

Waterfront Centre, Shellharbour Frasers Property on behalf of Shellharbour Council DA Acoustic Report

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# **Document Control Record**

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## **Table of Contents**

1.0	Introduction	2
2.0	Overview	4
2.1	Criteria	5
2.2	Activities within the building	5
2.3	Services equipment and potential mitigation	6
2.4	Function Room and outdoor breakout area	7
3.0	Conclusion	9
Α	APPENDIX A – GLOSSARY OF TERMS	10
В	APPENDIX B – INDICATIVE SERVICES DATA	12

# 1.0 Introduction

Inhabit has been engaged by Frasers Property to provide acoustic consultancy services for the Waterfront Centre, Shellharbour. The proposed centre, by Smart Design Studios, is a two-storey building located in the heart of Shell Cove that incorporates a broad range of community facilities including:

- Library
- Community Centre
- Visitors information centre
- Kitchen, amenities and staff areas.

The goal for the Waterfront Centre is to become a community hub for a broad range of activities. It will be inclusive and offer services and spaces that to inspire engagement and participation.

Multi-purpose spaces are proposed to be independently hire-able and the design should enable these spaces to operate without interference to the activities in the other areas. The interior design should also provide an acoustic environment that is comfortable, and appropriate for the intended purpose of each space.

The Centre is in located in the new Shell Cove precinct, the Waterfront centre is adjacent to apartments to the South and West, a proposed hotel to the North and the waterfront to the east.



This report provides an overview of the site and adjacencies, the potential noise emissions from the proposed building and noise mitigation measures to be undertaken during detailed design.

## 2.0 Overview

The proposed Waterfront Centre is located adjacent to apartment and hotel buildings to the south, west and North. Figure 1 shows the location of the Waterfront Centre and the relationship to surrounding buildings.



Figure 1: Site Plan – Refer to DA001 – Site Plan (A)

Figure 2 and Figure 3 show the line of sight and relative distance from to the balconies of the Aqua and Precinct D apartment balconies overlooking the plant of the Waterfront Centre. The distance to the balconies is generally in the order of 33-38m.



Figure 2: Line of sight of Waterfront Centre rooftop plant from Aqua apartment balconies



Figure 3: Line of sight of Waterfront Centre rooftop plant from Precinct D apartment balconies

## 2.1 Criteria

Noise emission from site is predominately due to operation of the rooftop plant and equipment. During design development the plant will be designed to reduce sound levels to minimise the impact on adjacencies and maintain amenity.

AS2107:2000 provides standards for recommended design sound levels (L<sub>Aeq</sub>) for apartment buildings. The recommended levels are summarised in the table below.

	Satisfactory	Maximum
Living areas	30dBA	40dBA
Sleeping areas	30dBA	35dBA

#### Table 1: A\$2107: 2000 recommended internal design sound level

We recommend that the building services for the Waterfront Centre be designed to achieve the sound levels. Typical external design sound level for external noise should be 10-15dB above) the satisfactory noise level defines by AS2107. These levels are considered conservative standards to provide amenity to adjacencies. The design criteria proposed for development of the plant is 40dBA.

Sleep disturbance is not considered as the noise sources are to be continuous, non-impulsive and designed to achieve appropriate internal levels.

#### 2.2 Activities within the building

Activities within the building are typically related to the functions of the library, visitor centre and meeting rooms. Activities in the function room will typically be meetings or presentations with light background music. The facility is not appropriate for high level amplified music or activities. Noise from activities in the function room and associated ground floor outdoor spaces shall be managed by Council to ensure that they do not affect the amenity of the adjacent community.

The impact of sound on amenity is related to the level, spectral content and impulsiveness of the sound and the distance, reflecting surfaces etc. A single number noise level does not adequately assess the impact of sound on amenity, particularly those that are unable to assess low frequency impulsive sources such as dBA - the A descriptor represents a spectrum that is predominately relevant to speech. Hence, prescribing a recommended maximum dBA for activities within the building is not considered appropriate where general sound levels associated with operation of the spaces are intended to be significantly below those that would result in disturbance to the community.

Council has advised that activities within the building are generally limited to daytime and extend into the evenings only on weekends and public holidays and shall be managed to respect the amenity the adjacent community.

It is recommended that Council provide contact details to the Community for an on-site Council representative who can respond to the Community and has the authority to take appropriate action to manage activities within the Centre.

## 2.3 Services equipment and potential mitigation

The plant platform is located on the West side of the roof of the Waterfront Centre. The services engineers have nominated indicative plant and provided sound level data for major equipment located on the plant platform including:

- VRV Condensor Unit
- PAC

The indicative noise level for these items are provided in Appendix B. There are also exhaust fans and other equipment proposed for the rooftop plant area. The indicative plant and noise levels provided by the services engineers are for the purposes of developing the preliminary design and associated assessment only.

Preliminary calculations were conducted on indicative plant to determine the potential noise emission from the building and to propose potential mitigation to be developed for integration during the detailed design process. The sound pressure level data provided by the services consultant indicates the noise level of the units is 57dBA for the RXQ10AYM and 68dBA for the UAYQ90CY1A. No directivity data is available. Reduction in sound level for a distance of 30m will be in the order of 29dB. Predicted levels are therefore in the order of 40dBA. The calculation indicates that a barrier and ceiling or other noise mitigation should be considered during detailed design to further reduce the risk of plant noise emission affecting adjacencies.

During detailed design development the final unit selections will be undertaken to reduce noise emission at the source. The selections would include the specification of proprietary attenuation appropriate for each item of rooftop plant.

As the plant is in direct line of sight to the balconies of the adjacent apartments Inhabit recommends that several initiatives be considered during detailed design to reduce noise from the rooftop units to the adjacent buildings. These options would be developed during detailed design in response to the equipment selections and associated noise emission data and include:

- Barrier and ceiling as indicated in Figure 4 below.
- Proprietary attenuators on for equipment discharge and inlet.
- Sound absorption to reduce reflections from the wall of the plant enclosure.
- Mount equipment on appropriate vibration isolators.



#### Figure 4: Potential barrier, ceiling and sound absorption

Based upon the indicative noise level data provided by the services engineers the noise emission reduction requirements will be achieved by the installation of a screen and ceiling over the plant area that conceals the direct line of sight to the units from the adjacent apartments, attenuation on fans where the directivity may adversely affect transmission and sound absorption applied the sound reflective surfaces.

#### 2.4 Function Room and outdoor breakout area

In their letter of 22 September, the Authorised Assessment Officer advised that: "The acoustic report is required to provide maximum levels for music so this can be monitored."

Referring to the Function Room, the Operational Plan of Management, dated June 2023, advises that: "WFC will be responsible for managing bookings of the community spaces and event management and associated services such as set up, pack up and close out. The function room will include activities that consist of soft acoustic disturbance during business hours to minimise disruptions to adjacent buildings and the community." The Operation Plan of Management advises the building will house a "Function room with access to external areas for breakout." We note that operation of any facility requires that the operator mange activities to avoid disruption to the community.

In providing their comments, the assessor references the acoustic report for the Waterfront Tavern project. Inhabit has been provided a copy of this report for review. We note that, to address noise disturbance, the Waterfront Tavern incorporates large operable panels enabling the "outdoor" areas to be closed, essentially rendering these areas indoor space.

The Waterfront Tavern acoustic report is based upon various assumptions regarding the operation of the venue including: noise is predominately within the speech frequency spectrum; areas are generally small; capacities have been determined from the fixed seating provided; and each "outdoor" area incorporates doors that enable the areas to be entirely enclosed. The reference used to develop the Tavern report advises that it is based on experience with other venues where: patrons were interacting with each other in a casual social situation; the crowd has a diffused orientation; the crowds did not contain people that were affected by alcohol, and the venues did not play music or have any other significant noise sources.

The assessor has requested that "numerical criterion" be provided to include in any relevant condition to enable the sound level to be monitored and managed in accordance with the operational plan of management. We understand that the Assessor requires that an enforceable limit for activities in the function room be provided that is consistent with the operational plan of management.

The venue is intended for meetings and presentations with light background music. The venue design is aligned with these proposed uses. Activities in the function room and adjacent outdoor area will be managed by Council to ensure that they do not affect the amenity of the adjacent Community.

For the proposed uses, sound will be produced by installed sound systems for speech and light background music. These activities will not result in excessive noise, significant low-frequency content, or impulsive transits. Management of these sound levels may be achieved through manual operation of the sound system or automated alert/limiters.

To enable sound to be monitored by the venue, the sound level should be established to be clearly measurable at or near the loudspeakers.

In response to the Assessors request for a numerical criterion, we recommend a noise level of 75dBC measured 3m<sup>1</sup> from the main loudspeakers be used as a guide for operation of the venue. This is a practical limit that can be monitored and controlled within the venue, automatically limited, and is consistent with the operational plan of management.

Live music can be hosted in the venue, however, the sound level must be below the limit described above. Drum kits or other instrument that produce sound levels that cannot conform to the limit, or cannot be automatically limited are not appropriate for the venue.

The management plan advises that the outdoor area is intended as an external breakout area for the function room. The outdoor area surrounding the facility is predominately public circulation and occasional activities in the Function Room.

The outdoor area is not suitable for events. Unlike the Waterfront Tavern, the capacity is not limited by fixed seating, there is no ability to enclose the outdoor space, and residences are in close proximity.

Changes to the operational plan of management may require that the current design be revisited and revised during the design development process.

1. Consistent with definition of background music provided in Queensland Government noise restrictions for licensed venues.

## 3.0 Conclusion

The following points are noted:

- Noise emission from the rooftop plant of the Waterfront Centre shall achieve the required noise criteria.
- Noise emission from the proposed Waterfront Centre predominately relates to the operation of rooftop plant and equipment located on the Western side of the building.
- Adjacent apartment buildings to the Southwest and West are located approximately 30m from the Waterfront Centre and have balconies that overlook the rooftop plant.
- During detailed design the equipment should be selected to minimise noise levels.
- Equipment should be mounted on appropriate vibration mounts to reduce vibration induced sound.
- An appropriate enclosure should be considered during detailed design to reduce sound emission to the South, West and North of the building.
- Sound absorptive treatment should be considered for the East wall of the plant enclosure to reduce the potential for sound reflections to West of the building.
- Activities within the building and associated outdoor areas shall be managed to maintain the amenity of the adjacent community. Council should consider implementing management practices and procedures including:
  - Limiting bookings for the Centre to activities that include light background music (i.e., no highlevel amplified music activities).
  - Installing noise monitors and limiters to maintain internal noise levels below the limit provided.
  - Educating patrons about the need to remain considerate of adjacent businesses and residences with respect to noise levels whilst on site, and
  - Providing contact details to the Community for a Council representative who has the authority to take appropriate action to manage activities within the Centre.

## A APPENDIX A – GLOSSARY OF TERMS

## GLOSSARY OF TERMS

A-weighted Level: As per dB(A) defined below.

**Ambient Sound:** Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far.

**Background Sound Level:** The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources;

**Decibel, dB:** Unit of acoustic measurement. Measurements of power, pressure and intensity may be expressed in dB relative to standard reference levels.

**dB(A):** Unit of acoustic measurement electronically weighted to approximate the sensitivity of human hearing to sound frequency.

**Noise Rating Number:** A single number determined from measured octave band sound pressure levels, usually of either plant noise or of the background sound level, determined according to AS1469. The number ascribed is the greatest of the set of octave band noise rating numbers calculated from the measured set of octave band sound pressure levels.

**Sound Pressure Level, Lp, dB:** A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 microPascals.

**Speech Intelligibility:** The percentage of meaningful speech material spoken by a talker or talkers that is correctly interpreted by a listener or listeners. One unit used to measure speech intelligibility is the Articulation Index.

**Speech Privacy:** A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. Methods of assessment of speech privacy are described in AS2822 in which Normal privacy is identified as a condition with an articulation index of less than 0.1, and confidential privacy as a condition with an articulation index of less than 0.5. In these conditions the percentage of mono-syllabic words understood by a listener would be about 10 percent and 5 percent respectively. It should be noted that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.

**Sound Reduction Index:** Equivalent to Sound Transmission Loss. A formal test for measuring and rating the sound reduction properties of a construction following ISO standards. The transmission loss of all materials varies with mass and frequency and may be determined by either laboratory or field tests. International Standards apply.

Weighted Sound Reduction Index (Rw): A single number value used to compare the sound reduction index for building elements. Rw and STC are not identical though may be considered, for most applications, as interchangeable. High Rw values mean high sound reduction. Rw is not a recommended basis for selecting or specifying facade glazing but does work well for partitions etc inside building

## **B** APPENDIX B – INDICATIVE SERVICES DATA

## RXYQ10AYM





# 11. Sound Data

# 11.1 Sound Pressure

Madal	1/1 Octave Sound Pressure Level (dB, ref 20µPa)								Overall	Noise Criteria
Widder	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	(dBA)	(NC)
UAYQ60CY1A	—	69	62	61	64	59	52	47	67	63
UAYQ90CY1A	77	76	64	65	63	60	55	48	68	66
UAYQ120CY1A	78	75	62	60	59	54	50	44	64	65
UAYQ150CY1A	77	74	61	60	61	54	52	45	65	63
UAYQ180CY1A	78	82	66	63	63	56	51	45	68	73
UAYQ210CY1A	85	76	69	66	65	61	53	46	70	66
UAYQ250CY1A	83	74	70	66	65	62	56	47	70	68
UAYQ300CY1A	_	76	71	66	66	60	55	46	70	66

## 11.2 Sound Power

Model	1/1 Octave Sound Pressure Level (dB, ref 1 pW)									
Model	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	(dBA)	
UAYQ60CY1A	—	84	77	76	79	72	67	62	82	
UAYQ90CY1A	91	91	79	78	78	72	68	61	82	
UAYQ120CY1A	96	91	79	78	80	72	70	64	83	
UAYQ150CY1A	93	90	79	78	80	73	71	64	83	
UAYQ180CY1A	95	96	83	82	84	78	73	66	87	
UAYQ210CY1A	101	94	87	85	87	81	76	69	90	
UAYQ250CY1A	99	91	88	85	86	83	77	69	90	
UAYQ300CY1A	_	91	88	87	86	81	78	70	90	

Note:

Microphone position: 1m away from every side of the unit and 1m above floor level





UAYQ90CY1A

