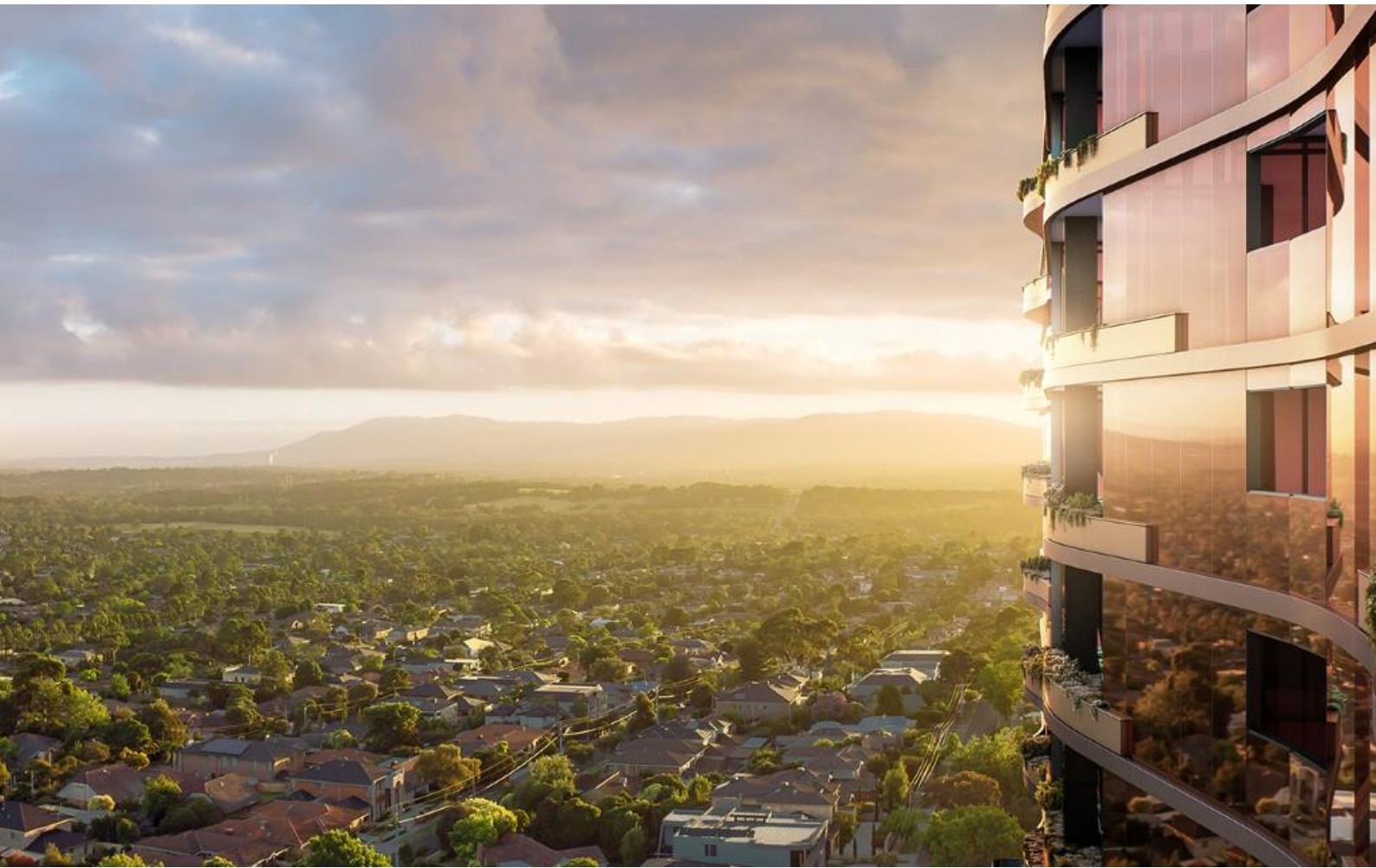
ADP
Consulting : Engineering

240-246 Normanby Road, South Melbourne

Noise Impact Assessment

Prepared for: Manors Gate Group

Project No: MEL2486
Date: 23 September 2021
Revision: 04



Creating great environments with great people

Project:	240-246 Normanby Road, South Melbourne
Location:	240-246 Normanby Road South Melbourne, VIC 3205
Prepared by:	ADP Consulting Pty Ltd Level 11, 60 Albert Road South Melbourne VIC 3205
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Project Team	
Client / Principal	Manors Gate Group
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1. Introduction

1.1 Document purpose

ADP Consulting Pty Ltd has been retained on behalf of Manors Gate Group to undertake acoustics engineering services for the proposed new mixed-use development at 240 Normanby Road, South Melbourne.

This document is to be used as a briefing document (and may be issued to the responsible authority as part of the Town Planning Application) and is to be used for information to the client and the design team prior to the detailed design.

This report addresses the DEWLP's RFI seeking:

- an acoustic report which assesses the impact of noise emanating sources such as existing industries and traffic noise
- where necessary the report should: make design recommendations to ensure an appropriate level of internal amenity is achieved in dwellings within the development, particular the proximity of large plant areas to serviced apartments in the lower podium levels.

In addition, this report addresses:

- the impact on nearby sensitive receivers from the operation of the proposed development (including noise emission from emergency plant and equipment)
- the internal noise levels (particularly from traffic) and reverberation times of the development
- noise separation between noisy areas (such as plant rooms, gym, pool areas, etc.) and sensitive spaces
- vibration requirements from footfall and plant and equipment

The design criteria and acoustic treatment concepts in this report demonstrate the pathways by which these shall be addressed by the project team through further analysis, recommendations and coordination as the design progresses.

1.2 Referenced drawings, codes and standards

The followings drawings, conditions and other project-specific information has been referenced in preparing this report:

- Fender Katsalidis architectural drawings, dated on 17 September 2021 (Architectural Drawings)
- Fender Katsalidis Urban Context Report, dated 20 November 2020 (Urban Context Report)

The following guidelines, standards and regulatory requirements have been used to define the site-specific acoustic criteria and construction for the development.

- AS/NZS 1668.1:2015 The use of ventilation and air conditioning in buildings Part 1: Fire and smoke control in buildings (AS/NZS 1668.1:2015)
- AS/NZS 2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors (AS/NZS 2107:2016)
- AS 2670.2-1990 Evaluation of human exposure to whole-body vibration – Continuous and shock-induced vibration in buildings (1 to 80 Hz) (AS 2670.2:1990)
- AS/NZS ISO 717:2004 Acoustics – Rating of sound insulation (AS/NZS ISO 717:2004)

- ASHRAE Handbook – HVAC Applications (SI), Chapter 48 – Noise and Vibration Control (ASHRAE)
- NSW EPA's Noise Policy for Industry, dated October 2017 (NPfI)
- State Environment Protection Policy (Control of noise from commerce, industry and trade) No. N-1 dated 15 June 1989 (SEPP N-1)
- State Environment Protection Policy (Control of music noise from public premises) No. N-2 dated 3 August 1989 (SEPP N-2)
- EPA Victoria, Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues (Publication 1826.4), dated 4 May 2021 (EPA Noise Protocol).
- The State of Victoria Department of Environment, Land, Water & Planning's document, Assessing external noise impacts for apartments planning practice note 83 (PPN83)
- Better Apartments Design Standards, New apartment design standards for Victoria – prepared by the State of Victoria Department of Environment, Land, Water & Planning, dated December 2016 (BADS)
- Victorian Planning Provisions – Amenity Impacts 58.04, dated 13 April 2017 (Clause 58)
- National Construction Code 2019 – Volume One, Building Code of Australia Class 2 to 9 Buildings (NCC)

1.3 Project summary

ADP Consulting understands that the development includes the construction of a new residential tower, making up the following components and characteristics, for which there are corresponding acoustic design objectives:

- Basement, comprising of:
  - Enclosed car park
  - Storm water tank and fire tank
  - Bicycle storage spaces
- Ground floor, comprising of:
  - Residential lobby
  - Serviced apartment lobby
  - Fire pump
  - 3 commercial tenancies
  - Building manager's office
  - Resident and service apartment waste area
  - Loading bay
  - Fire control room
  - Retail tenancies
- Levels 1 and 2, comprising of:
  - Single room serviced apartments
  - Plant rooms
  - Swimming pool
  - Steam, sauna room and showers
  - Back of house areas
  - Serviced apartment Gymnasium
  - Comms room
  - Changing rooms and amenities
- Levels 3 to 5, comprising of:
  - Single room serviced apartments
  - Back of house areas
  - Conference Centre
  - Restrooms
  - Store rooms
  - Apartment Gymnasium
  - Meeting rooms
  - Amenities breakout
  - Dining room
  - Games room
  - Karaoke room
  - Theatre

- Levels 6 to 23 tower above podium, comprising of:
  - 1, 2, 3 and 4-bedroom residential terraces and apartments (including affordable housing)
  - Indoor and outdoor amenity area, including lounge and library
- Level 24, comprising of:
  - Penthouse apartments
- Roof, comprising of:
  - Rooftop plant areas including PV array façade access and cooling tower

1.4 Site plan

Figure 1 provides a site plan of the proposed development and surrounds

Figure 1 Site plan

2. Site investigations and noise measurements

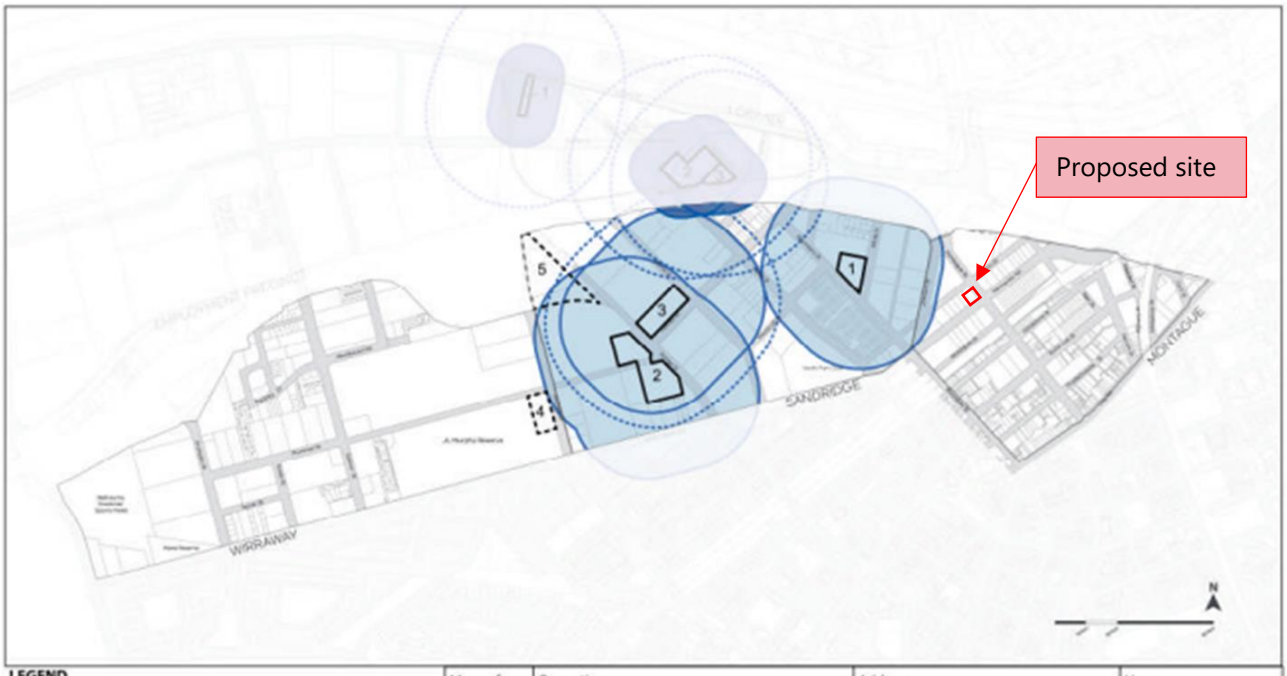
2.1 Site investigations

Based on our site survey and investigations we have identified the following receivers as being the nearest noise sensitive premises to the proposed development:

- Existing residences:
  - Residences located 400m to the North (58-70 Lorimer St, Docklands) on the other side of the West Gate Freeway
  - Residences located 300m to the South (221 Station St, Port Melbourne)
- Proposed residences (as shown in Figure 1 as green):
  - 2-28 Montague St and 80 Munro St (approved)
  - 60-62 Johnson St (approved)
  - 234-236 Normanby Rd (approved)
  - 253-273 Normanby Rd (approved)
  - 248-254 Normanby Rd (under review)
  - 256-262 Normanby Rd (approved)
  - 264-270 Normanby Rd (under review)
  - 272 Normanby Rd (under review)
- Commercial:
  - Commercial premises directly to the southeast
- The development itself that includes
  - Services requiring noise attenuation to ensure low indoor noise levels in occupied areas and compliance with noise emission regulations
  - An expected standard of amenity compliant with all applicable codes, regulatory requirements, and client brief or other standards

Furthermore, as identified in Figure 2, the proposed development site is located outside of the 250m amenity buffer of the City of Port Phillip – Resource Recovery Centre (transfer station) and therefore an assessment is not required.

Figure 2 Transfer station amenity buffer zones



LEGEND

- Sites with buffers
- Sites without buffers
- Precinct boundaries
- 100m amenity buffer*
- 250m amenity buffer*
- 300m amenity buffer

*Derived from *Recommended Seperation Distances for Industrial Residual Air Emissions (publication number 1518, March 2013)*

Map ref no.	Operation	Address	Use
1	City of Port Phillip - Resource Recovery Centre	78 White Street, Port Melbourne	Transfer station
2	Delta Group	577 Plummer Street and 299 Bridge Street, Port Melbourne v	Transfer station
3	Colonial Brewery	89 Bertie Street, Port Melbourne	Brewery
4	City of Port Phillip Depot - Citywide	477 Graham Street, Port Melbourne	Industry (Truck depot and storage)
5	Port Melbourne Metals	349 Bridge Street, Port Melbourne	Materials recycling facility (Metals)

2.2 Noise measurements

Noise measurements were taken for a project directly across the road located at 2-28 Montague St and 80 Munro St by ADP Consulting in 2017. These measurements have been used in the following sections to quantify noise levels in the area and to determine the EPA Noise Protocol noise limits.

We note that COVID-19 government-imposed restrictions are currently leading to atypical acoustic site conditions and the preference to assume or refer to previously measured ambient/environmental noise levels until these restrictions are lifted further.

2.2.1 Noise measurement equipment

The following instrumentation was used for noise measurements and analysis:

- Bruel and Kjaer 2250 Integrating Sound Level Meter (S/N: 3011318)
- Bruel and Kjaer type 1 microphone – comprising of:
  - ZC 0032 preamplifier (S/N: 25754)
  - 4189 capsule (S/N: 3087045)
- Bruel and Kjaer Sound Calibrator Type 4231 (S/N: 3018299)
- Infobyte iM4 Integrating-Averaging Sound Level Meter – noise logger (S/N: 101)

All instrument systems are laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement

system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.3dB during measurements. No adjustments for instrument drift during the measurement period were warranted.

2.2.2 Attended noise measurements

Attended noise measurements were conducted on Thursday 30 November 2017 at locations A1, A2 and A3 shown in Figure 1. Table 1 presents the noise levels measured at each location.

Table 1 Attended noise measurements, 30 November 2017

Location	Start time	Comments	Traffic noise level, L_{Aeq} dB(A)
A1	5.25pm	**At 3m from Montague St and 10m from Munro St.** The character of the noise comprised of: > Mainly traffic from Montague St	73
A2	5.39pm	**At 3m from Montague St in front of OTIS sign.** The character of the noise comprised of: > Mainly traffic from Montague St	72
A3	5.57pm	**At 3m from Munro St and 25m from Montague St kerb.** The character of the noise comprised of: > Traffic from Montague St > Industrial noise across Munro St	68

2.2.3 Unattended noise measurements

Unattended noise measurements were conducted between Wednesday 13 December 2017 and Wednesday 20 December 2017 at locations L1 and L2 shown in Figure 1 and described as:

> **Location L1 (roof):** Northeast corner of existing building on Montague Street boundary – purpose is to measure traffic noise

> **Location L2 (roof of existing building):** Southwest façade facing Johnston Street, 25m from Southern corner – purpose is to measure background noise levels

2.2.3.1 Traffic noise

Unattended noise levels measured at Location L1 have been used to determine the noise levels along Montague Street (Table 2). These noise levels have been used as a basis for traffic noise in this report.

Table 2 Measured noise intrusion levels

Location L1 – Montague Street – Traffic noise	Measured noise levels, L_{Aeq}, dB
Day (06:00-22:00) – $L_{Aeq\ (16hr)}$	70
Night (22:00-06:00) – $L_{Aeq\ (8hr)}$	67

2.2.3.2 Background noise levels

Unattended noise levels measure at both Locations (L1 and L2) have been used to determine the external noise emission criteria presented in Section 3.1. Please note that the methodology presented in the EPA Noise Protocol has been used to determine the L_{A90} noise levels.

Table 3 Measured background noise levels

Noise Measurement	**Daytime** (07:00-18:00)	**Evening** (18:00-22:00)	**Night-time** (22:00-07:00)
Location L1 – Montague St			
L_{Aeq}	71	70	67
L_{A90}	65	62	58
Location L2 – Johnston St			
L_{Aeq}	61	58	55
L_{A90}	56	54	51

3. Noise criteria

3.1 Noise emission

New Environment Protection Regulations (EP Regulations) in Victoria started to take effect on 1 July 2021. The EP Regulations include the EPA Noise Protocol as the new reference document which sets the required approach to determine noise limits and assess noise emissions. The EPA Noise Protocol has replaced the following:

- State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade), SEPP N-1
- State Environment Protection Policy (Control of Music Noise from Public Premises), SEPP N-2

3.1.1 Commercial, industrial and trade premises noise – EPA Noise Protocol Part I

Noise emission restrictions apply to existing and future base-building and tenant activity and systems. These must be planned, designed and installed to include suitable sound attenuation, vibration isolation, and other necessary acoustic treatments. Recommendations outlined in this report provide an approach that need to be incorporated in the proposed development to meet the requirements of the EPA Noise Protocol Part I.

The EPA Noise Protocol Part I requirements include determination of noise limits at the nearest external noise sensitive receivers as well as within the 240 Normanby Road, South Melbourne development.

The EP Regulations define the following as noise sensitive areas:

- Residential premises
- Retirement villages
- Hospitals
- Child-care centres
- Kindergartens
- Primary and secondary schools
- Tourist establishments
- Camping grounds
- Caravan parks in rural areas.

The methodology to determine the noise limits is the same as the methodology described in SEPP N-1. It requires the establishment of background noise levels, and a zoning level determined by the surrounding land use. For emergency equipment such as standby generators, standby boilers and fire pumps, increased noise limits apply.

Table 4 present the site-specific operational noise emission criteria for impacts to nearby residences. Background levels have been measured at Location L2 and were used to calculate the site-specific noise emission criteria.

Table 4 Noise emission criteria - residential

Time of operation	Site specific noise criteria $L_{eq,\ 30\ min}$, dB(A)	
	Operational	Emergency
Day (07:00-18:00)	62	72
Evening (18:00-22:00)	57	62
Night (22:00-07:00)	54	59

It should be noted that the cumulative noise emissions from operations at the proposed development are to meet the specific noise criteria defined in Table 4, and planning should be undertaken with proposed tenants so that these criteria are complied with.

Whilst not included in the above tables, it is the responsibility of the eventual retail tenancies to ensure any music noise emissions (e.g. live music, amplified and pre-recorded music) comply with the EPA Noise Protocol Part II.

Due to the limited information for retail/commercial tenancies currently available and the nature of the acoustic analysis required, each tenancy may be required to demonstrate compliance with EPA Noise Protocol Part I and Par II, based on the type of noise they will emit.

Therefore, a separate submission to Council may be required to demonstrate such compliance. There are sufficient provisions in the design for each tenancy to provide acoustic treatment or management processes to meet the criteria scheduled in Table 4.

3.1.2 Entertainment venues and events – EPA Noise Protocol Part II

Noise emission restrictions apply to future commercial tenant music and entertainment noise. Live and pre-recorded music must be planned, designed and installed to include suitable sound attenuation and other necessary acoustic treatments. This report provides an approach that needs to be incorporated in the proposed development to meet the noise emission requirements of the EPA Noise Protocol Part II.

As the Karaoke room is a proposed source of music noise and classed as an "indoor venue", this report provides an approach that needs to be incorporated in the proposed development to meet the noise emission requirements of the EPA Noise Protocol Part II.

Table 5 EPA Noise Protocol Part II day/evening period noise limits (subject to change) – Indoor venue

Descriptor	dB(A)
Base noise limit, L_{eq}	32
Minimum measured period $L_{90,15min}$ falling within operating hours of venue	51
Calculated noise limit – any number of events, L_{eq}[1]	56

Note: 1. The L_{Aeq} noise limits for indoor venues for the day/evening period are the background L_{A90}+5 dB, except where these fall below the base noise limit.

Table 6 EPA Noise Protocol Part II night period noise limits (subject to change) – Indoor venue

Descriptor	Frequency (Hz)							
	63	125	250	500	1000	2000	4000	dB(A)
Base noise limit, L_{10} (dB)	40	30	20	20	15	10	10	-
Minimum measured period $L_{90,15min}$ falling within licensed operating hours of venue (dB)	69	59	49	49	44	39	39	51
Calculated noise limit, L_{10} (dB)[1]	77	67	57	57	52	47	47	-

Notes: 1. The L_{OCT10} noise limits for indoor venues for the night period are the background L_{OCT90} + 8 dB, except where this fall below the base noise limit.

3.1.3 Sleep disturbance – Noise Policy for Industry

In the absence of a state specific sleep disturbance criteria, we have chosen to refer to the NSW NPfI regarding criteria for sleep disturbance. Night-time noises, which occur infrequently and for short durations of time, have the potential to cause sleep disturbances. Such noise sources may include operation of loading docks, refuse collection and other activities.

Table 7 presents recommended sleep disturbance criteria based on the NPfI and the measured background noise levels presented in Section 2.2.3. Noise emission from such short duration noise events should be controlled to meet these criteria to reduce the risk of sleep disturbance to residences at night.

Table 7 Noise emission criteria – Transient noise events

Activity	Noise descriptor	Internal noise criterion L_{Amax}, dB(A)
Operation of loading dock, refuse collection, etc.	$L_{Aeq, 15min}$	56
	L_{AFmax}	66

3.2 Internal noise levels and reverberation times

Table 8 schedules the indoor noise limits for the proposed development. Table 8 includes the indoor noise limit criteria recommended in BADS, Clause 58 and AS/NZS 2107:2016.

We would also like to identify that, indoor background noise levels in terms of Sound Pressure Level (SPL) deemed acceptable to majority of reasonable occupants are published in AS/NZS 2107:2016.

Furthermore, AS/NZS 2107:2016 refers to ideal reverberation times for various spaces. Low reverberation times are critical for speech intelligibility and perception of a space as having high acoustic quality. Table 8 also schedules the recommended reverberation times for different relevant spaces.

Table 8 Internal design and sound pressure levels and reverberation time recommendations

Type of occupancy	**Design SPL, L_{Aeq}, dB(A)**		**AS/NZS 2107:2016 Reverberation Time, seconds**
	AS/NZS 2107:2016	**BADS / PPN83 / Clause 58**	
Sleeping areas (night-time)	35 to 40	$L_{Aeq,8hr}$ 35	-
Living areas	35 to 45	$L_{Aeq,16hr}$ 40	-
Kitchens	< 55	-	-
Dining area	45 to 50	-	Minimise
Toilets	< 50	-	-
Apartment common areas (e.g. foyer, lift lobby)	45 to 50	-	-
Gym / pool	< 50	-	< 1.0
Foyers and recreation areas	45 to 50	-	Minimise
Small retail stores (general)	< 50	-	Minimise
Enclosed carparks	< 65	-	-
As final layouts and configurations are yet to be determined, AS/NZS 2107:2016 should be used to determine acceptable noise levels in areas not scheduled above.			

Low reverberation time also assists with noise reduction, and sound absorption in plant rooms and loud back of house areas is a cost-effective way to prevent noise intrusion to more sensitive areas.

3.3 Fire mode noise conditions

Some building systems only operate in fire mode and during periodic testing, so they do not add to background noise under typical conditions. According to AS/NZS 1668.1:2015, these systems are subject to noise limits, presented in Table 9, relating not to occupant comfort but rather to occupant distress and the intelligibility of emergency commands. Here, the 65 dB(A) limit supports the audibility of fire alarms.

Table 9 Fire mode maximum sound pressure levels

Area type	**Maximum SPL, L_{Aeq}, dB(A)**
Occupied Area	65
Fire-isolated exit (e.g. fire stair)	80

3.4 Internal vibration requirements

Vibration is the oscillation of an object, structure, or surface at frequencies typically below 20 Hz, which is inaudible but instead can be "felt". **Structure-borne sound** means oscillation at frequencies higher than 20Hz, resulting in audible noise, which is transmitted through rigid building elements and radiated by surfaces.

Human response to building vibration is a complex phenomenon. There is great variability in the vibration tolerance of humans, and as a result, human comfort criteria cannot robustly be defined and quantified. Acceptable values of human exposure to vibration depend on human activity and the character of the vibration, and they are further influenced by individual attitudes, expectations, and perceptibility.

Limits for vibration of the building structure potentially affecting human comfort can be calculated based on AS/NZS 2670.2:1990. This standard proposes maximum vibration levels in terms of baseline curves and multiplication factors for minimising the disturbing perceptibility of vibration within the dwellings of this development, Table 10 specifies appropriate limits for floor vibration in a simplified form.

Table 10 Vibration limits

Type of occupancy	**Time**	**Continuous vibration limits: r.m.s. acceleration (m/s^2) Preferred / maximum**	**Impulsive vibration limits: r.m.s. acceleration (m/s^2) Preferred / maximum**	**Intermittent vibration limits: Vibration Dose Value VDV ($m/s^{1.75}$) Preferred / maximum**
Offices, retail, circulation / other occupied ventilated space	Day or night	0.020 / 0.040	0.640 / 1.280	0.40 / 0.80
Residences	Day	0.010 / 0.020	0.300 / 0.600	0.20 / 0.40
	Night	0.007 / 0.014	0.100 / 0.200	0.13 / 0.26

3.5 Gym noise and vibration levels

For the purpose of minimising the disturbing perceptibility of vibration caused by the usage of gyms within the adjacent occupied areas of this development; Table 10 specifies appropriate limits for noise in a simplified form.

Further to these vibration limits, airborne and structure-borne sound transmitted by any gyms within the adjoining apartment areas of this development shall comply with the limits scheduled in Table 11.

Table 11 Gym maximum internal airborne and structure borne sound pressure levels

Activity	**Adjacent space**	**Internal noise criterion, L_{max}, dB(A)**
Gym usage noise	Apartment	25

3.6 Pool / spa / car stacker noise and vibration levels

For the purpose of minimising the disturbing perceptibility of vibration caused by the usage of any pools, spas or gyms within the adjacent occupied areas of this development; Table 10 specifies appropriate limits for floor vibration in a simplified form.

Further to these vibration limits, airborne and structure-borne sound transmitted by any pools, spas or gyms within the adjacent occupied areas of this development shall also comply with the limits scheduled in Table 12.

Table 12 Pool/spa maximum internal airborne and structure borne sound pressure levels

Activity	**Adjacent space**	**Internal noise criterion, L_{Amax}, dB(A)**	
		Day / Evening (7am to 10pm)	**Night** (10pm to 7am)
Pool usage noise Spa usage noise	Apartment	Airborne: 40 Structure borne: 35	Airborne: 30 Structure borne: 25

We note that the due to the offensive nature of structure borne noise, the criterion is set to 5dB(A) below that of the airborne noise.

3.7 Construction requirements (NCC)

For apartments of multi-residential buildings, the NCC specifies minimum sound insulation ratings between various occupancies. This is defined in terms of a weighted standardised level difference $D_{nT,w}$ and a weighted standardised level difference with adapted spectrum $D_{nT,w}+C_{tr}$. These ratings are determined by field testing conducted in accordance to AS/NZS 1276.1 or ISO 717.1.

The NCC also offers deemed-to-satisfy provisions based on wall sound insulation ratings determined by laboratory testing in accordance to AS/NZS ISO 717.1 standard.

Table 13 schedules field-tested sound insulation ratings needed to achieve compliance, along with corresponding deemed-to-satisfy provisions.

Table 13 Internal NCC requirements

Element	Description	NCC performance	
		Deemed to Satisfy	Field testing rating
Walls	Airborne Sound		
	Separating any two sole occupancy units	$R_w + C_{tr} \geq 50$	$D_{nT,w} + C_{tr} \geq 45$
	Separating a habitable room in one dwelling and a laundry, kitchen, bathroom or toilet in another dwelling	$R_w + C_{tr} \geq 50$ + impact	$D_{nT,w} + C_{tr} \geq 45$ + impact
	Separating a sole occupancy unit and a stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w \geq 50$	$D_{nT,w} \geq 45$
	Separating a sole occupancy unit and a plant room or lift shaft	$R_w \geq 50$ + impact	$D_{nT,w} \geq 45$ + impact
Doors	Door that separates a sole occupancy unit from a stairway, public corridor, public lobby or the like	$R_w \geq 30$	$D_{nT,w} \geq 25$
Floors	Airborne Sound		
	Separating any two sole occupancy units, or separating a sole occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	$R_w+C_{tr} \geq 50$	$D_{nT,w}+C_{tr} \geq 45$
	Impact Sound		
	Separating any two sole occupancy units, or separating a sole occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or parts of a different classification	$L_{n,w} \leq 62$	$L_{nT,w} \leq 62$
Services	If the adjacent room is a habitable room	$R_w+C_{tr} \geq 40$	N/A
	If the adjacent room is a non-habitable (wet) room	$R_w+C_{tr} \geq 25$	N/A
	Access panel in acoustical walls and acoustical barrier ceilings	$R_w+C_{tr} \geq 25$ equivalent	N/A
	If a storm water pipe passes through a sole-occupancy unit, it must be separated as stated above		

Note: Open kitchens are considered non-habitable (wet) source rooms but also habitable receiver rooms. For instance, where services are adjacent to a kitchen which is open to a living room, the kitchen would then be a habitable room and an NCC performance requirement of $R_w + C_{tr} \geq 40$ would apply to the services.

Where there is an identified risk of structure-borne sound transmission, the NCC requires a discontinuous construction, as scheduled in Table 14.

Table 14 NCC Specified constructions for wall impact sound insulation

Wall or door type	Discontinuous construction
Wall separating a wet area in one unit from a habitable room in adjacent unit OR wall separating a unit from a plant room or a lift shaft	Discontinuous construction means a wall having a minimum 20mm cavity between 2 separate leaves and: For masonry walls where ties are required between leaves, they are to be of the resilient type, and For walls other than masonry, no mechanical linkage between the leaves, except at the perimeter.

In addition to codified ratings, specific higher-performing constructions may be required in some areas (e.g. plant rooms) to reduce noise to the adjacent tenancies. Similarly, specific detailed constructions and treatments may be needed to maintain the specified sound insulation rating even across wall elements beyond typical wall types, such as at the junction of internal walls and the façade.

Notwithstanding deemed-to-satisfy provisions based on lab tests, field performance is critically dependent on good workmanship and installation quality, which is also a requirement of the acoustic design.

4. Preliminary acoustic assessment

4.1 Façade treatment assessment

Based on previous project experience in Melbourne, due to thermal requirements, residential developments have been designed with double glazing to comply with the NCC's Section J.

Furthermore, we would like to note that PPN83 provides a pathway for meeting the internal noise levels (page 2). It proposes:

- Undertaking an assessment of the impact of the external noise through an acoustic assessment report prepared by a suitably qualified consultant; or
- Applying a standard design treatment for noise.

Based on the methodology presented in PPN83 an acoustic assessment for external traffic noise is required. We therefore recommend that during the design development phase of each stage of the project, that an engineered solution is provided to ensure that the internal noise levels presented in Table 8 are achieved. As the façade design is yet to be finalised, acoustic measures will be used during the design development phase of the project. These acoustic measures may include:

- double glazed systems
- heavy glazing system framing
- fixed framing
- reduced glazed areas by introducing wall or spandrel panels
- wintergardens

Please note that all aspects of the façade design need to be coordinated and that acoustic performance may not be the only driver. Other factors that need to be considered, and include:

- Thermal requirements
- Visual consistency of the facades
- Structural requirements of glass
- Wind loading requirements of the glass (particularly at higher) levels

We note that the development is required to comply BADS / PPN83 / Clause 58 (for the residential component of the building) and AS/NZS 2107:2016 as a minimum standard in other areas.

In order to achieve compliance with the abovementioned requirements, further assessment during the design development phase of the project is proposed.

4.2 Building services

Commercial noise emissions, including plant noise emissions, from any base-building systems and commercial tenancies within the subject development are required to comply with the EPA Noise Protocol Part I noise limits.

At time of writing, plant and equipment selection is yet to be finalised. It is anticipated that provision has been included in the current scheme to incorporate standard acoustic treatment, such as silencers, barriers,

acoustically lined ductwork, acoustic louvres, etc. to meet the noise emission requirements of the EPA Noise Protocol Part I.

As the design progresses through the detailed design phase, acoustic measures will be incorporated in the design so that the noise emission criteria presented in Section 3.1.1 will be complied with.

Generally, the following allowances should be made for in the design:

- Support points for major plant items should be structurally rigid. Mid span areas of floor slab should be avoided where practical. Ideally columns, thick structural slabs or very strong beams should be provided in such cases
- Minimum 200mm concrete slabs and 150mm precast/in-situ concrete walls (or equivalent) surrounding plant rooms
- Vibration isolators for equipment rotating plant and machinery located in plant rooms with >90% isolation efficiency
- Plant and associated motor and drive assemblies should be mounted on steel chassis or concrete inertia bases (in accordance with ASHRAE)
- All penetrations to plant rooms should be properly dimensioned, packed and sealed
- Main services ducts and pipes to have their own individual penetrations, with suitable spacing to allow good sealing
- Allowance for acoustic attenuation treatments e.g. louvres or internal lining to air inlets and discharges to meet external noise emission criteria
- For major equipment such as chillers and cooling towers, allow for local stiffening of the plant room floor
- Speed controllers, if used, should be of good quality and compatible with the motor model. Poor quality controllers can result in significant increase in motor noise, as much as 10dB(A), with an offensive characteristic such as high frequency tone
- Selection of low noise fans, allowance for smooth airflow conditions in ductwork, use of attenuators and lined duct work while minimising regenerated noise at bends, take-offs and transitions

4.3 Gym

Further to our review of the Architectural drawings, we have identified a gym is proposed in the amenities area. It is understood that the gym shall be designated as non-commercial and provided for the amenity of the guests, and closed at 10pm before the night period per Section 3 – any other situation shall be highlighted to ADP Consulting.

Activities in gyms, particularly the dropping of weights, can generate high levels of vibration and structure-borne noise in the underlying building structure. Vibration isolation is therefore necessary to reduce the transfer to adjacent sensitive areas such as residences, particularly when gyms are located over sensitive areas.

Any noise and vibration transmitted by gyms within the proposed development is required to comply with the noise and vibration limits scheduled in Section 3.5. Specific gym designs to achieve these limits shall be the responsibility of the relevant contractor, and may require:

- Free-weights, machine-weights and other intensive activities be avoided.
- The development of an effective management strategy for the gym operator and gym users.
- Gym floors and equipment to feature acoustic isolation treatments.

It is recommended that a gym design, equipment types and layouts) is prepared at the earliest convenience. These gym designs can be acoustically reviewed, and isolation measures can be developed further.

4.4 Loading dock

A loading dock is included within the proposed development, located on the northern side of the building. There are proposed future residential premises to the immediate north of the loading dock (across Munro St).

Due to the proximity of this loading dock to a future proposed residence (located at 2-28 Montague St and 80 Munro St), it is recommended that the loading dock is used during the day and evening periods only (7am to 10pm).

We have calculated that during the loading and unloading of trucks, the noise level at the closest proposed residences to the north will be 51dB(A). This noise level complies with the criteria presented in Section 3.1 and no further acoustic measures are required.

4.5 Garage doors, car stackers and car lifts

We make the following comments for the selection, installation and operation of the garage doors, car stackers and car lifts:

- We recommend that during the selection of the equipment that the contractor ensures internal noise compliance with the criteria presented in Section 3.1.1 and noise emission compliance with the criteria presented in Section 3.1. It is recommended that the selected equipment adheres to a maximum L_{max} noise emission level of 60dB(A) at a distance of 3 metres.
- It is recommended that:
  - All elements, including guides/tracks/channels, motors, pumps, drums, brackets and the like, be isolated from the building structure via the installation of flexible connections such as anti-vibration mounts. Manufacturers typically offer noise/vibration reduction packages as accessories which may be considered – the treatments are to be installed in accordance with the manufacturer's specification.
  - In order to minimise airborne and structure-borne noise associated with operations such as the shunting of drives, rattling/resonance and the snapping of locking mechanisms, particular care shall be exercised at installation to adjust elements appropriately – installation should provide smooth, quiet operational motion.

5. Conclusion

A site investigation of the existing surrounds at 240-246 Normanby Road, South Melbourne has been completed to determine existing noise levels for the environment and surrounds for a proposed mixed-use redevelopment of the site.

Current standards associated with the development have been reviewed and assessed in accordance with existing site constraints. Preliminary construction standards have been provided to ensure that the City of Port Phillip and other guidelines are satisfied.

Therefore, there are no site conditions that would preclude the development from complying with the criteria defined in this report.

The design criteria and acoustic treatment concepts in this report demonstrate the pathways by which these shall be addressed by ADP Consulting and the project team through further analysis, recommendations and coordination as the design progresses.

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Appendix A
Glossary of acoustic terms

Air-borne sound

The sound emitted directly from a source into the surrounding air, such as speech, television or music.

Ambient sound

Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far. This is normally taken to be the L_{Aeq} value.

Background noise level

The average of the lowest levels of the noise levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources. Usually the L_{A90} value represents the background noise level.

dB(A)

Unit of acoustic measurement weighted to approximate the sensitivity of human hearing to sound frequency.

Decibel scale

The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. Therefore, a 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. It is generally accepted that a 10 dB increase in the sound pressure level corresponds to a perceived doubling in loudness.

Examples of decibel levels of common sounds are as follows:

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

Frequency

The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.

L_{90}, L_{10}, etc

A statistical measurement giving the sound pressure level which is exceeded for the given percentile of a measurement period (i.e. L_{90} is the level which is exceeded for 90 percent of a measurement period). L_{90} is commonly referred to as a basis for measuring the background sound level.

$L_{Aeq,T}$

The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.

L_{Amax}

The maximum sound pressure level measured over the measurement period.

L_{Amin}

The minimum sound pressure level measured over the measurement period.

Day

Referred to as the period between 7am and 6pm for Monday to Saturday and 8am to 6pm for Sundays and Public Holidays.

Evening

Referred to as the period between 6pm and 10pm for Monday to Sunday and Public Holidays.

Night

Referred to as the period between 10pm and 7am for Monday to Saturday and 10pm to 8am for Sundays and Public Holidays.

Assessment background level (ABL)

The overall background noise level on each day, evening and night periods for each day of the noise monitoring.

Rating background level (RBL)

The overall background level on each day, evening and night periods for the entire length of noise monitoring.

Reverberation

The persistence, after emission by the source has stopped, of a sound field in an enclosure.

Sound isolation

A reference to the degree of acoustical separation between two spaces. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term 'sound isolation' does not specify any grade or performance quality and requires the units to be specified for any contractual condition.

Sound pressure level, L_p, dB of a sound

A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the R.M.S. sound pressure to the reference sound pressure of 20 micro Pascals.

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