88 Mill Point Road

Acoustics Report

Development Application

Attention: Achilles Limbouris

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Revision

Revision	Date	Comment	Prepared By	Approved By
001	07/12/2020	Draft Acoustic DA	IK	IK
002	14/12/2020	Acoustic DA Report	IK	IK

Contents

Executive Summary

Stantec has been appointed by Southlink Investment Properties Pty Ltd trading as Peakstone (Peakstone) to undertake acoustic assessment for the 88 Mill Point Road project. The project will see the development of a multi-storey mixed-use development to be located at the above street address in South Perth, WA.

As part of the development approval process and schematic design for the mixed-use development, an acoustic assessment has been carried out in order to satisfy the requirements stated in the relevant policies and guidelines applicable to the project. This includes:

- *Western Australian Environmental Protection (Noise) Regulation 1997 (EPNR);*
- *Australian and New Zealand Standard AS/NZS 2107:2016 - Acoustics – Recommended design sound levels and reverberation times for building interiors (AS2107);*
- *State Planning Policy 5.4 – Road and Rail Noise 2019 (SPP 5.4);*
- *State Planning Policy 7.3 – Residential Design Codes Volume 2 – Apartments* (SPP 7.3);
- National Construction Code 2019, Building Code of Australia (NCC 2019 Amendment 1)*;* and
- Association of Australasian Acoustical Consultants – *Guideline for Apartment and Townhouse Acoustic Rating Version 1.0* (AAAC).

The acoustic criteria derived from the aforementioned documentation forms the basis of acoustic design for the project and includes the following acoustic parameters:

- Airborne sound insulation and impact sound isolation between adjoining apartments;
- Internal noise levels resulting from noise intrusion from mechanical services and via the façade due to external sources; and
- Noise emissions from the proposed development to the nearest noise sensitive receivers.

Traffic Noise Intrusion

As per the SPP 5.4 requirements, a traffic noise assessment has been carried out and the minimum recommended external façade construction has been provided in the form of glazing and wall configurations. The predicted noise levels at the building façades were obtained through the use of the 3D noise modelling software Package, SoundPLAN 8.2, with the model calibrated based on on-site noise measurements and future traffic predictions provided by Main Roads WA.

The proposed external configurations consist mainly of glazed elements. This will require a range of configurations in order to achieve the internal noise targets stipulated in the SPP 5.4:

Glazing Configuration Recommendations

Residential Units	Room Living Areas & Bedrooms
Northwest corner apartments, (Level 35 Penthouses)	Living area – Double Glazing Unit: • 6mm glass + 12mm air gap + 10.38mm laminated glass
North & west facing	Double Glazing Unit: • 6mm glass + 12mm air gap + 8.38mm laminated glass
South & east facing	Double Glazing Unit: • 6mm glass + 12mm air gap + 6mm glass

Mechanical Services Noise Emissions

Mechanical services noise emissions are required to comply with the environmental noise regulations (EPNR). Details of mechanical plant selection have not been provided. Mechanical plant selections will be reviewed during the design stages to ensure that compliance is maintained.

The proposed locations of plant items most relevant to environmental noise emissions have been identified:

- Carpark exhaust fans discharging at ground level; and
- Cooling towers on the roof top (above level 35 of the tower).

Waste Collection

Under the EPNR Regulation 14A, the assigned noise levels of Regulation 7 do not apply to waste collection (both domestic and commercial sources).

Based on preliminary information from the waste consultant, regular council waste and recycling collection may be sufficient to serve the development, with waste loading to occur within the enclosed carpark. The additional impact on the acoustic amenity of neighboring residential/hotel buildings may be considered negligible.

1. Introduction

1.1 Overview

Stantec has been appointed by Peakstone to undertake acoustic assessment for the 88 Mill Point Road project. The project will see the development of a multi-storey mixed-use development that consists of commercial premises and predominantly apartments, located at the above address in South Perth, WA.

This report presents the key acoustic considerations and criteria pertinent to the project. The criteria will form the basis of the acoustic design for the following areas:

- Traffic noise impact on the development; and
- Noise emission from the mechanical equipment servicing the building.

1.2 Project Location

The project site is bound by Mill Point Road to the west and Ferry St to the north, being approximately 230m from the Kwinana Freeway. The site is surrounded by residential and mixed-use commercial developments.

The proposed project site is located within the City of South Perth. Figure 1 below shows the surrounding area of the project location. Traffic noise is expected to be of special consideration due to its proximity to Mill Point Road, Labouchere Road and Kwinana Freeway.

Source: NearMaps

Figure 1: Site location and surrounding area

2. Acoustic Criteria

The acoustic criteria presented in this Development Application report are derived from the following documentation;

- *Western Australian Environmental Protection (Noise) Regulation 1997 (EPNR);*
- *Australian and New Zealand Standard AS/NZS 2107:2016 - Acoustics – Recommended design sound levels and reverberation times for building interiors (AS2107);*
- *State Planning Policy 5.4 – Road and Rail Noise 2019 (SPP 5.4);*
- *State Planning Policy 7.3 – Residential Design Codes Volume 2 – Apartments* (SPP 7.3);
- *National Construction Code 2016 Volume 1, Building Code of Australia Class 2, 3 and 9c Buildings (NCC 2019 Amendment 1); and*
- Association of Australasian Acoustical Consultants – *Guideline for Apartment and Townhouse Acoustic Rating Version 1.0* (AAAC).

2.1 Environmental Protection (Noise) Regulation 1997

Environmental noise impacts resulting from the noise emissions from the project are addressed through the Environmental Protection Act 1986, with the regulatory requirements detailed in the Environmental Protection (Noise) Regulations 1997 (EPNR).

The EPNR establishes the maximum permissible noise emission levels (assigned levels) to be received at all adjacent noise-sensitive premises during specific periods of the day as a result of the cumulative noise emissions from all sources proposed for the project site. Compliance to relevant noise limits outlined in the EPNR is compulsory.

The EPNR states noise emissions from any premises are considered not to *significantly contribute to* the noise at a receiver if the noise emissions are 5 dB or below the assigned levels.

In brief, the assigned levels are determined by considering of the amount of commercial and industrial zones, as well as main transport corridors and sporting venues surrounding the noise sensitive premises. The assigned levels apply at premises receiving the noise (noise sensitive receiver) and not to areas within the project site or lot. In addition, the Environmental Protection (Noise) Regulations 1997 identify the following in Schedule 3, clause 2A.

"If the land within either of the circles is categorised on the land use map as land in respect of which mixed uses are permitted, the use of that land that results in the highest influencing factor is to be used in the determination of the influencing factor."

The nearest noise sensitive receivers have been considered as the residential properties surrounding the area, with the closest measurable noise sensitive receivers being located at 80 Mill Point Road South Perth.

For the purpose of determining the Influencing factor for 80 Mill Point Road, the land zoning provided on the City of South Perth's online mapping system (Town Planning Scheme 6) has been used to ascertain land use.

Traffic data for roads surrounding the nearest noise sensitive receiver were obtained from Main Roads Western Australia (MRWA) on the 7th December 2020. The available traffic data has been presented in Table 1.

Table 1: Traffic count data (MRWA)

Transport Corridors	EPNR Classification [1)]	Average Daily Traffic Volumes					
		2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Kwinana Freeway (at Narrows Bridge)	Major Road	-	189,894	188,352	190,225	189,296	186,531
Mill Point Road (east of Onslow Street)	Major Road	-	21,120	-	-	20,623	20,090

Labouchere Road (south of Judd Street)	Secondary Rd	-	-	-	15,691	14,605	-

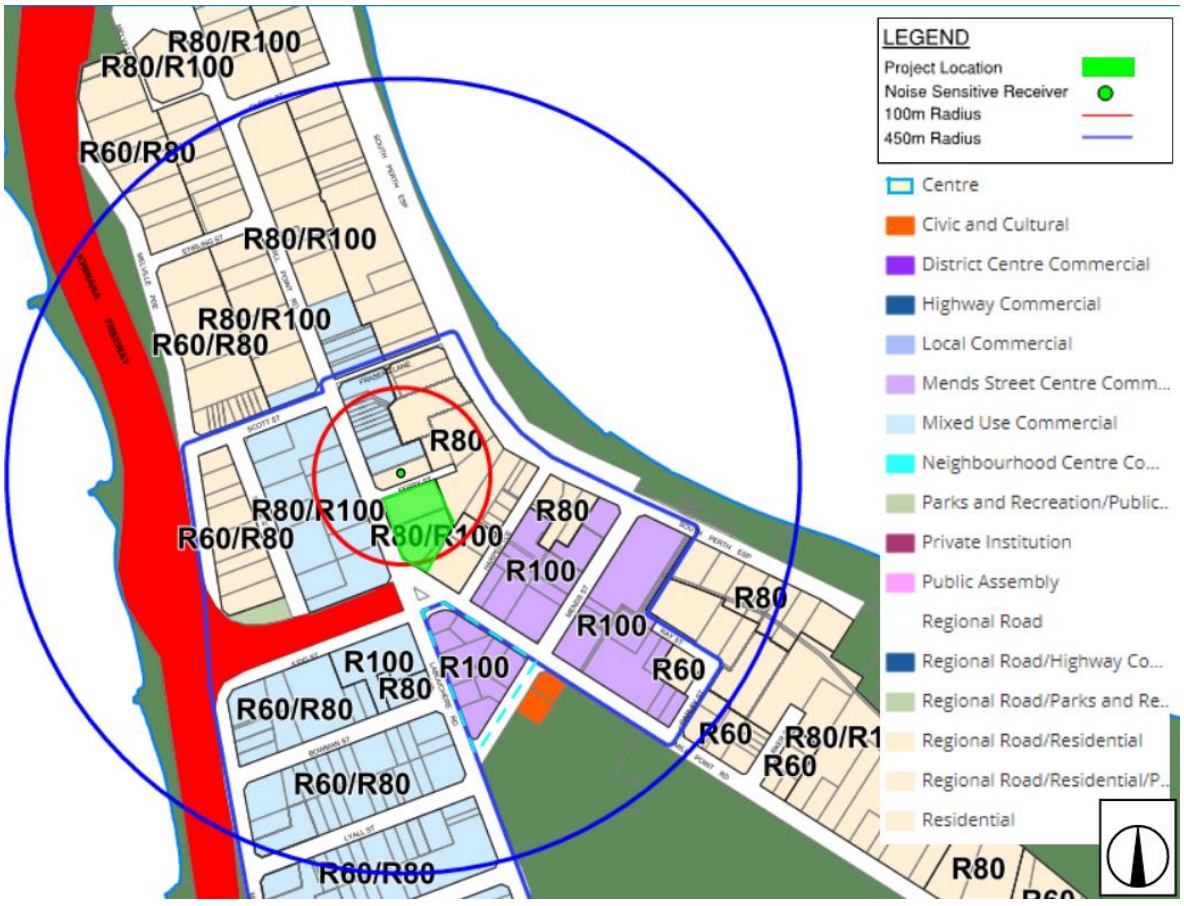
1) As defined by the EPNR. Secondary roads have between 6000-15000 vehicles per day. Major roads have greater than 15000 vehicles per day.

2.1.1 Influencing Factor for 80 Mill Point Road

The influencing factor for 80 Mill Point Road results from identifying major roads, commercial and industrial areas for all nearest noise sensitive receivers is 9 dB, as summarised in Table 2.

Table 2: Influencing factor (IF) noise sensitive 88 Mill Point Road

Noise Sensitive Premises	Commercial Zones	Industrial Zones	Transport Corridors	Influencing Factor
80 Mill Point Rd	31 % within a 100 m radius 21 % within a 450 m radius	0 % within a 450 m radius	Mill Point Road (major road) within 100m radius	9 dB



Source: City of South Perth online mapping system

Figure 2: Zoning map of areas surrounding 80 Mill Point Road

2.1.2 Assigned Noise Levels for Nearest Sensitive Receiver

Table 3 summarizes the assigned levels at the nearest noise sensitive premises. It is required that all noise emissions from the development are below the assigned level for all defined periods of the day and at the lot boundary of the receiver or 15m from any associated building. It is noted that the EPNR assigned levels only apply at the premises receiving the noise only and not to noise within the site.

Table 3: Assigned levels for 80 Mill Point Road

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: Highly sensitive area	0700 to 1900 hours Monday to Saturday	54	64	74
	0900 to 1900 hours Sunday & public holidays	49	59	74
	1900 to 2200 hours all days	49	59	64
	2200 hours on any day to 0700 hours Monday to Saturday, and 0900 hours Sunday & public holidays	44	54	64
Noise sensitive premises: any area other than highly sensitive areas	All Hours	60	75	80
Commercial premises	All Hours	60	75	80
Industrial and utility premises	All Hours	65	80	90

2.1.3 Noise Character Adjustments

Regulation 7 states that the noise character must be “free” of annoying characteristics, namely —

- Tonality, e.g. whining, droning;
- Modulation, e.g. like a siren; and
- Impulsiveness, e.g. banging, thumping.

Regulation 9 (1) establishes the methodology for determining noise characteristics. If these characteristics cannot be reasonably and practicably removed, a series of adjustments to the measured levels are required, indicated in Table 4.

Table 4: Noise character adjustment

Adjustment where noise emission is not music these adjustments are cumulative to a maximum of 15 dB			Adjustment where noise emission is music	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

2.1.4 Noise Emissions mechanical services

At this stage no information has been on mechanical equipment. Typically, projects of this type involve noise emissions from mechanical services such as air conditioning units and condensers and exhaust fans.

It is important that noise emissions from the site do not present any form of tonality, modulation or impulsiveness (as defined by the EPNR).

Given that data from mechanical plant manufacturers is generally limited to broadband data or in 1/1 octave band value, it is not possible to objectively determine tonality, as it is described in the EPNR. 1/3 octave band data is required yet is typically unavailable.

Therefore, a +5 dB correction shall be conservatively assigned when assessing noise emissions from mechanical equipment. In summary, Noise emissions from mechanical equipment shall comply with L_{A10} 39 dB at the nearest noise sensitive receiver (80 Mill Point Road).

2.2 State Planning Policy 5.4

The project is also required to comply with the State Planning Policy 5.4 – Road and Rail Noise (SPP 5.4).

The SPP 5.4 establishes the indoor and outdoor noise criteria that apply to a noise sensitive land use due to noise emissions from road and rail transport. As indicated in Figure 3, the project location is within the SPP 5.4 trigger zone for the Kwinana Freeway (300m including ramps), but outside of the passenger rail line trigger zone (100m).

Source: Department of Planning, Lands and Heritage https://espatial.dplh.wa.gov.au/planwa/Index.html?viewer=planwa

Figure 3: SPP 5.4 Zone (Department of Planning, Lands and Heritage)

The noise criteria provided in Table 5 applies to new noise-sensitive development proposals at 1 m from the most exposed, habitable façade.

Table 5: Noise target criteria for SPP5.4

Proposal	New/Upgrade	Noise Targets		
		Outdoor		Indoor
		Day (L_{Aeq} (Day) dB) (6am - 10 pm)	Night (L_{Aeq} (Night) dB) (10pm - 6am)	L_{Aeq} dB
Noise-Sensitive land-use and/or development	New noise-sensitive land-use and/or development within the trigger distance of an existing/proposed transport corridor	55	50	Day: L_{Aeq} 40 (living and work areas) Night: L_{Aeq} 35 (Bedrooms)

The policy requires outdoor targets are to be met at all outdoor areas as far as is reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines.

2.3 State Planning Policy 7.3

State Planning Policy 7.3 – Residential Design Codes Volume 2 – Apartments (SPP 7.3) may be referred to as the Residential Design Codes. The purpose of the Residential Design Codes is to provide a comprehensive basis for the control of residential development throughout Western Australia.

Volume 2 of the Policy provides planning and design standards for residential apartments (multiple dwellings) in areas coded R40 and above, within mixed use development and activity centres.

Element Objective 4.7, Managing the Impact of Noise, states that:

- *The NCC stipulates performance requirements for managing structure-borne sound. However, evidence suggests these requirements do not manage noise levels to the satisfaction of occupants. This element identifies design initiatives that aim to exceed these minimum requirements to provide better long-term outcomes for residents.*

The Element Objectives 4.7 are:

- O 4.7.1 – The siting and layout of development minimises the impact of external noise sources and provides appropriate acoustic privacy to dwellings and on-site open space; and
- O 4.7.2 – Acoustic treatments are used to reduce sound transfer within and between dwellings and to reduce noise transmission from external noise sources.

Acceptable outcomes which assist in satisfying the objectives are:

- A 4.7.1 – Dwellings exceed the minimum requirements of the NCC, such as a rating under the AAAC Guideline for Apartment and Townhouse Acoustic Rating (or equivalent);
- A 4.7.2 – Potential noise sources such as garage doors, driveways, service areas, plant rooms, building services, mechanical equipment, active communal open space and refuse bins are not located adjacent to the external wall of habitable rooms or within 3m of a window to a bedroom; and
- A 4.7.3 – Major openings to habitable rooms are oriented away or shielded from external noise sources.

The AAAC Guideline internal noise level criteria are presented in Section 2.4 and the sound insulation criteria are presented in Section 2.5.1.

2.4 Internal Noise Levels and Reverberation Times

The criteria recommended below are based on the limits presented in Australian Standard *'Acoustics – Recommended design sound levels and reverberation times for building interiors' (AS 2107:2016).* The levels stated in AS 2107:2016 apply to the combined internal noise levels from building services and external sources. The internal noise level criteria in AS2107 recommend continuous equivalent (L_{Aeq}) levels for background noise. This document is a common reference for establishing satisfactory goals for quasi-static mechanical and external traffic noise ingress.

In addition, it is proposed apartments **may** be designed to achieve noise levels that are in accordance to the Star Ratings from the AAAC guidelines, which apply more stringent criteria requirements when compared to the AS2107. The star rating system was created by the AAAC in order to provide guidelines for higher acoustical quality in dwellings. The 6-star rating is the highest star rating achievable in the AAAC guideline. A summary of the AS2107 and AAAC rating criteria is summarized below in Table 6.

Table 6: Design internal noise levels (AS2107 and AAAC)

Type of Occupancy	**Design Sound Level**						
RESIDENTIAL BUILDINGS Houses and apartments near minor roads	**AS2107** L_{Aeq} **dB(A)**	**AAAC 4 Star**		**AAAC 5 Star**		**AAAC 6 Star**	
		Continuous Noise L_{Aeq} **dB(A)**	**Intermittent Noise** L_{Amax} **dB(A)**	**Continuous Noise** L_{Aeq} **dB(A)**	**Intermittent Noise** L_{Amax} **dB(A)**	**Continuous Noise** L_{Aeq} **dB(A)**	**Intermittent Noise** L_{Amax} **dB(A)**
Living areas	30 – 40	≤ 35 – 37(1)	≤ 45 – 50(1)	≤ 30 - 35(1)	≤ 35 - 40(1)	≤ 27 - 32(1)	≤ 27 - 40(1)
Sleeping areas	30 – 35	≤ 32	≤ 35 - 45	≤ 30	≤ 30 - 40(1)	≤ 27	≤ 27 - 35(1)
Wet areas including bathrooms, ensuites and laundries	30 – 40	≤45(2)	≤ 48(2)	≤42(2)	≤ 42(2)	≤40(2)	≤ 40(2)
Apartment common areas (e.g. foyer, lift lobby)	45 – 50	-	-	-	-	-	-
Enclosed Carparks	< 65	-	-	-	-	-	-

1) Lower value in range applies to noise from internal building service and appliances. Higher value in range applies to external noise intrusion.
2) Applies to noise from internal building service and appliances only.

The AAAC guideline states that any noise that consists of tonal or impulsive characteristics shall include a penalty of the following:

- If the characteristics are clearly audible a 5 dB(A) penalty shall be applied
- If the characteristics are just audible, a 2 dB(A) penalty shall be applied

Given that the recommended AS2107 Design internal noise levels can be considered comparable to AAAC 4-5-star rating, this acoustic report has provided recommendations to comply with the internal noise criteria outlined in AS2107.

AS2107 provides recommended reverberation times for optimising the acoustic amenity in occupied spaces. The relevant reverberation times have been outlined in Table 7.

Table 7: Recommended reverberation times from AS2107

Type of occupancy/activity	Recommended reverberation time (T), s
RESIDENTIAL BUILDINGS - Houses and apartments in inner city areas or entertainment districts or near major roads —	
Sleeping areas (night-time)	-
Living areas	-
Work (study) areas	-
Apartment common areas (e.g. foyer, lift lobby)	See Note 1
General Areas	
Enclosed Carparks	–
General Retail Tenancies	See Note 1

1) Reverberation time should be minimised as far as practicable for noise control.

2.5 Sound Transmissions and Insulation — National Construction Code 2019

The acoustic requirements for inter-tenancy walls, floors etc. in residential buildings are outlined in the National Construction Code 2019 Volume 1, Building Code of Australia Class 2, 3 and 9c Buildings (NCC 2019 Amendment 1). The acoustic requirements outlined in NCC 2019 are summarised in Table 8.

Table 8: Sound insulation requirements in accordance with NCC 2019

Construction	Condition	Deemed-to-Satisfy Requirements	Verification Requirements
Walls	**Airborne Sound Insulation**		
	Between sole-occupancy units	Minimum $R_w + C_{tr}$ 50	Minimum $D_{nT,w} + C_{tr}$ 45
	Between a sole-occupancy unit and a plant room, lift shaft, stairway corridor, public corridor or the like	Minimum R_w 50	Minimum $D_{nT,w}$ 45
	Impact Sound Insulation		
	Between a laundry, kitchen, bathroom or sanitary compartment in a sole-occupancy unit, and a habitable room in an adjoining unit	Discontinuous construction [1)]	As deemed to satisfy
	Between a sole-occupancy unit and a plant room or lift shaft	Discontinuous construction [1)]	As deemed to satisfy
Floors	**Airborne Sound Insulation**		
	Between sole-occupancy units and between sole occupancy unit and lift shaft, stairway or public corridor	Minimum $R_w + C_{tr}$ 50	Minimum $D_{nT,w} + C_{tr}$ 45
	Impact Sound Insulation		
	Between sole-occupancy units and between sole occupancy unit and lift shaft, stairway or public corridor	Maximum $L_{n,w}$ 62	Maximum $L_{nT,w}$ 62

Construction	Condition	Deemed-to-Satisfy Requirements	Verification Requirements
Services	**Airborne Sound Insulation**		
	Between a habitable room (other than a kitchen) in a sole-occupancy unit and a duct, soil, waste or water supply pipe duct (if the duct or pipe is located in a wall or floor cavity and serves or passes through more than one sole-occupancy unit)	Minimum $R_w + C_{tr}$ 40	N/A
	Between a kitchen or non-habitable room in a sole-occupancy unit and a duct, soil, waste or water supply pipe duct (if the duct or pipe is located in a wall or floor cavity and serves or passes through more than one sole-occupancy unit	Minimum $R_w + C_{tr}$ 25	N/A
	If a storm water pipe passes through a sole-occupancy unit (habitable room other than kitchen)	Minimum $R_w + C_{tr}$ 40	N/A
	If a storm water pipe passes through a sole-occupancy unit (kitchen or non-habitable room)	Minimum $R_w + C_{tr}$ 25	N/A

1) *For the purposes of this Part, "discontinuous construction" means a wall having a minimum 20 mm cavity between two separate leaves.*

2.5.1 AAAC Recommended Sound Insulation Criteria

It is proposed that the design may be in line with the star rating requirements as per AAAC guidelines for acoustic performance between party walls & floors. The acoustic performance of walls and floors between separate tenancies for the proposed apartments for various star ratings has been provided in Table 9.

Table 9: AAAC Performance Requirements

Construction	Condition	4 Star Criteria	5 Star Criteria	6 Star Criteria
Walls	**Airborne Sound Insulation**	**$D_{nT,w} + C_{tr}$**		
	Between separate tenancies	≥ 45	≥ 50	≥ 55
	Between a lobby/corridor and bedroom	≥ 40	≥ 45	≥ 50
	Between a lobby/corridor and living area	≥ 35	≥ 40	≥ 45
	Corridor, foyer to living space via doors	≥ 30	≥ 35	≥ 40
	Impact Sound Insulation			
	Between tenancies	Yes(1)	Yes(1)	Yes(1)
	Between common areas and tenancies	No	Yes(1)	Yes(1)
Floors	**Airborne Sound Insulation**	**$D_{nT,w} + C_{tr}$**		
	Between separate tenancies	≥ 45	≥ 50	≥ 55
	Between a lobby/corridor and bedroom	≥ 40	≥ 45	≥ 50
	Between a lobby/corridor and living area	≥ 35	≥ 40	≥ 45
	Corridor, foyer to living space via doors	≥ 30	≥ 35	≥ 40
	Impact Sound Insulation	**$L_{nT,w} + C_{tr}$**		
	Between tenancies	≤ 50	≤ 45	≤ 40

Construction	Condition	4 Star Criteria	5 Star Criteria	6 Star Criteria
	Between all other spaces and tenancies	≤ 50	≤ 45	≤ 40

1. *Walls will be required to be of discontinuous construction in order to achieve impact sound isolation requirements*.

2.6 Further Acoustic Considerations

Based on Stantec Acoustics discussions with the architect, the following will be factored into acoustic design of the project;

- A higher degree of acoustic separation between adjacent apartments has been proposed for consideration by the Client. Acoustic separation performance of party walls and floors is typically addressed through NCC 2019, which provides the bare minimum requirements;
- Where increased acoustic separation is preferred (for example, to address Element Objective 4.7 of *State Planning Policy 7.3 – Residential Design Codes Volume 2 – Apartments*), the recommendations outlined in the AAAC may be adopted. It is noted that to achieve the performance recommendations disclosed in the AAAC document, additional treatments, above what is typically recommended in NCC 2019, may be required and could incur additional cost to the project.
- Footfall noise is general a common source of complaints within apartments, in particular where harder floor finishes are used. The acoustic requirements from NCC 2019 are a minimum and may not necessarily offer a higher degree of acoustic isolation. Recommendations for upgrading the acoustic performance of the acoustic treatments for floors will be provided (including incorporating the ceilings in providing additional impact isolation) for consideration by the client;
- An indoor pool is proposed to be located on Level 26 with plant underneath. Acoustic isolation of the swimming pool will need to be considered, along with appropriate vibration isolation of any mechanical plant mountings. As a starting point, 280mm clearance should be made available under the pool to accommodate a vibration isolating spring system;
- Gym floors (Podium Level 2, Level 26) should incorporate a floor raised by 100 – 150mm in order to accommodate a typical vibration isolating sprung floor system;
- The Wine Bar and Function room (Ground Level), several pump rooms (Podium Levels 1 and 2) and theatre room (Podium Level 2) have apartments located directly above. Consideration should be given to the noise emissions from these spaces. Noise emissions from these spaces must also comply with the EPNR at the nearest sensitive receivers; and
- Noise emissions from the services and plant will need consideration. At these stages of the project equipment details are typically unavailable. However, detailed reviews of mechanical plant shall be conducted during design development stages of the project.

3. Noise Survey

3.1 Overview

Typically, the two main sources of noise considered in noise intrusion assessments are transportation (i.e. road, rail or aircraft noise) and mechanical services noise from within the same or adjoining developments.

Unattended noise measurement (noise logging) was undertaken near the project site to ascertain the typical noise levels at the proposed development. This section provides discussion of the measurement methodology and summary of measured noise levels which were used to calibrate the noise model for the project.

3.2 Measurement Methodology

3.2.1 Equipment Details

Measurements have been conducted using instrumentation equivalent to an integrating sound level meter equipped with one octave and one-third octave band filters, and an omni-directional condenser microphone. All instrumentation meets Type 1 specifications as per ANSI S1.4 and ANSI S1.43.

All sound level meters were calibrated by an authorised NATA (National Association of Testing Authorities) laboratory less than 2 years ago and have successfully passed all IEC 61672- 2019, IEC 61260-2019, DIN 45657-2005, and ISO/IEC 17025-2018 standards and specifications.

The time constant for the RMS detector were set to a slow response (1 sec) for all measurements. The sound level meter was calibrated before and after each measurement session using a Type 1 acoustic calibrator. The calibrator was also calibrated less than 2 years ago and is in compliance with AS IEC 60942-2004.

A complete schedule of equipment used during for acoustic measurements is provided in Table 10. A copy of calibration certificates for the relevant instrumentation may be provided upon request.

Table 10: Equipment and calibration details

Manufacturer / Model	Serial Number
Brüel & Kjær 4231 - Calibrator	3005155
NTi Audio XL2 – Sound Level Meter	A2A-14416-E0

3.3 Measurement Location

Unattended noise measurements were conducted to determine the general noise impacts from traffic utilising Kwinana freeway, which is the main transport corridor affecting project noise levels. The data was analysed to ascertain the typical ambient noise levels at different times of the day.

The location of the noise measurements is indicated in Figure 4. Measurements were made at the rear of 5 Stone St, approximately 25m from the edge of the road reserve of the Kwinana Freeway southbound and 200m from the project site. The location was selected to gain accurate data on the Freeway, as it is the major noise source in the noise model and provides the trigger for an SPP 5.4 assessment.

Source: NearMap

Figure 4: Noise measurement location

3.4 Noise Measurement Summary

Unattended noise monitoring was undertaken between the 3rd and 8th December 2020. The objective of the unattended noise logging was to identify daily noise trends and typical noise impacts affecting the proposed development site.

Noise data obtained from the logger have been presented in a graph provided in Figure 5.

Average (L_{eq}) noise levels for weekdays during the measurement period were:

- 64 dB(A) between 6 AM – 10 PM; and
- 59 dB(A) between 10 PM – 6 AM.

Weather data for the period was sourced from the Perth Metro weather station (ID 009225) via Weatherzone. Recorded wind speeds averaged 3.4 m/s during weekdays. No rainfall was recorded over the measurement period.

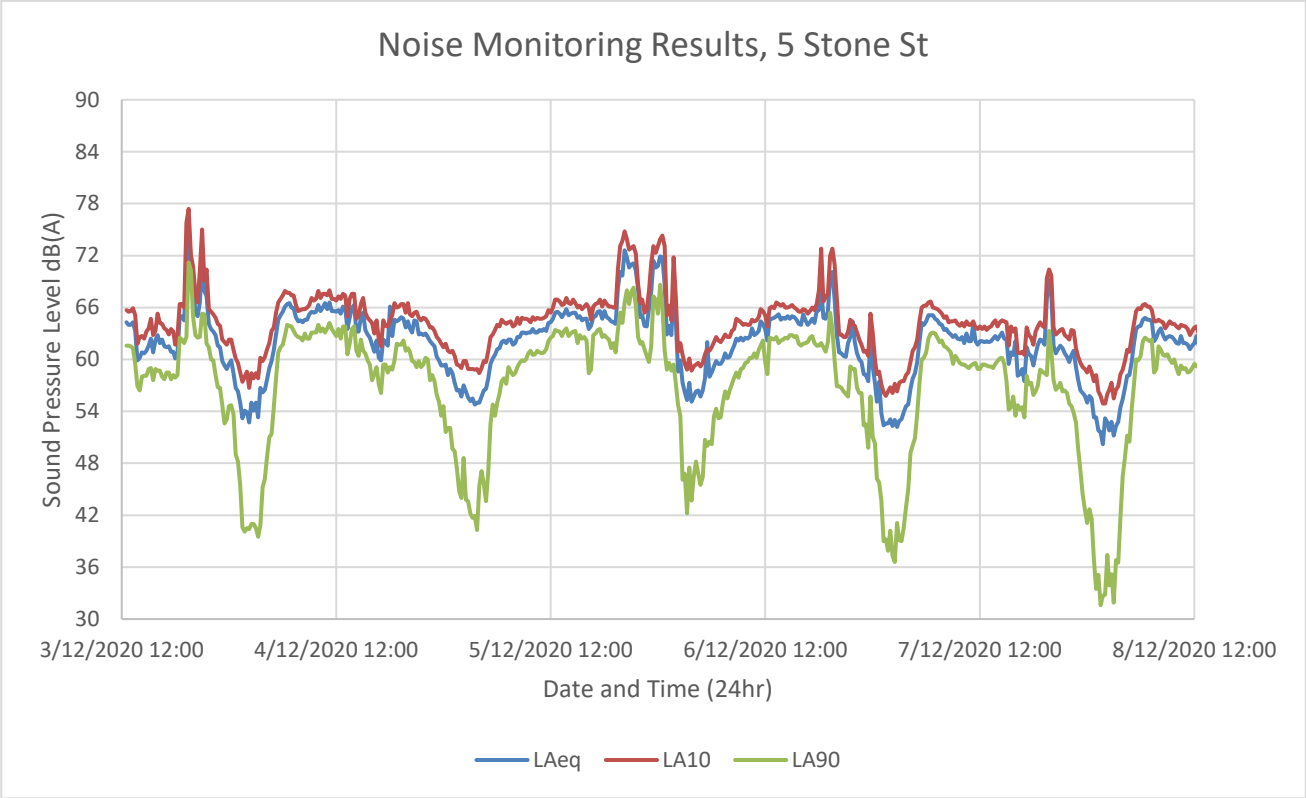


Figure 5: Unattended noise monitoring results, 03 – 08 December 2020

4. Traffic Noise Intrusion (SPP5.4)

An assessment of external transport noise impacts affecting the site was undertaken in accordance with the SPP 5.4. Detailed methodology and assessment specifications are detailed in the SPP 5.4 Guidelines (referred to as the Guidelines in the remainder of this report). Sound PLAN v8.2 (3D noise modelling software) was used to simulate noise emissions expected from road transport corridors and, subsequently, to determine noise levels at the façades of the development

A noise intrusion assessment for the proposed residential tower was conducted based on the predicted noise levels from the 3D noise model. The noise assessment takes into account current and future predicted traffic volumes, calibrated using on-site noise measurements. External wall and glazing have been provided according to the noise intrusion assessment results with the view of providing satisfactory internal noise levels that achieve the internal noise level criteria detailed in this report.

Roof configuration recommendations have also been provided based on rain noise intrusion assessment.

Calculations were undertaken following the methodology described in British Standard BS EN 12354:2000 and by utilizing the worst case (i.e. highest measured) noise levels at each façade to determine suitable glazing to address the noise sensitive of each space. Appropriate corrections were applied to the linear spectral noise levels to compensate for potential losses due to flanking paths and façade correction.

4.1 Assessment Methodology

The noise environment surrounding the proposed development was assessed using Sound PLAN v8.2 to determine the predicted noise effects on the receivers within the developments. The noise assessment takes into consideration the current and future traffic volumes that the receivers will be exposed to. The results from the assessment were then used to determine the noise intrusion into apartments.

Noise levels for the proposed redevelopment were modelled at a distance of 1 m from the building façade. Receiver noise levels predicted at the building façade also include a +2.5 dB façade correction as per the SPP 5.4 requirements. The relevant sections of the SPP5.4 Noise Modelling Checklist has been complied with and provided in Appendix B.

4.1.1 Noise Modelling Inputs

Topography

Considering the proximity of the noise source and very little change in elevation between the surrounding major roads and project site (GoogleEarth) the ground topography was considered to be flat. To suit the current conditions of the project location, a ground condition of 0.6 has been used in the model, which is in between a soft ground condition (1) and a reflective ground condition (0).

Road Traffic

The road traffic noise assessment has been conducted based on the methodology described by the Calculation of Road Traffic Noise algorithm (CoRTN, UK Transport Agency).

The CoRTN algorithm has been developed to calculate $L_{A10,18hr}$ noise levels. However, SPP5.4 requires road noise assessments to be based upon the energy averaged $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ noise descriptors for the daytime and night-time respectively. Conversions are applied using the method outlined in the DEFRA publication, *"Method for Converting the UK Road Traffic Noise Index $L_{A10,18hour}$ to the EU Noise Indices for Road Noise Mapping."*

This algorithm considers the following parameters:

- Noise levels measured on site;
- Traffic volume during each period of the day, and for current and future scenarios (awaiting Main Roads WA data);
- Average traffic speeds;
- Height of each individual noise source (passenger vehicles, heavy vehicles – engine and exhaust);

- Percentage of heavy vehicles; and
- Gradient and surface of road.

Road traffic noise source heights were incorporated into the noise model in accordance to the description detailed by the Guidelines. The modelled heights of vehicle "strings" are provided below;

- Passenger vehicles: + 0.5 m
- Heavy vehicles — Engine noise: + 1.5 m
- Heavy vehicles — Exhaust: + 3.6 m

The predicted average daily traffic volumes for 2020 and 2041 were obtained from Main Roads Western Australia (MRWA), Reference No. 41723, and included the proportion of vehicles during day and night, as well as the percentage of heavy vehicles that transit Kwinana Freeway, Mill Point Road and Labouchere Road.

SPP 5.4 requires all noise assessments to consider changes in traffic volumes expected over the next 20 years. The MRWA predicted traffic volumes for 2041 were used for this. Table 11 summarises the current and future predicted traffic volumes used in the assessment model.

Table 11: Current and Future Traffic Volumes

Road	Assessment Year	Predicted Daily Vehicle Volume	Day time [1] Vehicle Hourly Volume	Night-time [1] Vehicle Hourly Volume	Heavy Vehicle Percentage [2]	Mean Speed
Kwinana Fwy (at Narrows Bridge)	Current – 2020	200,941	11,289	2,539	5.5 %	80 km/h
	Future – 2041	262,200	14,731	3,313	5.5 %	
Mill Point Rd (east of Onslow St)	Current – 2020	22,304	1,306	176	4.2 %	60 km/h
	Future – 2041	27,400	1,604	217	4.2 %	
Labouchere Rd (South of Judd St)	Current – 2020	16,311	959	121	4.3 %	60 km/h
	Future – 2041	22,600	1,329	167	4.3 %	

1) Day time period refers to 0600 AM – 2200 PM. Night-time refers to 2200 PM – 0600 AM.

2) Heavy vehicle percentage based on the latest MRWA traffic counts has been incorporated in the assessment.

Noise Logging Data Calibration

The noise logging data obtained as per Section 3.4 was viewed as acceptable with no major disturbances. Based on this, the average L_{Aeq} noise levels during day and night-time periods were used to calibrate the traffic noise source within the 3D model. The average noise measured during day and night-time has been summarised in Table 12:

Table 12: Average Measured Noise Levels ($L_{eq,T}$)

Reference	Time	L_{Aeq} dB(A)
5 Stone St	Day 07:00 AM to 22:00 PM	64
	Night 22:00 PM to 07:00 AM	59

4.2 Noise Modelling Results

The results of the SoundPLAN noise model show that the noise levels are the highest for the for future traffic scenario (2041) at the façade. Refer to Appendix C for detailed façade noise maps which show the varying noise levels across the façade of the development.

The predicted noise levels at the Podium Level 02 common outdoor area comply with the outdoor 'noise target' values in SPP 5.4.

As it would be not be reasonable and practical to design the building to achieve compliance to the outdoor noise levels at each balcony (including those facing towards Kwinana Freeway), internal noise levels have been targeted for the residential tower and retail tenancies. Details of recommended façade configurations have been provided in the sections below.

4.3 External Envelope

4.3.1 External Wall

Based on the architectural layouts (Dated 11th December 2020), it is evident that the building envelope will consist of primarily glazed elements. The noise intrusion has been calculated for all façade elements relative to their surface area.

Where solid elements are used as the external wall, the walls are required to achieve $R_W + C_{tr}$ 45 as a minimum to achieve acceptable internal noise levels.

Typically, this can be achieved with the following configuration:

- 110mm Concrete Panel

Alternative construction material may be used to achieve the required performance. This will, however, require review and approval of the Acoustic Engineer.

Where lightweight construction is proposed, this will result in reduced acoustic performance specifically in the lower frequencies. As a result, this may have some impact on the recommended glazing types.

4.3.2 External Glazing

Glazing configurations to achieve the required internal noise levels have been provided for all residential units, taking into consideration the predicted external noise levels in Appendix C. This configuration is to achieve acceptable internal noise levels considering traffic noise generated from the identified major transport corridors. Assessment of glazing configuration to mitigate noise intrusion from other sources near the project will be undertaken at a later stage of the project.

To ensure compliance to the recommended internal noise levels specified in SPP 5.4, the following treatments as detailed in Table 13 shall be applied and read in conjunction with the external glazing mark-up provided in Appendix D;

Table 13: External Glazing Recommendations

Reference (Appendix D)	Glazing Configuration	$R_W + C_{tr}$	Spectrum Sound Transmission Loss (dB)						
			63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2kHz	4k Hz
GT-1	6mm glass + 12mm air gap + 10.38mm glass	**36 (42; -6)**	27	28	27	38	45	47	51
GT-2	6mm glass + 12mm air gap + 8.38mm glass	**35 (40; -5)**	26	27	26	37	44	45	50

Reference (Appendix D)	Glazing Configuration	$R_W + C_{tr}$	Spectrum Sound Transmission Loss (dB)						
			63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2kHz	4k Hz
GT-3	6mm glass + 12mm air gap + 6mm glass	**30 (35, -5)**	23	25	21	35	41	37	39

Note: Glazing performance provided for glass only. Overall performance of the glazing system including the frames and seals shall not degrade by more than 3 dB as per the performance requirement stated.

4.3.3 Roof Construction

Whilst it is not a mandatory requirement of the NCC, rain noise intrusion through any lightweight roof shall be considered with a view of ensuring an adequate level of amenity for occupants. Additionally, roof construction should be adequately designed to control external noise intrusion from noise sources identified in this report such as mechanical services. The following construction is adequate to fulfil the rain noise requirements.

One layer of Colorbond sheet metal or similar (0.42 mm); and

- 75 mm thick high-density Anticon insulation hard-fixed to the underside of roof and over steel purlins;
- Minimum ceiling cavity to be 300mm;
- Suspended ceiling system; and
- Min. 50 mm thick glass wool insulation (min. 11kg/m^3) one layer of 13 mm standard plasterboard.

5. Waste Collection

Based on preliminary information from the waste consultant, regular council waste and recycling collection may be sufficient to serve the development. The additional impact on the acoustic amenity of neighboring residential/hotel buildings may be considered negligible.

Under the EPNR Regulation 14A, the assigned noise levels of Regulation 7 do not apply to waste collection (both domestic and commercial sources), provided:

- The works are carried out in the quietest reasonable and practicable manner;
- The equipment used to carry out the works is the quietest reasonable available; and
- In the case where a noise management plan is required (e.g. works are to occur outside of 0700 – 1900 hours Monday through Saturday or 0900 – 1900 hours Sundays and public holidays), the plan is submitted and approved, with works carried out according to the plan.

Generally, local councils cannot confirm collection times for residential waste collections, however they endeavour to conduct waste collection during the hours 0700 – 1900 hr Monday to Saturday in accordance with the WA Department of Environmental Regulation's Draft Guide to Management of Noise from Waste Collection and Other Works (December 2014).

According to the current architectural drawings, waste collection is proposed from the ground floor carpark. The bin loading area is shown in Figure 6.

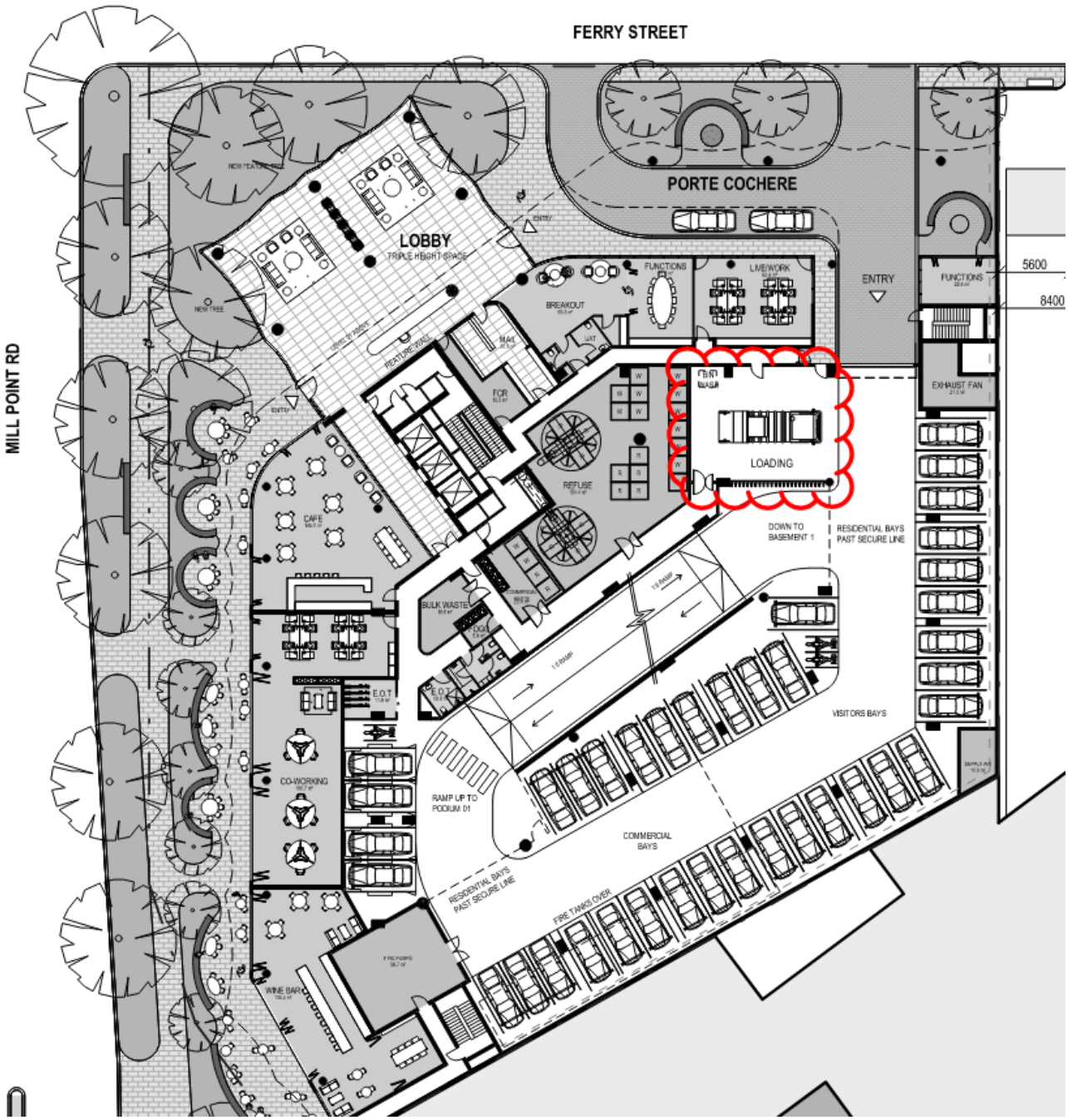


Figure 6: Ground Floor Loading Bay

6. Mechanical Services Noise Emission

Noise generated via the mechanical services from the proposed development is required to comply with the EPNR criteria at all nearest sensitive receivers. Once details of equipment are available, appropriate recommendations will be provided as required to comply with the EPNR at all times of day.

The proposed locations of plant items most relevant to environmental noise emissions have been identified:

- Carpark exhaust and supply air fans (Podium Level 01); and
- Cooling towers on the roof top (above Level 35).

Other mechanical plant and equipment has been identified as being housed within enclosed spaces:

- Substation, Switchroom, NBN room (Basement 1);
- Fire pumps (Ground);
- Heat pumps and relay pumps (Podium Level 02); and
- Pool plant (Level 25).

7. Conclusion

As part of the Development Application process for the 88 Mill Point Road project, an acoustic assessment has been carried out as detailed in this report.

Traffic noise assessment has been carried out as per the SPP 5.4 and the minimum recommended external façade construction has been provided in the form of glazing configurations. The predicted noise levels at the building façades were obtained through the use of the 3D noise modelling software Package, SoundPLAN 8.2.

Mechanical services noise emissions will be assessed to the environmental noise regulations (EPNR) in the next stages of design, with recommendations provided as necessary to ensure compliance.

Under the EPNR Regulation 14A, the assigned noise levels of Regulation 7 do not apply to waste collection (both domestic and commercial sources). Based on preliminary information from the waste consultant, regular council waste and recycling collection may be sufficient to serve the development, with waste loading to occur within the enclosed carpark. The additional impact on the acoustic amenity of neighboring residential/hotel buildings may be considered negligible.

Appendix A Glossary of Acoustic Terms

NOISE	
Acceptable Noise Level:	The acceptable LAeq noise level from industrial sources, recommended by the EPA (Table 2.1, INP). Note that this noise level refers to all industrial sources at the receiver location, and not only noise due to a specific project under consideration.
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).
Acoustic Barrier:	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ambient Noise:	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment Period:	The period in a day over which assessments are made.
Assessment Location	The position at which noise measurements are undertaken or estimated.
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, when extraneous noise is removed. 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 L90 noise level.
Decibel [dB]:	The units of sound pressure level.
dB(A):	A-weighted decibels. Noise measured using the A filter.
Extraneous Noise:	Noise resulting from activities that are not typical of the area. Atypical activities include construction, and traffic generated by holidays period and by special events such as concert or sporting events. Normal daily traffic is not considered to be extraneous.
Free Field:	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m 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).
Impulsive Noise:	Noise having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent Noise:	Level that drops to the background noise level several times during the period of observation.
LAmax	The maximum A-weighted sound pressure level measured over a period.
LAmin	The minimum A-weighted sound pressure level measured over a period.
LA1	The A-weighted sound pressure level that is exceeded for 1% of the time for which the sound is measured.
LA10	The A-weighted sound pressure level that is exceeded for 10% of the time for which the sound is measured.
LA90	The A-weighted level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
LAeq	The A-weighted “equivalent noise level” is the summation of noise events and integrated over a selected period of time.

LAeqT	The constant A-weighted sound which has the same energy as the fluctuating sound of the traffic, averaged over time T.
Reflection:	Sound wave changed in direction of propagation due to a solid object met on its path.
R-w:	The Sound Insulation Rating R-w is a measure of the noise reduction performance of the partition.
SEL:	Sound Exposure Level is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound Absorption:	The ability of a material to absorb sound energy through its conversion into thermal energy.
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 Pressure Level:	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level:	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise:	Containing a prominent frequency and characterised by a definite pitch.

Appendix B SPP 5.4 Noise Modelling Checklist

Checklist item		Action
Road traffic input data		
Road name	Kwinana Freeway (at Narrows Bridge)	
	16-hr daytime road traffic volume	297,616
	Percentage of heavy vehicles (daytime)	5.5 %
	8-hr night-time road traffic volume	33,472
	Percentage of heavy vehicles (night-time)	9.4 %
Road pavement	Open Graded Asphalt	-2.5 dB
Road traffic heights	Have the road emissions sources been modelled at the following heights?	
	Light and heavy vehicle tyre-road height at +0.5 m	Y
	Heavy vehicle engine height at +1.5 m	Y
	Heavy vehicle exhaust height at +3.6 m	Y
Traffic speed	What is the modelled road posted (signal) traffic speed?	80 km/h

Checklist item		Action
Road traffic input data		
Road name	Mill Point Road (east of Onslow Street)	
	16-hr daytime road traffic volume	35,008
	Percentage of heavy vehicles (daytime)	4.2 %
	8-hr night-time road traffic volume	2,368
	Percentage of heavy vehicles (night-time)	4.8 %
Road pavement	Dense Graded Asphalt	
Road traffic heights	Have the road emissions sources been modelled at the following heights?	
	Light and heavy vehicle tyre-road height at +0.5 m	Y
	Heavy vehicle engine height at +1.5 m	Y
	Heavy vehicle exhaust height at +3.6 m	Y
Traffic speed	What is the modelled road posted (signal) traffic speed?	60 km/h

Checklist item		Action
Road traffic input data		
Road name	Labouchere Road (south of Judd Street)	
	16-hr daytime road traffic volume	26,336
	Percentage of heavy vehicles (daytime)	4.3 %
	8-hr night-time road traffic volume	1,704
	Percentage of heavy vehicles (night-time)	5.9 %
Road pavement	Dense Graded Asphalt	
Road traffic heights	Have the road emissions sources been modelled at the following heights?	
	Light and heavy vehicle tyre-road height at +0.5 m	Y
	Heavy vehicle engine height at +1.5 m	Y
	Heavy vehicle exhaust height at +3.6 m	Y
Traffic speed	What is the modelled road posted (signal) traffic speed?	60 km/h

Noise prediction corrections			
Traffic emission	If using the Calculation of Road Traffic Noise algorithms, have the following corrections been applied?		
	-0.8 dB correction to heavy vehicle engine emission?		Y
	-8.0 dB correction to the heavy vehicle exhaust emission?		Y
Road pavement	Has one of the following corrections been applied to the tyre/road emission?		Y
	14 mm chip seal	+3.5 dB	
	10 mm chip seal	+2.5 dB	
	5 mm chip seal	+1.5 dB	
	Dense graded asphalt	0.0 dB	Y
	Novachip	-0.2 dB	
	Stone mastic asphalt	-1.5 dB	
	Open graded asphalt	-2.5 dB	
Australian traffic	Has a -1.7 dB Australian Road Research correction or reasonable equivalent applied?		Y
Receptor façade	Has a +2.5 dB building façade correction been applied?		Y

Road noise barriers		
Noise barriers	Have noise barriers been modelled as being fully reflective?	N
	If noise barriers have not been modelled as being fully reflective, have absorptive barrier designs been considered?	Y

Environmental inputs		
Receivers	Were receiver heights modelled at 1.4 m above floor level?	Y
	Have noise levels been predicted at the most affected façade/s?	Y

Road traffic noise predictions		
Predicted noise levels	Have noise levels been predicted at all floors of the development?	Y
	Have the noise predictions considered the 20-year planning horizon?	Y

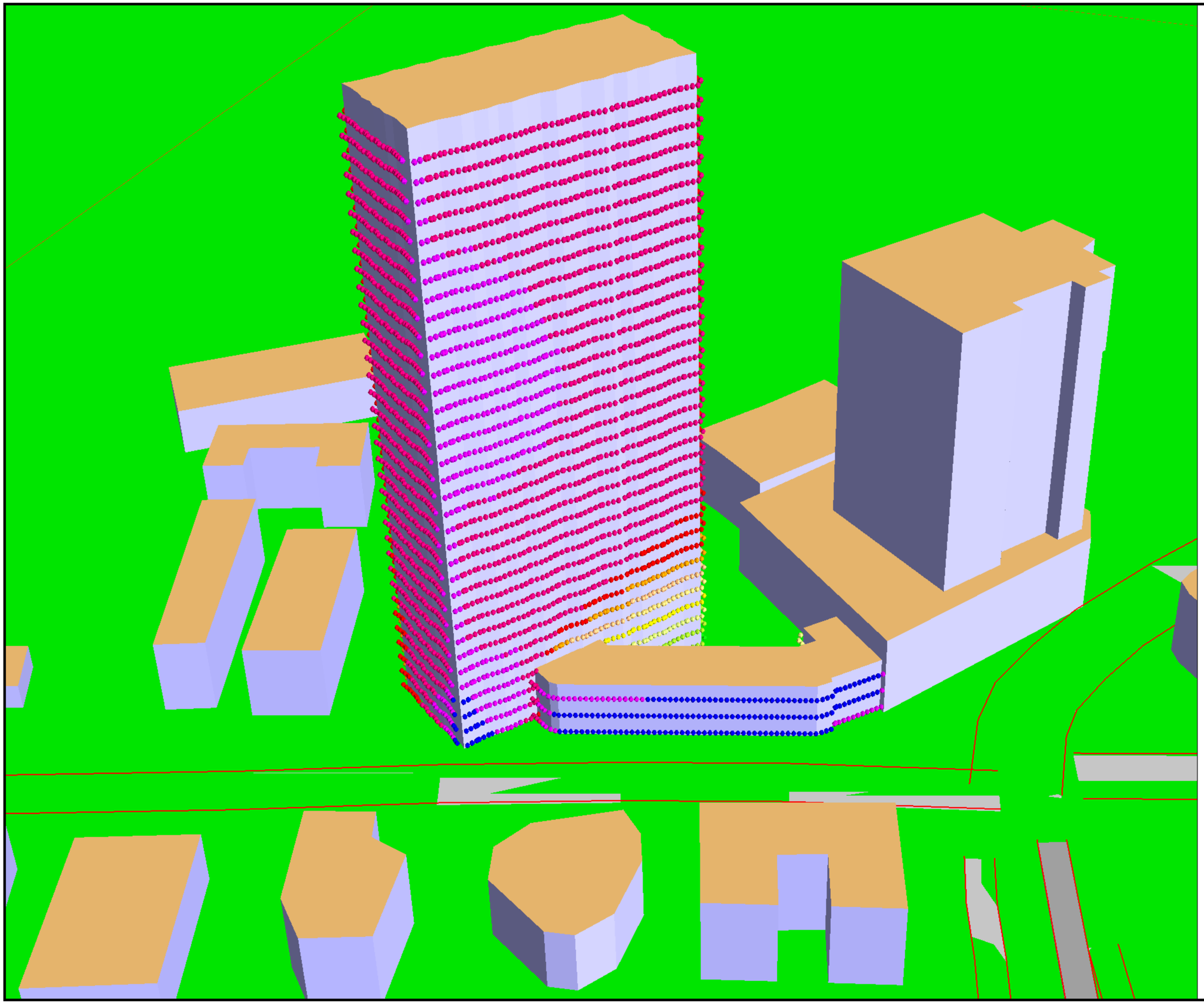
Appendix C Traffic Model Façade Noise Maps

88 Mill Point Road

301248278
9/12/2020
BEM

FUTURE DAY TIME TRAFFIC
SCENARIO (2041)

FACADE NOISE MAP
VIEW FROM WEST



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88 Mill Point Road

301248278
14/12/2020
BEM

FUTURE DAY TIME TRAFFIC
SCENARIO (2041)

FACADE NOISE MAP
VIEW FROM EAST

Noise level
in dB(A)

	< 42.0
42.0 <=	< 44.5
44.5 <=	< 47.0
47.0 <=	< 49.5
49.5 <=	< 52.0
52.0 <=	< 54.5
54.5 <=	< 57.0
57.0 <=	< 59.5
59.5 <=	< 62.0
62.0 <=	< 64.5
64.5 <=	< 67.0
67.0 <=	< 69.5
69.5 <=	< 72.0
72.0 <=	

0 10 20 30 40 50
m

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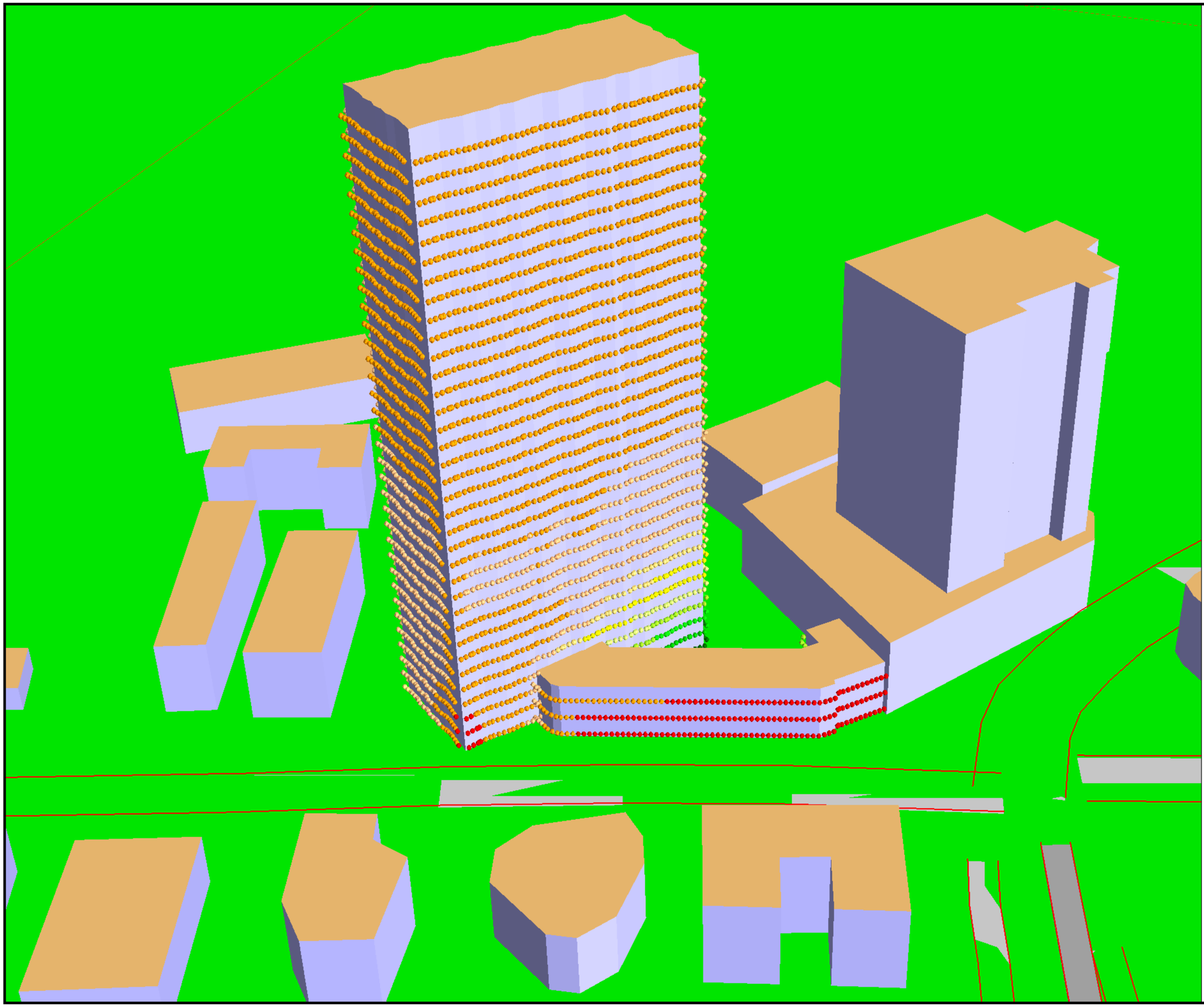
88 Mill Point Road

301248278
14/12/2020
BEM

FUTURE NIGHT TIME TRAFFIC
SCENARIO (2041)

FACADE NOISE MAP
VIEW FROM WEST



Noise level
in dB(A)

	< 42.0
42.0 <=	< 44.5
44.5 <=	< 47.0
47.0 <=	< 49.5
49.5 <=	< 52.0
52.0 <=	< 54.5
54.5 <=	< 57.0
57.0 <=	< 59.5
59.5 <=	< 62.0
62.0 <=	< 64.5
64.5 <=	< 67.0
67.0 <=	< 69.5
69.5 <=	< 72.0
72.0 <=	

0 10 20 30 40 50
m

Stantec

88 Mill Point Road

301248278
14/12/2020
BEM

FUTURE NIGHT TIME TRAFFIC
SCENARIO (2041)

FACADE NOISE MAP
VIEW FROM EAST

Noise level
in dB(A)

	< 42.0
42.0 <=	< 44.5
44.5 <=	< 47.0
47.0 <=	< 49.5
49.5 <=	< 52.0
52.0 <=	< 54.5
54.5 <=	< 57.0
57.0 <=	< 59.5
59.5 <=	< 62.0
62.0 <=	< 64.5
64.5 <=	< 67.0
67.0 <=	< 69.5
69.5 <=	< 72.0
72.0 <=	

0 10 20 30 40 50
m

Stantec

88 Mill Point Road

301248278
14/12/2020
BEM

FUTURE DAY TIME TRAFFIC SCENARIO (2041)

NOISE CONTOUR AT PODIUM 2 ELEVATION

Noise level
in dB(A)

	< 42.0
42.0 <=	< 44.5
44.5 <=	< 47.0
47.0 <=	< 49.5
49.5 <=	< 52.0
52.0 <=	< 54.5
54.5 <=	< 57.0
57.0 <=	< 59.5
59.5 <=	< 62.0
62.0 <=	< 64.5
64.5 <=	< 67.0
67.0 <=	< 69.5
69.5 <=	< 72.0
72.0 <=	

0 10 20 30 40 50
m

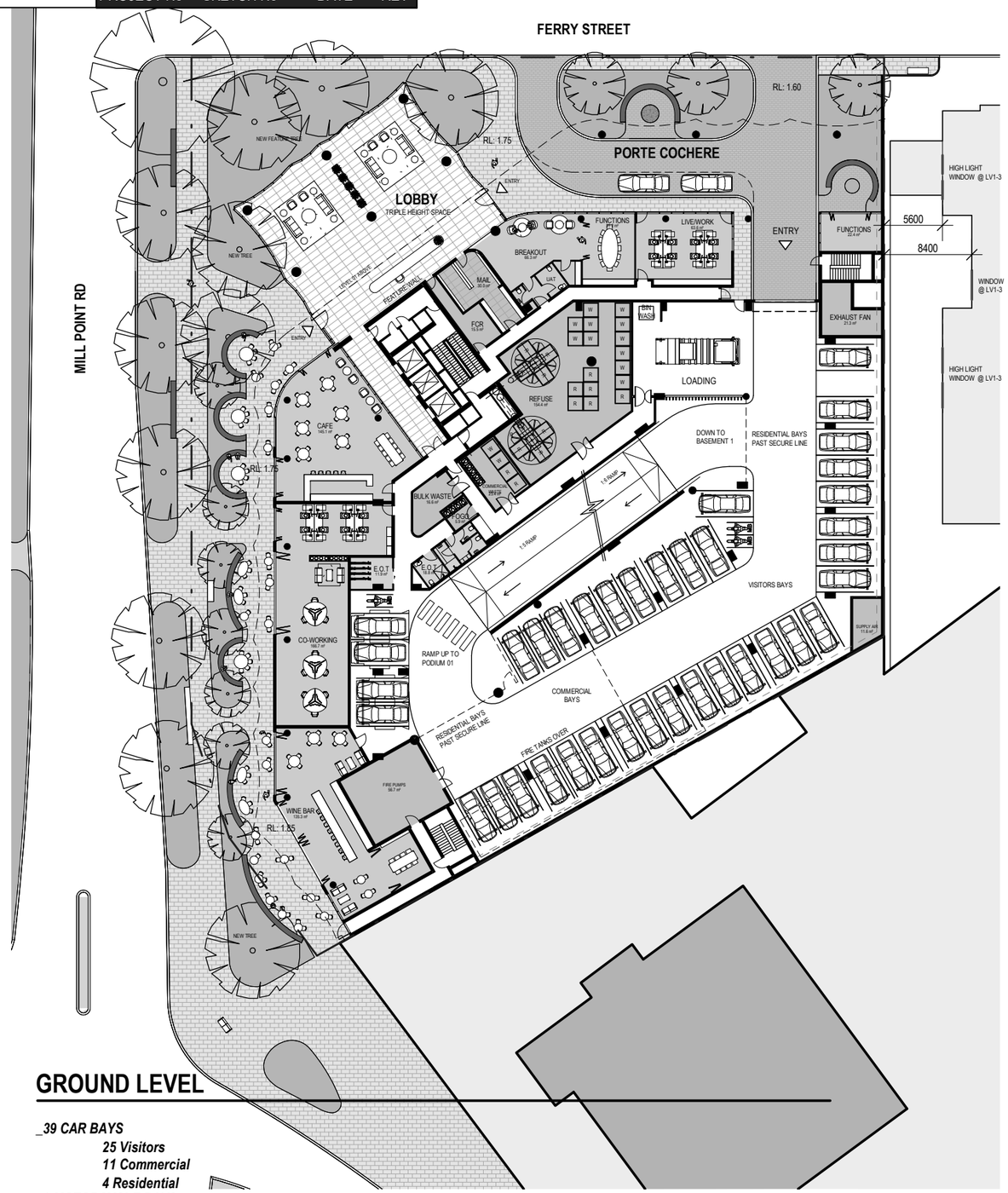
Stantec

Appendix D External Glazing and Wall Mark Up

SKETCH TITLE BY B.Martis

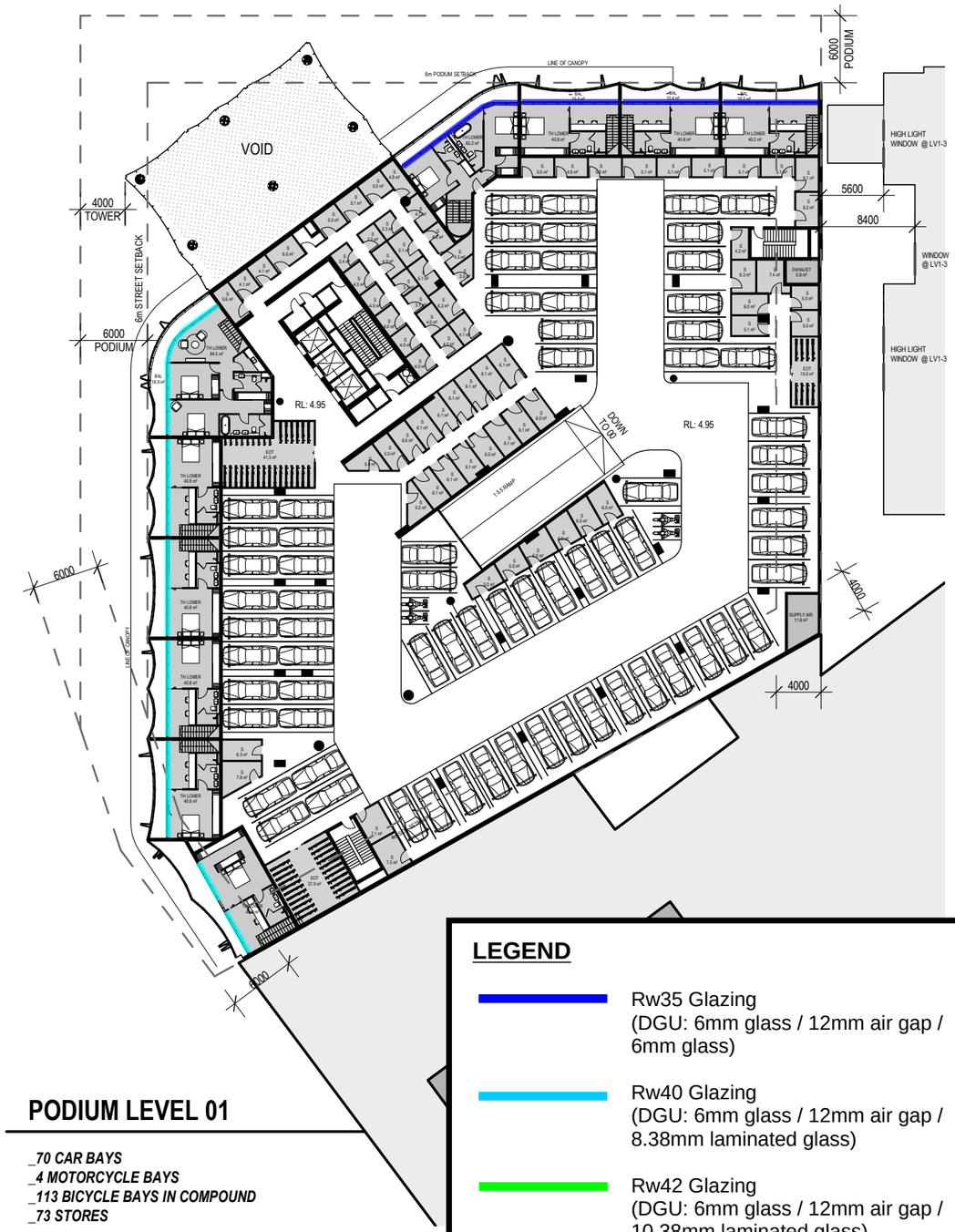
Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



GROUND LEVEL

_39 CAR BAYS
25 Visitors
11 Commercial
4 Residential
_3 MOTORCYCLE BAYS
_8 COMMERCIAL BICYCLE RACKS



PODIUM LEVEL 01

_70 CAR BAYS
_4 MOTORCYCLE BAYS
_113 BICYCLE BAYS IN COMPOUND
_73 STORES

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

CONSULTANT
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perth@hassellstudio.com

REFERENCE

NORTH

0m 5m 10m 15m 20m

NOTES
1. Do not scale drawing. Written dimensions govern
2. All dimensions are in millimeters unless noted otherwise
3. All dimensions shall be verified on site before proceeding with the work. Hassell shall be notified in writing of any discrepancies.
4. This drawing must be read in conjunction with all relevant contracts, specifications and drawings

This drawing is an uncontrolled copy. Unless noted otherwise

REV DESCRIPTION **DATE**

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD
SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 00 & 01

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_101

SCALE @ A3
1 : 500

PROJECT NO.
015032

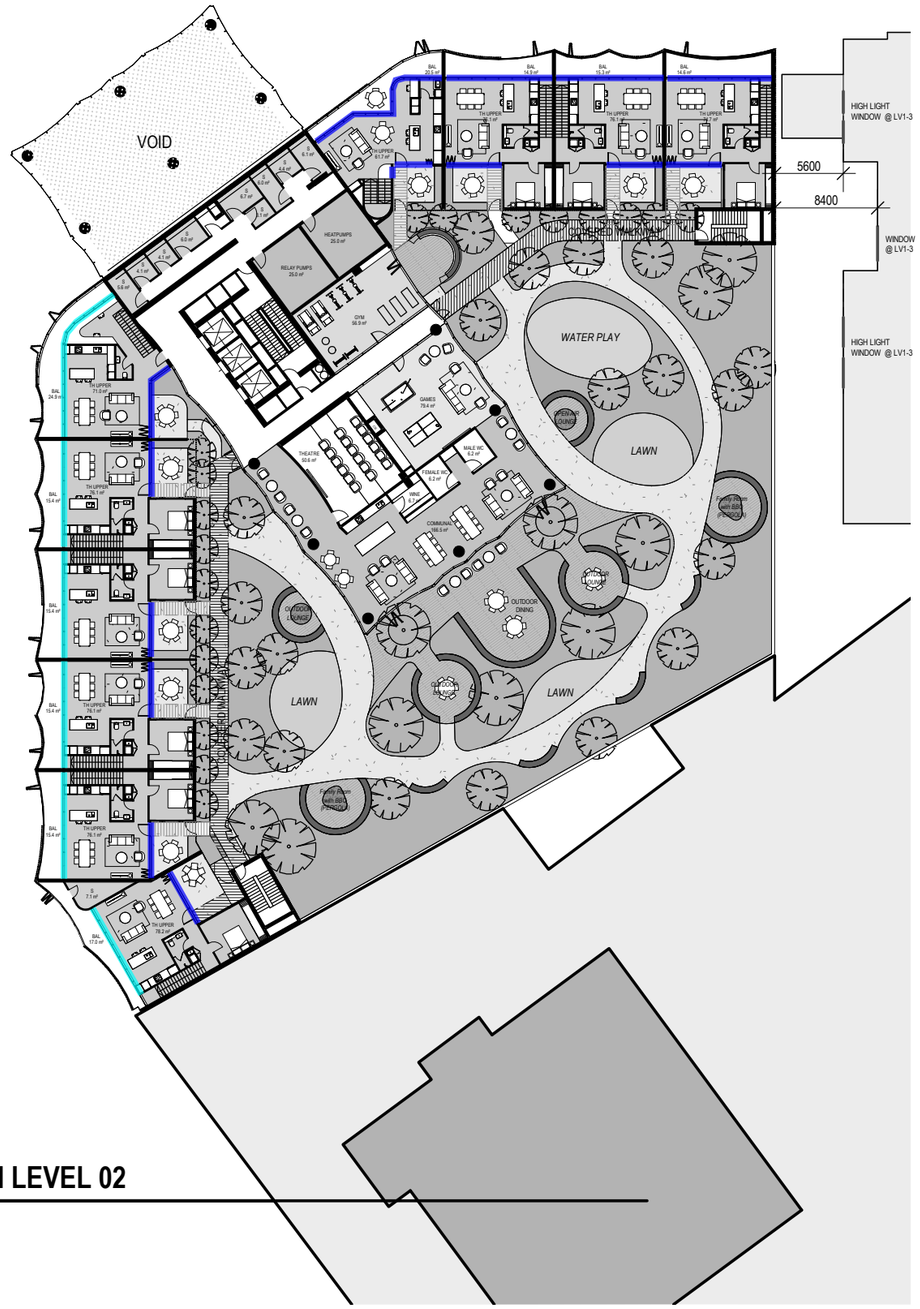
REV NO.

Stantec

SKETCH TITLE BY B.Martis

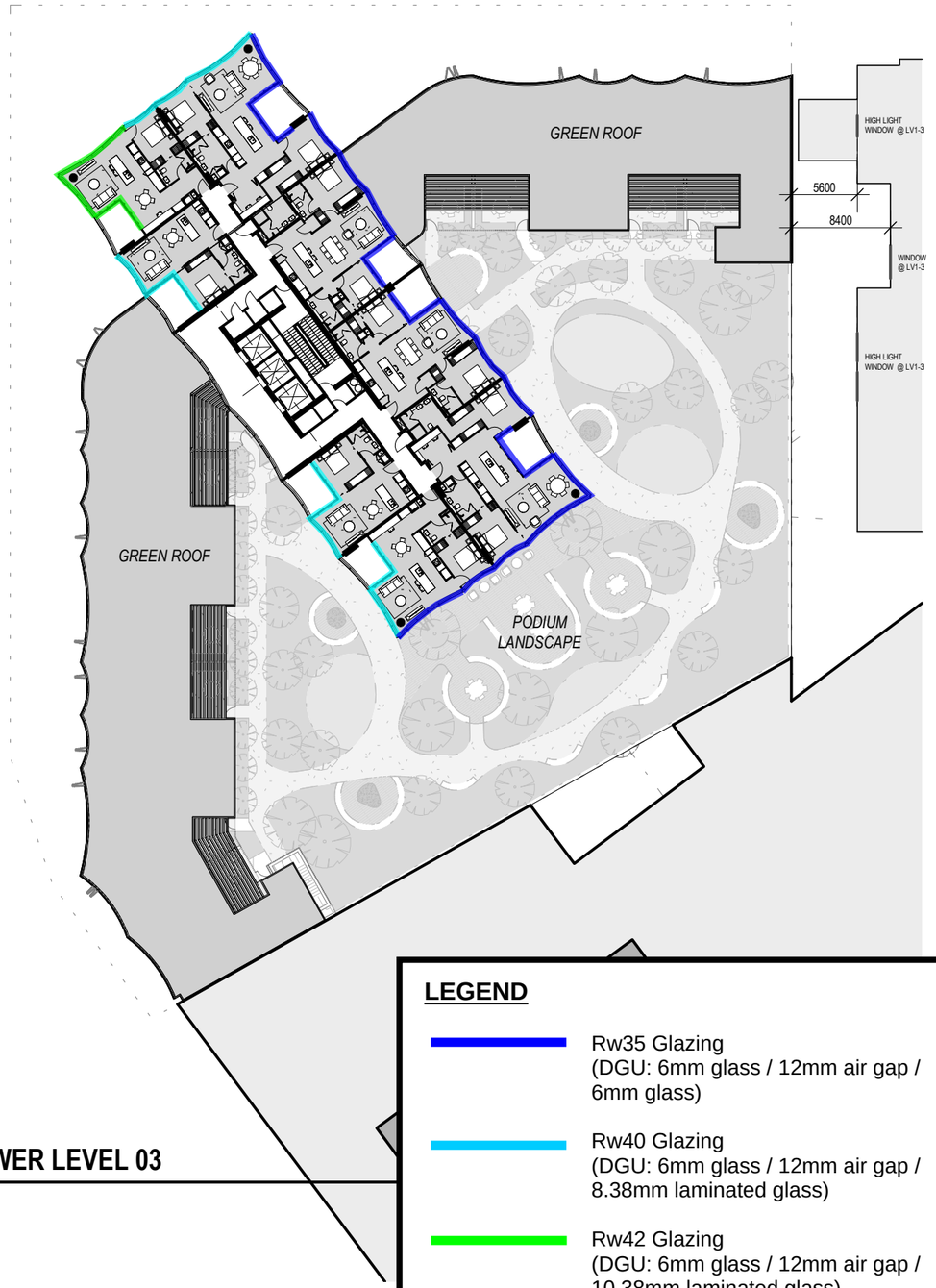
Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



PODIUM LEVEL 02

_STORES 9



TOWER LEVEL 03

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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REFERENCE

NORTH

0m 5m 10m 15m 20m

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REV DESCRIPTION **DATE**

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
PODIUM 02 & 03

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_102

SCALE @ A3
1 : 500

PROJECT NO.
015032

REV NO.

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
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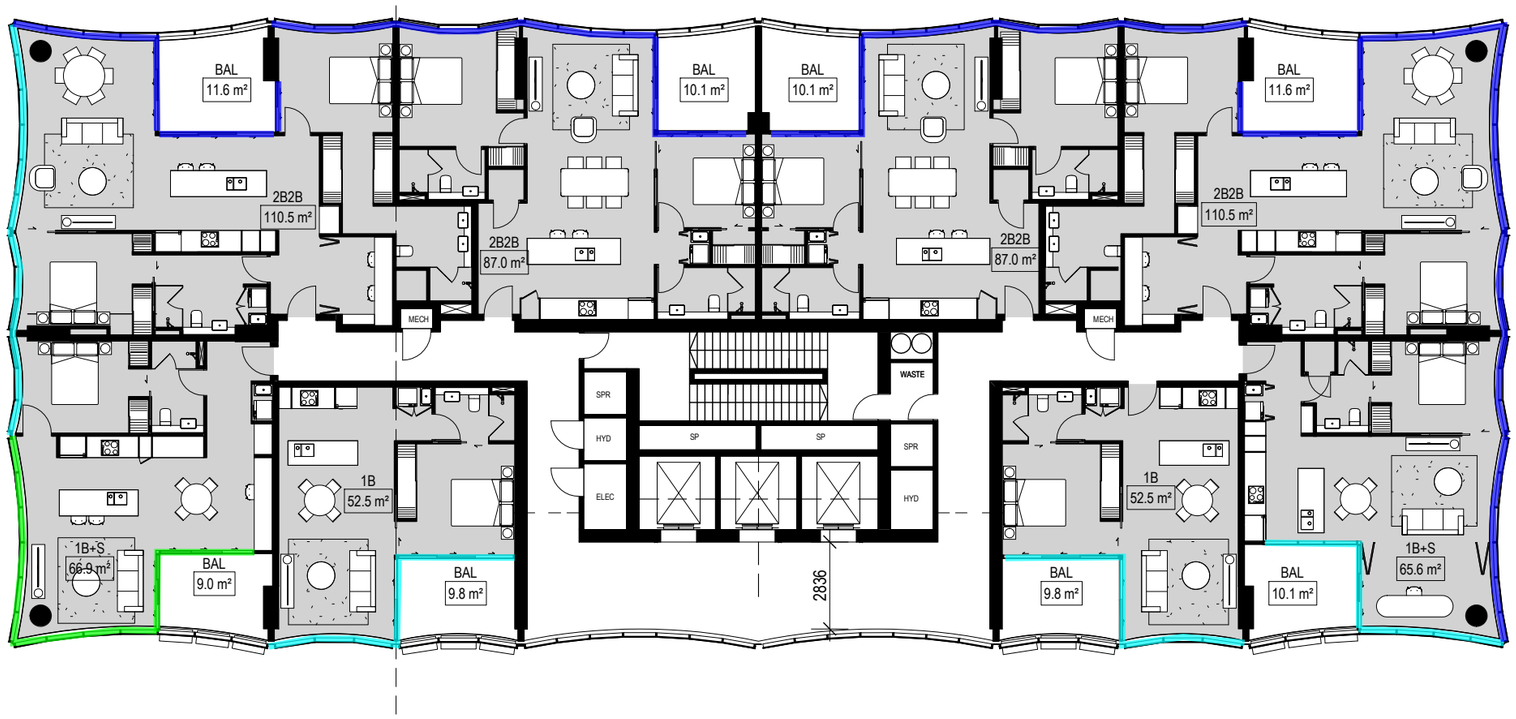

1 SK_0002 — LEVELS 3-6 (FLOOR TYPE 1)

1 : 200

LEVELS 3-7 (FLO

1B (53) x 2 =
1B+S (64) x 2 =
2B (96) x 2 =
2B (103) x 2 =

TOTAL NSA =
TOTAL BAL =
PR AREA =
GFA (79.3% EFF

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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REFERENCE

NORTH

0m 2m 4m 6m 8m

NOTES

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2. All dimensions are in millimeters unless noted otherwise
3. All dimensions shall be verified on site before proceeding with the work. Hassell shall be notified in writing of any discrepancies.
4. This drawing must be read in conjunction with all relevant contracts, specifications and drawings

This drawing is an uncontrolled copy. Unless noted otherwise

REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 3-6_TYPE 1

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_135

SCALE @ A3
1 : 200

PROJECT NO.
015032

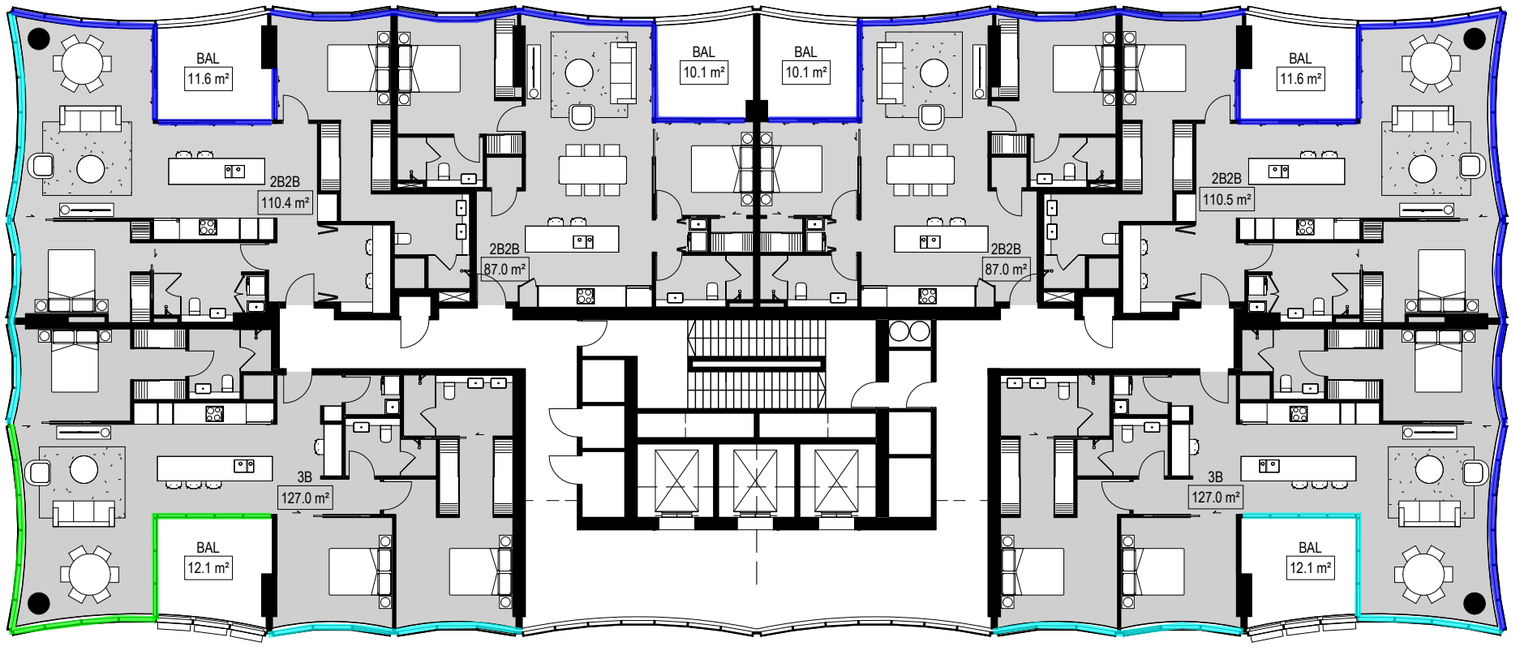
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 / SK_0002 LEVELS 7-14 (FLOOR TYPE 2)

1 : 200

LEVELS 8-12 (FL

2B2B (82) x 2 =
3B2B (123) x 2 =
3B2B (124) x 2 =

TOTAL NSA =
TOTAL BAL =
PR AREA =
GFA (80.3% EFF

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

CONSULTANT

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242 Murray Street
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T +61 8 6477 6000
perth@hassellstudio.com

REFERENCE

NORTH

0m 2m 4m 6m 8m

NOTES

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 7-14_TYPE 2

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_136

SCALE @ A3
1 : 200

PROJECT NO.
015032

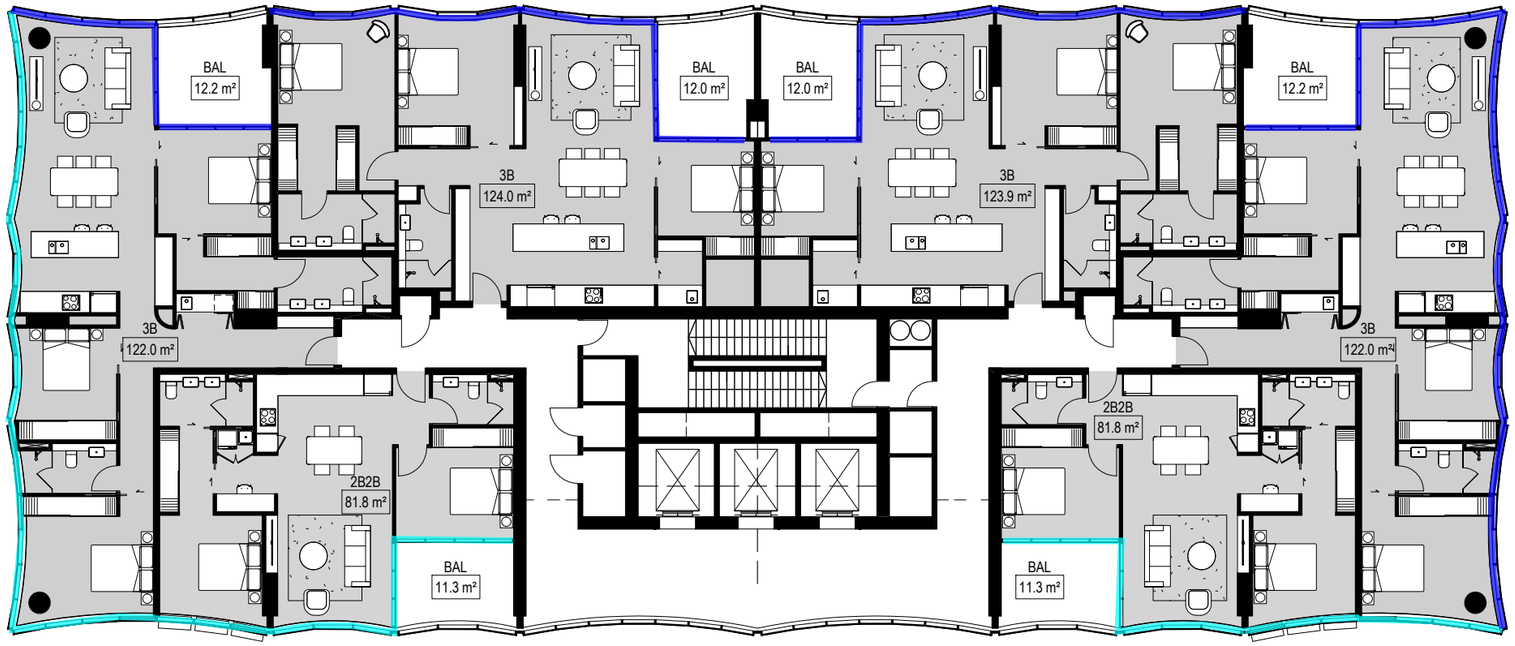
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 LEVELS 15-18 (FLOOR TYPE 3)

SK_0002 1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

CONSULTANT

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REFERENCE

NORTH

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 15-18_TYPE 3

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_137

SCALE @ A3
1 : 200

PROJECT NO.
015032

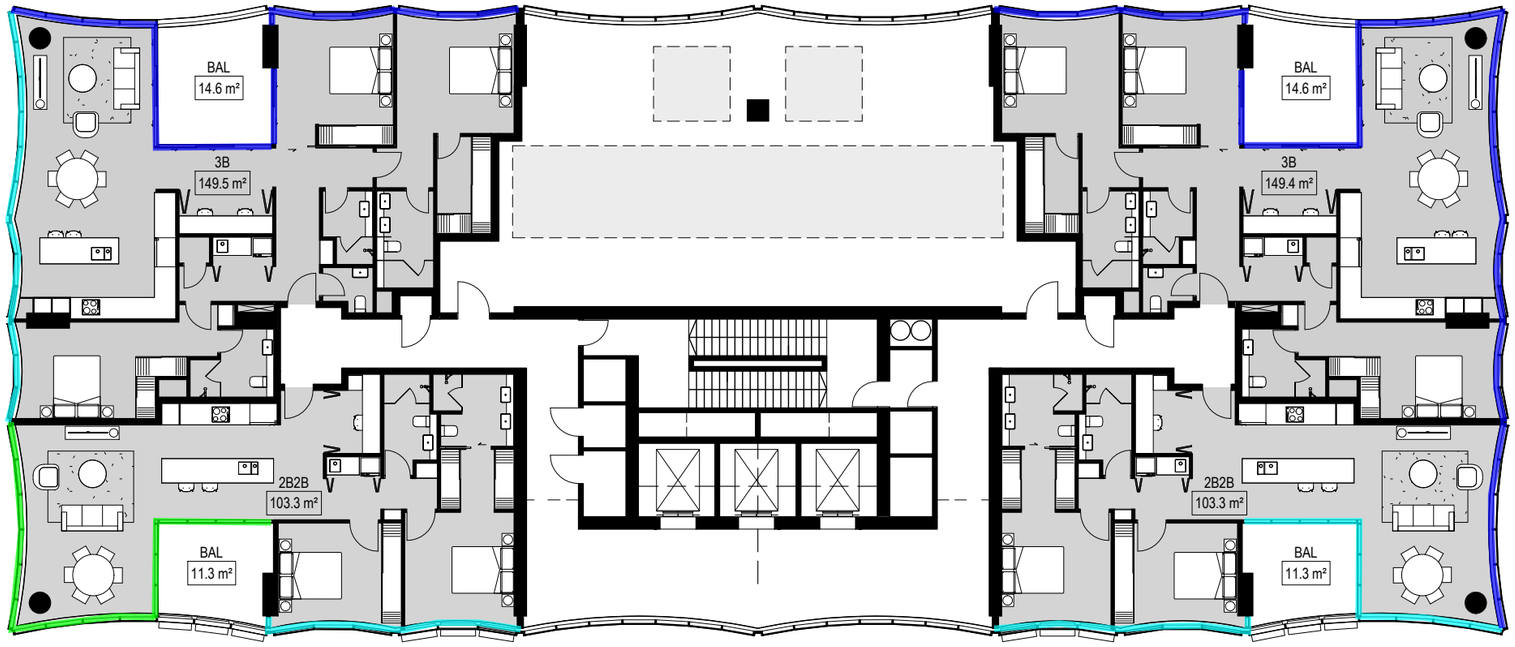
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 LEVELS 19 (FLOOR TYPE 4)

1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

CONSULTANT

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REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 19_Type 4

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_138

SCALE @ A3
1 : 200

PROJECT NO.
015032

REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

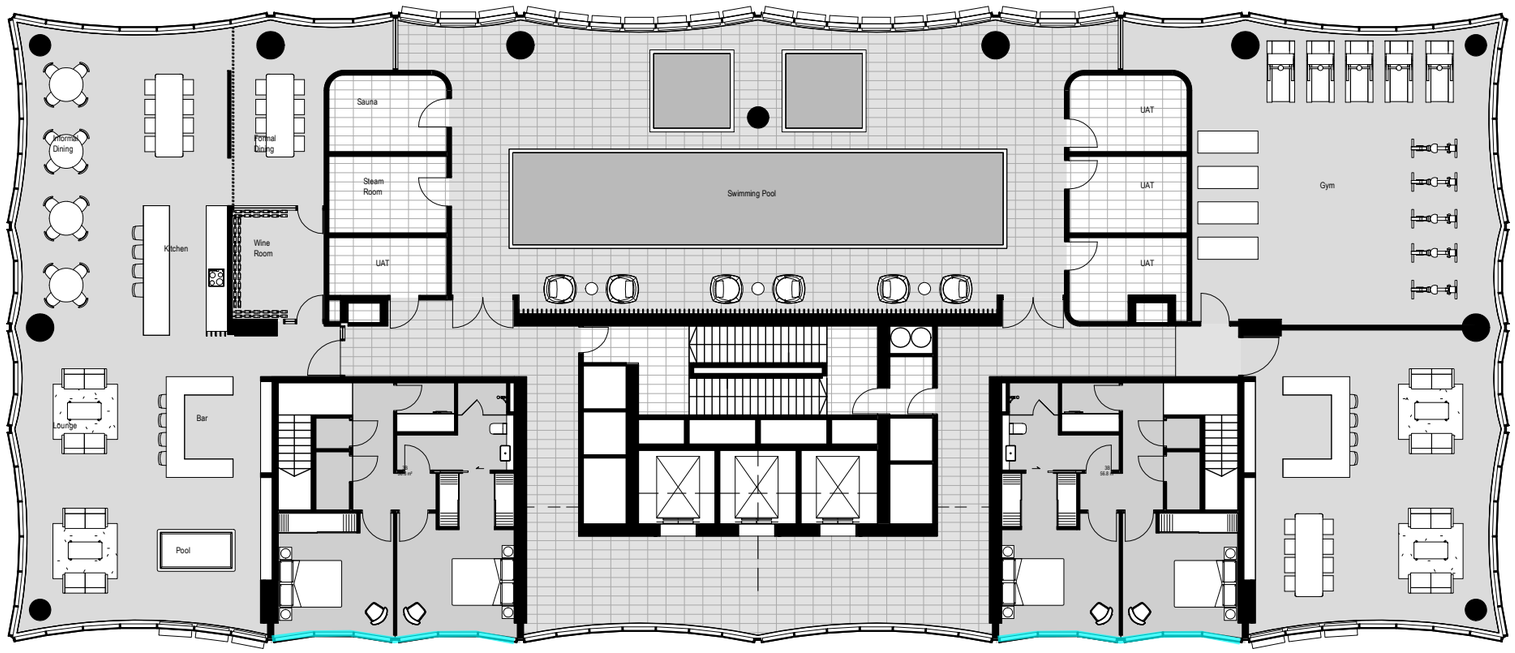
Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002

NOTES:

- PROVIDE MIN. 280mm CLEARANCE UNDER SWIMMING POOL FOR SPRUNG VIBRATION ISOLATION SYSTEM.

- PROVIDE MIN. 100mm RAISED GYM FLOOR TO ACCOMODATE SPRUNG VIBRATION ISOLATION SYSTEM.



1 / SK_0002 LEVELS 20 (FLOOR TYPE 5 & AMENITIES)

1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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perth@hassellstudio.com

REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 20_TYPE 5 & AMENITIES

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_139

SCALE @ A3
1 : 200

PROJECT NO.
015032

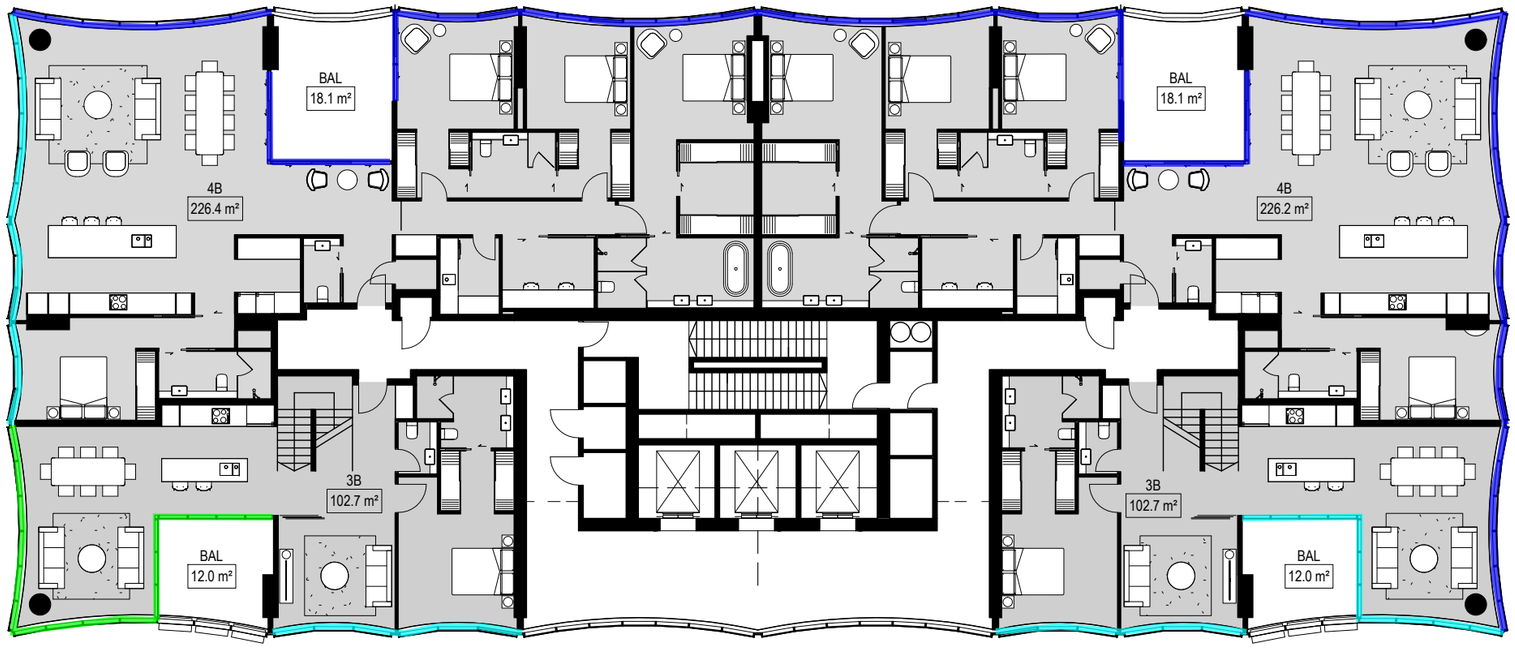
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 LEVELS 21 (FLOOR TYPE 6 _ SUB PH)

1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 21_TYPE 6_ SUB PH

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_140

SCALE @ A3
1 : 200

PROJECT NO.
015032

REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002

1 LEVELS 22-23 (FLOOR TYPE 7)

1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

CONSULTANT

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perth@hassellstudio.com

REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL22-23_TYPE 7

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_141

SCALE @ A3
1 : 200

PROJECT NO.
015032

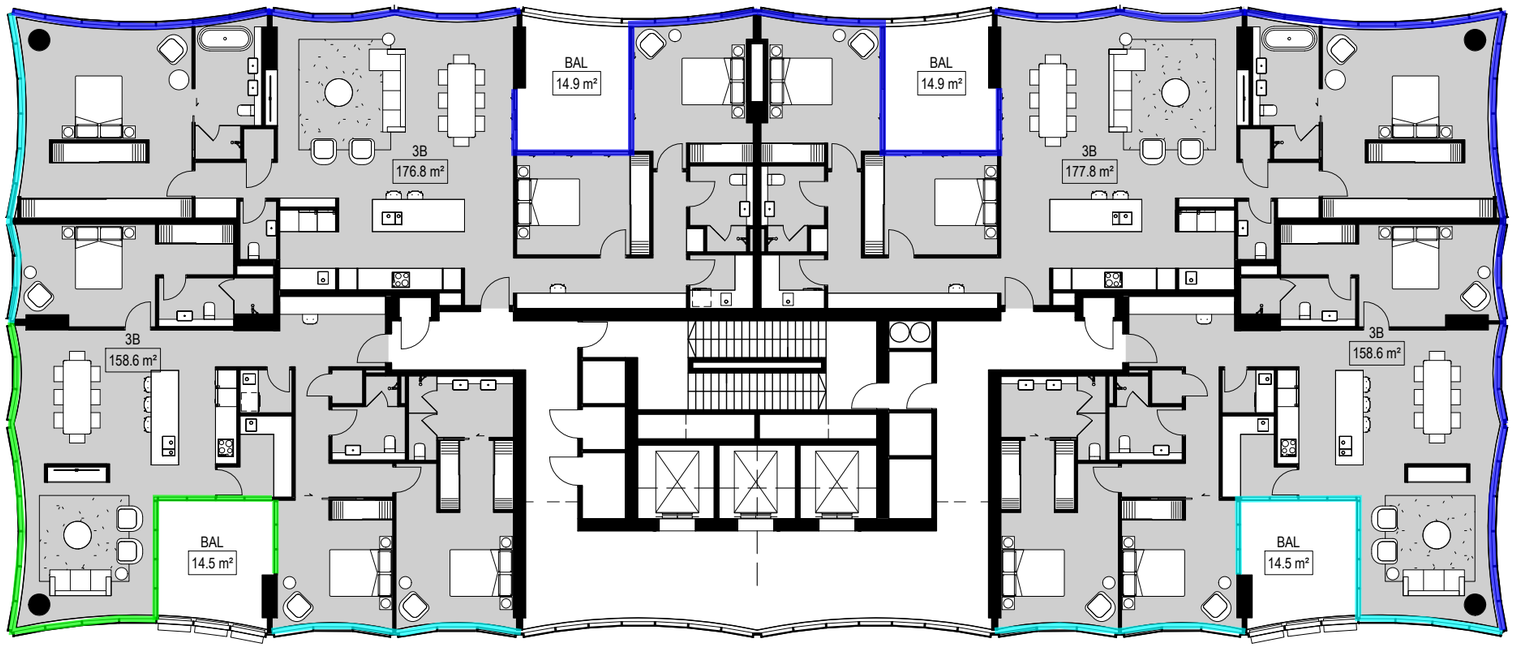
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 SK_0002 LEVELS 24-28 (FLOOR TYPE 8)

1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 24-28_TYPE 8

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_142

SCALE @ A3
1 : 200

PROJECT NO.
015032

REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002

1 LEVELS 29-31 (FLOOR TYPE 9)

1 : 200

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

CONSULTANT

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REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 29-31_TYPE 9

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_143

SCALE @ A3
1 : 200

PROJECT NO.
015032

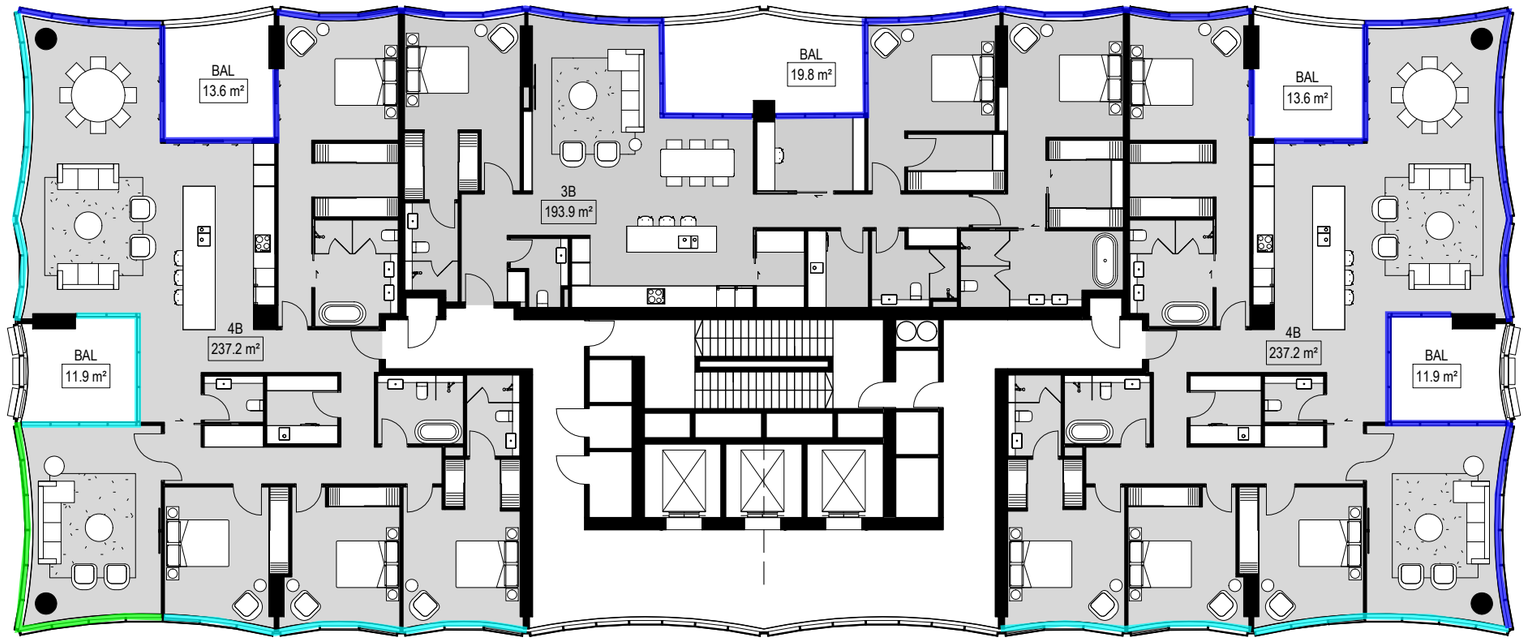
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 LEVELS 32-34 (FLOOR TYPE 10)

SK_0002 1 : 200

LEVELS 32-34 (F

2B2B (95) x 2 =
2B2B (103) x 2 -
3B2B (125)

TO-
TO BE UPDATE
TO BE UPDATEDTO
PR[illegible]A =
GFA (79.3% EFF

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV	DESCRIPTION	DATE
A	Development Application	17/12/20

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD
SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 32-34_TYPE 10

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_144

SCALE @ A3
1 : 200

PROJECT NO.
015032

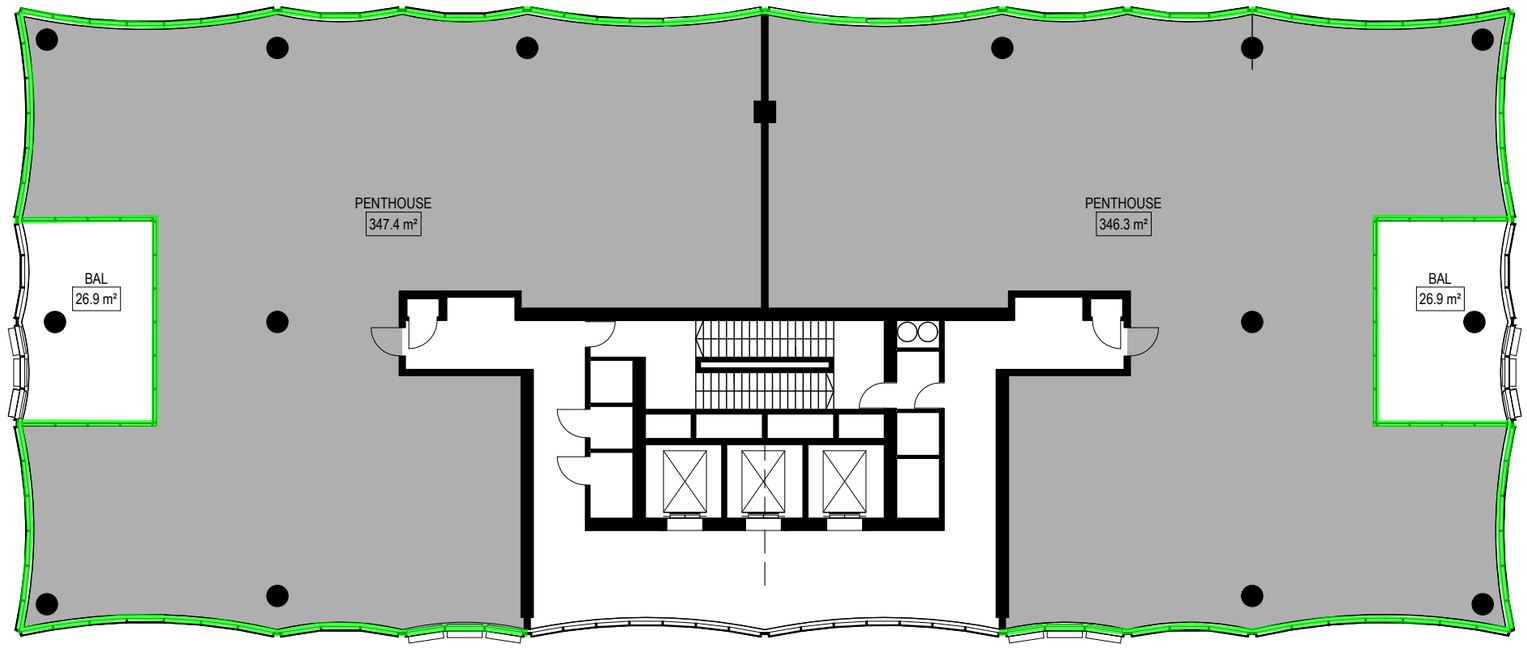
REV NO.
A

Stantec

SKETCH TITLE BY B.Martis

Acoustic External Glazing Mark Up

PROJECT No	SKETCH No	DATE	REV
301248278	AC-SK-001	14/12/2020	002



1 LEVELS 35 (FLOOR TYPE 11)

SK_0002 1 : 200

NOTES:

- PENTHOUSE FLOOR LAYOUT TBA. GLAZING RECOMMENDATIONS TO BE CONFIRMED.

LEVELS 35 (PEN

PH1 UPPER (169
PH2 UPPER (1

TOTA
TO
F
GF

TO BE UPDATED
UPDATED

LEGEND

- Rw35 Glazing (DGU: 6mm glass / 12mm air gap / 6mm glass)
- Rw40 Glazing (DGU: 6mm glass / 12mm air gap / 8.38mm laminated glass)
- Rw42 Glazing (DGU: 6mm glass / 12mm air gap / 10.38mm laminated glass)

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REFERENCE

NORTH

0m 2m 4m 6m 8m

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REV DESCRIPTION **DATE**

CLIENT
ZONE Q

PROJECT
88 MILL POINT ROAD

SOUTH PERTH
WESTERN AUSTRALINA

STATUS

DRAWING TITLE
LEVEL 35_TYPE 11 PH

REVIEWED
Checker

APPROVED
Approver

DRAWING NO.
XX_145

SCALE @ A3
1 : 200

PROJECT NO.
015032

REV NO.

Design with
community in mind

Ground Floor
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Perth WA 6000
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For more information please visit
www.stantec.com

Stantec