Sydney Metro

# Sydney Metro - 52 McLaren Street, North Sydney
# Acoustic Assessment

July 2022

# Table of contents



# Table index

# Figure index

# Glossary

| Term | Definition |
|---|---|
| dB | Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. |
| dB(A) | Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies. |
| $L_{Aeq(period)}$ | Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. |
| $L_{A90(period)}$ | The sound pressure level that is exceeded for 90 per cent of the measurement period. |
| $L_{Aeq(15hr)}$ | The $L_{Aeq}$ noise level for the period 7:00 to 22:00 hours. |
| $L_{Aeq(9hr)}$ | The $L_{Aeq}$ noise level for the period 22:00 to 7:00 hours. |
| $L_{Amax}$ | The maximum A-weighted sound pressure level occurring in a specified time period. |
| Noise sensitive receiver | A noise modelling term used to describe a map reference point where noise is predicted. They consist of areas or places potentially affected by noise or vibration including:<br>• a residential dwelling<br>• an educational institution, library, childcare centre or kindergarten<br>• a hospital, surgery or other medical institution<br>• an active (for example sports field, golf course) or passive (for example national park) recreational area<br>• commercial or industrial premises<br>• a place of worship. |
| Rating background level | The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. |
| Tonality | Noise containing a prominent frequency or frequencies characterised by definite pitch. |
| Vibration | The variation of the magnitude of a quantity which is descriptive of the motion or position of a mechanical system, when the magnitude is alternately greater and smaller than some average value or reference. Vibration can be measured in terms of its displacement, velocity or acceleration. The common units for velocity are millimetres per second (mm/s). |

# 1. Introduction

## 1.1 Overview

This Acoustic Assessment has been prepared by GHD Pty Ltd to support the proposed development at 52 McLaren Street, North Sydney. The subject site is adjacent the site of the northern entrance portal of the future Sydney Metro Victoria Cross Station. The proposed development consists of a mixed-use building, 24 storeys in height at the southern end of the site, and 8 storeys in height at the northern end. The residential uses are located at floors 3 to 23 inclusive, with commercial uses at floors 1 and 2. The scheme also includes retail floorspace, and an opportunity for the provision of a 900 sqm childcare centre at ground level, as well as a through-site link to Elliot Street. Parking is provided over 3 basement levels beneath the building.

## 1.2 Scope of works

GHD has undertaken the following works as part of this acoustic assessment:

- Undertake a desktop study to gain understanding of the local area, location of the development in relation to the noise generating sources (road and rail) and any other factors that may contribute to the noise assessment
- Review relevant policies and guidance documents, as listed in Section 4.1
- Discuss ground borne rail noise and vibration impacts from the Sydney Metro as detailed in Chapter 11 (Operational Noise and Vibration) of the Sydney Metro Chatswood to Sydenham Environmental Impact Statement (EIS) and Appendix E (Noise and Vibration Technical Information) of the Sydney Metro Chatswood to Sydenham Submissions and Preferred Infrastructure Report
- Discuss airborne noise impacts from existing noise monitoring information provided in Appendix N (Noise and Vibration Impact Assessment Report) of the Victoria Cross Over Station Development EIS
- Provide in principal acoustic treatment to comply with the internal noise goals specified by North Sydney Council DCP
- Provide high level acoustic information regarding mitigation of noise emission from commercial and residential developments
- Based on the information provided in the EIS, discuss the likely vibration impacts on the proposed sensitive receivers adjacent to the rail line, including residential, non-residential and open space areas
- Determine relevant noise emission criteria based on the requirements of the North Sydney Council DCP and information detailed in the Victoria Cross Over Station Development EIS

## 1.3 Assumptions and limitations

The following assumptions were made as part of this study:

- This report and assessment for the proposed development is based on the preliminary architectural drawings produced by GHD Woodhead
- This report and assessment relies on information provided in the following documents:
  - Chapter 11 (Operational Noise and Vibration) of the Sydney Metro Chatswood to Sydenham Environmental Impact Statement (EIS)

– Appendix E (Noise and Vibration Technical Information) of the Sydney Metro Chatswood to Sydenham Submissions and Preferred Infrastructure Report
– Appendix N (Noise and Vibration Impact Assessment Report) of the Victoria Cross Over Station Development EIS

# 2. Project description

## 2.1 Site location and proposed development

### 2.1.1 Proposed development summary

The proposal is for a mixed-use building, 24 storeys in height at the southern end of the site, and 8 storeys in height at the northern end. The residential uses are located at floors 3 to 23 inclusive, with commercial uses at floors 1 and 2. The scheme also includes retail floorspace, and an opportunity for the provision of a 900 sqm childcare centre at ground level, as well as a through-site link to Elliot Street. Parking is provided over 3 basement levels beneath the building. A summary of the proposed development is provided in Table 2-1.

Figure 2-1 Visualisation of the proposal viewed from the south-east

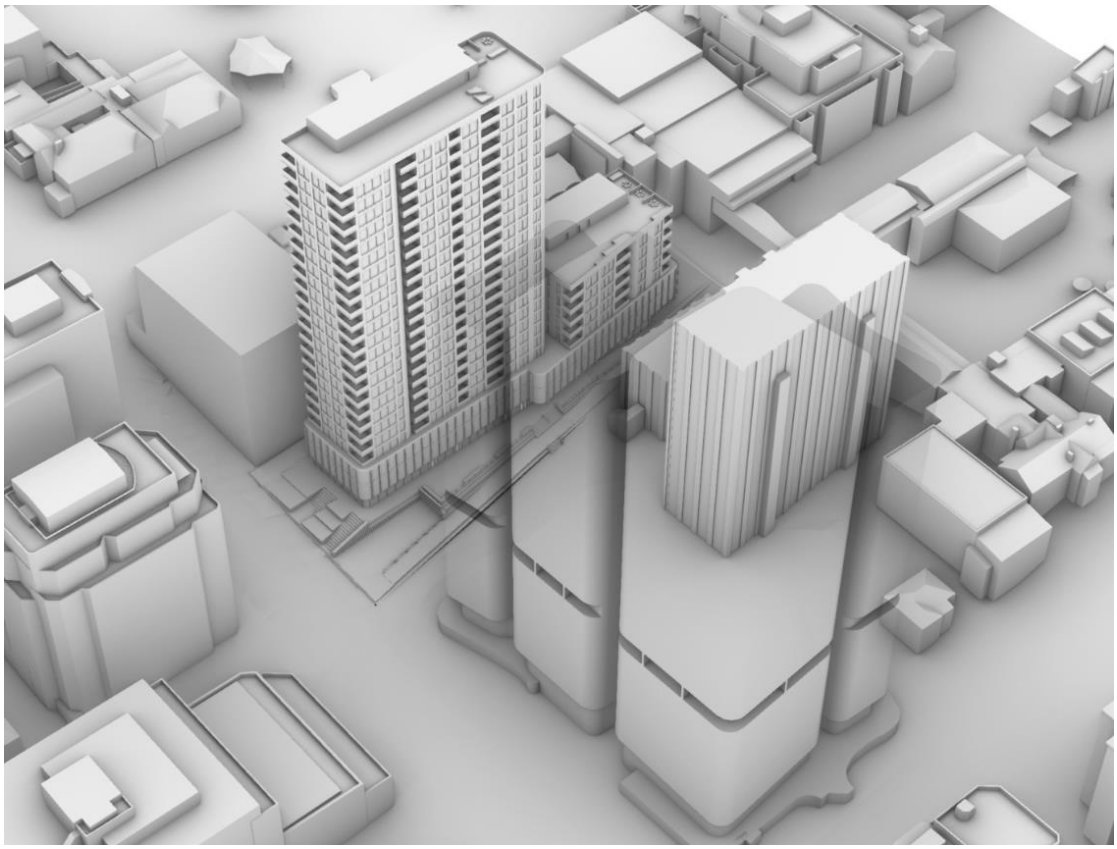


Table 2-1 Proposed development key features

| Component | Proposed use breakdown |
|---|---|
| Residential | Studio: 21 dwellings<br>1 bed: 63 dwellings<br>2 bed: 62 dwellings<br>3 bed: 26 dwellings<br>**Total: 172 dwellings** |
| Commercial office | 2,573 $m^2$ GFA |
| Retail | 427 $m^2$ GFA |
| Childcare | 460 $m^2$ GFA (internal)<br>450 $m^2$ (external amenity) |
| Car Parking | Residential:<br>• 104 (including 34 accessible spaces) |

| Component | Proposed use breakdown |
|---|---|
| | Residential Visitors:<br>• No residential visitor parking provision, in line with North Council DCP |
| | Childcare:<br>• 2 x all-day designated car spaces for staff (Health and Work Safety requirement)<br>• 4 x additional car spaces (including 1 accessible) for drop off during the hours of 7:30 am-9:30 am and pick-up between 4:00 pm and 6:00 pm (10-minute parking limit) |
| | Retail/Commercial:<br>• 7 spaces (including 1 accessible space). |
| | Car Share:<br>• 4 spaces. |
| | **Total**: 121 |
| Motorcycle Parking | • 12 spaces |

# 3. Existing environment

During the EIS phase for the Sydney Metro project, extensive background noise monitoring was undertaken to determine the existing acoustic environment and establish the relevant noise criteria. The monitoring applicable to this project was undertaken in September 2015 prior to works commencing on the Sydney Metro project, and as such, the acoustic environment may have changed since the monitoring was done. However, due to significant construction work on both the Sydney Metro site and other surrounding developments, further noise monitoring was not able to be undertaken at this time.

As such, the noise monitoring from the EIS has been used at this stage to determine quantify the existing noise environment. Further noise monitoring should be undertaken as part of a detailed development application to determine the acoustic environment following completion of the Sydney Metro project.

## 3.1 Sydney Metro Chatswood to Sydenham EIS – Technical Paper 2: Noise and Vibration

The Noise and Vibration Technical Paper prepared for the Sydney Metro Chatswood to Sydenham Environmental Impact Statement (EIS) was prepared by Jacobs Group (Australia) Pty Ltd on 28 April 2016. An updated noise assessment was undertaken as part of Modification 1.

As part of the Noise and Vibration Technical Paper, long term unattended noise monitoring was undertaken at 25 representative locations across the proposed project area. One of these locations was 237 Miller Street, North Sydney, which is directly south of 52 McLaren Street and considered representative of the development site for this project.

Details of this noise monitoring are provided below in Table 3-1.

Table 3-1 Noise monitoring results, dBA

| Location ID from EIS | Address | Rating background level, RBL $L_{A90(period)}$ | | | Ambient noise levels, $L_{Aeq(period)}$ | | |
|---|---|---|---|---|---|---|---|
| | | Day | Evening | Night | Day | Evening | Night |
| B.18 | 237 Miller Street, North Sydney | 65 | 57 | 51 | 74 | 71 | 66 |

Attended monitoring was also undertaken at 237 Miller Street, to characterise the noise sources in the area. Results of these are presented in Table 3-2.

Modification 1 Submissions Report outlines the change in use for 52 McLaren Street, from Metro to potential future redevelopment.

Based on information provided in both reports, the plant and equipment will be designed to achieve compliance with the noise criterion of 56 dBA through appropriate noise attenuation measures such as equipment selection, location and attenuation.

Table 3-2 Noise monitoring results, dBA

| Location | Date / time | Details | Measured noise level, dB(A) | |
|---|---|---|---|---|
| | | | Day | Evening |
| 237 Miller Street, North Sydney | 15 September 2015 9:53 am -Day | Traffic along Miller Street and McLaren Street dominant. Tree rustling (wind) contributed to the $L_{A90}$. Constant “City hum” was observed | 72 | 59 |

## 3.2 Sensitive receivers

The site is located within the North Sydney Council Local Government Area (LGA) and consists of LOT 2 in DP218407, located at 52 McLaren Street, North Sydney.

The site is located within a B4 Mixed Use area. The sensitive land uses surrounding the site, along with the zoning and relative location is provided in Table 3-3: The sites listed are relevant to the assessment of noise from the development.

Table 3-3 Sensitive land uses surrounding site

| Site | Direction / approximate distance | Planning zone |
|---|---|---|
| Mixed use (commercial and residential) | All direction directly adjacent | B4 Mixed Use |
| Rydges Hotel | East – adjacent | B4 Mixed Use |
| Quest Hotel North Sydney | South – 100 metres | B4 Mixed Use |
| Wenona School | North-east – 20 metres | SP2 Infrastructure |

| | | |
|---|---|---|
| North Sydney Council Chambers | West – 60 metres | SP2 Infrastructure |
| St Thomas Anglican Church | West – 180 metres | SP2 Infrastructure |
| Monte Sant Angelo College | South-west – 150 metres | SP2 Infrastructure |
| Residential | North – 100 metres | R2 Low Density |
| Residential | West – 100 metres | R3 Medium density |
| Residential | East – 110 metres | R4 High Density |
| Ted Mack Civic Park | North-west – 65 metres | RE1 Public Recreation |
| North Sydney Stanton Library | North-west – 100 metres | SP2 Infrastructure |

The site location is shown in Figure 3-. The circle around the site represents a 200-metre study area for the noise emission study. Noise generated at the site is not anticipated to exceed the relevant noise emission criteria outside this study area.

The background levels from the noise monitoring detailed above would be appropriate for sensitive residential receivers surrounding the site, as the acoustic environment would not be expected to be too dissimilar within the study area.


Figure 3-1 Site location

*Source: https://www.planningportal.nsw.gov.au/spatialviewer – Modified by GHD*

# 4. Noise and vibration criteria

## 4.1 Legislative and policy context to the assessment

This section outlines the relevant noise and vibration criteria for the proposed mixed-use development at 52 McLaren Street, North Sydney. These are divided into the following sections:

- Noise impacts on the proposed development from surrounding noise generating sources
- Rail vibration impacts on the proposed development
- Noise emission from the proposed development on surrounding sensitive receivers

For the purpose of assessing noise and vibration from state infrastructure the following assessment procedures and guidelines have been considered:

- North Sydney Council Local Environment Plan (LEP) 2013 and Development Control Plan (DCP) 2013
- NSW Government State Environment Planning Policy (Infrastructure) 2007
- Department of Planning - Development near rail corridors and busy roads - Interim Guideline (December 2008)
- Noise Policy for Industry (EPA 2017)
- Part F5 Building Code of Australia (BCA) (Australian Building Codes Board, 2019)
- Protection of the Environment Operations Act 1997 (POEO Act)
- Protection of the Environment Operations (Noise Control) Regulation
- State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017

Guidance has also been taken from the following guidelines to assist in the adoption of suitable noise criteria:

- Department of Environment, Climate Change and Water (DECCW) NSW Road Noise Policy (March 2011)
- Noise Guide for Local Government (EPA 2013)
- Rail Infrastructure Noise Guideline (EPA 2013)
- Australian Standard 3671:1989 Acoustics – Road traffic noise intrusion – Building siting and construction
- Australian Standard AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors
- Assessing Vibration – a Technical Guideline (DEC 2006)
- Guideline for Child Care Centre Acoustic Assessment (Association of Australasian Acoustical Consultants, 2020)

## 4.2 Noise impacts on the proposed development

### 4.2.1 North Sydney Council Development Control Plan (DCP) 2013,

***Part B (Development Controls), Section 2 – Commercial and Mixed Used Developments***

Section 2.3.9 of Part B (Development Controls) of the North Sydney Development Control Plan (DCP) 2017 details acoustic privacy requirements for the residential component of any mixed-use development. This is provided for reference below.

***2.3.9 Acoustic privacy***

***Objective***

***O1*** *To ensure all residents within mixed use developments are provided with a reasonable level of acoustic privacy.*

***Control***

***P1*** *This subsection only applies to the residential component of any mixed use development.*

***P2*** *New dwellings shall be designed and constructed to comply with the criteria specified in Table B-2.6 for all noise intrusion from external noise sources (including mechanical services noise from within the development itself), with windows and doors closed:*

| *TABLE B-2.6: Acoustic Amenity* | | |
|---|---|---|
| *Internal space* | *Time period* | *Max 1 hr noise level ($L_{Aeq, 1\ hour}$)* |
| *Living areas* | *Day or Night* | *≤ 40 dBA* |
| *Sleeping areas* | *Day or Night* | *≤ 35 dBA* |

*Notes: Readings are to be $L_{Aeq\ (1hour)}$, when measured during the noisiest 1 hour period between Day 7 am to 10 pm; and Night – 10 pm to 7 am.*

***P3*** *Where multiple dwellings are provided within the same building, the residential components of the building shall be designed and constructed to comply with the requirements in Table B-2.7 regarding acoustic insulation of walls and floors.*

| *TABLE B-2.7: Acoustic transmission* | |
|---|---|
| *Item* | *Criteria* |
| *Field Sound Reduction Index R'w of walls floors services and ducts* | *BCA as Amended,*<br>*Except that Field Noise Reduction Index of all inter-tenancy walls shall be designed to achieve ≥ $R'_w$ 55 and the intent of the BCA requirements.* |
| *Field Sound reduction Index R'w of doors* | *Any door (including the effects of its frame and any edge gaps) in a wall between a dwelling and a stairwell or other internal common area shall be designed to achieve an ≥ $R'_w$ 28* |
| *Impact Isolation of Floors* | *Where the floor of a dwelling separates a habitable room of one dwelling and a habitable room, bathroom, toilet, laundry,* |

| | |
|---|---|
| | *kitchen, plant room, stairway, public corridor, hallway and the like of a separate tenancy, the floor shall be designed to achieve a weighted standardised impact sound pressure level, $L_{n'tw}$ not more than 55 dB.* |

***P4*** *An acoustic report prepared by a certified acoustic consultant must be submitted with all development applications which involves the construction of 4 or more new dwellings and must address the requirements to P2.*

***P5*** *Buildings are to be designed and rooms positioned to reduce noise transmission within and between dwellings.*

***P6*** *Bedrooms should be designed so that wardrobes provide additional sound buffering between rooms within the dwelling or between adjoining dwellings over and above the requirements in P3 above.*

***P7*** *Windows and doors should be located away from external noise sources, or buffers used where separation cannot be achieved.*

***P8*** *Materials with low noise penetration properties should be used where practical.*

***P9*** *Locate bedrooms and private open spaces away from noise sources such as garages, driveways, mechanical equipment and recreation areas.*

***P10*** *Mechanical equipment, such as pumps, lifts or air conditioners should not be located adjacent to bedrooms or living rooms of dwellings within the development or on adjoining properties.*

***P11*** *Where dwellings are located on busy roads incorporate the following into the design of the development to reduce traffic noise within the dwelling:*

*(a) cavity brick walls;*

*(b) double glazing;*

*(c) solid core doors;*

*(d) concrete floors; and*

*(e) recessed balconies.*

***P12*** *Development comprising places of public worship, hospitals, educational facilities or child care centres or containing residential uses on land which is on or is within 100m of a railway corridor, a road corridor for a freeway, a tollway, a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RMS) must consider the requirements of the DoP's Development Near Rail Corridors and Busy Roads – Interim Guideline (19 December 2008) in accordance with cl.87(2) and cl.102(2) of SEPP (Infrastructure) 2007. An acoustic report may be required to be prepared to demonstrate compliance with this Guideline and the acoustic requirements within cl.87(3) and cl.102(3) of the SEPP (Infrastructure) 2007.*

***P13*** *Where possible, avoid the use high brick fences on busy roads. High fences present a harsh and bland appearance to the street, obstruct views from the footpath to gardens and dwelling entries, reduce amenity for pedestrians and reduce casual surveillance of the street. Try to reduce acoustic impacts through other acoustic reduction measures.*

### 4.2.2 State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)

Clause P12 of the North Sydney Council DCP requires a development within 100 metres of a *railway corridor, a road corridor for a freeway, a tollway, a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles* must consider the requirements of *Development Near Rail Corridors and Busy Roads – Interim Guideline* in accordance with Clauses 87 and 102 of *SEPP (Infrastructure) 2007.*

#### *Clause 87 (Rail Corridors)*

The construction of noise sensitive developments such as residential dwellings, churches, hospitals and schools that is on land in or immediately adjacent to a rail corridor triggers the requirement to consider noise mitigation measures under the ISEPP where specific internal noise levels for internal areas should be achieved.

Due to the location of the site in relation to the rail line, Clause 87 of the iSEPP is applicable to this development. While this is a cause for consideration, due to the metro being underground , airborne noise impacts are unlikely to arise. Potential ground-borne noise and vibration impacts are discussed in Section 5.3.

#### *Clause 102 (Road Corridors)*

Construction of noise sensitive developments such as residential dwellings, churches, hospitals and schools on land in or adjacent to the road corridor may trigger the need to consider noise mitigation measures under the ISEPP. Dwellings must meet specific internal noise levels for habitable rooms such as bedrooms and other living area.

The proposed development site is not within 100 metres of *road corridor for a freeway, a tollway, a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles,* therefore an assessment of noise impacts in accordance with Clauses 87 and 102 of *SEPP (Infrastructure) 2007* is note required.

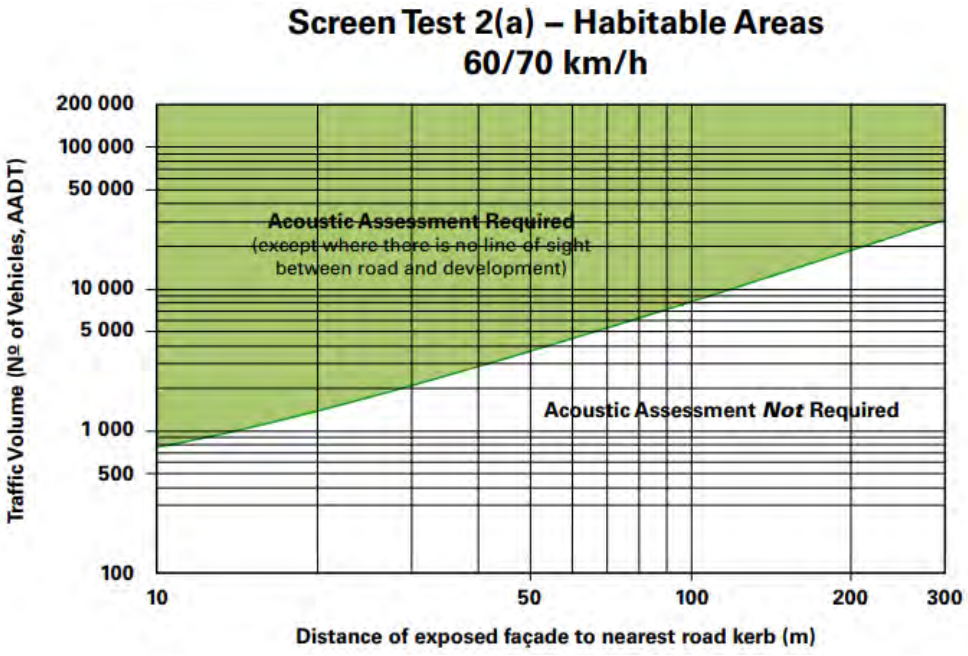
### 4.2.3 Development Near Rail Corridors and Busy Roads – Interim Guideline

The Development Near Rail Corridors and Busy Roads Interim Guideline (Department of Planning, 2008) is a document prepared by the Department of Planning to assist in reducing the health impacts of rail and road noise on sensitive adjacent developments. The Infrastructure SEPP refers to the guidelines which must be taken into account where development is proposed in, or adjacent to, specific roads and railway corridors under clauses 87 and 102.

While the development does not technically require an assessment of road traffic noise impacts due to the distance from the major roads, the noise levels at the site are dominated by road traffic in the area, in particularly from the Warringah Freeway, The Pacific Highway, and Miller Street. This guideline provides guidance related to noise control measures and acoustic treatments to reduce noise levels into sensitive areas of residential developments.

The screen tests in Figure 4-1 is for residential flat buildings and other sensitive developments near busy roads. The tests take into account the volume of traffic and the distance between the proposed development and the road. The screen test should be conducted to establish whether or not an acoustic assessment is required. If an acoustic assessment is necessary, then the noise control treatment required should be determined by a qualified acoustic engineer.

Figure 4-1 Acoustic assessment zone – road noise




### *Road and rail traffic noise to non-residential land uses*

Guidance has been taken from the NSW Road Noise Policy (RNP) and the Rail Infrastructure Noise Guideline (RING) to determine suitable noise target levels to assess road and rail traffic noise to non-residential land uses that are not covered by the Development Near Rail Corridors and Busy Roads Interim Guideline. These noise target levels should be used as a guide and not as limits as the RNP and RING are used to assess new road and rail infrastructure and not for new land use developments. Where noise levels exceed these target levels, feasible and reasonable mitigation should be considered to reduce the noise levels.

The lower (more-stringent) of the criteria within the RNP and the RING have been adopted and are summarised in Table 4-1.

Table 4-1 Noise criteria for non-residential land uses

| Non-residential sensitive land use | Assessment noise target levels | |
|---|---|---|
| | Day (7 am to 10 pm) | Night (10 pm to 7 am) |
| Child care facilities | Sleeping rooms $L_{Aeq(1\ hour)}$ 35 (internal) | - |
| | Indoor play areas $L_{Aeq(1\ hour)}$ 40 (internal) | |
| | Outdoor play areas $L_{Aeq(1\ hour)}$ 55 (external) | |

Section 3.8 of the Development Near Rail Corridors and Busy Roads Interim Guideline provides generic advice for avoiding airborne noise and vibration impacts by good design, including:

- Assess potential noise and vibration impacts during master planning / concept planning stage
- Increasing separation between buildings and road/rail noise sources
- Building location, design orientation and room layout

- Locating habitable areas as far away from road/rail noise sources, where possible
- Less sensitive rooms (laundries, bathrooms, corridors etc.) should be placed on the noisy side of the building
- Using non-sensitive or less noise-sensitive buildings as noise shields
- Using ground-level podiums to increase acoustic shielding
- Using balconies with solid balustrades to reduce noise entering the interior of the building
- Where space allows, use noise barriers to reduce traffic noise
- Building treatments (walls, windows, doors, roofs)
- Design to minimise adverse vibration and ground-borne noise impacts

Residential apartment developments also need to meet the requirements set out in SEPP 65, which includes a suite of nine design quality principles, including Principle 6: Amenity. The NSW Apartment Design Guide (Department of Planning and Environment, 2005) provides detail on how residential development proposals can meet these principles (including acoustic amenity) through good design and planning practice.

SEPP 65 development in locations adjacent to rail corridors and busy roads must have regard to the *Development near rail corridors and busy roads Interim Guideline*.

### 4.2.4 State Environmental Planning Policy (SEPP) No 65 – Design Quality of Residential Apartment Development

The main aims, objectives and principals of SEPP 65 related to acoustic are as follows:

- to improve the design quality of residential apartment development in New South Wales
- the design quality of residential apartment development is of significance for environmental planning for the State due to the economic, environmental, cultural and social benefits of high quality design
- **Principle 6: Amenity**
  - Good design positively influences internal and external amenity for residents and neighbours. Achieving good amenity contributes to positive living environments and resident well being.
  - Good amenity combines appropriate room dimensions and shapes, access to sunlight, natural ventilation, outlook, visual and acoustic privacy, storage, indoor and outdoor space, efficient layouts and service areas and ease of access for all age groups and degrees of mobility.

The Apartment Design Guide, prepared by NSW Planning and Environment in 2015, explains how to apply SEPP 65's design principles to the design of new apartments, as detailed below.

### 4.2.5 Apartment Design Guide (NSW Planning and Environment, 2015)

The NSW Planning and Environment's *Apartment Design Guide* provides information related to design and layout of apartments, including acoustic issues. These are reproduced below.

Table 4-2 Objective 4H-1 (Apartment Design Guide)

| Objective 4H-1<br>Noise transfer is minimised through the siting of buildings and building layout |
|---|
| ***Design guidance*** |
| Adequate building separation is provided within the development and from neighbouring buildings/adjacent uses (see also section 2F Building separation and section 3F Visual privacy) |
| Window and door openings are generally orientated away from noise sources |
| Noisy areas within buildings including building entries and corridors should be located next to or above each other and quieter areas next to or above quieter areas |
| Storage, circulation areas and non-habitable rooms should be located to buffer noise from external sources |
| The number of party walls (walls shared with other apartments) are limited and are appropriately insulated |
| Noise sources such as garage doors, driveways, service areas, plant rooms, building services, mechanical equipment, active communal open spaces and circulation areas should be located at least 3m away from bedrooms |

Table 4-3 Objective 4H-2 (Apartment Design Guide)

| Objective 4H-2<br>Noise impacts are mitigated within apartments through layout and acoustic treatments |
|---|
| ***Design guidance*** |
| Internal apartment layout separates noisy spaces from quiet spaces, using a number of the following design solutions:<br>• rooms with similar noise requirements are grouped together<br>• doors separate different use zones<br>• wardrobes in bedrooms are co-located to act as sound buffers |
| Where physical separation cannot be achieved noise conflicts are resolved using the following design solutions:<br>• double or acoustic glazing<br>• acoustic seals<br>• use of materials with low noise penetration properties<br>• continuous walls to ground level courtyards where they do not conflict with streetscape or other amenity requirements |

For properties located high generating noise sources such as road, rail or aircraft traffic, the following design guidance is provided.

Table 4-4 Objective 4J-1 (Apartment Design Guide)

| Objective 4J-1<br>In noisy or hostile environments the impacts of external noise and pollution are minimised through the careful siting and layout of buildings |
|---|
| ***Design guidance*** |
| To minimise impacts the following design solutions may be used:<br>• physical separation between buildings and the noise or pollution source<br>• residential uses are located perpendicular to the noise source and where possible buffered by other uses<br>• non-residential buildings are sited to be parallel with the noise source to provide a continuous building that shields residential uses and communal open spaces<br>• non-residential uses are located at lower levels vertically separating the residential component from the noise or pollution source. Setbacks to the underside of residential floor levels should increase relative to traffic volumes and other noise sources<br>• buildings should respond to both solar access and noise. Where solar access is away from the noise source, non-habitable rooms can provide a buffer<br>• where solar access is in the same direction as the noise source, dual aspect apartments with shallow building depths are preferable (see figure 4J.4)<br>• landscape design reduces the perception of noise and acts as a filter for air pollution generated by traffic and industry |
| Achieving the design criteria in this Apartment Design Guide may not be possible in some situations due to noise and pollution. Where developments are unable to achieve the design criteria, alternatives may be considered in the following areas:<br>• solar and daylight access<br>• private open space and balconies<br>• natural cross ventilation |

Table 4-5 Objective 4J-2 (Apartment Design Guide)

| Objective 4J-2<br>Appropriate noise shielding or attenuation techniques for the building design, construction and choice of materials are used to mitigate noise transmission |
|---|
| ***Design guidance*** |
| Design solutions to mitigate noise include:<br>• limiting the number and size of openings facing noise sources<br>• providing seals to prevent noise transfer through gaps<br>• using double or acoustic glazing, acoustic louvres or enclosed balconies (wintergardens)<br>• using materials with mass and/or sound insulation or absorption properties e.g. solid balcony balustrades, external screens and soffits |

### 4.2.1 Building Code of Australia (BCA)

Clause P3 and Table B-2.7 of the North Sydney Council DCP provides requirements for acoustic transmission between residential components within a multi-dwelling development. This includes requirements of the BCA, along with some additional requirements.

The BCA is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia whilst allowing for variations in climate and geological or geographic conditions.

The BCA provides requirements with regards to the transmission of airborne and structure-borne noise through floors, walls and services. The BCA Part F5 performance requirements from the intertenancy walls and floors for the residential Sole Occupancy Units (SOUs) have been summarised in Table 4-6.

Table 4-6 Summary of the BCA Part F5 acoustic requirements

| **Floors** | | **BCA Performance Requirements** |
|---|---|---|
| **From Area** | **To Area** | |
| Sole occupancy unit – All spaces | Sole occupancy unit – All spaces | $R_w + C_{tr}$ (airborne) ≥ 50<br>$L_{n,w} + C_I$ (impact) ≤ 62 |
| | Plant room, lift shaft, stairway, public corridor, public lobby or areas of different classification | $R_w + C_{tr}$ ≥ 50 |
| Plant room, lift shaft, stairway, public corridor, public lobby or areas of different classification | Sole occupancy unit – All spaces | $R_w + C_{tr}$ (airborne) ≥ 50<br>$L_{nT,w} + C_I$ (impact) ≤ 62 |
| **Walls** | | **BCA Performance Requirements** |
| **From Area** | **To Area** | |
| Sole occupancy unit – Habitable areas (other than kitchen) | Sole occupancy unit – Habitable areas (other than kitchen) | $R_w + C_{tr}$ ≥ 50 |
| Sole occupancy unit – Wet areas | Sole occupancy unit – Wet areas | $R_w + C_{tr}$ ≥ 50 |
| Sole occupancy unit – Non-habitable areas (incl. bathroom, sanitary compartment, laundry, kitchen) | Sole occupancy unit – Habitable areas (other than kitchen) | $R_w + C_{tr}$ ≥ 50 and Discontinuous Construction |
| Sole occupancy unit – All spaces | Stairway, public corridor, public lobby or the like or areas of different classification | $R_w$ ≥ 50 |
| **Ceiling spaces / risers** | | **BCA Performance Requirements** |
| **From Area** | **To Area** | |
| Sole occupancy unit – Habitable areas (other than kitchen) | Services ducts/ Risers | $R_w + C_{tr}$ ≥ 40 |
| Sole occupancy unit – Non-habitable areas (incl. bathroom, sanitary, kitchen, laundry) | Services ducts/ Risers | $R_w + C_{tr}$ ≥ 25 |
| **Door** | | **BCA Performance Requirements** |
| **From Area** | **To Area** | |
| Sole occupancy unit – All spaces | public corridor, public lobby or the like | $R_w$ ≥ 30 |

## 4.3 Rail ground-borne noise and vibration impacts on the proposed development

### 4.3.1 Ground-borne noise design objectives – Rail Infrastructure Noise Guideline

The proposed development is located approximately 50 metres to the east of the Sydney Metro rail alignment, which is underground at this section. At this location there are potential ground-borne rail noise impacts.

The Rail Infrastructure Noise Guideline provides noise design objectives within buildings at the most affected habitable area, as detailed in Table 4-7. It should be noted that the Sydney Metro has incorporated measures into the design of the rail and as such ground-borne noise impacts are not expected within this development.

Table 4-7 Ground-borne noise design objectives- RING

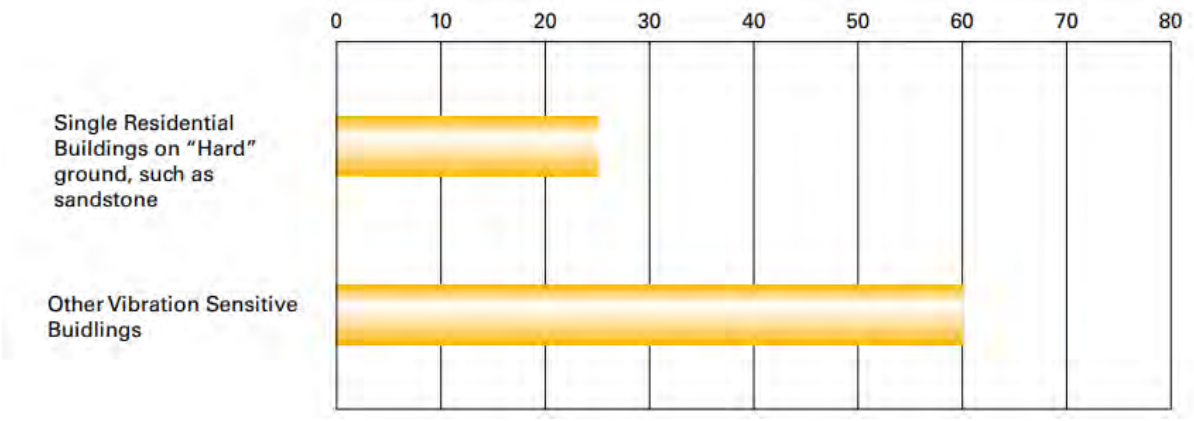
| Receiver | Time of day | Noise trigger levels (dBA) |
|---|---|---|
| Residential | Day (7 am to 10 pm) | 40 $L_{Amax(slow)}$ |
| | Night (10 pm to 7 am) | 35 $L_{Amax(slow)}$ |
| Schools, educational institutions, places of worship | When in use | 40-45 $L_{Amax(slow)}$ |

### 4.3.2 Rail vibration – Development Near Busy Roads and Corridors

With reference to ground vibration, the Development Near Busy Roads and Corridors assessment zones for typical development sites adjacent to rail corridors is reproduced in Figure 4-2. Accordingly, for residential development within the 25 metres of the railway Development Near Busy Roads and Corridors recommends that a more detailed vibration assessment will be needed.

However, it should be noted that the Sydney Metro has incorporated measures into the design of the rail and as such vibration impacts are not expected within this development.

Figure 4-2 Acoustic assessment zones –rail vibration




### 4.3.3 Vibration trigger levels – Rail Infrastructure Noise Guideline

The Rail Infrastructure Noise Guideline (RING) specifies trigger levels in order to evaluate vibration associated with rail activities. RING refers to the NSW Government's Assessing Vibration – a Technical Guideline (AVTG). AVTG provides a methodology to assess vibration exposure in terms of the Vibration Dose Value (VDV). The assessment procedure takes into

account the overall vibration level, duration of the vibration and the number of occurrences in each assessment period (day and night). The acceptable VDV criteria taken from the above guideline are detailed in Table 4-8.

It should be noted that compliance with the vibration trigger levels presented below generally ensure compliance with the relevant ground-borne noise criteria.

Table 4-8 Vibration trigger levels – VDV ($m/s^{1.75}$) (RING)

| Location | Daytime (7 am to 10 pm) | | Night-time (10 pm to 7 am) | |
|---|---|---|---|---|
| | Preferred value | Max value | Preferred value | Max value |
| Residence | 0.2 | 0.4 | 0.13 | 0.26 |
| Offices, schools, educational institutions and places of worship | 0.4 | 0.8 | 0.4 | 0.8 |

## 4.4 Noise emission from the proposed development

### 4.4.1 North Sydney Council Development Control Plan (DCP) 2013,

***Part B (Development Controls), Section 2 – Commercial and Mixed Used Developments***

Section 2.3.2 of Part B (Development Controls) of the North Sydney Development Control Plan (DCP) 2017 details noise emission requirements associated with the operation of non-residential premises or non-residential components of a building.

**Objectives**

**O1** To ensure reasonable levels of acoustic amenity to nearby residents.

**Provisions**

**P1** Noise emission associated with the operation of non-residential premises or non-residential components of a building must not exceed the maximum 1 hour noise levels ($L_{Aeq\ 1\ Hour}$) specified in Table B-2.3.

| *TABLE B-2.3 – Noise Emission Limits* | | | |
|---|---|---|---|
| *Time period* | | | *Max 1 hr noise level ($L_{Aeq,\ 1\ hour}$)* |
| *Day* | *Week* | *Time* | |
| *Weekday* | *Day* | *7 am – 6 pm* | *60 dBA* |
| | *Evening* | *6 pm – 10 pm* | *50 dBA* |
| | *Night* | *10 pm – 7 am* | *45 dBA* |
| *Weekend* | *Day* | *8 am – 6 pm* | *60 dBA* |
| | *Evening* | *6 pm – 10 pm* | *50 dBA* |
| | *Night* | *10 pm – 8 am* | *45 dBA* |

**Notes:** $L_{Aeq\ (1hour)}$ readings are to be measured during the noisiest 1 hour period between Day – 7/8 am to 6/7 pm, Evening – 6/7 pm – 10 pm and Night – 10 pm to 7/8 am.

***P2*** *In terms of determining the maximum noise levels as required by P1 above, the measurement is to be taken at the property boundary of the nearest residential premises. Within a mixed use development, the boundary is taken to be nearest floor ceiling or wall to a residential dwelling on the site.*

***P3*** *Despite P1 above, the noise emission associated with the operation of non-residential premises or non-residential components of a building must not exceed 5 dBA above the background maximum 1 hour noise level (LAeq 1 Hour) during the day and evening and not exceeding the background level at night when measured at the boundary of the property.*

***P4*** *Council may require the submission of an Acoustic Report to ensure compliance with P1 above.*

***P5*** *Plant and machinery should incorporate noise reduction measures to minimise their impacts.*

***P6*** *Developments should be designed and / or incorporate features that reduce noise transmission.*

***P7*** *Where practical, development should incorporate adequate measures for tonal, low frequency, impulsive, or intermittent noise.*

***P8*** *Developments must comply with EPA Noise Policy for Industry 2017 in particular the modification required for acceptable noise level (ANL).*

### 4.4.2 Protection of the Environment Operations Act 1997 (POEO Act)

The development should satisfy the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act) to determine whether the development emits 'offensive noise'.

'Offensive noise' is defined in the dictionary of the POEO Act as noise:

> *(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*
>
> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
>
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
>
> *(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.*

### 4.4.3 Protection of the Environment Operations (Noise Control) Regulation

The POEO (Noise Control) Regulation 2008 provides the following information regarding noise emission from pool pumps, residential air-conditioners and heat pump water heaters.

> ***52 Air conditioners and heat pump water heaters***
>
> *1. A person must not cause or permit an air conditioner or heat pump water heater to be used on residential premises in such a manner that it emits noise that can be heard within a habitable room in any other residential premises (regardless of whether any door or window to that room is open):*
>
> *a. before 8 am or after 10 pm on any Saturday, Sunday or public holiday, or*

*b. before 7 am or after 10 pm on any other day. Maximum penalty: 100 penalty units in the case of a corporation, 50 penalty units in the case of an individual.*

*2. A person is not guilty of an offence under subclause (1) in relation to a heat pump water heater if the conduct alleged to give rise to the offence occurs within 6 months after the commencement of this Regulation.*

*3. A person is not guilty of an offence under subclause (1) unless:*

*a. the person has, within 7 days after causing or permitting an air conditioner or heat pump water heater to be used in such a manner, been warned by an authorised officer or enforcement officer not to cause or permit the air conditioner or heat pump water heater to be used in that manner, and*

*b. the person causes or permits an air conditioner or heat pump water heater to be used in that manner within 28 days after the warning has been given.*

*4. In this clause: heat pump water heater means a device that heats water using the energy generated from the compression of a gas.*

### 4.4.4 Noise Policy for Industry (NPfI) (Environment Protection Agency, 2017)

Clause P8 of the North Sydney Council DCP requires developments to comply with the *Noise Policy for Industry (NPfI)* (EPA, 2017). The details of the NPfI are detailed below.

The *Noise Policy for Industry* (NPI) (EPA, 2017) provides guidance on the assessment of operational noise impacts. The NPI may be applied to existing sites and noise limits may be reviewed to allow established sites to adapt to changes in the noise expectations of the community where required.

The project noise trigger level is the lower value of the intrusiveness noise level and the amenity noise level. The intrusiveness noise level aims to protect against significant changes in noise levels and the amenity noise level aims to protect against cumulative noise impacts from existing industry.

#### *Project intrusiveness noise level*

The intrusiveness noise level aims to protect against significant changes in noise levels. Typically, this will be the project noise trigger level in areas with low existing background noise levels. The intrusiveness noise level is determined by a 5 dBA addition to the measured background noise level. The *Noise Policy for Industry* (EPA, 2017) recommends that the intrusive noise criteria for the evening period should not exceed the day-time period and the night-time period should not exceed the evening period. The intrusiveness noise criteria are only applicable to residential receivers.

#### *Project amenity noise level*

The recommended amenity noise level is the noise level objective for total industrial noise at a receiver and is determined based on the overall acoustic characteristics of the receiver area, the receiver type and the existing level of industrial noise.

The project amenity noise level represents the noise level objective for noise from a single development. It aims to limit the cumulative noise impacts from other industries and developments on all receiver types. The project amenity noise level is determined by a 5 dBA subtraction from the recommended amenity noise level for receivers that are not impacted by more than four individual industrial noise sources.

The project amenity noise level may be modified in the following cases:

- Developments within high traffic noise levels
- Developments located near or inside an existing industrial cluster
- Where the project amenity noise level is at least 10 dBA lower than the existing industrial noise level
- Where there are no other existing or proposed industries within the development area.

The *Noise Policy for Industry* (EPA, 2017) recommended amenity criteria for the identified receiver types surrounding the proposal site are provided in Table 4-9.

Table 4-9 Noise policy for industry recommended amenity noise levels

| Type of receiver | Noise amenity area | Time of day | Recommended amenity noise level $L_{Aeq(period)}$ noise level, dBA |
|---|---|---|---|
| Residence | Rural | Day | 50 |
| | | Evening | 45 |
| | | Night | 40 |
| | Suburban | Day | 55 |
| | | Evening | 45 |
| | | Night | 40 |
| | Urban | Day | 60 |
| | | Evening | 50 |
| | | Night | 45 |
| Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks | See column 4 | See column 4 | 5 dBA above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day |
| School classroom | All | When in use (noisiest 1 hour period) | 35 (internal) |
| Hospital ward | All | When in use (noisiest 1 hour period) | 35 (internal)<br>50 (external) |
| Place of worship | All | When in use | 40 (internal) |
| Passive recreation | All | When in use | 50 |
| Active recreation | All | When in use | 55 |
| Commercial premises | All | When in use | 65 |
| Industrial premises | All | When in use | 70 |
| Industrial interface (applicable only to residential noise amenity areas) | All | All | 5 dBA above recommended noise amenity area |

### *Maximum noise level events*

The *Noise Policy for Industry* (EPA, 2017) recommends a maximum noise level assessment to assess the potential for sleep disturbance impacts which include awakenings and disturbance to sleep stages. An initial screening test for the maximum noise levels events should be assessed to the following levels.

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

If the screening test indicates there is a potential for sleep disturbance then a detailed maximum noise level assessment should be undertaken. The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

### *Project noise trigger levels*

For the existing site the project noise trigger levels that would be used to assess noise impacts are provided in Table 4-10.

The *Noise Policy for Industry* (EPA, 2017) states that *"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 industrial developments = Recommended amenity noise level (Table 2.2) minus 5 dB(A)"*

Table 4-10 Project noise trigger levels, dBA

| Receiver | Time period | Intrusiveness noise level $L_{Aeq(15\ min)}$ | Project amenity noise level, $L_{Aeq(15\ min)}$[1,2,3] | Maximum noise level events | Project noise trigger level, dBA |
|---|---|---|---|---|---|
| Residential development (urban) | Day | 70 | 58 | | **58** $L_{Aeq(15\ min)}$ |
| | Evening | 62 | 48 | | **48** $L_{Aeq(15\ min)}$ |
| | Night | 56 | 43 | 52 $L_{Amax}$ | **43** $L_{Aeq(15\ min)}$<br>**52** $L_{Amax}$ |
| School classroom | When in use (noisiest 1 hour period) | | 35 (internal) | | **35** $L_{Aeq(15\ min)}$ (internal)<br>**45** $L_{Aeq(15\ min)}$ (internal)[5] |
| Place of worship | When in use | - | 50[5] | - | **53** $L_{Aeq(15\ min)}$ |
| Active recreation | When in use | - | 58 | - | **58** $L_{Aeq(15\ min)}$ |
| Commercial | All | - | 63 | - | **63** $L_{Aeq(15\ min)}$ |
| Industrial | All | - | 68 | - | **68** $L_{Aeq(15\ min)}$ |

Note 1: The project amenity noise levels have been calculated by subtracting 5 dBA from the recommended amenity noise levels as the project constitutes a single premises addition to an existing industrial area.

Note 2: The NPI recommends applying a 3 dBA addition to the $L_{Aeq(period)}$ noise level to convert the amenity noise level to a $L_{Aeq(15\ min)}$.

Note 3: The NPI recommends that evening intrusiveness levels should be no greater than the day-time intrusiveness level. Therefore the day-time background noise level has been used to calculate the project intrusiveness noise level for the evening period.
Note 4: The NPI recommends that night-time intrusiveness levels should be no greater than the daytime or evening intrusiveness level. Therefore the daytime background noise level has been used to calculate the project intrusiveness noise level for the night-time period.
Note 5: Assuming open windows provide a 10 dB external to internal noise reduction.

### 4.4.5 State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017

The State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 doesn't provide any specific requirements related to noise emission from a child care facility.

It does make reference to the following documents as general conditions of complying development certificates:

- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Noise Control) Regulation 2008

The requirements of these documents are detailed in Section 4.4.2 and 4.4.3.

### 4.4.6 Guideline for Child Care Centre Acoustic Assessment (Association of Australasian Acoustical Consultants, 2020)

Further guidance on acoustic impacts from child care centres is provided in the Guideline for Child Care Centre Acoustic Assessment, prepared by the Association of Australasian Acoustical Consultants (AAAC, 2020).

This document provides the following information regarding the recommended noise levels for receivers in both indoor and outdoor areas of childcare centres.

***7.0 External Noise Impacts on Children***

***Road, Rail Traffic and Industry***

*The noise level $L_{eq(1hr)}$ from road, rail traffic or industry at any location within the outdoor play or activity area during the hours when the Centre is operation shall not exceed 55 dB(A).*

*The noise level $L_{eq(1h)r}$ from road, rail traffic or industry at any location within the indoor play or sleeping areas of the Centre during hours when the centre is operating shall not exceed 40 dB(A).*

The guideline also provides the following noise criteria regarding noise emissions from the childcare centre at nearby receivers.

***5.0 Noise Criteria***

***Residential Receptors***

***Outdoor Play Area***

*For most centres as the duration of time that children are allowed to play outside is reduced then the overall noise impact reduces. Therefore, it is reasonable to allow a higher level of noise impact for a shorter duration of outdoor play. AAAC members regard that a total time limit of approximately 2 hours outdoor play per day (e.g. 1 hour in the morning and 1 hour in the afternoon) should allow an additional emergence above the background of 5 dB noise level emitted from the outdoor play area*

***Up to 2 hours (total) per day -*** *The $L_{eq,\ 15\ minute}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB at the assessment location.*

***Outdoor Play Area***

***More than 2 hours (total) per day -*** *The $L_{eq,\ 15\ minute}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.*

*The assessment location is defined as the most affected point on or within any residential receiver property boundary.*

***Commercial Receptors***

*The $L_{eq,15\ min}$ noise level emitted from the Child Care Centre shall not exceed 65 dB(A) when assessed at the most affected point at or within any commercial property boundary*

# 5. Noise and vibration impacts on the proposed development

## 5.1 Summary of noise target levels

A summary of the noise target levels for residential and non-residential land uses within the proposed mixed-use development at 52 McLaren Street, North Sydney are presented in Table 5-1.

Table 5-1 Rail and road traffic noise target levels

| Residential buildings (internal) | | |
|---|---|---|
| Type of Occupancy | Recommended Max level, dBA | Policy / Document |
| Sleep areas (bedroom) | 35 (Night-time) – airborne noise | North Sydney Council DCP and DNRCBR[1] |
| | 35 $L_{Amax(slow)}$ – ground-borne noise | RING[2] |
| Sleeping areas (bedroom) | 40 (Daytime) – airborne noise | North Sydney Council DCP and DNRCBR[1] |
| | 40 $L_{Amax(slow)}$ – ground-borne noise | RING[2] |
| Non-residential buildings (internal) | | |
| Type of occupancy | Recommended Max level, dBA | Policy / Document |
| Commercial buildings | 40 (when in use) – airborne noise | DNRCBR[1] |
| Child care centres (indoor play area) | 40 (when in use) – airborne noise | AAAC Guideline |
| | 40-45 $L_{Amax(slow)}$ – ground-borne noise | RING[2] |
| Child care centres (sleeping areas) | 40 (when in use) – airborne noise | AAAC Guideline |
| | 40-45 $L_{Amax(slow)}$ – ground-borne noise | RING[2] |
| Outdoor spaces | | |
| Type of occupancy | Recommended Max level, dBA | Policy / Document |
| Child care centre (outdoor play area) | 55 (when in use) | AAAC Guideline |

Notes:

1) Development Near Rail Corridors and Busy Roads Interim Guideline

2) Rail Infrastructure Noise Guideline

## 5.2 Airborne noise impacts

### 5.2.1 Summary of noise impacts

Based on information provided in the Noise and Vibration Technical Paper prepared for the Sydney Metro Chatswood to Sydenham Environmental Impact Statement (EIS), including long term noise monitoring and site observations, there are likely to be considerable noise impacts on the proposed site from surrounding traffic sources, along with general “city hum” from the surrounding urban environment.

The significant noise sources in the vicinity of the site includes:

- Warringah Freeway – approx. 220 metres to the west
- Miller Street – approx. 50 metres to the east
- Pacific Highway – approx. 300 metres to the west
- North Sydney urban area – to the south
- Future noise impacts from the Metro site, including pedestrian noise and mechanical plant noise

As noise monitoring couldn’t be undertaken at present due to considerable construction activities at the time of this assessment, this information will be used for a preliminary assessment of noise impacts on the proposed development. Noise monitoring should be considered at later phases of the project to guide the design of the building to ensure noise impacts are addressed.

In addition to additional noise monitoring, detailed noise modelling should also be undertaken to determine noise impacts on different levels of the development, as higher levels may be exposed to higher noise levels from the surrounding roads.

Details of this existing ambient noise levels are provided below in Table 3-1. As specific details of where the logger was located and the sources and direction of noise measured was not known, additional noise monitoring and modelling should be undertaken at a later stage to determine noise impacts on each façade of the building, as well levels higher up the development.

Table 5-2 Noise monitoring results, dBA

| Address of noise monitoring | Ambient noise levels, $L_{Aeq(period)}$ | | |
|---|---|---|---|
| | Day | Evening | Night |
| 237 Miller Street, North Sydney | 74 | 71 | 66 |

### 5.2.2 In principal noise mitigation recommendations

At this stage of the development, specific layouts of the residential and commercial components of the building have not been designed, and as such, detailed assessment of noise intrusion impacts has not been undertaken.

The following in principle noise mitigation measures should be considered in the design of the proposed development, based on guidance from the Apartment Design Guide and Development Near Rail Corridors and Busy Roads

### *Building location, design orientation and room layout*

- Locating habitable areas as far away from road/rail noise sources, where possible
- Less sensitive rooms (laundries, bathrooms, corridors etc.) should be placed on the noisy side of the building
- Using non-sensitive or less noise-sensitive buildings as noise shields

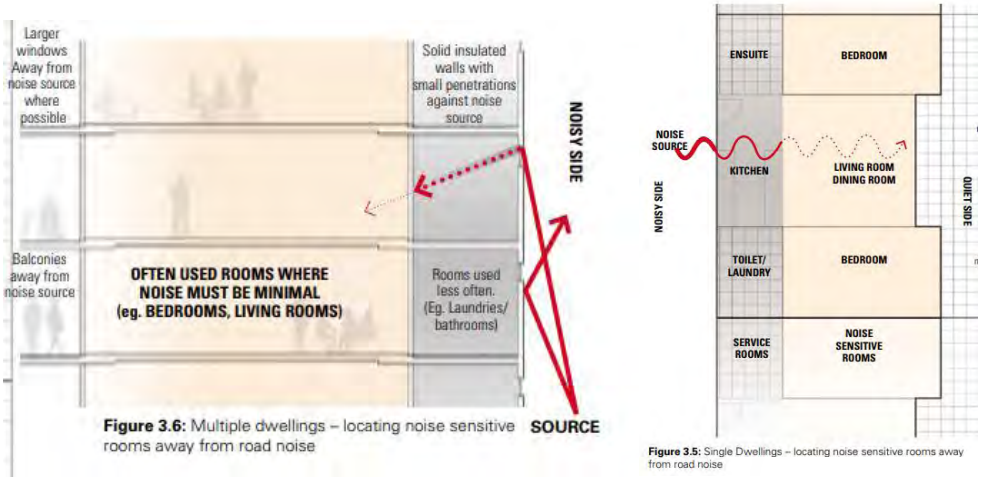



Figure 5-1 Location of sensitive rooms away from noise sources (Figures 3.5 and 3.6 from Development Near Rail Corridors and Busy Roads)

- Locating non-residential uses at lower levels vertically separating the residential component from the noise or pollution source. Setbacks to the underside of residential floor levels should increase relative to traffic volumes and other noise sources
- Use of podiums on lower levels to act as a shield to the higher residential receivers

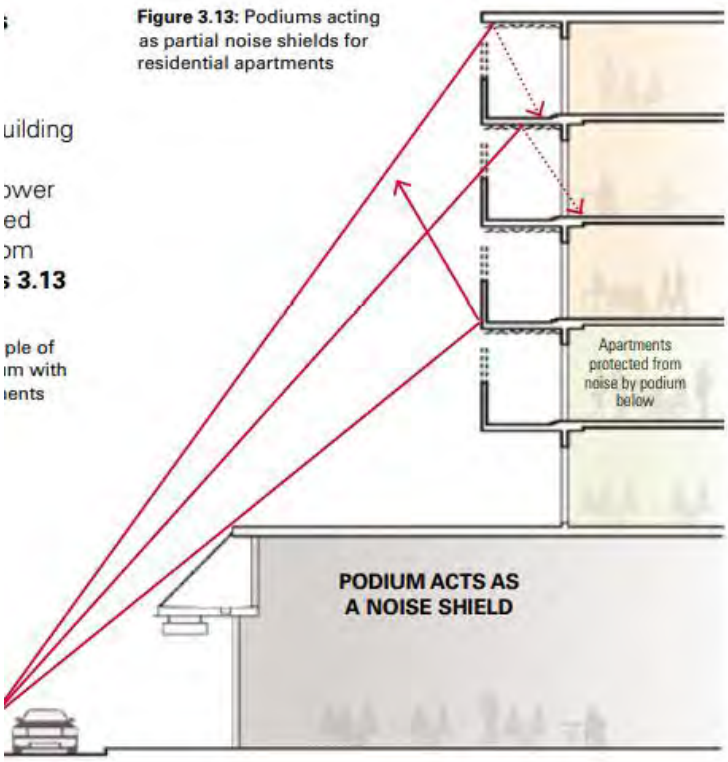



Figure 5-2 Podium acting as shielding (Figure 3.13 from Development Near Rail Corridors and Busy Roads)

- Use of enclosed balconies (with openable glass/louvres) or winter gardens. Note that reflections from hard surfaces within the winter garden can sometimes increase noise levels. Absorptive materials should be installed to reduce reflected noise.

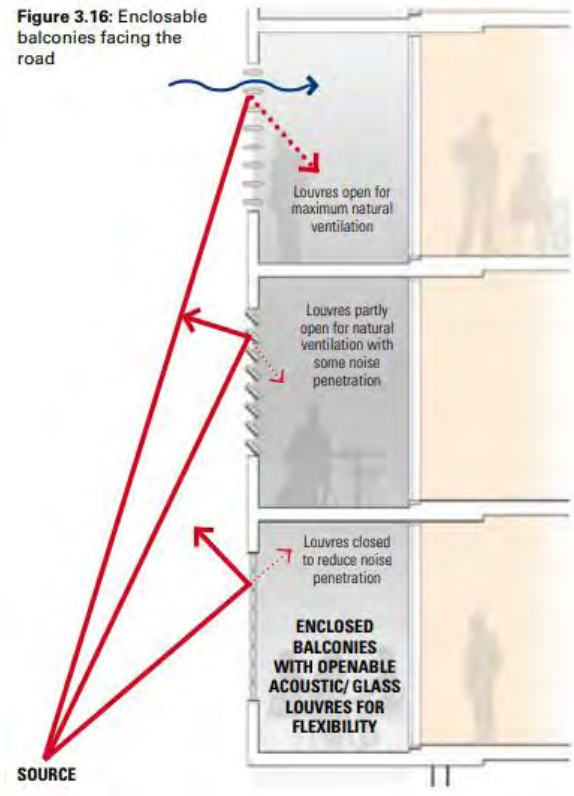


Figure 5-3 Enclosed balconies (Figure 3.16 from Development Near Rail Corridors and Busy Roads)

***Building design***

Where it isn't possible to include the above design features, the following measures should be implemented, as discussed in the Apartment Design Guide:

- limiting the number and size of openings facing noise sources
- providing seals for operable windows and doors to prevent noise transfer through gaps
- using double or acoustic glazing, acoustic louvres or enclosed balconies (wintergardens)
  - Based on existing noise monitoring, a reduction of between 31 and 34 dB is required to achieve the internal noise goals of the North Sydney DCP. At higher levels of the development, this may be higher due to exposure to busy roads surrounding the site. Consideration should be given to developing a 3D noise model later in the design process to determine reduction required for each façade/level
  - Based on this, significant glazing is likely to be required, and is likely to be double glazing. The required acoustic performance of the façade elements, including glazing, will be based on the overall size and location in relation to noise generating sources
- using materials with mass and/or sound insulation or absorption properties e.g. solid balcony balustrades, external screens and soffits

## 5.3 Ground-borne noise impacts

Ground-borne noise impacts from the Sydney Metro have been assessed in the Noise and Vibration Technical Paper prepared for the Sydney Metro Chatswood to Sydenham Environmental Impact Statement (EIS).

The structure-borne impacts from the operation of the Metro have been assessed against the requirements of the Rail Infrastructure Noise Guideline, and designed to achieve the noise design objectives of the guideline. Figure 5-4 below provides the predicted noise levels from ground-borne noise impacts from the operation of the Sydney Metro.

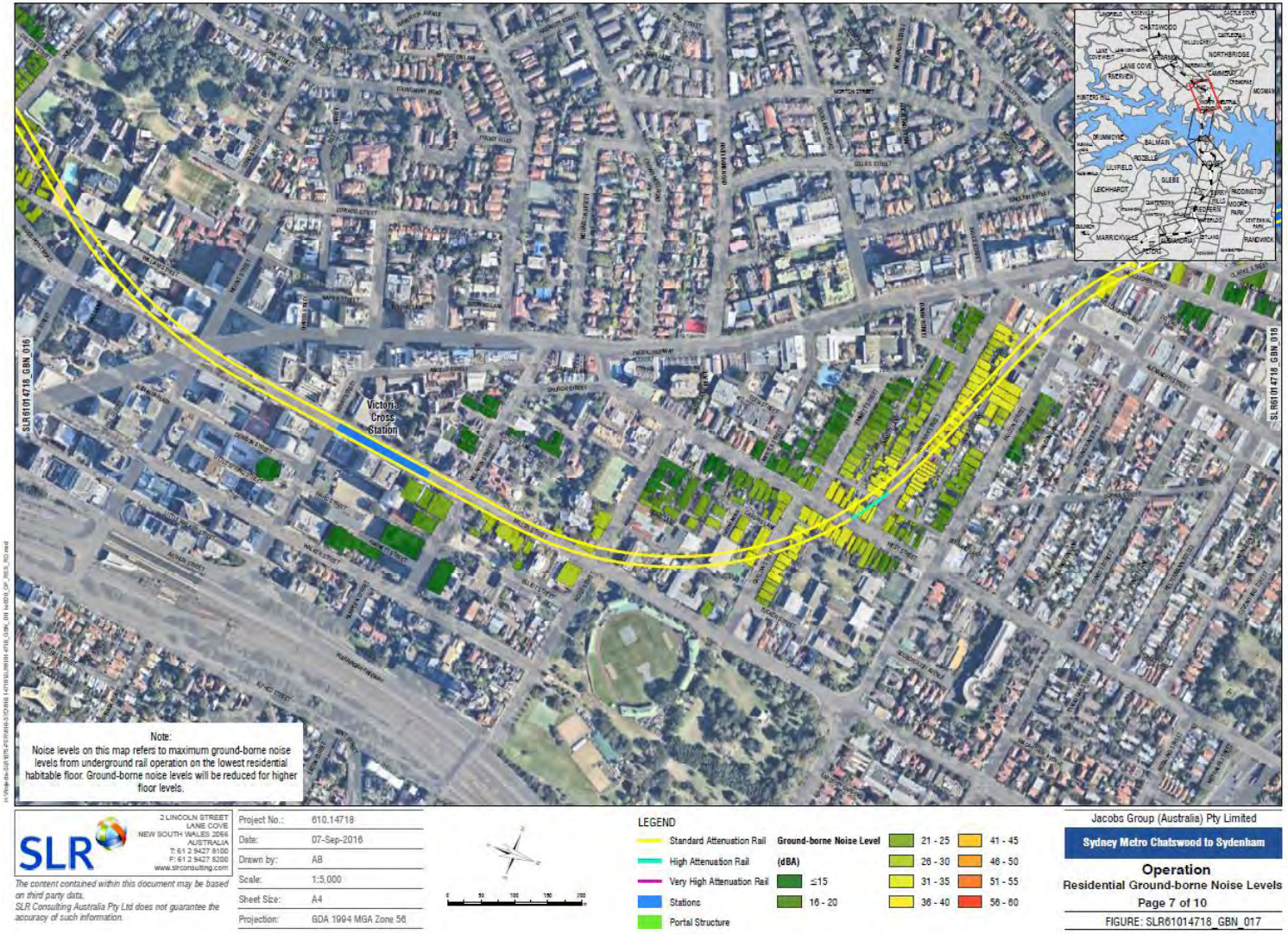



Figure 5-4 Residential ground-borne noise levels from operation of the Sydney Metro (Appendix E from EIS noise report)

It can be determined from the above that internal ground-borne noise levels are predicted to be below the design objectives of the guideline. Although only standard attenuation rail is proposed in the vicinity of the development site, the worst case levels are predicted to be in the range of 26-30 dBA at the ground level. As the figure suggests, ground-borne noise levels at higher levels will be less than this. It is likely that commercial tenancies will be located on the ground floor, therefore impacts at residential receivers would be less than those shown in the figure above.

Based on this information, impacts from rail operations are not expected.

## 5.4 Inter-tenancy acoustic privacy

As detailed in Section 4.2.1 of this report, internal partitions separating sensitive areas of a residential are required to be designed to achieve the requirements of the North Sydney DCP and the Building Code of Australia. Typically, this is undertaken post Development Application.

A detailed acoustic report should be prepared prior to construction detailing the construction methodology proposed to achieve the requirements of the North Sydney DCP and the Building Code of Australia.

# 6. Noise impacts from the proposed development

## 6.1 Summary of noise target levels

A summary of the noise emission levels for the proposed mixed-use development at 52 McLaren Street, North Sydney are presented in Table 6-1. Note that the emission from the site needs to achieve the goals set out in P1 of the North Sydney Council DCP (Section 2.3.2 of Part B as detailed in Section 4.4.1), the EPA's Noise Policy for Industry and the POEO (Noise Control) Regulation 2008.

Compliance with these requirements is likely to result in noise impacts which are not considered "offensive" under the POEO Act.

Table 6-1 Project specific noise emission levels, dBA

| Receiver | Time period | Rating background level, RBL $L_{A90(period)}$ | EPA's Noise Policy for Industry | | | North Sydney Council DCP | Project noise level, dBA | POEO (Noise Control) Regulation 2008 | AAAC Guideline for Child Care Centre Acoustic Assessment |
|---|---|---|---|---|---|---|---|---|---|
| | | | Intrusiveness noise level $L_{Aeq(15\ min)}$ | Project amenity noise level, $L_{Aeq(15\ min)}$[1,2,3] | Maximum noise level events | Max 1 hr noise level ($L_{Aeq,\ 1\ hour}$) | | | |
| Residential development (R2, R3 and R4 land uses surrounding the site in all directions) | Day | 65 | 70 | 58 | - | 60 | **58** $L_{Aeq(15\ min)}$ | - | Up to 2 hours (background + 10 dB) – $L_{Aeq(15,min)}$ < 75<br>Greater than 2 hours (background + 5 dB) – $L_{Aeq(15,min)}$ < 70 |
| | Evening | 57 | 62 | 48 | - | 50 | **48** $L_{Aeq(15\ min)}$ | - | $L_{Aeq(15,min)}$ < 62 – background + 5 dB |
| | Night | 51 | 56 | 43 | 66 $L_{Amax}$ | 45 | **43** $L_{Aeq(15\ min)}$<br>**66** $L_{Amax}$ | Inaudible | $L_{Aeq(15,min)}$ < 596 – background + 5 dB |
| School classroom (Wenona School and Monte Sant Angelo College) | When in use (noisiest 1 hour period) | - | - | 35 (internal) | - | **-** | **35** $L_{Aeq(15\ min)}$ (internal)<br>**45** $L_{Aeq(15\ min)}$ (internal)[5] | - | - |
| Place of worship (St | When in use | - | - | 50[5] | - | | **53** $L_{Aeq(15\ min)}$ | - | |

| Receiver | Time period | Rating background level, RBL $L_{A90(period)}$ | EPA's Noise Policy for Industry | | | North Sydney Council DCP | Project noise level, dBA | POEO (Noise Control) Regulation 2008 | AAAC Guideline for Child Care Centre Acoustic Assessment |
|---|---|---|---|---|---|---|---|---|---|
| | | | Intrusiveness noise level $L_{Aeq(15\ min)}$ | Project amenity noise level, $L_{Aeq(15\ min)}$[1,2,3] | Maximum noise level events | Max 1 hr noise level ($L_{Aeq,\ 1\ hour}$) | | | |
| Thomas Anglican Church) | | | | | | | | | |
| Active recreation (Ted Mack Civic Park) | When in use | | - | 58 | - | | **58** $L_{Aeq(15\ min)}$ | - | |
| Commercial (B4 Mixed use surrounding the site in all directions, North Sydney Council Chambers and North Sydney Stanton Library) | All | | - | 63 | - | | **63** $L_{Aeq(15\ min)}$ | - | 65 |

### 6.1.1 Likely noise generating equipment

It is likely that the following noise generating sources would be included in the proposed development:

- Air conditioning units
- Air handling units and/or cooling towers
- Ventilations fans, eg car park fans, stair pressurisation fans, commercial extraction fans, wet area exhaust fans
- Supply air fans
- Generators (emergency / backup)
- Noise from proposed child care centre, in particular children playing outdoors

### 6.1.2 In principal noise mitigation recommendations

The following in principle noise mitigation measures should be considered in the design. It is likely that noise level emission from the site with the design and incorporation of mitigation measures would achieve the noise emission requirements detailed in Table 6-1.

- Where possible, selection of mechanical plant with low noise levels
- Acoustic barriers / enclosures for any external plant, such as rooftop plant
- Appropriate location of plant rooms away from sensitive receivers
- Construction of plant rooms with high acoustic performing materials (i.e. concrete panels, solid concrete blocks)
- The installation of acoustic louvres where appropriate for plant rooms
- Design of ductwork systems, incorporating the following where appropriate
  - acoustic attenuators for exhaust / supply fans
  - internal lining of ductwork
  - duct outlets directed away from sensitive receiver locations

A full acoustic assessment should be undertaken at a later stage of the project to ensure that noise emission from the site achieves the noise emission requirements detailed in Table 6-1, and provides specific noise mitigation measures to achieve this where required.

# 7. Conclusion

GHD has prepared an acoustic assessment for the proposed mixed-use development at 52 McLaren Street, North Sydney.

The assessment outlines the legislative and policy requirements, including the requirements of North Sydney Council, related to acoustic impacts from the proposed development. These have been outlined in Section 4 of this report and relate to the following:

- Noise impacts on the proposed development
- Noise impacts from the proposed development

Based on information from previous documentation related to the Sydney Metro project, it has been determined that the major noise sources within the vicinity of the site are from the surrounding road network, along with the general noise from the urban centre of North Sydney. In principal noise mitigation recommendations have been provided to provide guidance in the design of the development. A detailed study should be undertaken at later stages of the development to ensure measures are incorporated to achieve the noise requirements.

It is likely that noise mitigation measures can be incorporated into the design of the development to meet the noise emission requirements outlined in Section 5.1. A range of in principle noise mitigation measures are provided in Section 6.1.2 for control of noise impacts from the proposed site on surrounding sensitive land uses.

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https://projects.ghd.com/oc/Sydney1/sydneymetromclarenst/Delivery/Documents/2127384_RPT_52 McLaren Street North Sydney - Acoustic Assessment.docx

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