

2 Zodiac Dr, Alkimos

Acoustics Development Application Report



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PREPARED FOR:

PREPARED BY: JLM

FHSI Design Pty Ltd

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Executive Summary

Stantec have been engaged by FHSI Design Pty Ltd to conduct an acoustic assessment and prepare an acoustic report in support of the development application for a residential development proposed for 2 Zodiac Dr, Alkimos WA 6038 located within the City of Wanneroo.

As part of the development approval process for the residential 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:

- 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); and
- National Construction Code 2022 Volume 1, Building Code of Australia Class 2 Buildings (NCC 2022)

This acoustic report has been prepared for submission to City of Wanneroo and demonstrates that the project is taking into consideration all acoustic aspects pertinent to the project. Recommendations are provided in this report to address and mitigate any acoustic issues identified.

Traffic Noise Intrusion

Traffic noise assessment has been carried out and the minimum recommended external façade construction has been provided in the form of glazing, roof and wall configurations. The predicted noise levels at the building façades have been based on the on-site attended measurements conducted to assess a worst-case scenario.

The glazing configurations to achieve the design internal noise levels have been summarized below:

Glazing Configuration	R_w + C_{tr}
<u>SG Option</u> 6.38mm Laminated Glass	29(32;-3)
<u>DG Option</u> 6mm glass + 12mm air gap + 6mm glass	29 (36;-7)

Patron Noise Intrusion

During the on-site measurements conducted, noise emitted from Ocean 27 or its respective outdoor area was not considered audible at all measurement locations. It cannot be confirmed if the tenancy's outdoor area was in use. Stantec has conducted a high-level assessment based on expertise and knowledge from previous projects of similar size and capacity to determine the predicted noise impact that the patrons using the outdoor area could have on the proposed development. Based on façade recommendations for wall, glazing and roof elements detailed within this report, Target internal noise levels are expected to be achieved based on typical use of the tenancy's outdoor area.

Mechanical Service Noise Emission Assessment

It is expected that the following mechanical services are expected within the development:

- Fans and condensing units serving apartments

At this stage no mechanical unit information is available. When the full mechanical equipment schedule has been provided a detailed noise assessment will be conducted prior to the issue of Building Permit. Specific acoustic treatments will be provided to achieve compliance to the relevant EPNR assigned noise levels at nearest noise sensitive receivers.



1. Introduction

Stantec have been engaged by FHSI Design Pty Ltd to conduct an acoustic assessment and prepare an acoustic report in support of the development application for a residential development proposed for 2 Zodiac Dr, Alkimos WA 6038 located within the City of Wanneroo.

As part of the development approval process for the residential 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:

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This acoustic report has been prepared for submission to City of Wanneroo and demonstrates that the project is taking into consideration all acoustic aspects pertinent to the project. Recommendations are provided in this report to address and mitigate any acoustic issues identified.

1.1 Site Description

The proposed development is primarily surrounding of residential developments to the north, south and east with Ocean 27 (restaurant Bar and Café) located approximately 75m to the north-west.

No major roads surround the project site within a 450m radius. The project site and other areas identified above have been provided in Figure 1.



Source: Nearmap

Figure 1: Project location



1.2 Architectural Volumes

The proposed development is expected to consist of the following architectural volumes as shown in Table 1.

Table 1: Architectural Volumes

Level	Area
Basement	Carpark
Ground Floor – Level 2	Apartment Units



2. Acoustic Criteria

2.1 Western Australia 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 project location, with the closest measurable receiver being 10 Zodiac Dr, Alkimos WA 6038.

The current District Planning Scheme 2 (DPS2) was accessed via City of Wanneroo website.

Traffic data for roads surrounding the nearest noise sensitive receiver were obtained from Main Roads Western Australia (MRWA) on the 11th August 2023.

No traffic count data for the surrounding traffic corridors were readily available. Considering the surrounding area, they are not expected to be Major traffic corridors (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

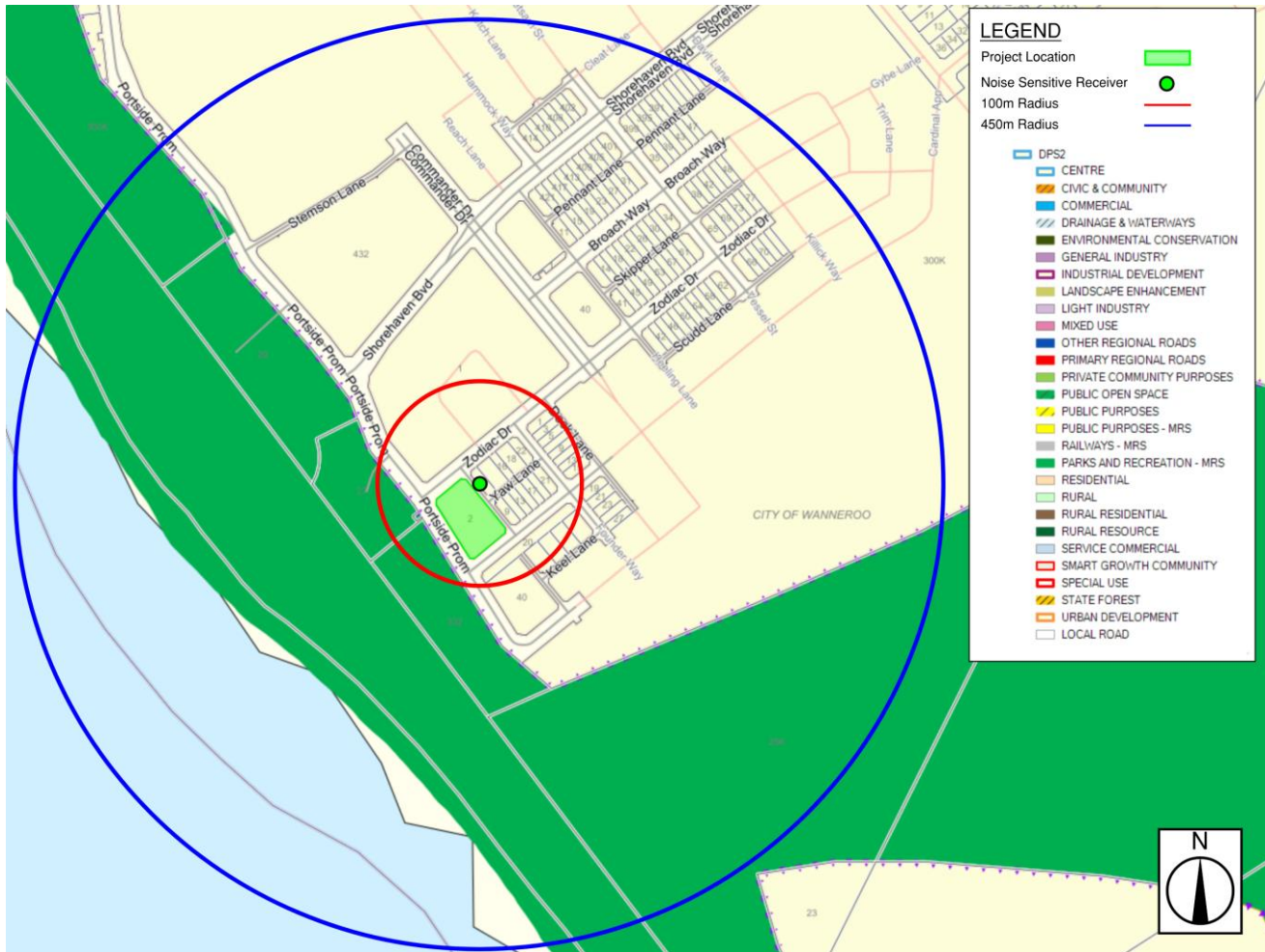
The influencing factor for 10 Zodiac Dr results from identifying major roads, commercial and industrial areas for all nearest noise sensitive receivers.

The overall influencing factor assessment is summarized in Table 2 and the planning maps indicating the land use type (obtained from City of Wanneroo online mapping system) has been marked up in Table 2.

Table 2: Influencing factor (IF) at noise sensitive receiver

Noise Sensitive Premises	Commercial Zones	Industrial Zones	Transport Corridors	Influencing Factor
10 Zodiac Dr	4% within a 100m radius 1% within a 450m radius	None	No major transport corridors within a 450m radius	0 dB





Source: City of Wanneroo Online Mapping System

Figure 2: Zoning map of areas surrounding 10 Zodiac Dr

2.1.2 Assigned Noise Levels for Nearest Sensitive Receiver

Table 3 summarizes the assigned levels at the nearest noise sensitive premises, which is added to the influencing factor calculated for the receiver detailed in Table 2. 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 noise sensitive receiver

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		LA10	LA1	LAmx
Noise sensitive premises: Highly sensitive area	0700 to 1900 hours Monday to Saturday	45	55	65
	0900 to 1900 hours Sunday & public holidays	40	50	65
	1900 to 2200 hours all days	40	50	55
	2200 hours on any day to 0700 hours Monday to	35	45	55

Type of premises receiving noise	Time of day	Assigned Level (dB)		
		LA10	LA1	LAm _{ax}
	Saturday, and 0900 hours Sunday & public holidays			
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

Given the data available from air conditioning unit manufacturers is generally limited to broadband data or in 1/1 octaves, it is not possible to objectively determine tonality as described in the noise regulations. One-third octave band data is required, and this information is not typically available. In such cases, a + 5 dB penalty is to be applied to all predicted sound levels generated by noise sources.

Therefore, a +5dB penalty shall be conservatively applied to noise levels generated from mechanical services when assessing noise emissions from mechanical equipment.

2.2 Internal Noise Levels

The internal noise level criteria detailed in this section are based on the recommendations provided in the Australian Standard AS 2107:2016 ‘Acoustics – Recommended design sound levels and reverberation times for building interiors’ (AS 2107).

AS2107 provides recommended internal noise levels (defined as the equivalent continuous A-weighted sound pressure level — $L_{Aeq,t}$) for optimising the acoustic amenity in occupied spaces. The level of noise in an enclosed space typically consists of noise from building services and/or noise intrusion due to external sources (e.g. traffic).

The relevant internal noise level criteria have been outlined in Table 5.

Table 5: Recommended internal noise levels from AS2107

Type of occupancy/activity	Recommended design sound level, L_{eq} dB(A)
RESIDENTIAL BUILDINGS – Houses and apartments in suburban areas or near minor roads	
Sleeping areas (night-time)	30 – 35
Living areas	30 – 40
Apartment common areas (e.g. foyer, lift lobby)	45 – 50
GENERAL AREAS –	
Carpark	<65

The internal noise level criteria in AS2107 refer to the 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.

2.3 National Construction Code NCC 2022 Requirements

The acoustic requirements for inter-tenancy walls, floors etc. in residential buildings are outlined in the National Construction Code 2022 Volume 1, Building Code of Australia Class 2, 3 and 9c Buildings (NCC 2022). The acoustic requirements outlined in NCC 2022 are summarised in Table 6.

Table 6: Sound insulation requirements in accordance with NCC 2022

Construction	Condition	Deemed-to-Satisfy Requirements	Verification Requirements
Walls	<u>Airborne Sound Insulation</u>		
	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
	<u>Impact Sound Insulation</u>		
	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
Floor	<u>Airborne Sound Insulation</u>		
	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



Construction	Condition	Deemed-to-Satisfy Requirements	Verification Requirements
	<u>Impact Sound Insulation</u>		
	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
Services	<u>Airborne Sound Insulation</u>		
	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.



3. Noise Survey

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.

Given the location of the project, the dominant noise source is expected to be due to noise from the surrounding traffic corridors. Additionally, it is noted that Ocean 27 (Restaurant bar and Café) is also in the nearby proximity which is expected to have an outdoor area used for patrons based on the information provided online.

3.1 Measurement Methodology

3.1.1 Measurement Locations

Short-term attended noise measurements were undertaken to establish the surrounding acoustic environment.

Measurements were conducted between 7th August 2023 at the location shown in Figure 3.



Source: Nearthmap

Figure 3: Measurement locations (Attended)

3.1.2 Meteorological Conditions

On-site measurements were conducted with the following meteorological conditions noted as summarised in Table 7.

Table 7: On-site Meteorological Conditions

Parameter	Recorded Value
Wind Speed (maximum)	2.0m/s
Wind Direction	NW
Temperature	19 Degrees Celsius

Parameter	Recorded Value
Cloud Coverage	85%
Relative Humidity	82%

3.1.3 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.

The sound level meter was calibrated by an authorised NATA (National Association of Testing Authorities) laboratory less than 2 years ago and have successfully passed all AS 1259 and AS/NZS 4476 standards and specifications.

The time constant for the RMS detector were set to a slow response (1 sec) for all measurements on all sound level meters. The sound level meter was calibrated before and after the 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 all equipment used during for acoustic measurements is provided in Table 8. A copy of calibration certificates for the relevant instrumentation may be provided upon request.

Table 8: Equipment and Calibration Details

Manufacturer / Model	Serial Number
Brüel & Kjær 2250 - Sound Analyser	3002096
Brüel & Kjær 4231 - Calibrator	3005155

3.2 Noise Measurement Summary

3.2.1 Attended Monitoring

A summary of the noise data for the attended noise measurements has been provided in Table 9.

Noise from the ambient environment such as trees rustling, wind and birds were identified as the dominant noise source, while vehicles using the surrounding traffic corridors were recorded intermittently.

It is noted that at the time of measurement, Noise from the nearby Ocean 27 Restaurant bar and Café was not considered audible.

Table 9: Attended noise measurement results

Ref	Date and Time	L _{eq, 15min} dB(A)	Spectrum Noise Levels (dB)							
			63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
A1	7/08/2023 14:33	46	55	52	46	43	41	36	35	24
A2	7/08/2023 14:49	44	53	50	45	43	39	34	24	15



4. Noise Intrusion Assessment

4.1 External Envelope

Noise intrusion calculations were undertaken following the methodology described in British Standard BS EN 12354:2000 and by utilizing the measured noise levels in Section 3.2.1 to determine suitable glazing to achieve the required internal noise levels. Appropriate corrections were applied to the linear spectral noise levels to compensate for potential losses due to flanking paths and façade correction.

4.1.1 External Wall

The noise intrusion has been calculated for all façade elements, which is relative to their surface area.

It is noted in the latest architectural drawings that the majority of the façade will be comprised of glazed elements.

Stantec recommends solid wall elements have a minimum performance of R_w 40 – 45. Typically, with masonry elements this can be achieved by 100mm concrete wall.

Where lightweight construction is proposed, this will result in reduced acoustic performance specifically in the lower frequencies.

The following construction detailed in Table 10 is recommended if lightweight walls are to be used, to ensure compliance with the recommended internal noise levels for residential units as specified AS2107.

Table 10: Façade wall element configuration

Configuration	Wall Performance R_w
<p>One row of 92mm studs (0.55BMT) at 600mm centres with –</p> <ul style="list-style-type: none">• Min. 100mm thick glasswool insulation (min. density 14kg/m³) positioned between row of studs;• One layer 6mm thick fibre cement sheet (min. surface mass 9.4kg/m²) to outside face; and• One layer 13mm thick standard plasterboard (min. surface mass 8.4kg/m²) fixed to the other side of the row of studs	<p>> 40</p>

4.1.2 Glazing

Glazing systems and entryway elements typically provide lower airborne sound insulation performance than external walls, forming weak acoustic links in the building envelope.

To satisfy internal noise level design targets, glazed elements located at the façades are determined based on the composite sound reduction index (i.e. the combined sound insulation performance of all façade elements relative to their surface area).

Glazing types for each noise sensitive space located at each façade of the proposed development have been comparatively assessed against the noise levels detailed in this report. The table below provides the glazing performance and proposed locations required to satisfy internal noise level design targets.

The performance ratings outlined below are required for compliance to internal noise level design targets and apply to the glazing system as a whole (i.e. frame, seals and window hardware), with a maximum allowable deviation of 2-3dB only.



Table 11: Façade Glazing configuration

Glazing Configuration	$R_w + C_{tr}$ (R_w ; C_{tr})	Spectrum Sound Transmission Loss (dB)						
		63	125	250	500	1k	2k	4k
<u>DG Option</u> 6mm glass + 12mm air gap + 6mm glass	29(36;-7)	22	23	19	35	43	42	50
<u>SG Option</u> 6.38mm Laminated Glass	29(32;-3)	15	19	24	29	33	35	41

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.

4.1.3 Roof Construction

Whilst it is not a mandatory requirement of the NCC, rain noise intrusion 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, to satisfactorily provide internal noise levels which are compliant with the criteria established in section 2.2. The following construction is adequate to fulfil the 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;
- Suspended light weight steel framing system; and
- Min. 50 mm thick glass wool insulation (min. 14kg/m³) one layer of 13 mm standard plasterboard.

4.2 Crowd Patron Noise – Ocean 27

During the on-site measurements conducted (refer section 3.2.1), noise emitted from Ocean 27 or its respective outdoor area was not audible at the measurement locations. It cannot be confirmed if the tenancies outdoor area was in use. Stantec has conducted a high-level assessment based on expertise and knowledge from previous projects of similar size and capacity to determine the predicted noise impact that the patrons using the outdoor area could have on the proposed development.

The above façade recommendations for wall, glazing and roof elements detailed in section 4.1 are expected to be adequate to achieve the target internal noise levels within the development from typical use of Ocean 27's outdoor area.



5. Noise Emission Assessment

5.1 Mechanical Services

It is expected that the following mechanical services are expected within the development:

- Fans and condensing units serving apartments

At this stage no mechanical unit information is available. When the full mechanical equipment schedule has been provided a detailed noise assessment will be conducted prior to the issue of Building Permit. Specific acoustic treatments will be provided to achieve compliance to the relevant EPNR assigned noise levels at nearest noise sensitive receivers.



6. Conclusion

Stantec have been engaged by FHSI Design Pty Ltd to conduct an acoustic assessment and prepare an acoustic report in support of the development application for a residential development proposed for 2 Zodiac Dr, Alkimos WA 6038 located within the City of Wanneroo.

Traffic noise assessment has been carried out and the minimum recommended external façade construction has been provided in the form of glazing, roof and wall configurations. The predicted noise levels at the building façades have been based on the on-site attended measurements conducted to assess a worst-case scenario.

During the on-site measurements conducted, noise emitted from Ocean 27 or its respective outdoor area was not considered audible at all measurement locations. It cannot be confirmed if the tenancies outdoor area was in use. Stantec has conducted a high-level assessment based on expertise and knowledge from previous projects of similar size and capacity to determine the predicted noise impact that the patrons using the outdoor area could have on the proposed development.

Internal design noise levels have been predicted to be achieved based on the recommended external envelope configurations provided in this report.

At this stage no mechanical unit information is available. When the full mechanical equipment schedule has been provided a detailed noise assessment will be conducted prior to the issue of Building Permit. Specific acoustic treatments will be provided to achieve compliance to the relevant EPNR assigned noise levels at nearest noise sensitive receivers.





Appendices

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.
LAmx	The maximum A-weighted sound pressure level measured over a period.
LAmn	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.



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