ref. 20210202.1 dated 23<sup>rd</sup> July 2021) provided to PKA. The report details out a noise survey conducted to establish the relevant noise goals for Stage 1 of the development. However, the surveys conducted are relevant and appropriate to establishing the ambient noise levels and project noise goals for Stage 2 of the development as well. The following sections and tables present the measured noise levels and acoustic goals.

### 4.1.1 Mechanical Plant & Other Retail Breakout Noise Goals (Project Trigger Levels)

The table below presents the results of the noise monitor measurements. The noise criteria defined in the *Noise Policy for Industry* (NPfI) is listed below. The assessment periods are defined by the NSW NPfI are Daytime: 7 am to 6 pm, Evening: 6 pm to 10 pm and Night: 10 pm to 7 am.

**Table 4-1 NPfI Project Noise Trigger Levels at Residential Receivers at (R2, R3 & R4)**

All values in dB(A)

Receiver Type	Period	Measured RBL ( $L_{A90\text{-period}}$ )	Acceptable Noise Levels ( $L_{Aeq\text{-period}}$ )	NSW Noise Policy for Industry Criteria		Project Noise Trigger Levels $L_{Aeq15\text{min}}$
				Amenity $L_{Aeq15\text{min}}$	Intrusiveness $L_{Aeq15\text{min}}$	
Residential (Sub-urban)	Day	50	55	53	55	53
	Evening	47	45	43	52	43
	Night	44	40	38	49	38

**Table 4-2 NPfI Project Noise Trigger Levels at Residential Receivers (R1 & R5)**

All values in dB(A)

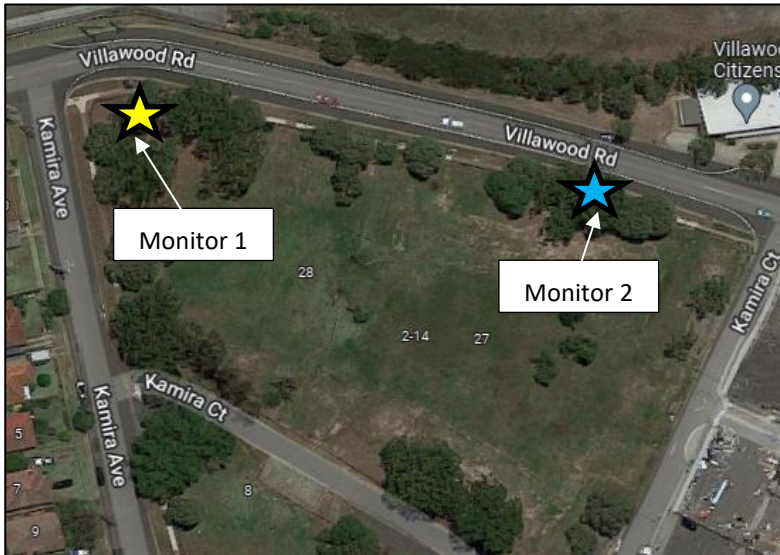
Receiver Type	Period	Measured RBL ( $L_{A90\text{-period}}$ )	Acceptable Noise Levels ( $L_{Aeq\text{-period}}$ )	NSW Noise Policy for Industry Criteria		Project Noise Trigger Levels $L_{Aeq15\text{min}}$
				Amenity $L_{Aeq15\text{min}}$	Intrusiveness $L_{Aeq15\text{min}}$	
Residential (Sub-urban)	Day	48	55	53	53	53
	Evening	47	45	43	52	43
	Night	40	40	38	45	38

Although established separately, the results show that the overall noise goals for mechanical plant, retail and vehicular noise breakout goals (project trigger levels) for all receivers are the same and are primarily driven by the sub-urban amenity acoustic criteria.

#### 4.1.2 Traffic Noise Intrusion & Reduction Required

The noise survey conducted by Acoustic Logic and detailed in their report was based on two unattended noise monitors as shown in the below figure.

**Figure 4-1 Approximate Location of Unattended Traffic/Train Noise Monitors**



**Table 4-3 Traffic Noise Levels Measurements at Location of Noise Monitor**

Noise Monitor Location	Period	Measured Traffic Noise Level at proposed setback
Monitor 1	Day (0700 - 2200) $L_{eq}$ 15hr	60 dB(A)
	Night (2200 - 0700) $L_{eq}$ 9hr	55 dB(A)
Monitor 2	Day (0700 - 2200) $L_{eq}$ 15hr	59 dB(A)
	Night (2200 - 0700) $L_{eq}$ 9hr	52 dB(A)

The values were used to model the noise intrusion to ensure correction to the various facades and levels of the proposed building to estimate the noise reduction required into residential spaces.

#### 4.1.3 Construction Noise Goals

Assuming the construction is proposed during normal daytime working hours 7am to 6 pm, the noise criteria are presented in the following table.

**Table 4-4 EPA NSW Interim Construction Noise Guidelines Criteria for Site**

Receivers	Daytime Background, dB(A)	Noise affected level (Criterion), dB(A)
R2, R3 & R4	50 dB(A)	60 dB(A)
R1 & R5	48 dB(A)	58 dB(A)

The “Highly Noise Affected” criterion has a set level of 75 dB(A).

#### 4.1.4 Childcare Centre Noise Breakout Goals

The following table presents a summary of the project noise goals for the project.

**Table 4-5 Project Noise Goals for Children Noise Breakout to Any Residential Receiver**

Receiver Type	Period	Measured RBL ( $L_{A90}$ )	AAAC Criteria for Play Areas (RBL <40dB(A)) $L_{Aeq15min}$
Residential	Day 7am to 6pm	48 dB(A)	53 dB(A) for more than 4 hours of play  58 dB(A) for up to 4 hours of play

The above noise goals are to assess noise breakout from play areas of the childcare centre. Noise impact from plant and equipment must be assessed in accordance with the NSW Noise Policy for Industry 2017 acoustic criteria in Section 4.1.1 during fit out and availability of a mechanical schedule.



## 5.0 ASSESSMENT

All recommendations must be checked by respective assessing representatives to ensure compliance with other non-acoustic requirements.

### 5.1 External Noise Intrusion

Calculations were performed to estimate the acoustic requirements of the façade and elements as presented below. The upgrades are to mitigate traffic, train and other mechanical plant and equipment noise intrusion into the various spaces within the development.

#### 5.1.1 External Walls

The external wall should have a Weighted Sound Reduction index of **R<sub>w</sub> 40**. This can be achieved with standard construction that satisfy general BCA requirements. External windows and other elements must adhere to the recommendations made in Section 5.1.3.

#### 5.1.2 Roof

The roof should have a Weighted Sound Reduction index of **R<sub>w</sub> 50**. Although not required for traffic or train noise intrusion, PKA recommends this extra upgrade to mitigate potential rooftop plant and equipment. This is typically comprised of concrete construction and will therefore comply readily. Other constructions must be checked appropriately.

#### 5.1.3 Windows/Doors

The minimum R<sub>w</sub> rating for each window will vary from room to room and are shown below. The following table presents the glazing requirements and suitability of each space for natural ventilation. The following recommendations must be checked prior to Construction Certification following the availability of exact dimensions and a detailed glazing schedule.

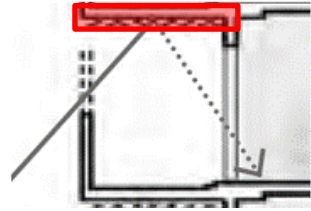
**Table 5-1 Glazing/Door R<sub>w</sub> Requirements**

Elements on Ground Floor, Level 1, Level 2, Level 3	Minimum (R <sub>w</sub> ) Requirement	Indicative Thicknesses (Refer to notes below)
All external doors and windows in A of markup in Section 5.1.3.2	32	6mm lam
All other doors and windows	32 (Recommended but not mandatory for compliance)	6mm lam

The above R<sub>w</sub> ratings recommended are more than the minimum required to comply strictly with the SEPP clause 102 criteria. However, the train line to the north includes freight train activity and the intermittent noise impacts of the additional low frequency is not captured by the average noise levels during the day (L<sub>Aeq-15hr</sub>) and night (L<sub>Aeq-9hr</sub>). Therefore, the above upgraded ratings were recommended to address this. Refer to section 5.1.3.1 for additional details that must be adhered to for ensuring that acoustic compliance is met and retained.

The following table presents passive mitigation options to ensure acoustic windows/doors **directly facing the train line** can remain open to use with natural ventilation requirements where needed. Note that the following table is suitable only for the current development and provided plans and must be checked by an acoustic consultant in case of any future modifications.

**Table 5-2 Upgrades Required for Using Acoustic Rated Windows for Natural Ventilation**

Scenario	Treatment	Detail
Windows/Sliding Doors within a balcony	Lining of the Soffit with weatherproof absorption material of minimum NRC 0.8  (Marked in red in the detail)	Balustrade shielding with soffit insulation absorption 
Windows/Sliding Doors with an operable area <b>less</b> than 4m <sup>2</sup> without a balcony (directly exposed)	No additional treatment required	-
Windows/Sliding Doors with an operable area <b>more</b> than 4m <sup>2</sup> without a balcony (directly exposed)	Other propriety solutions or mechanical ventilation	-

#### 5.1.3.1 Notes for Windows

1. The  $R_w$  rating is required for the complete glazing and frame assembly. The glazing thicknesses will not necessarily meet the required  $R_w$  rating without an appropriate frame system. It will therefore be necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the required values provided above.
2. The entire frame to the glazing must be sealed into the structural opening using acoustic mastics and backer rods. Normal weather proofing details do not necessarily provide the full acoustic insulation potential of the window system. The manufacturers' installation instructions for the correct acoustic sealing of the frame must be followed. The sliding doors and windows should be fitted with proper acoustic seals (e.g. silicon Schlegel Q-Lon seals). **No brush seals.**
3. The above glazing thicknesses assume single glazing. Acoustically, double glazing (in particular DGU units) can have reduced performances where the stated  $R_w$  rating may not result in compliance with the internal noise criteria. If double glazing is recommended for reasons other than acoustics (e.g. thermal, wind loading etc.), the glazing selections must be checked by PKA or a qualified acoustic consultant to determine compliance.
4. It is possible that structural demands for wind loading or fire rating or the like may require more substantial glass and framing assemblies than nominated above. Where this is the case, the acoustic requirements must clearly be superseded by the structural or fire rating demands.
5. The window systems must be tested in accordance with the following:
  - Australian Window Association Industry Code of Practice Window and Door – Method of Acoustic Testing.
  - AS 1191 *Acoustics – Method for laboratory measurement of airborne sound insulation of building elements.*

### 5.1.3.2 Markup for Traffic Noise Intrusion Zones

The markup below presents the various zones used to nominate the recommended acoustic ratings presented above in Table 5-1.

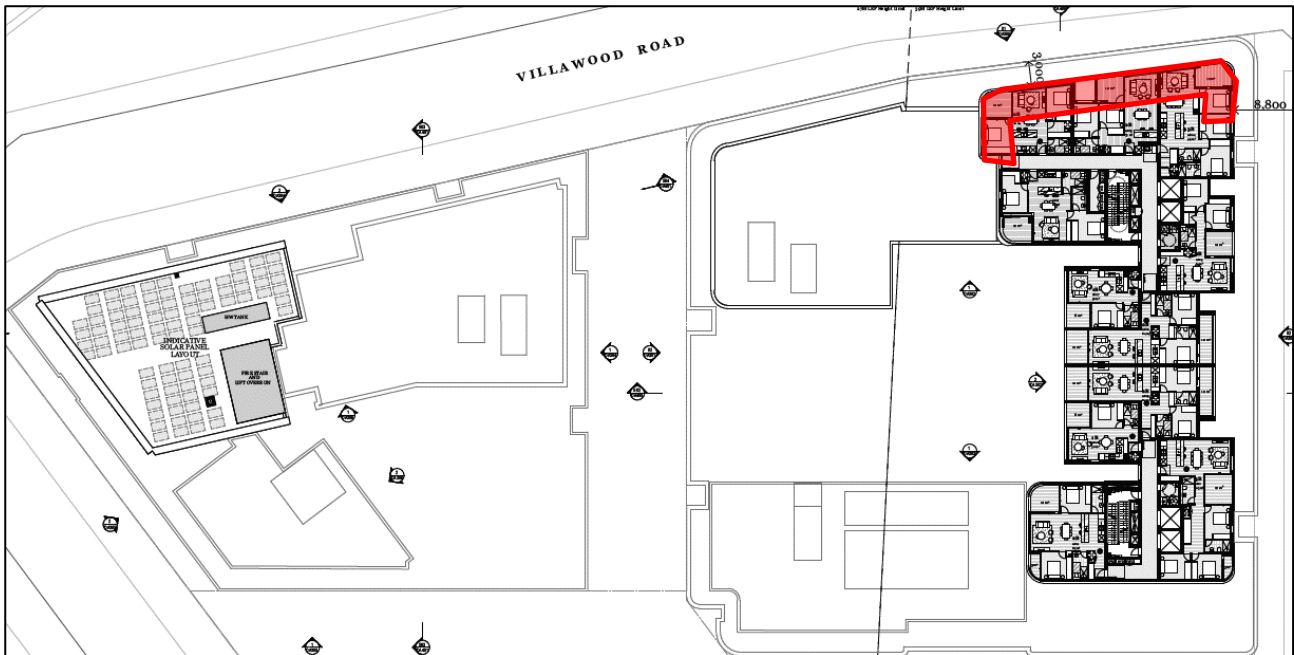
**Figure 5-1 Traffic Intrusion Requirements for Glazing (Level 1&2) – Zone A in Red**



**Figure 5-2 Traffic Intrusion Requirements for Glazing (Level 3,4&5) – Zone A in Red**



**Figure 5-3 Traffic Intrusion Requirements for Glazing (Level 6 to 11) – Zone A in Red**



## 5.2 Vehicular Noise Impact

PKA reviewed the Traffic Impact Assessment report prepared by Traffwise Consultants Pty Ltd, project ref. 2021-7 (28), dated 10<sup>th</sup> April 2022 which provides the following information regarding peak trip generation.

**Table 5-3 Traffic Generation from Premises (Vehicles per hour – vph)**

Development Generated Traffic	In	Out	Total
Weekday AM Peak	122	162	284
Weekday PM Peak	223	183	406

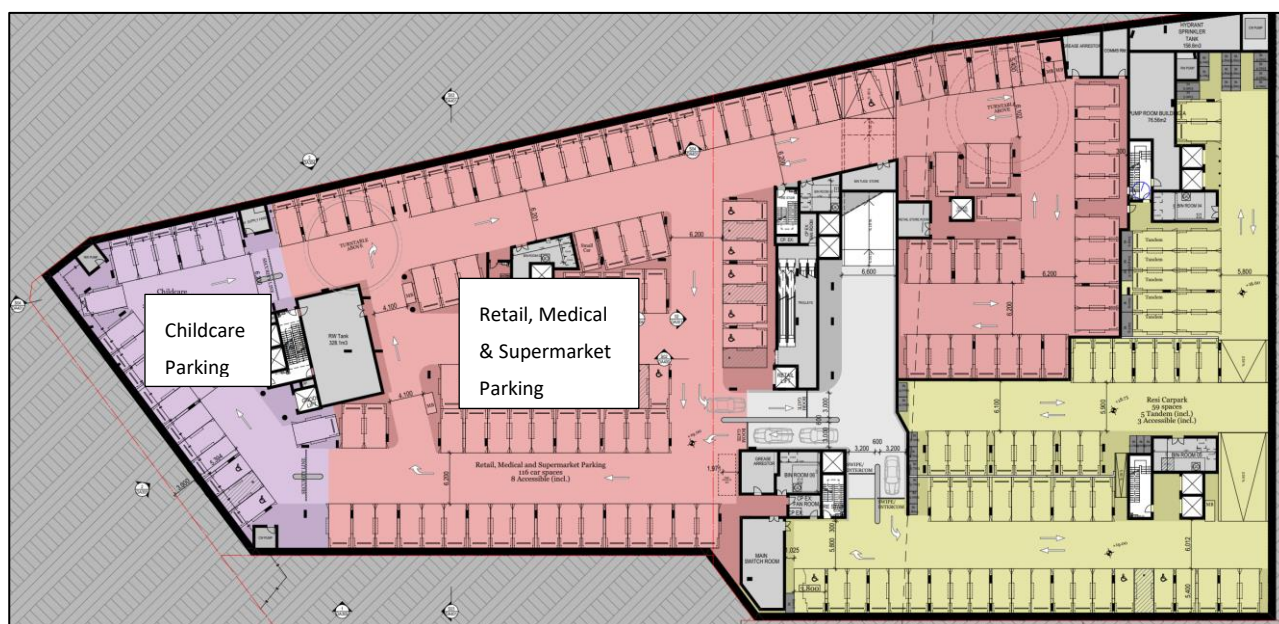
The above table reflects trip generation from the use of the residential basement car parks, supermarket, childcare centres and other commercial retail premises across the entire development. Based on the information, the PM peak hour activity is the busiest period overall. As a worst-case scenario, this results in a consideration of 56 cars entering and 46 cars leaving during the busiest PM 15-minute period. All of the parking activity is in the basement and not exposed to the nearby receivers.



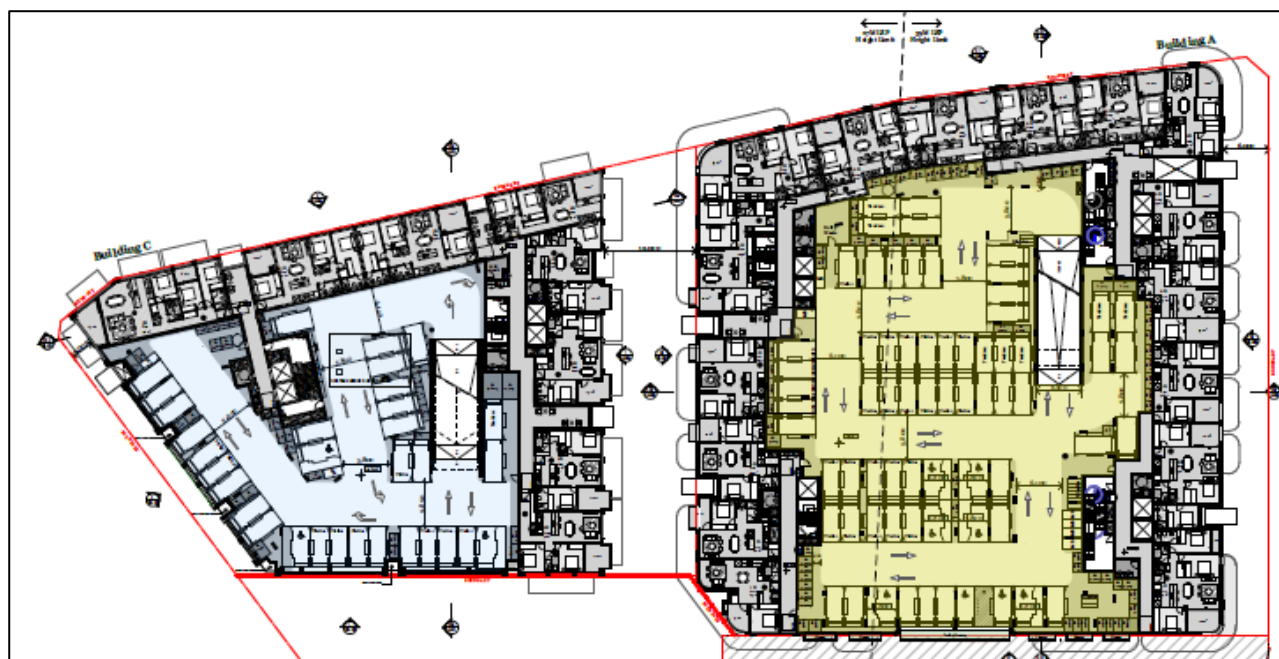
**Table 5-4 Time Frames and Typical Sound Pressure Levels – Carpark Activity**

Event Description	Sound Pressure Levels (10m)	Duration of each Event (Exposure Time to receivers while not on public road)
Car Entering and driving into the car park	61 dB(A)	10 seconds
Cars driving out of the car park	61 dB(A)	10 seconds

**Figure 5-4 Basement Plan with Car Park Layout**



**Figure 5-5 Level 1 & 2 Residential Car Park Layout (Indicative)**





The results of the traffic noise impact from the proposed car park activity during the peak day and night 15 minute period is shown below in Table 5-5 below.

**Table 5-5 Worst-Case Traffic Noise Impact from Car Park Operation**

Calculated Noise Impact to Residential Receivers	NPfI Project Trigger Levels – Noise Criteria ( $L_{eq\ 15min}$ )	Complies?
Calculated Peak Activity $L_{eq15min}$ : 41 dB(A)	Daytime 53 dB(A)  Evening 43 dB(A)	Yes

The proposed use of the car park complies with the established acoustic criteria. No additional mitigation measures will be necessary.

### 5.3 Mechanical Plant & Equipment

- Plant and Equipment selections are generally not available at the DA stage of the development. These are typically available prior to the preparation of Construction Certification documentation. The selection and placement of any outdoor mechanical equipment such as condenser units, exhausts serving car parks and toilets, roller doors for access etc. must be designed to acoustically comply with the criteria established in Section 4.1.1 of this report. This must be checked by an acoustic consultant and the appropriate criteria must be selected depending on the location of the equipment and the positioning of the residential receiver's boundary from the main road (to check if shielded from traffic noise).
- Mechanical plant located on the rooftop will likely require acoustic screening. An assessment must be performed to ensure that any plant on the lower rooftop of one building doesn't affect any apartments in the other building overlooking the rooftop plant on the lower levels.
- In addition to screening, low setback and night-modes may have to be considered for the individual units in cases where exceedances are observed with the acoustic criteria established.
- All equipment serving the retail and the supermarket premises (even if located internally) must be assessed to ensure that the levels and positioning of the equipment does not affect residential receivers both externally and apartments within the building. The equipment must be isolated to ensure that structure-borne noise transfer within the building is mitigated to level to comply with the indoor design levels recommended for residential premises in accordance with the AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors.
- The above compliance with the AS2107 recommended levels are applicable for the selections of the turntable in the basement level. Care must be taken to ensure structure-borne isolation of the turntable to the building to prevent noise transfer to the residential units above.
- Plant rooms and shafts must comply with the BCA Part F5 requirements detailed in Section 3.5.

## 6.0 RECOMMENDATIONS

### 1. Traffic/Rail and other External Noise Intrusion

The development must consider the acoustic mitigation measures detailed in Section 5.1 of this report to ensure compliance with the SEPP Infrastructure Traffic & Rail Noise Intrusion and internal noise goals from other external noise intrusion.

### 2. BCA Part F5 Sound Insulation Requirements

All walls and floors separating sole occupancy units must comply with the construction ratings listed in Section 3.5 of this report.

### 3. Mechanical Noise Mitigation

The selection and placement of any outdoor mechanical equipment such as condenser units, exhausts serving car parks and toilets, roller doors for access etc. must be designed to acoustically comply with the criteria established in Section 4.1.1 of this report. In addition, comments made in Section 5.3 must be considered during the detailed design stages of preparing the mechanical plans.

### 4. Construction Noise & Vibration

If the preparation of a Construction Noise & Vibration Management Plan is required by the certifying authority, the noise criteria established in Sections 3.6, 3.7 and 4.1.3 must be considered.

### 5. Childcare Centres

Prior to the occupation of the childcare centre, the noise impact must be assessed as per Sections 3.9 and 4.1.4. All plant and equipment serving this area must be addressed as per item 3 above. The assessment must be based on the proposed operational management plan for the use of the space.

### 6. Other Commercial & Retail

Depending on the purpose of use of each retail and commercial space, the walls (and floor where applicable) must be acoustically upgraded to ensure suitability for the adjacent tenancy. PKA recommends that at a minimum, the walls separating different commercial tenancies be upgraded to a  $R_w$  55 construction. Higher performance may be required if the spaces are proposed to be used for activities such as dance studios, high impact training, gyms etc. For any of the restaurants and café that are proposed, a separate acoustic assessment has to be conducted in accordance with the acoustic requirements of the Liquor & Gambling NSW (criteria listed in Section 3.8).

## APPENDIX A DRAWINGS USED TO PREPARE REPORT

This report was prepared using drawings provided by DKO Architecture (NSW) Pty Ltd, Project No. 00012870.

No.	Rev.	Title	Date
DA000	A	Cover Page	14-04-2022
DA001	A	Development summary	14-04-2022
DA002	A	Car Parking Summary	14-04-2022
DA100	A	Site Analysis Plan	14-04-2022
DA102	A	Existing Trees Site Analysis	14-04-2022
DA103	A	Demolition Plan	14-04-2022
DA104	A	Staging Plan	14-04-2022
DA105	A	Proposed site Plan	14-04-2022
DA200	A	Basement Plan	14-04-2022
DA201	A	Ground Floor Plan	14-04-2022
DA202	A	Level 1 Plan	14-04-2022
DA203	A	Level 2 Plan	14-04-2022
DA204	A	Level 3 Plan	14-04-2022
DA205	A	Level 4 Plan	14-04-2022
DA206	A	Level 5&6 Typical Plan	14-04-2022
DA207	A	Level 7 Plan	14-04-2022
DA208	A	Level 8 -10Plan	14-04-2022
DA209	A	Roof Plan	14-04-2022
DA300	A	N & E Elevations Building A	14-04-2022
DA301	A	S & W Elevations Building A	14-04-2022
DA302	A	N & E Internal Elevation Building A	14-04-2022
DA303	A	S Internal Elevation Building A	14-04-2022
DA304	A	N & E Elevation Building C	14-04-2022
DA305	A	S & W Elevation Building C	14-04-2022
DA306	A	N & E Internal Elevation	14-04-2022



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