

Yeronga Heart Commercial Building

70 Park Road, Yeronga

Noise Impact Assessment

Prepared for: Minister for Economic Development Queensland

Attention: James Reid

Date: 13 December 2021

Prepared by: Monica Saralertsophon

Ref: 301401462

Stantec Australia Pty Ltd

Level 3, 52 Merivale Street, South Brisbane QLD 4101

Tel: +61 7 3811 4500 Web: www.stantec.com

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Revision

Revision	Date	Comment	Prepared By	Approved By
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PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

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1. Introduction

Stantec Australia Pty Ltd (Stantec) have been engaged by Turner & Townsend on behalf of Economic Development Queensland to undertake a noise impact assessment for the development application stage (DA) of the proposed Yeronga Heart Commercial Building.

The project site is located at 70 Park Road (Lot 3 on SP300888), Yeronga QLD 4104 and is within the Brisbane City Council (BCC).

This acoustic services report:

- Defines understanding of the existing site and proposed uses of the buildings, as well as the acoustic quality standards for the project;
- Establishes criteria pertinent to the following acoustic parameters:
 - External noise intrusion / internal noise levels;
 - Environmental noise emissions;
- Provides design recommendations for the abovementioned parameters based on the applicable design guidelines discussed in this report;

A glossary of terms used in this report is provided in **Appendix A**.

The recommendations made in this report are specific to the building design at the date of issue of this report. The building design is subject to change during the following stages. Where this occurs, the assumptions made to inform the recommendations in the report may no longer be valid; therefore, further advice should be sought to ensure that the acoustic outcomes presented in this report are achieved.

The performance of products referred to in this report are made to meet the acoustic requirements only. It does not consider other aspects, including but not limited to thermal, wind, impact, structural, mechanical, national construction code, security and fire requirements. Relevant discipline reports, drawings and specifications should be referred to for conformance.

This report relates to this specific project and must not be applied to any other project without prior consultation with Stantec. Designs and conditions can vary between projects causing significant variations in acoustic performance and relevant subsequent advice to one project may not apply to another.

This report shall not be relied upon as providing any warranties or guarantees of construction quality regarding acoustics.



2. Referenced Documentation

2.1 Regulations, Policies, Standards and Guidelines

The following documents detailed in **Table 1** are relevant to the project and are referred to throughout this report.

Table 1: Applicable Regulations, Policies, Standards and Guidelines referenced in this report

Title	Abbreviation
State Development Assessment Provisions Version 2.6 (effective 7 February 2020 from Department of Infrastructure, Local Government and Planning)	SDAP
Australian Standard AS 1055.1-1997 Acoustics – Description and measurement of environmental noise	AS 1055
International Standards Organization 9613-2:1996 Attenuation of sound during propagation outdoors – Part 2: General method of calculation	ISO 9613
Yeronga Priority Development Area - Development Scheme published by the Department of State Development, Manufacturing, Infrastructure and Planning August 2019	YDS
AAAC Guideline for Commercial Building Acoustics Version 2.0, November 2020	AAAC Guidance

2.2 Study Inputs

Acoustic assessment and the preparation of this report have been conducted based on the following received documentation detail in **Table 2**.

Table 2: Received documentation

Date Received	Details	Revision / Date Prepared	Prepared by	Form at
08/10/2021	Architectural Drawings Package - Preliminary Issue: 211026_CHQ_ARCH	Draft Concept Design Revision 5 25 October 2021	Archipelago	pdf



3. Project Details

3.1 Site Description

3.1.1 Project Location

The project site is located at 70 Park Rd (Lot 3 on SP300888), Yeronga QLD 4104 and is within the Brisbane City Council (BCC). The site is exposed to noise emissions from rail transportation lines carrying passenger and freight situated to the north of the site. The railway line is a primary passenger connection route between Gold Coast, Logan and Brisbane council regions.

The project site has been shown in context with existing surrounding developments and noise monitoring locations (conducted by Stantec and discussed in **Section 4.1**) in **Figure 1**.

Figure 1: Project site and noise monitoring location



Note: Drawings supplied by Archipelago, Draft Concept Design, dated 25 October 2021. Mark up by Stantec



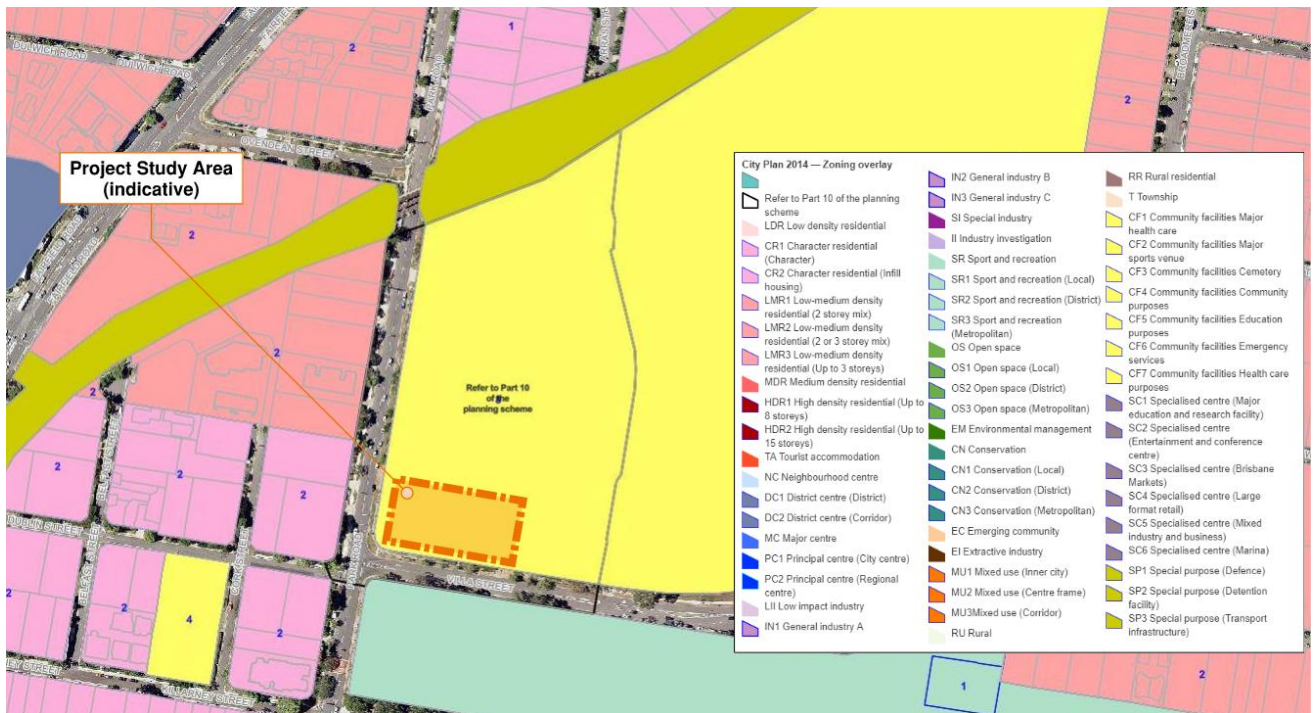
3.1.2 Surrounding Land Uses / Zoning

The Brisbane City Council City Plan 2014 [Interactive Mapping](#) (online) was accessed and reviewed on the 6 December 2021 to determine site information, as well as existing and proposed land-uses of the areas surrounding the site (see **Figure 2**). The following was identified:

- The project site is:
 - situated within Yeronga Priority Development Area (PDA) – Development Scheme and Dutton Park-Fairfield neighbourhood plan zone;
 - currently zoned CF5 Community facilities (Education purposes) by the BCC City Plan;
- Existing land uses surrounding the project site generally consist of the following zoning;
 - LMR2 Low-medium density residential (2 or 3 storey mix);
 - CR2 Character (Infill housing);
 - CF5 Community facilities (Education purposes);
 - SP3 Special purpose (Transport infrastructure)
 - SR1 Sport and recreation (Local);
 - SR2 Sport and recreation (District);
- The nearest noise sensitive receptors to the project site (outside of the Yeronga PDA) are located at:
 - Future residential development (north)
 - 25 – 51 Park Rd, Yeronga 4104; and
 - 31 Dublin St, Yeronga 4104.
- The project site is not located within;
 - State designated noise corridor - rail network
 - Aircraft Noise Exposure Forecast (ANEF) contours; and
 - State designated noise corridor – state-controlled road.



Figure 2: Land use / zoning surrounding the project site



Source: Brisbane City Council City Plan 2014 [Interactive Mapping](#) (online – City Plan Zone 2014 Zone overlay, accessed 6/12/2021)

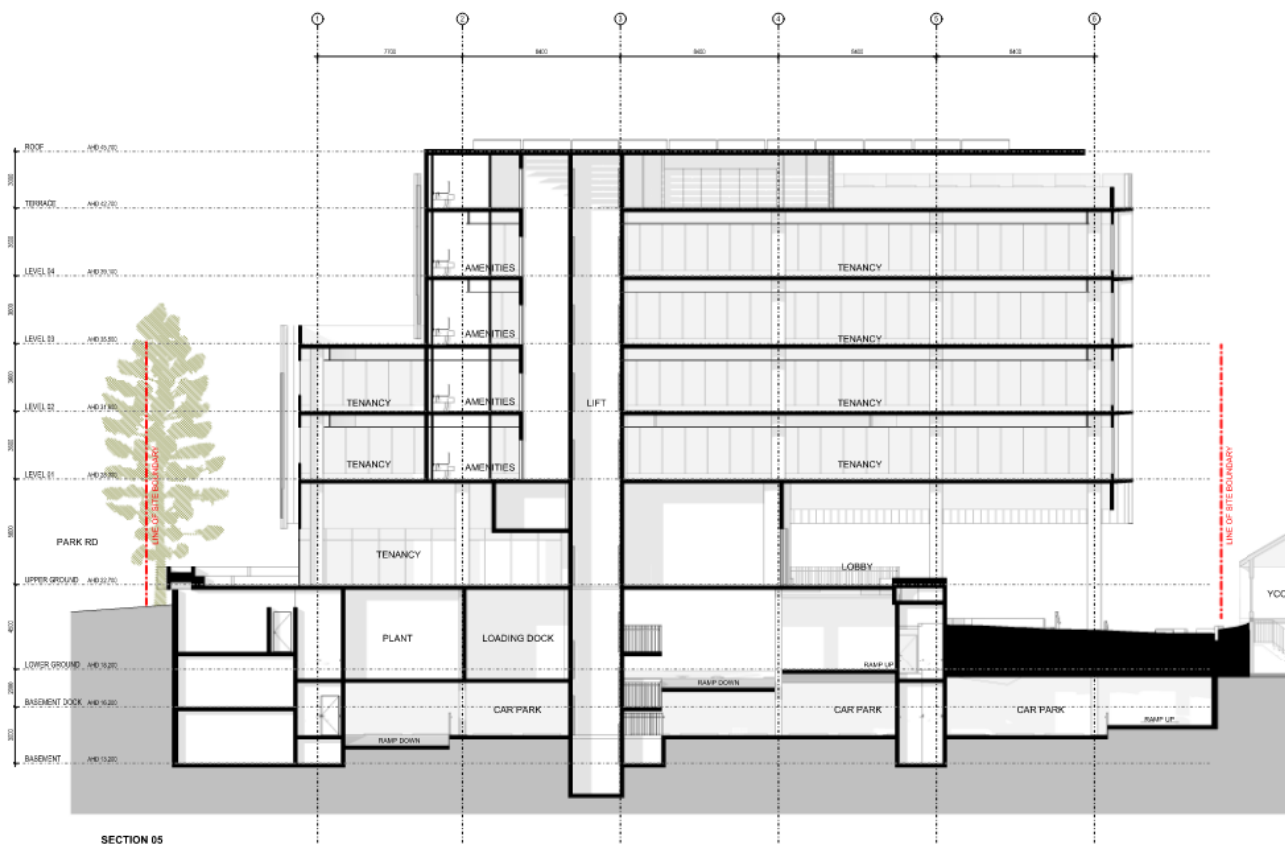
3.2 Project Description

Based on the architectural documentation received (refer to **Table 2**) the project will consist of six (6) multistorey commercial building with common lobby on ground floor and 3 levels for underground parking and loading dock. The services plant areas are proposed on the lower ground floor and roof level of the building.

An indicative section view of the proposed building showing the proposed plantroom location on lower ground floor is presented in **Figure 3**.



Figure 3: Indicative section view



3.3 Acoustic Issues and Future Design Considerations

The following items are to be considered for the project:

- The proposed site is in close proximity to potentially sensitive receivers (residents along Park Road and Yeronga High School) with the nearest horizontal distance of 28 m from the project boundary to the residential boundary, and 90 m to the Yeronga High School boundary. Noise emissions from any mechanical plant or operational activities proposed for the project will need to comply with the criteria outlined by the BCC City Plan (where applicable), EPA 1994 and EPP 2019.
- The proposed development site is potentially exposed to rail and road traffic noise. The building envelope design is to provide adequate sound insulation from the external sources, such that resultant acoustic amenity (indoor noise levels) is suitable for the proposed use.



4. Existing Acoustic Condition

4.1 Noise survey

4.1.1 Unattended Noise Measurement Method

To quantify the existing noise environment on site, an unattended noise monitoring (noise logging) was conducted from Friday 23rd April 2021 to Friday 30th April 2021 (inclusive). The location of the noise monitoring location has been shown in **Figure 1**.

Noise measurements were conducted following guidance from Australian Standard AS 1055:2018 – *Acoustics – Description and measurement of environmental noise*, and the instruments were configured as follows:

- A-weighting frequency response;
- FAST time response; and
- 15-minute, 1 minute and 1 second intervals.

The sound level meter was calibrated before and after the measurement period. The instrument showed a drift less than ± 1 dB during the course of monitoring; therefore, measurements are considered valid according to AS 1055:2018. Complete details and full measured results, refer to the details presented in **Appendix B**.

4.1.2 Noise Survey Results

A summary of relevant of the average unattended noise levels recorded at each measurement location from Friday 23rd April 2021 to Friday 30th April 2021 (inclusive) presented in **Table 3**. For further details and full measured results, refer to **Appendix B**.

Table 3: Summary of relevant noise descriptors used to determine noise limits and inform acoustic assessment

Time period	Equivalent Continuous Noise Level, $L_{eq}(\text{period})$ dB(A)	Rating Background Level, RBL dB(A)	Background Noise Level, $L_{90}(\text{period})$ dB(A)	Equivalent Continuous Noise Level, $L_{eq}(1\text{hr})$ dB(A)	Maximum noise levels L_{Max} dB(A)
Day ¹⁾	62	45	45	64	89
Evening ¹⁾	61	45	49	62	85
Night ¹⁾	58	35	38	63	87
NOTES: Day – 7am-6pm Evening – 6pm-10am Night – 10pm-7am					



5. Acoustic Criteria

5.1 Yeronga PDA – Development Scheme

Acoustic Requirements

The [Yeronga Priority Development Area – Development Scheme](#) (Yeronga PDA DS) prepared by the Economic Development Queensland (EDQ) outlines a single requirement regarding noise intrusion on the site within **Section 2.5.6 Community safety and development constraints**:

The siting, design, construction and operation of development supports community safety and gives appropriate consideration to development constraints by:

3. *avoiding, to the greatest extent practicable, then managing or mitigating significant adverse impacts:*
 - b. *from noise emissions on sensitive uses ⁴¹, including those from transport noise corridors (in this section, note 41 of the scheme states “**for guidance on acoustic amenity, refer to the Brisbane City Plan Centre or mixed-use code**”), and*
 - c. *on the environment.*

Relationship with Brisbane City Plan 2014

Schedule 6 of the Planning Regulation 2017 (Planning Regulation) prohibits Brisbane City Plan 2014 from making PDA-related development assessable under the Planning Act. However, schedule 2 adopts definitions from Brisbane City Plan 2014 and the development scheme calls up various other parts of the Brisbane City Plan 2014 as guidance.

Under section 71 of the ED Act, if there is a conflict between the development scheme and a planning instrument, or assessment benchmarks prescribed by regulation under the Planning Act or another Act for the Planning Act, the development scheme prevails to the extent of any inconsistency.

5.2 Environmental Noise Emissions

5.2.1 Brisbane City Council – City Plan 2014

The Brisbane City Council – City Plan 2014 (version 21, effective as of 28th May 2021) requires developments to be designed to maintain the expected level of amenity for the area where they are constructed.

In accordance with Section 3b of the Yeronga PDA DS, guidance on acoustic amenity shall be sought from the Brisbane City Plan when assessing noise emissions from the project site to external sensitive uses, specifically, the centre or mixed-use code. A summary of the acoustic-related performance and acceptable outcomes defined under the [9.3.3 Centre or mixed-use code](#) have been provided in **Table 4**.

Table 4: Performance outcomes and acceptable outcomes (BCC City Plan, Table 9.3.3.3.A)

Performance outcomes	Acceptable outcomes
PO1 Development: a. has hours of operation which are controlled so that the use does not detrimentally impact on the amenity of adjoining residents; b. does not result in noise emissions that exceed the noise (planning) criteria in Table 9.3.3.3.F, low frequency noise criteria in Table 9.3.3.3.G and night-time noise criteria in Table 9.3.3.3.H in a sensitive zone or a nearby sensitive use, except music noise where located in a Special entertainment precinct identified in a neighbourhood plan. Note—A noise impact assessment report prepared in accordance with the Noise impact assessment planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO1.1 Development: a. for accommodation activities, dwelling unit or emergency services has unlimited hours of operation; b. for a club, if licensed, bar, function facility, hotel or nightclub entertainment facility does not generate noise which is clearly audible and detectable, or impacts on the amenity of a resident, in a dwelling or other sensitive use; Note—Development for a club, if licensed, bar, function facility, hotel or nightclub entertainment facility is not expected to achieve this outcome. c. for any other use: i. where in the Principal centre zone or Major centre zone has unlimited hours of operation; ii. where in the District centre zone, Neighbourhood centre zone or Mixed use zone:



Performance outcomes	Acceptable outcomes
	A. has hours of operation, including for deliveries, which are limited to 6am to 10pm; or B. does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use; iii. where in any other zone: A. has hours of operation, including for deliveries, which are limited to 6am to 8pm; or B. does not generate noise which is clearly audible and disturbing in a dwelling or other sensitive use.
	AO1.2 Development ensures mechanical plant or equipment is acoustically screened from an adjoining sensitive use. Note—Mechanical plant includes generators, motors, compressors and pumps e.g. air-conditioning, refrigeration or cold room motors

Noise (planning) criteria

The applicable noise planning criteria from the *centre or mixed-use zone code* (Table 9.3.3.3.F) has been reproduced in Table 5.

Table 5: Noise (planning) criteria (Table 9.3.3.3.F, City Plan 2014)

Criteria Location	Intrusive Noise Criteria	Acoustic Amenity Criteria		
	Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus the value in this column for the relevant criteria location, where T equals: - day – 11hr - evening – 4hr - night – 9hr	Day, evening and night $L_{Aeq,adj,T}$ are not greater than the values in the columns below for the relevant criteria location, where T equals: - day – 11hr - evening – 4hr - night – 9hr		
		Day	Evening	Night
Low–medium density residential zone boundary	3 dB(A)	55 dB(A)	45 dB(A)	40 dB(A)
Character residential zone boundary	3 dB(A)	55 dB(A)	45 dB(A)	40 dB(A)
At a sensitive use in the mixed-use zone	5 dB(A)	60 dB(A)	55 dB(A)	50 dB(A)
Notes: $L_{Aeq,adj,T}$: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy. - RBL: Rating background level determined in accordance with the methodology in the Noise impact assessment planning scheme policy. - dB(A): A-weighted decibels				

Low frequency noise criteria

Low frequency noise emissions from the proposed development shall comply with the acoustic performance criteria outlined in Table 6.



Table 6: Low frequency noise criteria (Table 9.3.3.3.G, City Plan 2014)

Criteria location	Day (7am-6pm) $L_{Ceq,adj,11hr}$ is not greater than the following values at the relevant criteria location	Evening (6pm-10pm) $L_{Ceq,adj,4hr}$ is not greater than the following values at the relevant criteria location	Night (10pm-7am) $L_{Ceq,adj,9hr}$ is not greater than the following values at the relevant criteria location
Low-medium density residential zone boundary	65 dB(C)	65 dB(C)	60 dB(C)
Character residential zone boundary			
At a sensitive use in the mixed-use zone	75 dB(C)	75 dB(C)	70 dB(C)
Notes: $L_{Ceq,adj,T}$: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy. - dB(C): C-weighted decibels			

Night-time noise criteria

The relevant night-time noise criteria outlined by Table 9.3.3.3.H of the City Plan 2014 has been reproduced in **Table 7**.

Table 7: Night-time noise criteria (Table 9.3.3.3.H, City Plan 2014)

Criteria location	Where the existing $L_{Aeq,9hr\ night}$ at the criteria location is:	Average of the highest 15 single L_{Amax} events over a given night (10pm–7am) period is not greater than the following values at the relevant criteria location	The absolute highest single L_{Amax} event over a given night (10pm–7am) period is not greater than the following values at the relevant criteria location
Low-medium density residential zone boundary	< 45 dB(A)	50 dB(A)	55 dB(A)
Character residential zone boundary	45 to 60 dB(A)	$L_{Aeq,9hr\ night} + 5\text{ dB(A)}$	$L_{Aeq,9hr\ night} + 10\text{ dB(A)}$
	> 60 dB(A)	65 dB(A)	70 dB(A)
Mixed use zone	Not applicable	65 dB(A)	70 dB(A)
Notes: L_{Amax}: The A-weighted maximum sound pressure level determined in accordance with the methodology in the Noise impact assessment planning scheme policy. $L_{Aeq,9hr}$: The A-weighted equivalent continuous sound pressure level of the development during the night- time period 10pm to 7am, determined in accordance with the methodology in the Noise impact assessment planning scheme policy. - Night: 10pm to 7am - dB(A): A-weighted decibels			

5.2.2 Queensland Environmental Protection Act 1994

The objective of the [Queensland Environmental Protection Act 1994](#) (EPA 1994) is “to protect Queensland’s environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.”

To uphold this intent, and of relevance to acoustic assessment for the project, the EPA 1994 defines a series of noise-related standards in Chapter 8, Part 3B Offences relating to noise standards. The following sections are considered applicable:

Section 440R Building work

- (1) A person must not carry out building work in a way that makes an audible noise—
 - (a) on a business day or Saturday, before 6.30a.m. or after 6.30p.m; or
 - (b) on any other day, at any time.
- (2) The reference in subsection (1) to a person carrying out building work—
 - (a) includes a person carrying out building work under an owner-builder permit; and
 - (b) otherwise does not include a person carrying out building work at premises used by the person only for residential purposes.



Section 440V Refrigeration equipment

- (1) This section applies to a person who is—
 - (a) an occupier of premises at or for which there is plant or equipment for refrigeration (refrigeration equipment); or
 - (b) an owner of refrigeration equipment that is on or in a vehicle, other than a vehicle used or to be used on a railway.
- (2) The person must not use, or permit the use of, the refrigeration equipment on any day—
 - (a) before 7a.m, if it makes a noise of more than 3dB(A) above the background level; or
 - (b) from 7a.m. to 10p.m, if it makes a noise of more than 5dB(A) above the background level; or
 - (c) after 10p.m, if it makes a noise of more than 3dB(A) above the background level.
- (3) In this section—
 - (2) **vehicle** includes a trailer.

Section 440U Air-conditioning equipment

- (1) This section applies to premises at or for which there is air-conditioning equipment.
- (2) An occupier of the premises must not use, or permit the use of, the equipment on any day:
 - (a) before 7am, if it makes a noise of more than 3dB(A) above the background level¹; or
 - (b) from 7am to 10pm, if it makes a noise of more than 5dB(A) above the background level; or
 - (c) after 10pm, if it makes a noise of more than 3dB(A) above the background level.

5.2.3 Environmental Protection (Noise) Policy 2019

The [Queensland Environmental Protection \(Noise\) Policy 2019](#) (EPP 2019) identifies environmental values to be enhanced or protected, states acoustic quality objectives, and provides a framework for making decisions about the acoustic environment.

Schedule 1 Acoustic Quality Objectives

The acoustic quality objectives are stated in Section 7 of Schedule 1 of the EPP 2019. In accordance with EPP 2019, the acoustic quality objectives are stated for a defined type of noise sensitive use and specified period of the day (reproduced in **Table 8**). The environmental values which EPP 2019 aims to enhance or protect are also stated. It is intended that the acoustic quality objectives be progressively achieved as part of achieving the purpose of EPP 2019 over the long term.

Table 8: Acoustic quality objectives as defined in Schedule 1 of the EPP 2019

Sensitive Receptor	Time of Day	Acoustic Quality Objectives ¹⁾ (measured at the receptor) dB(A)			Environmental Value
		L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}	
residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30	35	40	health and wellbeing, in relation to the ability to sleep
library and educational institution (including a school, college and university) (for indoors)	when open for business or when classes are being offered	35	—	—	health and wellbeing

¹ NOTE: According to the EPA 1994:

- Background level means the background A-weighted sound pressure level under the prescribed standard measured as L_{A90, T}.
- L_{A90, T} means the A-weighted sound pressure level obtained using time weighting 'F' that is exceeded for 90% of the measuring period (T).



Sensitive Receptor	Time of Day	Acoustic Quality Objectives ¹⁾ (measured at the receptor) dB(A)			Environmental Value
		L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}	
school or playground (for outdoors)	when the children usually play outside	55	—	—	health and wellbeing, and community amenity
Notes: 1) The L _{Aeq,Adj,T} noise limits apply to all noise sources, whilst the L _{A10,Adj,1hr} and L _{A1,Adj,1hr} only apply to intermittent noise sources (i.e. excludes air conditioning).					

5.3 Building Acoustics Design Targets

For building acoustics criteria, we refer to the following documents:

- Association of Australasian Acoustical Consultants (AAAC) Guideline for AAAC Guideline for Commercial Building Acoustics 2020; and
- Australian Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors.

Applicable noise and vibration criteria from the Guideline are presented in the following sections.

5.3.1 Indoor Design Sound Levels and Reverberation Times

Unoccupied ambient sound levels and reverberation times in AS/NZS 2107:2016 have been applied. These criteria will affect the design of building services and facades.

Indoor design sound levels

The goal noise levels in Australian Standard AS/NZS 2107:2016 are to be met allowing for the combined balanced summation of noise from mechanical services and noise intrusion from road traffic noise. That is, the recommended design sound levels given in **Table 9** below apply for the combined noise from building services (supply, breakout, return etc.) and intrusive noise (traffic noise etc.). Typically, this means that the noise level of each of these noise sources should be controlled to 3 dBA less than the upper value of the recommended design sound level range in the table. For noise intrusion, design ambient noise limits are achieved during the worst case of a 60-minute period.

It is important to keep in mind that if background noise levels are too low, inadequate acoustic masking may result in loss of acoustic insulation between spaces and speech privacy.

As the proposed is for a base building, the design of the building envelope will design to meet the most stringent internal noise levels of likely space usage to provide flexibility of use for future tenancies.

Reverberation times

The most common acoustical parameter used to define the acoustical quality of a space is the reverberation time. The amount of reverberation in any room is a function of the room volume and the amount of acoustical absorption in a room. The usual location to apply specific reverberation control treatments is the ceilings. In hospitals, ceiling types are dictated in most situations by infection control requirements. In some situations, it is not possible to meet the reverberation time criteria due to the ceiling being required to be smooth and cleanable for infection control.

Acoustic design criteria applicable to building services and noise intrusion are reproduced from Australian Standard AS/NZS 2107:2016 in **Table 9** below (note not all building uses listed in the table apply to this project). For any other space use types not listed in the table, refer to AS/NZS 2107:2016 directly.



Table 9: Recommended Indoor Design Sound Levels and Reverberation Times based on AS/NZS 2107:2016

Type of occupancy/activity	Design sound level range, dBA	Design reverberation time range, s
OFFICE BUILDINGS		
Cafeterias	45 – 50	< 1.0
Corridors and Lobbies	45 – 50	< 1.0
Public Spaces	40 – 50	0.5 to 1.0
Open plan office	40 to 45	0.4 (see note1)
Reception Areas	40 – 45	0.6 to 0.8
Toilets	45 – 55	-
Notes		
1. Reverberation time should be minimised for noise control		

6. Acoustic Assessment and Recommendations

6.1 Overview

The following sections outline the acoustic services design recommendations for the project. The recommendations nominated target compliance with the acoustic performance objectives outlined in **Section 5**.

Whilst the recommendations provided herein have generally considered standard construction types, review of the preferred construction methods outlined in this report shall be conducted and adopted. Any alternatives to the recommendations provided in this report should be submitted to the acoustic engineer for review.

6.2 Building Envelope Construction

Draft report note: This is on the basis that the entire building is commercial use and not "Health care"/. Should "health care" use be applied this will trigger intruding noise limits under the SDAP

A upgraded facade will be required and as a result "health care" areas should be nominated. In the absence of specific areas been noted, the entire building will require upgrade. This will add unnecessary additional cost for commercial spaces

As the building is entirely commercial there is no requirements within the Priority Development Scheme or Brisbane City Council's - Centre or Mixed Use Code to require that the building is insulated against intruding noise.

It will be the responsibility of the building designers following development approval to control external noise transmission into the building to meet the internal noise level targets specified in **Table 9** and in particular, the project brief has stated requirement for Green Star Design & As Built v1.3, 5 Star rating.

The building envelope construction require to adequately reduce noise intrusion into the building will be review and updated as the design progresses.



6.3 Mechanical Plant Noise Emissions

6.3.1 Assessment Overview

Noise sources from general operations at the site typically include mechanical services noise from refrigeration, air-conditioning and ventilation equipment associated with the proposed buildings. These systems should be designed and installed to comply with the steady-state noise criteria stated in **Section 5.2**.

Details of mechanical plant selections are not typically available during the DA stage; therefore, detailed calculations of mechanical noise emissions could not be conducted. However, based on the design drawings, the plant rooms are proposed on the lower ground floor and at roof level of the development.

In lieu of detailed information, calculations were conducted based on first principle formulae to estimate the maximum sound power level (L_w) of the combined plant expected to comply with the noise limits at the closest sensitive receptors (future residential receiver to the north of site).

The following was assumed for assessment of noise emissions from mechanical plant, which are considered as being conservative and result in overestimated noise emission levels:

- Major plant will be situated in the roof of each proposed development.
- Noise attenuation factors such as sound source directivity, building shielding effects, noise barriers and other noise controls are not applied. The midpoint of each dedicated roof plant space has been considered.
- To protect the acoustic amenity of prospective occupants, each proposed building has been considered as the nearest noise sensitive receptor (NOTE: the criteria for *Low-medium density residential zone boundary* as defined by the BCC City Plan has been applied where applicable).
- A standard façade correction of + 2.5 dB was also applied to the results.

6.3.2 Mechanical Plant Noise Limits

Based on the assessment methods and inputs described above, the maximum theoretical mechanical plant noise emission levels are presented in **Table 10** for the specified periods of the day.

Table 10: Maximum plant sound power levels (L_w) based on shortest distance to noise sensitive location

Plant Room Location	Environmental noise limits applicable for the specified period, L_{eq} dB(A) ¹⁾			Maximum permissible sound power level (L_w) during specified period, dB(A) ²⁾		
	Day (7 AM – 6 PM)	Evening (6 PM – 10 PM)	Night (10 PM – 7 AM)	Day (7 AM – 6 PM)	Evening (6 PM – 10 PM)	Night (10 PM – 7 AM)
102m ² Plant space - roof	48	48	38	78	78	68
353m ² Plant space - roof				83	83	73
NOTES: 1) Based on the most-stringent criteria outlined in Section 5.2 . 2) The preliminary maximum plant noise level stated above are exclusive of any noise mitigation measures such as barriers, screens, louvres, attenuators or any other noise control device implemented to reduce source noise levels. In the event these are implemented, higher equipment noise levels are possible; however, will require further assessment.						

It is noted that the above result is preliminary only, where the only purpose is to assess the viability of the project from a noise emissions perspective. Therefore, a development approval condition **should not** be imposed based on the limiting sound power level stated above. Instead, noise emissions from the relevant items described in the following sections shall be further assessed during subsequent design stages of the project, when specific details regarding the source type (e.g., operative periods, sound power levels, designated location, etc.) are developed.



Necessary details and information for thorough completion of the noise impact assessment shall be requested from and coordinated with the design team. The requirements (if any) and the extent of noise control measures should be evaluated and specified during such stages to ensure the noise limits defined in this report are met.

Whilst it is unlikely that extensive acoustic treatments will be required for compliance with environmental noise limits, it is considered for solid noise barriers to north, east and south sides of the plant room are recommended to assist in attenuation of noise to adjacent sensitive receptors. In addition, costing provisions shall be made for the following:

- Noise barriers or acoustic louvres;
- Acoustic attenuators;
- In-duct linings; and / or
- Quiet equipment selections or selections with custom silencer / attenuation options.

7. Conclusion

Stantec has undertaken a noise impact assessment for the development application stage of the Yeronga Heart Commercial Building project located at 70 Park Rd, Yeronga QLD 4104.

This acoustic report has:

- outlined the acoustic services scope of works for the project;
- established relevant acoustic criteria in accordance with current Legislation, Regulations, Council Policies, Australian Standards and Design Guidelines;
- identified key acoustic issues that are to be addressed by the project during subsequent design stages
- detailed acoustic assessments undertaken for the project.

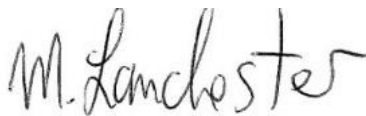
It is noted that the treatments and recommendations nominated in this acoustic report are preliminary only and are for coordination with the project team as the design progresses.

We trust that this report to be sufficient for your current requirements; however, should you have any queries, please do not hesitate to contact the undersigned on (07) 3029 5000.

Regards,



Monica Saralertsophon (Author)
Senior Acoustic Consultant for Stantec



Michael Lanchester (Reviewer)
Acoustics Section Manager (QLD) for Stantec



Appendix A Glossary of Acoustic Terms

TERM	DEFINITION
Adverse Weather	Weather conditions that affect noise (wind and temperature inversions) that occur at a particular site for a significant period of time. The previous conditions are for wind occurring more than 30% of the time in any assessment period in any season and/or for temperature inversions occurring more than 30% of the nights in winter).
Assessment Location	The position at which noise measurements are undertaken or estimated.
Assessment Period	The period in a day over which assessments are made.
Attenuation	A reduction in the magnitude of sound.
A-weighting	A frequency dependent filter applied to an instrument-measured noise. In its simplest form, the filter is designed to replicate the relative sensitivity to loudness perceived by the human ear.
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level.
Barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ctr	A standard weighting curve which replicates low frequency noise, such as that from traffic. Often added to DnT,w or Rw to characterise airborne sound insulation performance.
dB	The abbreviation for decibel.
dB(A)	A-weighted sound level in decibels.
Decibels	The relative unit of measure for noise, which is a logarithmic ratio between the measured level and reference (threshold) level of 0 dB.
Free Field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5 m from any acoustic reflecting structures other than the ground.
Frequency	Frequency is synonymous to pitch. Frequency or pitch can be measured on a scale in units of Hertz (Hz). Most noise sources typically comprise of a vast, and often complex, range of frequencies.
Frequency Response	This is a characteristic of a system which has a measured response resulting from a known applied input. In a mechanical structure, the frequency response function (FRF) is the spectrum of the vibration of a structure divided by the spectrum of the input force to the system. To measure the frequency response of a mechanical system, one must measure the spectra of both the input force to the system and the vibration response.
Intermittent Noise	Level that drops to the background noise level several times during the period of observation.
LA1	The A-weighted sound pressure level exceeded for 1 % of the measurement time period.
LA10	The A-weighted sound pressure level exceeded for 10 % of the measurement time period.
LA90	The A-weighted sound pressure level exceeded for 90 % of the measurement time period. Typically represents the background noise level of an environment.
LAeq	The equivalent continuous sound pressure level in dB(A). It is often accompanied by an additional suffix "T", which is indicative of the measurement time period. (e.g. LAeq,15min, symbolising the measurement is evaluated over 15-minutes).
LAmx	The maximum A-weighted sound pressure level recorded over the measurement period.
Reflection	Sound wave changed in direction of propagation due to a solid object met on its path.
Reverberation	The persistence of a sound within a space, which will naturally decay over time. Most apparent once the source signal has ceased emitting. Reverberation may have effects on speech intelligibility if not adequately controlled. Reverberation time, represented in seconds, can vary depending on the volume and surface finishes of the space.
Rw	Weighted sound reduction index. A single number value which represents the airborne sound insulation performance of a partition or building element that has been determined under laboratory testing conditions.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Power Level	The total sound energy radiated by a source, expressed in Watts. The sound power level is ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Sound Pressure Level	The measured acoustic wave strength in a given environment and at a particular point of interest where the total sound level expressed is relative to a reference pressure, i.e. the threshold of human hearing. Sound pressure level is typically measured using a standard sound level meter with a microphone, expressed in decibels (dB).
Spectrum	The spectrum is the result of transforming a time domain signal to the frequency domain. Spectrum analysis is the procedure of doing the transformation, and it is most commonly done with an FFT analyser.



Appendix B Noise Monitoring Details

Unattended noise logging was conducted from Friday 23rd April 2021 to 30th April 2021 (inclusive) at the location shown in **Figure 1** (coordinates in **Table 11**). This location was selected due to a high degree of exposure to the railway line.

Table 11: Noise monitoring coordinates

Monitor	Latitude	Longitude
001	-27.515506	153.020467

The following instrumentation was used:

- An NTi XL2 Class 1 sound level meter (S/N A2A-12892-E0), and Pulsar 105 Class 1 acoustic calibrator (S/N 72913). The instrument had a current calibration certificate by a certified National Association of Testing Authorities (NATA) acoustics laboratory at the time of measurements.

Noise measurements were conducted in accordance with Australian Standard AS 1055.1-1997 – *Acoustics – Description and measurement of environmental noise*, and the instruments were configured as follows:

- A-weighting frequency response;
- FAST time response;
- 15-minute, 1 minute and 1 second intervals.

The sound level meter was calibrated before and checked at the end of the measurement period. The instrument showed a drift less than ± 1 dB during the course of monitoring; therefore, measurements are considered valid according to AS1055.1-1997.

Audio was recorded during the measurements period and used for the purpose of identifying contributing noise sources.

Noise monitoring results

The raw sound level meter files were post-processed to determine relevant long-term noise descriptors, some of which were used to determine the applicable noise limits.

Results and time trace plots of relevant noise descriptors are provided below (see **Table 12** and **Figure 4**).

). Where data was not measured for a full period (i.e. at the start and end of measurement), the cells are shown dashed in the table. In addition, the noise descriptor averages are presented.

A summary of weather observations by the Bureau of Meteorology (BoM) during the monitoring period is presented in **Table 13**. Where adverse weather (e.g. rain, excessive wind) occurred within the monitoring period, the measured data has been excluded.

Table 12: Summary of measured noise levels (rounded)

Noise descriptor	Average	23-Apr-21	24-Apr-21	25-Apr-21	26-Apr-21	27-Apr-21	28-Apr-21	29-Apr-21
LA10(18hr),6am-12am	61	—	61	60	60	62	62	62
LAeq,7am-6pm	62	—	61	60	60	63	64	63
LAeq,6pm-10pm	61	61	60	60	60	60	62	61
LAeq,10pm-7am	58	58	58	57	59	59	59	—
RBL,7am-6pm	45	—	41	38	40	44	45	46
RBL,6pm-10pm	45	43	43	42	47	43	44	43
RBL,10pm-7am	35	33	33	32	35	35	34	—
LA90,7am-6pm	45	—	43	41	43	47	48	49
LA90,6pm-10pm	49	45	46	47	48	47	47	47
LA90,10pm-7am	38	38	37	36	39	39	38	—



Figure 4: Time trace of relevant noise descriptors

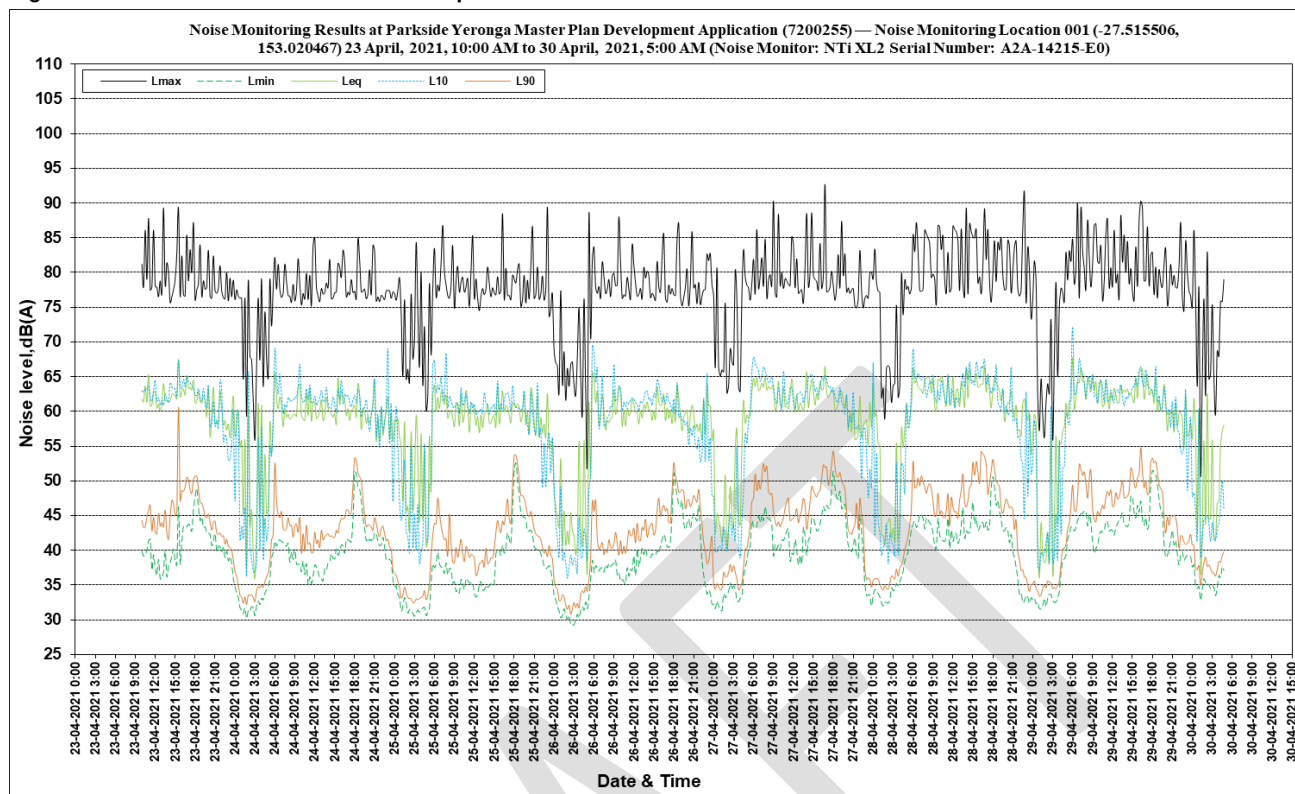


Table 13: Summary of BoM weather observations during unattended monitoring (monitored days highlighted)

Design with
community in mind

Level 3
52 Merivale Street
South Brisbane QLD 4101
Tel +61 7 3029 5000

For more information please visit
www.stantec.com

