Prepared for
Macquarie Point Development Corporation
ABN: 92 657 409 841

Macquarie Point Multipurpose Stadium

Project of State Significance Noise and Vibration Assessment

21-Aug-2024
Macquarie Point Multipurpose Stadium
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Client: Macquarie Point Development Corporation

ABN: 92 657 409 841

Prepared by

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Glossary

Term	Definition
'A' Weighted	Frequency filter designed to adjust the absolute sound pressure levels to correspond to the subjective response of the human ear. The A-weighting filter emphasises frequencies in the speech range (between 1 kHz and 4 kHz) which the human ear is most sensitive to.
Ambient noise	The A-weighted equivalent continuous sound pressure level LAeq, is typically the descriptor used to describe ambient noise.
Decibel [dB]	The measurement unit of sound.
Decibel scale	A three decibel increase in the sound pressure level corresponds to a doubling in sound energy. An increase or decrease of three decibels is typically considered to be the smallest change in sound level that a listener can detect. A change of five decibels, however, is clearly noticeable. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. This increase is typically perceived to sound twice as loud. The table below shows the sound pressure level that would be typically experienced when exposed to different sources:
	0 dB — Threshold of human hearing 40 dB — Whisper in a library 50 dB — Open office space 60 dB — Normal conversation 70 dB — Inside a car on a freeway 80 dB — Outboard motor 90 dB — Heavy truck pass-by 100 dB — Pneumatic hammer 110 dB — Rock concert 120 dB — 747 take off at 250 metres
L_{A10}	The value of 'A'-weighted Sound Pressure Level which is exceeded for 10 percent of the time during a given measurement period. [Unit: dB]
L_{A90} (Background level)	The value of 'A'-weighted Sound Pressure Level which is exceeded for 90 percent of the time during a given measurement period. LA90 Sound Pressure Levels are commonly used to represent background noise levels. [Unit: dB]
L_{Aeq}	The 'A'-weighted Equivalent Continuous Sound Pressure Level which is the constant Sound Pressure Level that, for a given duration, would be equivalent in sound energy to the time-varying Sound Pressure Level measured over the same duration. LAeq Sound Pressure Levels are commonly referred to as the average Sound Pressure Level. [Unit: dB]
L_{Amax}	The maximum 'A'-weighted Sound Pressure Level measured during a given time period. The LAmax would typically represent the maximum noise level occurring during short noise events such as a noisy truck passing. LAmax is a relevant descriptor in determining the likelihood of sleep disturbance and general annoyance.
Frequency [f]	Frequency is measured in Hertz (Hz). The frequency corresponds to the pitch of the sound: a high frequency to a high-pitched sound and a low frequency to a low-pitched sound.

Term	Definition
Octave band	The International Standards Organisation has agreed upon preferred frequency bands for sound measurement and the octave band is the widest band for frequency analysis. The upper frequency limit is approximately twice the lower frequency limit and each band is identified by its band centre frequency. Typical Octave Band frequencies for environmental noise assessments are: 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz.
Sensitive receptor	Areas where the occupants, buildings or land use are potentially susceptible to the adverse effects of exposure to noise and vibration.
Sound Power Level	The sound power level (L_w) is a measure of the total acoustic energy emitted by a source. It is expressed in decibels (dB) and is a logarithmic measure of the sound power (P) relative to a reference sound power (P_0), typically set at 10^{-12} watts.
Sound Pressure Level	A measure of the magnitude of a sound wave (Unit: Decibels). Mathematically, it is twenty times the logarithm to the base ten of the ratio of the root mean square sound pressure at a point in a sound field, to the reference sound pressure; where sound pressure is defined as the alternating component of the pressure (Pa) at the point, and the reference sound pressure is 2x10-5 Pa.
Tonality	Noise is subjectively more annoying when it has a tonal component (a perceptible hum or whine). Tonality can be determined by subjective assessment or from one-third octave band analysis of the noise. Where a noise is tonal, an adjustment is made to allow for the additional annoyance caused by the tone.
Impulsive noise	Impulsive noise refers to short bursts of sound characterized by a sudden onset and a rapid decay, typically lasting less than one second. These sounds are often high in intensity and can be startling or disruptive due to their abrupt nature. Impulsive noises are generally distinct and easily recognizable from continuous or steady-state noises.
Intermittent noise	Intermittent noise is a type of sound that occurs at irregular intervals, characterized by periods of silence or significantly lower noise levels between louder noise events. Unlike continuous noise, which maintains a steady level over time, intermittent noise fluctuates, making it more variable and sometimes more disturbing.
VDV (Vibration does value)	The Vibration Dose Value (VDV) is a measure used to assess the cumulative effect of vibration on humans over a specified period. It accounts for both the magnitude and duration of the vibration, providing a single value that reflects the potential for discomfort, annoyance, or health effects due to exposure to vibration. The VDV is calculated using the fourth power of the acceleration, which makes it particularly sensitive to high-magnitude vibration events.
PPV (Peak particle velocity)	Peak Particle Velocity (PPV) refers to the maximum instantaneous velocity of a particle within a medium (such as soil, rock, or a building structure) as it moves due to the passage of a vibration wave. PPV is directly related to the potential for damage to structures and the perception of vibration by humans. It is expressed in units of millimetres per second (mm/s).

1.0 Introduction

AECOM has prepared this Macquarie Point Multipurpose Stadium Noise and Vibration Assessment Report (Report) on behalf of the Macquarie Point Development Corporation (MPDC) in support of a development application for the Macquarie Point Multipurpose Stadium, Project of State Significance.

The purpose of the Report is to address the requirements relating to noise and vibration from the operation of the proposed Stadium as required by the Tasmanian Planning Commission's Guidelines for the Project of State Significance (PoSS), dated 16 February 2024.

The relevant conditions as addressed in this Report are outlined in the table in Section 1.1.

AECOM has been engaged as the lead engineering consultant to Cox+Cumulus on the Project to provide engineering design services, including the Acoustics discipline responsible for delivering the environmental noise and vibration scope of the new Multipurpose Stadium. The Stadium is proposed on the Macquarie Point Site that is subject to the Mac Point Draft Precinct Plan, which provides a blueprint for the future development of a mixed-use precinct.

This Report focuses specifically on potential noise and vibration associated with the Stadium and addresses each of the requirements of the PoSS guideline document. The predicted results are intended to aid decision makers in establishing appropriate acoustic planning provisions and noise criteria.

1.1 Macquarie Point Multipurpose Stadium Project of State Significance Guidelines

The Tasmanian Planning Commission has prepared the Guidelines for the Macquarie Point Multipurpose Stadium Project of State Significance (PoSS) dated 16 February 2024, to provide a framework for assessing the proposed Project. Section 8.4 of the Guidelines, reproduced in the table below, presents noise and vibration reporting requirements that shall be met to enable the Commission to undertake an appropriate assessment on the topic. Additionally, item 1.4.3 and 9.2.2 of the PoSS contain requirements for noise and have been included.

This Report presents a response to each of the items listed within Section 8.4, of the Guidelines, with reference to the relevant Report section given in Table 1.

Table 1 PoSS Guidelines for Noise and Vibration (Section 8.4)

No.	Item	Report Section
1.4	Design and Management Response	
1.4.3	Off-site noise sources and noise sensitive activities in the locality that may be affected by noise from the site	2.0, 5.0
8.4	Noise and Vibration	
8.4.1		
i	The reports are to describe the existing noise and vibration conditions of the project site and vicinity.	5.0
ii	The reports are to describe all sources of noise and vibration that can be reasonably identified from the use of the proposed Project, considering all types of expected and possible events	3.0, 6.0
iii	The reports are to analyse the potential effects of impacts from noise and vibration, taking into account, but not limited by, the following	
	a. the maximum potential impact (maximum capacity and maximum sound amplification) for each proposed or possible type of event;	6.3
	b. noise and vibration generated by the operation of the proposed development outside of event times, including building services plant, loading and waste collection;	7.2, 8.0
	c. noise and vibration generated by crowds arriving at and departing from the venue;	7.1.5, 8.0
	d. noise and vibration generated by any entertainment provided outside the venue;	7.1.6, 8.0
	e. noise levels estimated at the boundary of land owned or controlled by the Proponent and at the curtilage of noise-sensitive uses in the locality;	7.1, Appendix A
	f. how and where noise and vibrations are likely to travel, based on contour predictions;	Appendix A
	g. the nature of the noise and its potential to cause nuisance (tonal components, impulsive or intermittent noise, etc.)	7.4
	h. time of day (day, evening and night) and day of the week;	7.1, 7.3 & 7.4
	i. meteorological conditions, including normal and 'worst case' conditions and the expected frequency of 'worst case' conditions;	6.2
	j. the nature of noise-sensitive uses that may be affected by noise and vibration;	2.1
	k. the proximity of current, proposed or potential noise-sensitive uses;	2.1
	l. impacts and effects on fauna;	9.0
	m. cumulative impacts, taking into account surrounding sources of noise and vibration; and	7.3, 8.0
	n. comparison between the predicted emission levels with existing noise and vibration levels.	7.3
8.4.2		
i	The reports are to review and detail appropriate noise and vibration assessment methodology, standards and acceptable limits.	4.0, 6.0
ii	Where relevant, the choice of a particular methodology over alternative methodologies is to be explained	6.0
iii	Assessment of impacts and effects is to include information on the significance and duration of the impact.	7.1, 7.4
iv	Assumptions and judgements are to be stated clearly and the nature and magnitude of uncertainties are to be clearly defined.	1.2, 6.2
8.4.3		
i	The potential for emissions to cause nuisance is to be assessed, taking into account:	
	a. changes in noise frequencies and tonal components;	6.3 & 7.1
	b. increases in ambient noise levels;	7.3
	c. the time varying nature of emissions (e.g. impulsive or intermittent noise); and	7.4
	d. the temporal span of the noise emissions and its effects on nearby uses.	7.4
8.4.4	The reports are to describe any measures to limit and control noise and vibration to an acceptable level.	11.1
9.2	Construction Management	
9.2.2	The reports are to outline: potential adverse effects from construction noise	10.1

1.2 Limitations and Clarifications

- This Report presents an assessment of potential environmental noise and vibration from the operation of the Stadium in response to the PoSS guidelines. It does not include the acoustic design of the Stadium and its associated facilities within the precinct.
- AECOM's scope for the Project includes an environmental noise and vibration assessment and the internal acoustic design of the Stadium, with the exception of the in-bowl acoustic design, which is the responsibility of PMY Group. AECOM relies on the inputs from PMY Group where in-bowl acoustic is concerned, including the predicted noise levels from sporting events, concerts, PA systems, game sirens, etc., which are used in this Report when predicting environmental noise levels.
- The assessment of the existing acoustic environment has been based on historical long-term noise and vibration data held by MPDC which were collected by another acoustic consultant, and limited site attendance by AECOM. The operation of the port has not been captured to its full scale. Further site investigations will be conducted during the subsequent design phases.
- The environmental noise and vibration assessment has been based on the current architectural concept design drawings for the Stadium and precinct masterplan, which are expected to evolve over the course of the Project. Changes in architecture and materials will affect the noise emission from the Stadium. The Report has assessed the current design of key features such as the roof, facades, and built-form.
- Crowd noise and patron noise levels tend to have a high variance across different types of sporting events and concerts and can often be non-predictable. The information used to predict the noise impact for the Stadium has been based on reasonable assumptions taking into consideration the patron voice levels, the expected pedestrian circulation areas around the Stadium and the predicted pedestrian flows based the PoSS Crowd Modelling Report (PoSS 1.3 Crowd Modelling_240628). Detailed information regarding pedestrian modelling and expected movement for each type of event has not been provided for this assessment.
- Building services plant and equipment are yet to be designed and will develop throughout the design phases of the Project. The predictions for building plant and equipment have been based on typical noise levels for major plant and equipment.
- The District Infrastructure Strategy (DIS) does not form part of the Stadium design and is outside of AECOM's scope. It is expected that the noise emission from the Central Energy Plant will be designed to comply with the *Tasmanian Environment Protection Policy (Noise) 2009* (EPP).
- A detailed construction noise and vibration assessment has not been performed as part of the noise and vibration assessment presented in this Report. Information provided in this Report provides a high-level overview of the relevant issues and indicative construction noise levels that can be expected for typical construction activity such as piling and excavation at the Site boundary.

2.0 Project Site Description

The Project Site is approximately 10 hectares of former industrial rail yard, located between the Regatta grounds and the Macquarie Wharves in Hobart.

Since 2009, significant noise-generating operations, including freight handling activities (TasRail and Toll Transport), Boral's concrete batching plant and the Hobart Cold Storage Centre, have ceased operation on the Project Site.

North of the Site

Potential future developments include public ferry services and a storage/display centre for historic trams. The Huon Quays site has been closed and may be developed commercially. The existing Domain slipway facility will continue boat maintenance.

The parcel of land adjustment to the Domain boat ramp may be subject to future residential developments.

The Royal Hobart Regatta Grounds, including the Cenotaph, is adjacent to the north. It is crucial to ensure the operation of the Stadium does not impact the events at the Cenotaph, such as the Dawn Service, Last Post Ceremony or any other memorial services.

Southeast of the Site

The Macquarie Wharf makes up the majority of the land to the southeast, the wharf takes in both cruise ship visits and commercial cargo operations. A parcel of the land includes a water treatment plant, owned and operated by TasWater. The plant is scheduled for decommissioning by the end of 2025.

West of the Site

Davey Street and Tasman Highway bound the Site to the west. There are a number of noise sensitive receptors beyond these roads, including Baha'I Centre of Learning, ABC Broadcast Centre and residential apartments.

South of the Site

The majority of the noise sensitive receptors are located to the south of the Site, including residential apartments, hotels, and the School of Creative Arts. Federation Concert Hall is also a significant sensitive receptor located to the southwest of the Site at the corner of Davey Street and Evans Street.

Figure 1 overleaf provides an overview of the Project Site and identifies the nearest noise sensitive receptors.

2.1 Nearest Noise Sensitive Receptors

The table below presents the nearest noise sensitive receptors surrounding the Project Site.

Table 2 Noise Sensitive Receptor Locations

Receptor Reference	Location Description	Approximate Distance to the Stadium[1]
R1	Sullivans Cove Apartments	40 metres to the south
R2	Zero Davey Boutique Apartments	40 metres to the south
R3	University of Tasmania School of Creative Arts and Media	70 metres to the south
R4	MACq 01 Hotel	115 metres to the south
R5	IXL, Henry Jones Hotel	80 metres to the south
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	40 metres to the southwest
R7	Hotel Grand Chancellor	110 metres to the southwest
R8	7 Macquarie Street apartments	70 metres to the west
R9	The Old Woolstore Apartment Hotel	110 metres to the west
R10	Baha'I Centre of Learning	150 metres to the west
R11	ABC Broadcast Centre	230 metres to the west
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	180 metres to the north
R13	Royal Hobart Regatta Grounds (The Cenotaph)	90 metres to the north
R14	One Collins Apartment	200 metres to the west
R15	Royal Hobart Hospital	320 metres to the west
R16	Residential Apartments (1 Creswells Row)	250 metres to the southwest
R17	Residential Apartments (1-9 Ragged Lane)	180 metres to the west
R18	Residential Apartments (1-15 Terminus Row)	220 metres to the southwest

Note 1: The distance to the receptor is measured from the outer edge of the Stadium.

2.2 Stadium Envelope and the Precinct

The Mac Point Draft Precinct Plan (Oct 2023) proposes an integrated urban mixed-use site, and provides the opportunity to establish a multipurpose stadium on the edge of the Hobart CBD. The Stadium will provide Tasmania with a premier year-round event venue, hosting events both within and around the Stadium.

It is anticipated that the majority of events will take place within the Stadium, while smaller or ancillary events will be hosted in the plaza outside of the Stadium.

The Project is currently at the Concept Design stage and its architecture and planning will continue to evolve throughout the design phases. The current intent of the Stadium envelope is as follows:

- Roof: ETFE roof with a margin of composite/metal roof around the perimeter.
- West and north sides: includes auxiliary facilities associated with the Stadium. The facade will be a mixture of large sections of glazing, claddings, and openings for plant rooms.
- South and east sides: the facade will consist of a mixture of glazing, cladding and openings.

The Stadium has two main plazas, the Southern Plaza and the Western Plaza. The Western Plaza incorporates the existing Royal Engineering Building and an indigenous culture zone. The main entry points to the Stadium are via the Southern Plaza and entrances located on the north side of the Stadium.

A future bus plaza, drop-off zones and the district central energy facility are expected to be located to the northeast of the Stadium. A new access road is proposed around the northeastern side of the Royal Hobart Regatta Ground.

AECOM

N

0 50 100 Meters

Legend

- Receptors
- Macquarie Wharf
- Site Boundary

Receptor	Location Description
R1	Sullivans Cove Apartments
R2	Zero Davey Boutique Apartments
R3	University of Tasmania School of Creative Arts and Media
R4	MACq 01 Hotel
R5	IXL, Henry Jones Hotel
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)
R7	Hotel Grand Chancellor
R8	7 Macquarie Street apartments
R9	The Old Woolstore Apartment Hotel
R10	Baha'i Centre of Learning
R11	ABC Broadcast Centre
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development
R13	Royal Hobart Regatta Grounds (The Cenotaph)
R14	One Collins Apartment
R15	Royal Hobart Hospital
R16	Residential Apartments (1 Creswells Row)
R17	Residential Apartments (1-9 Ragged Lane)
R18	Residential Apartments (1-15 Terminus Row)

FIGURE 1: Site Map

Figure 1: Site Map

3.0 Noise and Vibration PoSS Brief

The scope of the noise and vibration assessment is based on addressing the items listed in Section 8.4 of the PoSS Guidelines, presented in section 1.1 of this Report. The proposed usage of facilities and operations of the Stadium has been based on the Stadiums Tasmania Macquarie Point Stadium User Brief (Initial Draft April 2024).

3.1 Potential Usage

The Macquarie Point Stadium will be used to host a range of year-round events. The potential usage and level of frequency are summarised below, extracted from the Stadiums Tasmania Draft User Brief.

- AFL – 15 matches per year inclusive of 10 national AFL matches plus 2 pre-season matches and 3 local finals/VFL and Talent League matches.
- Cricket – 11 matches per year inclusive of BBL, BBLW, Test(s) and ODI/T20
- NRL – 1 match every 3-4 years
- Rugby – 1 match every 3-4 years
- Football – up to 16 games per annum
- Concert – 1 major concert per annum, potential smaller concerts/festivals
- Conference/Trade Fairs – 1 event every 2-3 years, up to 2500 capacity
- Functions – function rooms with 250-1000 capacity, weekly use
- Community events – potential connections with existing community/mass participation events such as providing start/finish opportunities for Hobart Marathon or Ironmen events

For the purpose of this Report, the capacity of the Stadium is as follows:

- 23,000 seat venue with up to 1,500 additional standing room for major sports events, allowance of up to 1,500 staff
- 30,000 maximum capacity for patrons in concert mode, allowance of up to 1,500 staff
- 1,500 capacity for conferences (conferences will not be held simultaneously with Stadium events, therefore the conference capacity does not represent an increase to the spectator capacity)
- Less than 1,000 for typical weekday occupancy

3.2 Acoustic Modelling Scenarios

Based on the potential usage of the Stadium, a set of noise and vibration generating scenarios have been developed to perform the noise and vibration modelling for the Stadium. Each acoustic modelling scenario comprises the set of noise sources associated with typical events associated with the Stadium and is summarised in Table 3.

Table 3 Acoustic Modelling Scenarios

Scenarios	Event	Noise Sources
S1	Before and after sporting events	• Building services plant • Patrons within plaza, engaged in outdoor activity, food and beverage and merchandise outlets • Patrons entering and leaving the Stadium • Pre-game and post-game events in function rooms • Bus plaza
S2	During sporting events	• Building services plant • Crowd noise in Stadium bowl and concourse • PA system (speech, music) • Game sirens
S3	Before and after concerts	• Building services plant • Patrons within plaza, engaged in outdoor activity, food and beverage and merchandise outlets • Patrons entering and leaving the Stadium • Sound check (before concert only) • Bus plaza
S4	During concerts	• Building services plant • Crowd noise in bowl, concourse, on field. • Music sound levels
S5	Conference/Trade Fairs	• Building services plant • Crowd noise in bowl, concourse, on field. • PA system (speech, music)
S6	Plaza events	• Music sound level in plaza • Patrons within plaza, engaged in outdoor activity, food and beverage and merchandise outlets • Temporary generators
S7	Weekday occupancy (general stadium use)	• Building services plant • Function room facilities • Waste collections • Loading dock operation

4.0 Environmental Noise Policies and Guidelines

The overarching principles and objectives for noise control in Tasmania are provided in the *Environment Protection Policy (Noise) 2009*.

The main relevant legislation is the *Environmental Management and Pollution Control Act 1994* – particularly section 53, which defines the concept of *'environmental nuisance'*.

Specific requirements relating to noise levels and hours of operation are principally covered by the *Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2016* for particular activities such as the use of construction machinery and fixed domestic equipment.

Measurements of noise are to be made in accordance with the *Noise Measurement Procedures Manual*.

At present, there is no governing policy related to noise emissions from stadia, including concerts and sporting events, and patrons.

4.1 Tasmanian Environment Protection Policy (Noise) 2009

The *Tasmanian Environment Protection Policy (Noise) 2009* (EPP) provides guidance on the following types of noise:

- Public roads, railways, ports and airports
- Commercial and industrial activities
- Domestic and miscellaneous activities.

Noise produced by building plant serving the Stadium (e.g. building services and electrical services plant) and services operations within the Stadium (e.g. waste and loading dock operations) will be assessed in accordance with the EPP. The following sections summarise key relevant elements of the EPP.

4.1.1 Environmental values

Clause 7 of the EPP provides the following guidance with respect to the setting of Environmental Values for noise:

(1) Environmental values are the values or uses of the environment that are to be protected.

(2) The environmental values to be protected under this policy are the qualities of the acoustic environment that are conducive to –

a. the wellbeing of the community or a part of the community, including its social and economic amenity; or

b. the wellbeing of an individual, including the individual's –

i. health; and

ii. opportunity to work and study and to have sleep, relaxation and conversation without unreasonable interference from noise.

(3) It can be assumed that the environmental values specified in sub-clause (2)(b) will be protected for the majority of the human population where the acoustic environment indicator levels are not exceeded, and there are no individual sources of noise with dominant or intrusive characteristics.

4.1.2 Acoustic environment indicator levels

Acoustic environment indicator levels are defined in Table 1 of the EPP as a guideline, they are not mandatory limits. The indicator levels are provided in Table 4 below.

Table 4 Acoustic environment indicator levels according to Tasmanian EPP

Specific environment	Critical health effect(s)	L_{Aeq} [dB]	Time base [hours]	L_{Amax} fast [dB]	Relevant to Project?
Outdoor living area	Serious annoyance, daytime and evening	55	16	-	Yes
	Moderate annoyance, daytime and evening	50	16	-	Yes
Dwelling, indoors	Speech intelligibility and Moderate annoyance, daytime and evening	35	16	-	Yes
Inside bedrooms	Sleep disturbance, night-time	30	8	45	Yes
Outside Bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60	Yes
School class rooms and pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	During class	-	Yes (e.g. School of Creative Arts)
Pre-school bedrooms, indoor	Sleep disturbance	30	Sleeping-time	45	No
School, playground outdoor	Annoyance (external source)	55	During play	-	No
Hospital, ward rooms, indoors	Sleep disturbance, night-time	30	8	40	Yes (e.g. Royal Hobart Hospital)
	Sleep disturbance, daytime and evenings	30	16	-	Yes (e.g. Royal Hobart Hospital)
Hospitals, treatment rooms, indoors	Interference with rest and recovery	(1)			No
Industrial, commercial, shopping and traffic areas, indoors and outdoors	Hearing impairment	70	24	110	No
Ceremonies, festivals and entertainment events	Hearing impairment (patrons:<5 times/year)	100	4	110	Yes

Specific environment	Critical health effect(s)	L_{Aeq} [dB]	Time base [hours]	L_{Amax} fast [dB]	Relevant to Project?
Public addresses, indoors and outdoors	Hearing impairment	85	1	110	Yes
Music and other sounds through headphones/ earphones	Hearing impairment (free-field value)	85(2)	1	110	No
Impulse sounds from toys fireworks and firearms	Hearing impairment (adults)	-	-	140(3)	No
	Hearing impairment (children)	-	-	120(3)	No
Outdoors in parkland and conservation areas	Disruption of tranquillity	(4)			Yes

Table notes:

(1) As low as possible.
(2) Under headphones, adapted to free-field values.
(3) Peak sound pressure (not $L_{AF,max}$) measured.
(4) Existing quiet outdoor areas should be preserved, background sound should be kept low.

4.1.3 Noise impact studies

Clause 17 of the EPP provides that:

(1) If a regulatory authority has reasonable grounds to consider that a proposed or existing emission of noise from an industrial, commercial or infrastructural activity might prejudice protection of the environmental values, it should, where possible and appropriate, require any person responsible for the activity to undertake a noise impact study in accordance with an approved methodology.

(2) Where a noise impact study is carried out, it should consider –

a. noise levels at appropriate locations compared with noise limits applicable to the activity in any legislation, approval or proposed approval;
b. compliance with any other relevant requirements of legislation, approval or proposed approval;
c. the potential for reducing the impact of the activity's noise emissions or proposed emissions on the acoustic environment; and
d. the cumulative effect of the noise emissions or proposed emissions from the activity.

4.2 Environmental Management and Pollution Control (Noise) Regulations 2016

Clause 7 of the *Environmental Management and Pollution Control (Noise) Regulations 2016* provides the following with respect to noise from fixed equipment:

7. Fixed equipment:

(1) A person must not operate fixed equipment on any premises –
(a) from 7.00 a.m. until 10.00 p.m., if the fixed equipment, when so operated, emits noise that is greater than 45dB(A); or
(b) from 10.00 p.m. until 7.00 a.m., if the fixed equipment, when so operated, emits noise that is greater than 40dB(A).

(2) A measurement of noise, emitted by fixed equipment on any premises, that is to be measured at residential premises –
(a) is to be taken one metre from the external wall, of the residential premises, that is closest to the fixed equipment emitting the noise; or
(b) if the distance between the external wall of the residential premises closest to the fixed equipment and the property boundary of the residential premises is less than one metre, is to be taken at that property boundary.

It is noted that fixed equipment includes domestic heating equipment, systems for the production of hot water, air conditioners, evaporative coolers, pumps, generators or wind turbines, that are affixed at the location at which they are in use. It is included here as a useful reference point.

4.2.1 Environmental Management and Pollution Control Act 1994

Clause 53 of the *Environmental Management and Pollution Control Act 1994* provides the following with respect to the environmental nuisance with respect to noise, which is defined as:

the emission of noise that is not an emission specified in an environment protection policy to be an environmental nuisance, the emission is to be taken to unreasonably interfere with a person's enjoyment of the environment if it is unreasonable having regard to –

(a) its volume, intensity or duration; and
(b) the time, place and other circumstances in which it is emitted; and
(c) in the case of noise emitted from residential premises, whether it is, or is likely to be, audible in a habitable room in any other residential premises.

4.3 Noise Measurement Procedures Manual

Part F of the Tasmanian Environment Division's *Noise Measurement Procedures Manual* (NMPM) provides a measurement procedure for noise from sport and entertainment venues, as follows:

30.1 Measurement Location Measurement locations are to be selected in accordance with the general considerations of section 13.3 and are to be representative of the most effected section of the noise sensitive premises under investigation.

[Section 13.3 of the EPP relates to the selection of monitoring locations]

30.2 Measurement procedures Noise measurements must be taken during a time when activities at the outdoor concert venue are typical of the particular entertainment style. Measurement times must coincide with performances at the concert and are not to include times dominated by crowd noise, lulls between performances, arrival and departure of patrons and set-up and removal of services and equipment. Other ambient noise in the area must be measured during a lull in the noise from the concert under investigation or before and after the event. The sound level meter must be set to A-weighted frequency response and slow time response. The measurement must consist of 15 cumulative minutes of music audible at the measurement site, measured as the Leq. Significant extraneous noise and periods when music from the concert is not audible at the measurement location must be excluded for the measurement.

The NMPM provides correction procedures to account for the following characteristics of noise:

- Tonality (Clause 6.2)
- Impulsiveness (Clause 6.3)
- Modulation (Clause 6.4)
- Low frequency (Clause 6.5).

The NMPM provides that, for the purposes of measuring the background noise level, the times of the day are regarded as being divided into the following periods:

- Day - 7:00am to 6:00pm;
- Evening - 6:00pm to 10:00pm; and
- Night - 10:00pm to 7:00am the following day.

4.4 Stadium Event Noise Restrictions in other Jurisdictions

In the absence of specific Tasmania noise criteria for stadiums featuring sporting events and concerts, an overview of the applicable noise restrictions for comparable stadia in Australia and New Zealand have been presented in Table 5 below.

Table 5 Noise restrictions for stadia in Australia and New Zealand

Stadium	Type	Capacity	Document	Noise Criteria for Concerts/Events
Suncorp Stadium, Brisbane	Rectangular Open air	52,500	Major Sports Facilities Regulation 2014	70dB(A) $L_{eq,\ 15\ min}$ Applicable at the nearest sensitive receptors approximately 40 metres away.
Allianz Stadium, Sydney	Rectangular Open air	55,500 for concerts	The Consent Conditions (SSD 9835, Condition 48) include noise limits and operating times for Events, both Concert and Non-Concert Events	70dB(A) $L_{eq,\ 15min}$ for concerts 60dB(A) $L_{eq,\ 15min}$ for sports Applicable at the nearest sensitive receptors approximately 50 metres away.
Marvel Stadium, Melbourne	AFL oval Retractable roof	60,000 for concerts	EPA Publication 1826.4 "The Noise Protocol" – Clause 1.1 of Part 2: "Docklands noise attenuation area"	65dB(A) $L_{eq,\ 15min}$ (outdoors) 45dB(A) within internal areas of the Docklands area Applicable at the nearest sensitive receptors approximtely 30 metres to the north.
AAMI Park, Melbourne	Rectangular Open air	30,000 for concerts	EPA Publication 1826.4 "The Noise Protocol"	65dB(A) $L_{eq,\ 15\ min}$ (outdoors) 55dB(A) $L_{eq,\ 15\ min}$ (indoors) Applicable at the nearest sensitive receptors approximately 300 metres away.
Optus Stadium, Perth	AFL oval Open air	70,000 for concerts	Environmental Protection (Noise) Regulations 1997	Regulation 19B (1) Applicable at the nearest sensitive receptors approximately 500 metres away.
Forsyth Barr Stadium, Dunedin, NZ	Rectangular Enclosed ETFE roof	36,000 for concerts	Dunedin City District Plan, Spectator Events & Education Zone, 2007	75dB(A) $L_{10,\ 15\ min}$ for up to 3 events per year 8 additional events up to 65dB(A) $L_{10,\ 15\ min}$ Applicable at the nearest sensitive receptors approximately 500 metres away.
Te Kaha, Christchurch , NZ	Rectangular Enclosed ETFE roof	36,000 for concerts	Christchurch City Council, June 2021, Amendment	80dB(A) $L_{eq,\ 15\ min}$ for up to 6 concerts per year Additional 9 concerts per year up to 75dB(A) $L_{eq\ 15min}$ Applicable at the nearest sensitive receptors approximately 50 metres away.

Table notes:

(1) Regulation 19B states the following:

Regulation 19B provides an approval process for major venues such as Optus Stadium that hold large events on a regular basis throughout the year. The occupier of a venue may apply for approval to host a specific number and types of "notifiable events".

A venue approval will allow noise emissions from events to exceed the assigned noise levels stipulated on the regulations, provided the events are carried out in accordance with the venue's approval.

A regulation 19B venue approval provides fairness, certainty and protection for the community and local government as to what sorts of events they can expect from the venue, and also for the venue occupier as to the tenure for the viable operation of the venue.

(2) Noise criteria apply at nearby residences

(3) Te Kaha Stadium, Christchurch NZ, is currently in construction, due for completion in 2026.

4.5 Summary of Applicable Noise Guidelines for the Project

The applicable guidelines for each noise source associated with the Stadium are summarised in Table 6 below. As shown, no applicable noise guidelines exist within Tasmania for noise from stadium events. As a result, this Report presents predicted noise emissions from these noise sources alongside criteria from other jurisdictions, to aid comparison and understanding of the type and level of noise that can be expected.

Table 6 Applicable Noise Guidelines

Noise Source	Applicable Guidelines for Noise in Tasmania
Music Concerts	No current guideline within Tasmania
PA System	No current guideline within Tasmania
Game Sirens	No current guideline within Tasmania
Crowd Noise (In bowl)	No current guideline within Tasmania
Patron Noise (Outside of stadium)	No current guideline within Tasmania
Bus Plaza	Tasmanian Environmental Protection Policy (Noise) 2009
Building services plant (Permanent)	Tasmanian Environmental Protection Policy (Noise) 2009
Temporary generators	Tasmanian Environmental Protection Policy (Noise) 2009
Loading dock operation and waste collection	Tasmanian Environmental Protection Policy (Noise) 2009

5.0 Existing Noise and Vibration Conditions

The existing noise and vibration conditions at the Project site and surrounding areas were determined based on long-term monitoring data provided by Macquarie Point Development Corporation (MPDC).

AECOM conducted a site visit on the 12th and 13th June 2024 to perform noise and vibration measurements of existing conditions to supplement the long-term noise and vibration data.

The measurement locations for both existing long-term monitoring and attended measurements are shown in Figure 2 overleaf.

AECOM

N

0 50 100 Meters

Legend

- VV - Attended Vibration Measurements
- M - Attended Noise Measurements
- v - Long-Term Vibration Measurements
- n - Long-Term Noise Measurements
- Site Boundary

FIGURE 2: Noise & Vibration Measurement Locations

Figure 2: Noise and Vibration Measurement Locations

5.1 Attended Measurements

The specifications and details of the instrumentation used to conduct the measurements are presented in Table 7 below. All instrumentation has been laboratory calibrated and were calibrated for on-site use.

Table 7 Instrumentation

Instrument	Model	Serial Number	Application
Sound Level Meter	Rion NL52	1010744	Noise measurements
Vibration Meter	NoisePad	65953	Vibration measurements

The measured noise and vibration levels are presented in Table 8 and Table 9, respectively.

Table 8 Attended Noise Measurement Results

ID	Measured Noise Levels, dB	Details
M1	L_{Aeq}: 50 L_{A90}: 45	• Location: Evans Street • Observations: Dominated by Davey Street Traffic. Distant traffic audible. • Date: 12/06/2024 22:22 • Duration: 10 minutes
M2	L_{Aeq}: 48 L_{A90}: 44	• Location: The Story Bar • Observations: Dominated by Seagulls • Date: 12/06/2024 22:49 • Duration: 10 minutes
M3	L_{Aeq}: 44 L_{A90}: 40	• Location: Domain Boat Ramp • Observations: Dominated by Tasman Highway Traffic. Hum from port building services services just audible. • Date: 12/06/2024 23:18 • Duration: 10 minutes
M4	L_{Aeq}: 47 L_{A90}: 45	• Location: Water Treatment Plant • Note: This will be decommissioned as part of the Project • Observations: Dominated by water treatment plant noise • Date: 12/06/2024 23:30 • Duration: 10 minutes
M5	L_{Aeq}: 61 L_{A90}: 48	• Location: Corner Evans Street and Macquarie Street • Observations: Dominated by traffic on Macquarie Street • Date: 12/06/2024 23:44 • Duration: 10 minutes
M6	L_{Aeq}: 58 L_{A90}: 51	• Location: TasPorts Car Park • Observations: Dominated by excavator moving timber in port. Seagulls and distant traffic audible. • Date: 13/06/2024 09:10 • Duration: 5 minutes
M7	L_{Aeq}: 56 L_{A90}: 52	• Location: Macquarie Point Car Park • Observations: Dominated by excavator moving timber in port, Macquarie Point Construction and Seagulls. • Date: 13/06/2024 09:45 • Duration: 5 minutes
M8	L_{Aeq}: 59 L_{A90}: 48	• Location: Hunter Street Car Park • Observations: Dominated by Hunter / Evans Street traffic and Macquarie Point construction. Excavator moving timber in port just audible. • Date: 13/06/2024 10:00 • Duration: 5 minutes
M9	L_{Aeq}: 55 L_{A90}: 48	• Location: UTAS School of Creative Arts Façade • Observations: Dominated by UTAS loading dock activity and Hunter / Evans Street traffic. • Date: 13/06/2024 10:07 • Duration: 5 minutes
M10	L_{Aeq}: 51 L_{A90}: 47	• Location: The Story Bar • Observations: Dominated by Hunter Street traffic. Distant traffic audible. • Date: 13/06/2024 10:13 • Duration: 10 minutes
M11	L_{Aeq}: 71 L_{A90}: 64	• Location: Corner Evans Street and Macquarie Street • Observations: Dominated by traffic on Macquarie Street. Macquarie Point construction (rock breaker) audible. • Date: 13/06/2024 10:35 • Duration: 10 minutes
M12	L_{Aeq}: 65 L_{A90}: 58	• Location: Royal Engineers Building • Observations: Dominated by Davey and Macquarie Street traffic. Macquarie Point construction not audible • Date: 13/06/2024 11:10 • Duration: 10 minutes
M13	L_{Aeq}: 58 L_{A90}: 53	• Location: Baha'l Learning Centre Car Park • Observations: Dominated by Tasman Highway traffic. • Date: 13/06/2024 11:27 • Duration: 10 minutes
M14	L_{Aeq}: 52 L_{A90}: 49	• Location: Domain Boat Ramp • Observations: Dominated by Tasman Highway traffic. • Date: 13/06/2024 12:01 • Duration: 10 minutes

Table 9 Attended Vibration Measurement Results

ID	Measured Peak Vibration Levels, mm/s	Description of Events
VV1	0.14	• Location: TasPorts Car Park • Observations: Dominated by excavator moving timber in port • Date: 6/13/2024 9:31:53 AM • Duration: 5 minutes
VV2	0.19	• Location: Macquarie Point Car Park • Observations: Dominated by excavator moving timber in port. • Date: 6/13/2024 9:45:34 AM • Duration: 5 minutes
VV3	0.68	• Location: Hunter Street Car Park • Observations: Dominated by Hunter / Evans Street traffic and Macquarie Point construction. • Date: 6/13/2024 9:59:50 AM

ID	Measured Peak Vibration Levels, mm/s	Description of Events
		• Duration: 5 minutes
VV4	0.28	• Location: UTAS School of Creative Arts Façade • Observations: Dominated by UTAS loading dock activity and Hunter / Evans Street traffic. • Date: 6/13/2024 10:04:44 AM • Duration: 5 minutes
VV5	0.18	• Location: The Story Bar • Observations: Dominated by Hunter Street traffic • Date: 6/13/2024 10:14:17 AM • Duration: 10 minutes
VV6	0.4	• Location: Sullivans Cove Apartments (Evans Street) • Observations: Dominated by Evans Street traffic. Construction vibration from Macquarie Point may be present. • Date: 6/13/2024 10:29:51 AM • Duration: 5 minutes
VV7	0.09	• Location: Corner Evans Street and Macquarie Street • Observations: Dominated by traffic on Macquarie Street. • Date: 6/13/2024 10:42:59 AM • Duration: 10 minutes
VV8	0.15	• Location: Federation Concert Hall • Observations: Dominated by Traffic on Davey Street • Date: 6/13/2024 10:47:05 AM • Duration: 10 minutes
VV9	0.17	• Location: Royal Engineers Building • Observations: Dominated by Davey and Macquarie Street traffic • Date: 6/13/2024 11:08:49 AM • Duration: 5 minutes
VV10	0.24	• Location: Baha'i Learning Centre Car Park • Observations: Dominated by Tasman Highway traffic. • Date: 6/13/2024 11:28:21 AM • Duration: 5 minutes

5.2 Site Observations

The site investigation identified that the general acoustic environment in Macquarie Point is dominated by traffic noise from the Tasman Highway, Davey Street, Macquarie Street and local roads. There were loading activities occurring at the wharf during the measurement period. However, the noise contribution from the wharf is not evident at the closest residential receptor (R1 - Sullivans Cove Apartment) due to the background traffic levels.

Further, it has been confirmed the existing water treatment plant to the northeast of the site will be removed as part of the Project.

We note that construction works are intermittent but ongoing at the Project site. Measurements were undertaken to avoid construction noise as far as practical.

No significant vibration sources were noted other than construction activities. The general vibration background is dominated by road traffic.

5.3 Long-term Measurements

MPDC has previously engaged Hanson Associates to conduct long-term noise monitoring on site for the purpose of monitoring construction noise and vibration. Noise monitoring was carried out at three external locations, and vibration monitoring was conducted at one external location between 18 March and 23 May 2024.

The construction program during the monitoring period was also provided by MPDC, which was used to filter out any noise and vibration results affected by construction activities.

A summary of the noise and vibration monitoring data is presented in Table 10 and Table 11.

Table 10 Long-term Noise Monitoring Results

Location	Period	Representative Measured Noise Levels	
		$L_{Aeq, 1hr}$ dB	$L_{A90, 1hr}$ dB
TSO Rooftop – n3	Night (10pm to 7am)	49	42
	Evening (6pm to 10pm)	56	50
	Day (7am to 6pm)	59	55
Henry Jones Hotel Rooftop – n4	Night (10pm to 7am)	41	40
	Evening (6pm to 10pm)	47	45
	Day (7am to 6pm)	48	46
Site – n5	Night (10pm to 7am)	51	40
	Evening (6pm to 10pm)	58	51
	Day (7am to 6pm)	61	55

Note: Refer to Figure 2 for locations n3, n4, n5.

Table 11 Long-term Vibration Monitoring Results

Location	Representative Vibration Levels, Vsum, mm/s
Site – v2	0.12-0.21

6.0 Noise Modelling Methodology

The following sections describe the methodology adopted to model the potential noise impact from the operation of the proposed Stadium.

6.1 Noise Model

The environmental noise emission was performed in accordance with the CONCAWE prediction method. The following propagation effects were included in the predictive noise model:

- Attenuation of noise with distance, including geometrical spreading and air absorption
- Reflections from buildings and other acoustically-reflective structures
- Barrier effects due to obstructions between noise sources and residential receptors
- Ground absorption
- Local topographical changes
- Meteorological conditions

Modelling was conducted using SoundPlan Version 8.2 environmental noise modelling software, which implements the CONCAWE prediction methodology. The CONCAWE method was chosen so the worst case meteorological conditions noted in Noise Modelling Inputs and Limitations can be applied to the prediction model.

The envelope of the Stadium is extracted from the provided architectural model in Rhino. Due to the limitation of the SoundPlan software, the model has been simplified, which broadly involves replacing curves and meshes with simple planar facades and reducing the number of surfaces where possible to improve calculation times. The dome roof has been replaced with a flat roof at an average height of 39 metres above the pitch (the edge of the roof is 24 metres, with the highest point 54 metres above the pitch).

The simplification of the Stadium geometry is not expected to affect the noise prediction significantly, as the noise emission surfaces in the model remain largely unchanged.

6.2 Modelling Inputs, Assumptions and Limitations

The design inputs and assumptions used in the acoustic model are detailed in the table below.

Table 12 Noise Modelling Inputs and Limitations

Inputs	Comment
Architectural drawings	*MPS-COX-DR-01-A11-2000 Rev 4* *MPS-COX-DR-01-A20-0000 Rev 4* *MPS-COX-DR-01-A10-0010 Rev 5* *MPS-COX-DR-01-A20-0010 Rev 5* *MPS-COX-DR-01-A21-0010 Rev 5* *MPS-COX-DR-01-A30-0010 Rev 5* *MPS-COX-DR-01-A40-0010 Rev 5* *MPS-COX-DR-01-A20-0050 Rev 4* *MPS-COX-DR-01-A30-0000 Rev 2* *MPS-COX-DR-01-A30-0010 Rev 2* *MPS-COX-DR-01-A30-0020 Rev 2* *MPS-COX-DR-01-A40-0000 Rev 3* *MPS-COX-DR-01-A40-0010 Rev 2* *MPS-COX-DR-01-A40-0020 Rev 2* *MPS-COX-DR-01-A40-0030 Rev 2* *MPS-COX-DR-01-A40-0040 Rev 2* *MPS-COX-DR-01-A40-0050 Rev 2*
Topography	A mixture of supplied survey and internet sourced data was used to determine the topography of the assessment area: • Survey: *306246 D01 R0 Macquarie Point (MGA2020 GRID).dwg* • Elvis – Elevation and Depth (*elevation.fsdf.org.au*)
Receptor Locations	Noise sensitive buildings (receivers) were identified via Nearmap and Google Earth aerial studies of the project site, and via a site visit on 13 June 2024. The predicted noise level for each receptor was calculated at a height of 1.5 metres above each habitable level, and one metre from the centre of the most exposed façade.
Ground absorption	Ground absorptions have been assumed as follows: • An absorption coefficient of 0.0 (hard ground) has been assumed for residential and built-up areas. • An absorption coefficient of 0.5 (medium soft ground) has been assumed for parks. • An absorption coefficient of 0.0 (hard ground) has been assumed for water surface
Rounding	Noise levels are rounded to the nearest whole number.
Meteorological Conditions	Worst-case meteorological conditions have been assumed for the assessment: • Pasquil stability class F • Wind speed of 3m/s blowing directly from sources to receivers This represents a worst-case scenario for the acoustic modelling in which the noise is carried by the wind from the source to the receptor direction constantly. Increasing the wind speed above 3m/s in the noise model would not change the predicted results. Based on the historical data for the Hobart climate, this condition could be experienced more than 50% of the time throughout the day. However, it should be noted that in reality only receptors in the downwind direction are affected, whilst the assessment assumes all receptors are affected regardless of wind directions.
Building data	The building data has been provided by AECOM GIS team, the data is based on the existing Lidar of the area.
In-bowl event noise levels	PMY Group provided the noise levels of in-bowl events. For the purpose of the PoSS Report, the following inputs are adopted from the preliminary modelling results supplied by PMY. (*Macquarie Point Preliminary Acoustic Modelling Exterior Noise Levels 2024-06-16.xlsx):* • Concert music noise levels • PA systems • AFL sirens • Crowd noise.
Clarification	In addition to the in-bowl events, there are events that could occur in the outdoor plaza areas, as well as activities associated with the operations of the Stadium. Noise levels from these events have been based on data held by AECOM: • Crowd noise in outdoor food and beverage area • Patron arrival/departure noise • Waste collection • Loading dock operations • Temporary generators All noise sources used in the assessment are detailed in section 6.3.

6.3 Noise Sources

Details of the noise sources associated with the modelling scenarios listed in Table 13 are presented below.

Table 13 Noise Sources

Noise Source	Noise Modelling Data and Assumptions	Provided by

Concert	Assumptions for the concert noise modelling are:
	• The stage is set up at the north end of the Stadium, facing south
	• Two line speaker arrays, top at 12m above the pitch
	• Two concert scenarios are modelled:
	  ○ High-intensity concerts (rock): sound levels of 115 dBA at the mix position located at 50m from the stage
	  ○ Mid-intensity concerts (rock): sound levels of 105 dBA at the mix position located at 33m from the stage
		Supplied by PMY

PA System	Assumptions for the PA system modelling are: • Twenty eight (28) clusters of loudspeakers consisting of 3 Fulcrum AHC295 90x45 speakers, located at 26m above the pitch. • Sound levels of 90-95 dBA throughout the stands (bowl).	Supplied by PMY
Game Siren	Assumptions for the game siren modelling are: • Four (4) omni-directional clusters of sirens, located at 22m above the pitch • Sound levels of 100-105 dBA throughout the stands (bowl).	Supplied by PMY
Crowd Noise (In bowl)	Assumptions for the crowd noise modelling are: • Sound power level of 87 dBA per m^2 in the stand (assuming full crowd capacity) • Sound levels of 90 dBA throughout the stand (bowl).	Supplied by PMY
Patrons arriving and departing the Stadium	Patron noise outside the Stadium was predicted using the following assumptions: • People conversing with normal voice – Sound power level of 72dB per person talking • 25% of people talking • Crowd density of 1 person per $1m^2$ • Peak pedestrian flows based on the PoSS Crowd Modelling Report: **Peak 15 min Arrival and Departure Flow** Access Points / Arrival Flow / Departure Flow NW 1,111 3,437 NE 1,159 3,587 SW 821 2,541 SE 1,739 5,380 Total 4,831 14,945	AECOM data
Patrons at outdoor food and beverage area, OCR Lounges, Function rooms and the Goods Shed	Patron noise at outdoor food and beverage and function room areas was predicted using the following assumptions: • The Southern Plaza area will be used for food, beverage and merchandise • People conversing with raised voice – Sound power level of 76dB per person talking • 33% of people talking • Up to 2500 people in the Southern Plaza • Up to 180 people per OCR lounge • Up to 1500 people in the function rooms • Up to 1500 people in the Goods Shed	AECOM data
Bus	The total noise from buses idling in designated bus bays has been calculated based on the following assumptions: • Total of 15 buses idling (one in each bus bay) • Sound power level of 84dB for each idling bus	AECOM data
Building services plant (Permanent)	Building services plant room noise has been calculated based on the following assumptions: • Plant rooms typically include air handling units (AHU) and associated return air fans • Central plant including chillers and cooling towers are not part of the scope of the Project. Location of the central plant to be determined as part of the DIS • Typical plant room air intake and discharge openings on façade, Sound power level of 75 dBA each.	AECOM data
Temporary generators	Temporary generator noise has been calculated based on the following assumptions: • Two temporary gensets on ground level in the Southern Plaza • Each genset has a Sound pressure level of 65dBA at 10m	AECOM data
Loading dock operation and waste collection	Waste collection has been calculated based on the following assumptions: • One truck arriving/departing the loading dock in an hour period via the service road • Truck driving at 10km/h within the Project Site • Sound power level of waste truck: 110dB Loading dock operation has been calculated based on the following assumptions: • Three large trucks with trailers arriving/departing the loading dock in an hour period via the service road (including the OB trucks) • Truck driving at 10km/h within the Project Site • One electric forklift servicing the loading dock	AECOM data

7.0 Environmental Noise Assessment

The outcomes of the environmental noise assessment are detailed in this section. Each of the noise sources in Table 13 has been calculated at the identified nearest sensitive receptor locations (Table 2). Noise contour maps for each of the predicted noise sources have been included in Appendix A.

7.1 Prediction Results

7.1.1 Music concerts

The predicted concert noise levels at the nearest receptors based on the data and assumptions provided by PMY (Table 13) are presented in Table 14. The predicted music noise levels are presented for the two modelled concert scenarios. The modelled scenarios represent a potential worst case scenario for a rock concert and also mid-intensity concerts with lower music levels.

Table 14 Indicative Noise Levels from Concerts

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)	
		Mid-intensity (pop music, RnB or indie concerts)	Potential worst-case (rock concerts)
R1	Sullivans Cove Apartments	58	Up to 76
R2	Zero Davey Boutique Apartments	55	Up to 74
R3	University of Tasmania School of Creative Arts and Media	65	Up to 83
R4	MACq 01 Hotel	58	Up to 76
R5	IXL, Henry Jones Hotel	57	Up to 75
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	55	Up to 75
R7	Hotel Grand Chancellor	61	Up to 78
R8	7 Macquarie Street apartments	58	Up to 75
R9	The Old Woolstore Apartment Hotel	53	Up to 72
R10	Baha'I Centre of Learning	57	Up to 75
R11	ABC Broadcast Centre	56	Up to 73
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	53	Up to 71
R13	Royal Hobart Regatta Grounds (The Cenotaph)	64	Up to 80
R14	One Collins Apartment	57	Up to 75
R15	Royal Hobart Hospital	56	Up to 74
R16	Residential Apartments (1 Creswells Row)	50	Up to 68
R17	Residential Apartments (1-9 Ragged Lane)	54	Up to 72
R18	Residential Apartments (1-15 Terminus Row)	53	Up to 71

The predicted noise levels presented in the table above are the external noise levels at the receptors' facades. Considering that most sensitive receptors are indoors, assuming all windows and doors are closed during concerts, the building façade should provide a minimum sound reduction of 20dB(A). Receptors with solid façade (i.e. without windows) facing the Stadium, such as the Federation Concert Hall, would likely result in a higher noise reduction (i.e. lower internal noise levels).

The table below provides a comparison of the predicted music noise levels of the potential worst case scenario (loud rock concert) with the noise restrictions for other stadiums in Australia and New Zealand.

It should be noted that the predicted levels for mid-intensity concerts (pop music, RnB or indie music concerts) could be up to 19dB(A) lower than a typical rock concert (refer to noise level range in Table 14), which would be lower than the nominated noise restrictions for other stadiums.

Further, according to the Stadiums Tasmania User Brief, major concerts at Macquarie Point Multipurpose Stadium are only expected to occur once a year, which is considerably less than scheduled at other stadiums.

Table 15 Comparison of the Predicted Concert Noise Levels and Other Stadium Criteria

Stadium	Noise criteria	Comments on the Predicted Noise Levels from Macquarie Point Multipurpose Stadium
Suncorp Stadium, Brisbane	70dB(A) $L_{eq,\ 15\ min}$ Applicable at the nearest sensitive receptors approximately 40 metres away.	Predicted concert levels for the potential worst case scenario (loudest concerts) are up to 8dB(A) higher than the nominated criteria for Suncorp Stadium and Allianz Stadium. However, predicted levels could be considerably lower for pop music, RnB or indie music concerts (per the range provided in Table 14).
Allianz Stadium, Sydney	70dB(A) $L_{eq,\ 15min}$ for concerts 60dB(A) $L_{eq,\ 15min}$ for sports Applicable at the nearest sensitive receptors approximately 50 metres away.	
Marvel Stadium, Melbourne	65dB(A) $L_{eq,\ 15min}$ (outdoors) 45dB(A) within internal areas Docklands Applicable at the nearest sensitive receptors approximately 30 metres to the north.	Predicted concert levels for the potential worst case scenario (loudest concerts) are up to 13dB(A) higher than the nominated external criteria for Marvel Stadium and AAMI Park. Predicted levels could be up to 19dB(A) lower for pop music, RnB or indie music concerts (refer to Table 14). Further, it is worth noting that the residential apartment developments surrounding Marvel Stadium are required to be designed to ensure the internal noise criteria are achieved. Also, the outdoor criteria for Marvel Stadium and AAMI Park are based on the VIC EPA Publication 1826.4 "The Noise Protocol". They are not developed specifically for the stadiums and are irrespective of the distance to the nearest sensitive receptors.
AAMI Park, Melbourne	65dB(A) $L_{eq,\ 15\ min}$ (outdoors) 55dB(A) $L_{eq,\ 15\ min}$ (indoors) Applicable at the nearest sensitive receptors approximately 300 metres away.	
Optus Stadium, Perth	Regulation 19B [(1)] Applicable at the nearest sensitive receptors approximately 500 metres away.	There is no set limit for major events at Optus Stadium. Instead an approval process under Regulation 19B will be undertaken for major events which may allow the events to exceed the assigned noise levels.

Stadium	Noise criteria	Comments on the Predicted Noise Levels from Macquarie Point Multipurpose Stadium
Forsyth Barr Stadium, Dunedin, NZ	75dB(A) $L_{10,\ 15\ min}$ for up to 3 events per year 8 additional events up to 65dB(A) $L_{10,\ 15\ min}$ Applicable at the nearest sensitive receptors approximately 500 metres away.	Predicted concert levels for the potential worst case scenario are up to 3dB(A) higher than the nominated criteria for Forsyth Barr Stadium. Predicted levels could be up to 19dB(A) lower for pop music, RnB or indie music concerts (refer to Table 14).
Te Kaha, Christchurch, NZ	80dB(A) $L_{eq,\ 15\ min}$ for up to 6 concerts per year Additional 9 concerts per year up to 75dB(A) $L_{eq\ 15min}$ Applicable at the nearest sensitive receptors approximately 50 metres away.	Predicted concert levels for the potential worst case scenario at residential receptors are below the nominated criteria for Te Kaha. Predicted levels could be considerably lower for pop music, RnB or indie music concerts (refer to Table 14). There are residential receptors adjacent to Te Kaha Stadium across the boundary streets, similar to the condition on the south side of Macquarie Point Stadium.

7.1.2 PA System

The predicted PA noise levels at the nearest receptors based on the data and assumptions provided by PMY (Table 13) are presented in Table 16.

Table 16 Indicative Noise Levels from PA System

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	58
R2	Zero Davey Boutique Apartments	55
R3	University of Tasmania School of Creative Arts and Media	67
R4	MACq 01 Hotel	57
R5	IXL, Henry Jones Hotel	56
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	53
R7	Hotel Grand Chancellor	59
R8	7 Macquarie Street apartments	54
R9	The Old Woolstore Apartment Hotel	50
R10	Baha'i Centre of Learning	54
R11	ABC Broadcast Centre	53
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	49
R13	Royal Hobart Regatta Grounds (The Cenotaph)	62
R14	One Collins Apartment	54
R15	Royal Hobart Hospital	54
R16	Residential Apartments (1 Creswells Row)	44
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	49
R18	Residential Apartments (1-15 Terminus Row)	50

Assuming all windows and external doors are closed, the above predicted PA noise levels may result in internal noise levels of up to 47dB(A) at the UTS building and 39 dB(A) in the nearest receptors with living spaces. The Tasmanian EPP does not apply to PA noise. However, as a reference, according to the Tasmanian EPP indicator levels, the noise levels could cause disturbance to occupants within an education facility and residents.

However, the use of PA system is intermittent in nature and is unlikely to cause continued disturbance. Further, the use of the PA system is usually linked to sporting events, trade fairs and conferences, which generally occur during the day and evening periods.

7.1.3 Game Sirens

The predicted game siren noise levels at the nearest receptors based on the data and assumptions provided by PMY (Table 13) are presented in Table 17.

The nature of the game siren is impulsive, as such, the predicted noise is presented as L_{max} levels. L_{max} typically represent the maximum noise level occurring during short noise events.

Table 17 Indicative Noise Levels from Game Sirens

Receptor Reference	Receptor	Predicted Noise Levels L_{max}, dB(A)
R1	Sullivans Cove Apartments	69
R2	Zero Davey Boutique Apartments	65
R3	University of Tasmania School of Creative Arts and Media	77
R4	MACq 01 Hotel	68
R5	IXL, Henry Jones Hotel	68
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	64
R7	Hotel Grand Chancellor	71
R8	7 Macquarie Street apartments	66
R9	The Old Woolstore Apartment Hotel	61
R10	Baha'i Centre of Learning	65
R11	ABC Broadcast Centre	64
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	60
R13	Royal Hobart Regatta Grounds (The Cenotaph)	73
R14	One Collins Apartment	67
R15	Royal Hobart Hospital	67
R16	Residential Apartments (1 Creswells Row)	55
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	60
R18	Residential Apartments (1-15 Terminus Row)	60

The game sirens would be short and impulsive noise events, similar to ambulance or police vehicle passbys. Due to the distinctive sound characteristics of the AFL sirens, they are expected to be audible indoors at receptors with windows facing the Stadium even with windows closed. However, given the duration will be short (4 seconds) it is expected that disturbance to sensitive receptors would be brief. For receptors with solid wall façades, such as the TSO, the noise level may be imperceptible internally.

7.1.4 Crowd Noise (in-bowl)

The predicted crowd noise levels at the nearest receptors based on the data and assumptions provided by PMY (Table 13) are presented in Table 18.

Table 18 Indicative Noise Levels from Crowd Noise

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	55
R2	Zero Davey Boutique Apartments	50
R3	University of Tasmania School of Creative Arts and Media	63
R4	MACq 01 Hotel	54
R5	IXL, Henry Jones Hotel	53
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	49
R7	Hotel Grand Chancellor	55
R8	7 Macquarie Street apartments	51
R9	The Old Woolstore Apartment Hotel	45
R10	Baha'i Centre of Learning	50
R11	ABC Broadcast Centre	49
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	44
R13	Royal Hobart Regatta Grounds (The Cenotaph)	58
R14	One Collins Apartment	51
R15	Royal Hobart Hospital	50
R16	Residential Apartments (1 Creswells Row)	39
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	45
R18	Residential Apartments (1-15 Terminus Row)	45

Assuming all windows and external doors are closed, the above predicted crowd noise levels may result in internal noise levels of up to 43dB(A) in the UTS building and 35 dB(A) within living spaces at the nearest receptors.

Futher, considering the sound characteristics and likely time of occurrence (day and evening), crowd noise would likely be less noticeable compared to the other noise sources from the Stadium.

7.1.5 Patrons outside the Stadium (arriving/departing)

It should be noted that the assessment of patron noise is complex as it is dependent on the size and type of the crowds. Based on the assumptions detailed in Table 13 and the PoSS Crowd Modelling Report, the indicative noise levels per area are as follows.

Table 19 Source Data Used in Model (Patron Arriving/Departing)

Area	Peak Patron Flow	Overall L_w, dB(A)
Gate 1 Entrance and GA Entrance	5,380	99
Gate 2	2,541	96
Gate 3	3,437	97
Gate 4	3,587	97

The predicted indicative noise levels at the nearest receptors are presented in Table 20.

Table 20 Indicative Noise Levels from Patrons Outside the Stadium (Arriving/Departing)

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	47
R2	Zero Davey Boutique Apartments	41
R3	University of Tasmania School of Creative Arts and Media	40
R4	MACq 01 Hotel	34
R5	IXL, Henry Jones Hotel	30
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	36
R7	Hotel Grand Chancellor	31
R8	7 Macquarie Street apartments	33
R9	The Old Woolstore Apartment Hotel	26
R10	Baha'i Centre of Learning	31
R11	ABC Broadcast Centre	27
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	Negligible
R13	Royal Hobart Regatta Grounds (The Cenotaph)	30
R14	One Collins Apartment	28
R15	Royal Hobart Hospital	25
R16	Residential Apartments (1 Creswells Row)	25
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	26
R18	Residential Apartments (1-15 Terminus Row)	25

Note: where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A).

The predicted noise levels from patrons arriving and departing the Stadium indicate that they would be under the Tasmanian EPP indicator levels, and are likely to be imperceptible indoors with windows closed. It is also worth noting that the predicted levels are expected to be less than the external ambient noise levels.

7.1.6 Patrons at outdoor food and beverage, function rooms, OCR lounges and Goods Shed

Similar to patrons arriving and departing, indicative noise levels per area are presented below based on the assumptions detailed in Table 13.

Table 21 Source Data Used in Model (Patrons at outdoor food and beverage, function rooms, OCR lounges and Goods Shed)

Area	Patron Number	Overall L_w, dB(A)
Southern Plaza	2500 people	105
OCR Lounges on Level 3	180 people per lounge	94
Function rooms	1500 people	103
Goods Shed	1500 people	103

The predicted indicative noise levels at the nearest receptors are presented in Table 22.

Table 22 Indicative Noise Levels from Patrons at Outdoor Food and Beverage and OCR Lounges

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	39
R2	Zero Davey Boutique Apartments	40
R3	University of Tasmania School of Creative Arts and Media	44
R4	MACq 01 Hotel	38
R5	IXL, Henry Jones Hotel	36
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	39
R7	Hotel Grand Chancellor	35
R8	7 Macquarie Street apartments	41
R9	The Old Woolstore Apartment Hotel	36
R10	Baha'i Centre of Learning	42
R11	ABC Broadcast Centre	40
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	31
R13	Royal Hobart Regatta Grounds (The Cenotaph)	51
R14	One Collins Apartment	38
R15	Royal Hobart Hospital	33
R16	Residential Apartments (1 Creswells Row)	33
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	35
R18	Residential Apartments (1-15 Terminus Row)	34

Predicted noise levels generally fall within the Tasmanian EPP indicator levels. Patron noise associated with plaza events will be limited to the Southern Plaza and will likely occur during day and evening.

7.1.7 Bus plaza

The bus plaza is located to the north of the Stadium, away from the majority of the receptors with the exception of the land parcel earmarked for potential future residential development. The predicted noise levels based on the assumptions detailed in Table 13 are shown in Table 23.

Table 23 Indicative Noise Levels from Bus Plaza

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)	Acoustic environment indicator levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	Negligible	45
R2	Zero Davey Boutique Apartments	Negligible	45
R3	University of Tasmania School of Creative Arts and Media	Negligible	45
R4	MACq 01 Hotel	Negligible	45
R5	IXL, Henry Jones Hotel	Negligible	45
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	Negligible	45
R7	Hotel Grand Chancellor	Negligible	45
R8	7 Macquarie Street apartments	Negligible	45
R9	The Old Woolstore Apartment Hotel	Negligible	45
R10	Baha'i Centre of Learning	Negligible	45
R11	ABC Broadcast Centre	Negligible	45
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	33	45
R13	Royal Hobart Regatta Grounds (The Cenotaph)	29	Background sound should be kept low
R14	One Collins Apartment	Negligible	45
R15	Royal Hobart Hospital	Negligible	40
R16	Residential Apartments (1 Creswells Row)	Negligible	45
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	Negligible	45
R18	Residential Apartments (1-15 Terminus Row)	Negligible	45

Note: where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A).

Operational noise from the bus plaza is expected to comply with the Tasmanian EPP indicator levels. Noise from the bus plaza can be mitigated via practical management control.

7.1.8 Permanent building services plant

The assumptions in Table 13 summarise the building services plant sources and the noise levels that have been included in the noise model. The noise levels are based on estimates of similar plant size and consider any potential acoustic treatment (e.g. acoustic louvres, attenuators). The design of building services plant will develop through future design stages along with equipment selections, locations and noise control measures. Therefore, the predicted noise levels should be considered as indicative.

The predicted indicative noise levels at the nearest receptors are presented in Table 24.

Table 24 Permanent Building Services Plant

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)	Acoustic environment indicator levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	31	45
R2	Zero Davey Boutique Apartments	31	45
R3	University of Tasmania School of Creative Arts and Media	38	45
R4	MACq 01 Hotel	25	45
R5	IXL, Henry Jones Hotel	27	45
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	30	45
R7	Hotel Grand Chancellor	22	45
R8	7 Macquarie Street apartments	27	45
R9	The Old Woolstore Apartment Hotel	23	45
R10	Baha'i Centre of Learning	22	45
R11	ABC Broadcast Centre	Negligible	45
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	Negligible	45
R13	Royal Hobart Regatta Grounds (The Cenotaph)	Negligible	Background sound should be kept low
R14	One Collins Apartment	20	45
R15	Royal Hobart Hospital	Negligible	40
R16	Residential Apartments (1 Creswells Row)	21	45
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	Negligible	45
R18	Residential Apartments (1-15 Terminus Row)	21	45

Note: where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A).

Noise from the operation of the permanent building services plant is expected to comply with the Tasmanian EPP indicator levels. Noise mitigations such as attenuators, internally lined ducts, acoustic louvres, etc will be designed and implemented in the building services plant during the design stage of the project.

Additionally, it is expected that the noise emission from the Central Energy Plant will be designed to comply with the Tasmanian EPP.

7.1.9 Temporary generators

Temporary generators may be used for special outdoor events when additional power is required. The predicted noise levels are based on the assumptions established in Table 13. Actual noise levels from the temporary generators will depend on the unit capacity and locations, which may vary from event to event. Two large capacity generators have been assumed for this assessment to represent a worst-case scenario.

The predicted noise levels are presented in Table 25.

Table 25 Temporary Generators

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)	Acoustic environment indicator levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	Negligible	45
R2	Zero Davey Boutique Apartments	Negligible	45
R3	University of Tasmania School of Creative Arts and Media	37	45
R4	MACq 01 Hotel	31	45
R5	IXL, Henry Jones Hotel	26	45
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	Negligible	45
R7	Hotel Grand Chancellor	Negligible	45
R8	7 Macquarie Street apartments	Negligible	45
R9	The Old Woolstore Apartment Hotel	Negligible	45
R10	Baha'i Centre of Learning	Negligible	45
R11	ABC Broadcast Centre	Negligible	45
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	Negligible	45
R13	Royal Hobart Regatta Grounds (The Cenotaph)	Negligible	Background sound should be kept low
R14	One Collins Apartment	Negligible	45
R15	Royal Hobart Hospital	Negligible	40
R16	Residential Apartments (1 Creswells Row)	Negligible	45
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	Negligible	45
R18	Residential Apartments (1-15 Terminus Row)	Negligible	45

Note: where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A).

Similarly with the patron noise during plaza events, noise from temporary generators is only expected to occur at the Southern Plaza. Noise impact will be contained locally, and mitigation and management controls can be practicably implemented to minimise noise impact.

7.1.10 Loading Dock Operation and Waste Collections

The loading dock is located on the northwest corner of the Stadium, the access to the loading dock is via the service road from the northeast. Waste collection is likely to occur in the same area.

The prediction of the noise from the loading dock operation and waste collection is based on the proposed loading dock size (three truck bays) and assumptions of the frequency of truck arrival/departure and the equipment usage in the loading dock as detailed in Table 13.

The predicted noise levels are presented in Table 26.

Table 26 Indicative Noise Levels from Loading Dock Operation and Waste Collections

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)	Acoustic environment indicator levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	32	45
R2	Zero Davey Boutique Apartments	22	45
R3	University of Tasmania School of Creative Arts and Media	28	45
R4	MACq 01 Hotel	23	45
R5	IXL, Henry Jones Hotel	21	45
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	23	45
R7	Hotel Grand Chancellor	20	45
R8	7 Macquarie Street apartments	28	45
R9	The Old Woolstore Apartment Hotel	Negligible	45
R10	Baha'i Centre of Learning	26	45
R11	ABC Broadcast Centre	20	45
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	Negligible	45
R13	Royal Hobart Regatta Grounds (The Cenotaph)	35	Background sound should be kept low
R14	One Collins Apartment	24	45
R15	Royal Hobart Hospital	Negligible	40
R16	Residential Apartments (1 Creswells Row)	Negligible	45
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	22	45
R18	Residential Apartments (1-15 Terminus Row)	20	45

Note: where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A).

Noise from the operation of the loading dock is expected to comply with the Tasmanian EPP indicator levels. The location of the loading dock is away from existing noise sensitive receptors. Access to the loading dock is via the internal ring road. The risk of adverse noise impact from the loading dock operation is low.

7.2 Stadium Operations Outside of Events

The Stadium will be operational outside of sporting events and music concerts during normal working hours. The following elements are expected to operate on a regular basis:

- Permanent building services plant
- Loading dock operation
- Waste collection

Further, the normal operation of the Stadium needs to comply with the *Tasmanian Environment Protection Policy (Noise) 2009* (EPP). A combined noise assessment has been carried out, assuming all the above occur simultaneously in the worst-case scenario.

7.2.1 Noise to internal receptors

For education and health facilities, 10dB(A) has been added to the internal noise limit to simulate an open window. An open window typically provides a noise reduction of 10dB(A) for external noise sources.

Due to the absence of criteria for a concert hall and TV studio in the Tasmanian EPP, an internal noise level of 25 dB(A) has been adopted, based on Australian/New Zealand Standard 2107:2016, for the Federation Concert Hall and the ABC Broadcast Centre for the purpose of this assessment. A 20dB(A) reduction has been assumed through the building envelope, although the actual noise reduction is likely to be much higher. This reduction has been factored into the internal noise level to enable an external assessment. The resultant external indicator level used in the assessment is 45 dB(A) (i.e: 25dB(A) internal noise criteria plus 20 dB(A) façade reduction).

7.2.2 Predicted noise levels

The predicted noise levels and the acoustic environment indicator levels at the receptors are presented in Table 27.

Table 27 Indicative Noise Levels from Building Plant, Loading Dock Operation and Waste Collections During Normal Working Hours

Receptor Reference	Receptor	Predicted Noise Levels L_{eq}, dB(A)	Acoustic environment indicator levels L_{eq}, dB(A)
R1	Sullivans Cove Apartments	35	45
R2	Zero Davey Boutique Apartments	32	45
R3	University of Tasmania School of Creative Arts and Media	38	45
R4	MACq 01 Hotel	27	45
R5	IXL, Henry Jones Hotel	28	45
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	31	45
R7	Hotel Grand Chancellor	24	45
R8	7 Macquarie Street apartments	31	45
R9	The Old Woolstore Apartment Hotel	23	45
R10	Baha'i Centre of Learning	27	45
R11	ABC Broadcast Centre	20	45
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	Negligible	45
R13	Royal Hobart Regatta Grounds (The Cenotaph)	35	Background sound should be kept low
R14	One Collins Apartment	25	45
R15	Royal Hobart Hospital	Negligible	40
R16	Residential Apartments (1 Creswells Row)	21	45
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	22	45
R18	Residential Apartments (1-15 Terminus Row)	24	45

Note: where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A).

The predicted noise level at The Cenotaph is approximately 10dB lower than the measured existing ambient noise levels, meaning the noise from the Stadium operations will not increase the existing ambient noise level. Therefore, it is predicted that the requirement from the EPP will be achieved.

The noise levels from the regular operation of the Stadium outside of events are predicted to comply with the acoustic environment indicator levels noted in the *Tasmanian Environment Protection Policy (Noise) 2009*.

7.3 Cumulative Noise Impact and Comparison with Existing Noise Environment

As noted in Section 4.0, the existing noise environment is dominated by traffic along Tasman Highway, Davey Street, Macquarie Street and local roads. Other noise sources in the area include the marina operations, however, they are intermittent and irregular and do not contribute to the general acoustic environment in the area significantly.

The ambient noise levels in the vicinity of the stadium range between 41 – 50 L_{eq} dB(A) during the night, 47 – 56 L_{eq} dB(A) during the evening and 48 – 59 L_{eq} dB(A) during the day.

7.3.1 Stadium Daily Operations

The daily operation of the Stadium, as detailed in 7.2, is not expected to raise the existing ambient levels during the evening and day periods, and would only marginally raise the ambient levels at the closest receptor location during the night-time. The table below presents a cumulative noise impact assessment at the nearest sensitive receptors for the daily stadium operation outside of sporting events and concerts. The receptors are chosen due to their proximity to the Stadium, road network and port operation.

Table 28 Cumulative Noise Impact

Receptor Location	Existing Noise Levels[1,2]	Predicted Noise Level from Stadium daily operations L_{eq}, dB(A)	Resultant Cumulative Noise Levels L_{eq}, dB(A)	Comments
R1 - IXL, Henry Jones Hotel	Day – 48 Evening – 47 Night - 41	35	Day – 48 Evening – 47 Night - 42	Only a marginal increase in night time noise level is predicted
R2 - Zero Davey Boutique Apartments	Day– 59 Evening– 56 Night - 49	32	Day– 59 Evening– 56 Night - 49	No impact on existing noise levels
R6 - Federation Concert Hall (Tasmanian Symphony Orchestra)	Day– 59 Evening– 56 Night - 49	31	Day– 59 Evening– 56 Night - 49	No impact on existing noise levels

Notes
1: existing noise levels are based on the long-term monitoring data collected on site, as detailed in Section 5.3.
2: Time periods defined as: Day 7am – 6pm, Evening 6pm – 10pm, Night 10pm to 7am

Comments have been provided in regard to the cumulative vibration impact from the Stadium operations in Section 8.0.

7.3.2 Stadium Events

The noise environment in the vicinity of the Stadium and nearby receptors during sporting events, music concerts and plaza events would exceed the existing ambient noise levels and be dominated by noise from these events, as described in section 7.1.

Concerts at the Stadium will likely start during the evening (after 6pm) and finish at night (after 10pm). The predicted levels indicate that the noise from concerts in the worst-case scenario could be up to 34 dB(A) above ambient noise levels at the closet receptor.

Further, considering the majority of the sensitive receptors are located indoors, assuming all windows and doors are closed during concerts, the building façade should provide a minimum sound reduction of 20dB(A), resulting in internal noise levels of up to 58dB(A) (excluding UTS, which is unlikely to be in operation during concerts). This worst-case scenario noise level is likely to cause sleep disturbance during night time according to the guidance in the Tasmanian EPP. Potential mitigation measures are discussed in Section 11.1.

7.4 Noise Characteristics and Duration

In addition to the predicted noise levels, noise sources comprise characteristics that can cause increased adverse impacts to sensitive receptors. Such characteristics can be defined as tonality, modulation and impulsiveness and can result in noise levels being perceived as higher and more disruptive.

Table 29 presents a risk assessment of each noise source, its characteristics, and its expected impact on nearby receptors.

Table 29 Risk Assessment of Noise Source Characteristics

Noise Source	Noise Duration	Distance to Nearest Receptor	Characteristic	Potential Risk	Potential Mitigations[1]	Post Mitigation Risk
Music concerts	Over the event period. 1 concert per year.	40 metres	Varies according to the genre of music. Examples: low frequency (bass) sound	High	Stadium façade/roof treatment Guideline controls, e.g. noise limit, event and time limit Management plan	Moderate
Sporting events (PA system, crowd noise)	Over the event period. Nominally up to 1 event per weekend.	40 metres	No impulsive or tonal characters in general	Moderate	Stadium façade/roof treatment Guideline controls, e.g. event and time limit Management plan	Low to moderate
Game sirens	Short (4 second intervals during sporting event)	40 metres	Impulsive	Moderate	Stadium façade/roof treatment	Low to moderate
Plaza events with temporary generators	Occurring over a day(s)	30 metres	Generators used could be tonal	Moderate	Placement of generators Local acoustic enclosure	Low
Building services plant	Permanent	40 metres	Plant equipment may be tonal	Low (can be practicably mitigated through attenuations)	Acoustic louvres, Attenuators, BMS, Vibration isolation	Low
Loading dock and	Short but may occur several	170 metres	Truck reverse beepers and loading dock	Low due to distance to receptors.	Enclosed loading dock	Low

Noise Source	Noise Duration	Distance to Nearest Receptor	Characteristic	Potential Risk	Potential Mitigations[1]	Post Mitigation Risk
waste collections	times a week		operation could be tonal and impulsive		Schedule of delivery /waste collection	
Bus plaza	Pre and post events	300 metres from existing receptors, 30 metres to potential future apartments	Engine idling noise can be tonal	Low, management control can be implemented to avoid bus idling	Management controls Schedule of bus arrival and departure	Low

Note 1: details of the mitigation measures are included in Section 11.1.

8.0 Operational Vibration

The primary vibration generating sources associated with the operation of the Stadium are the following:

- Building services plant and equipment
- Loading dock operations
- Patrons walking around the precinct

The nearest sensitive receptor, in addition to those that are identified in Table 2, is the heritage-listed Royal Engineering Building located at the northwest corner of the precinct.

Building services plant equipment can be effectively vibration isolated through structural design and installation of appropriate isolation mounts. The propagation of vibration beyond the Stadium building is highly improbable.

Based on the current concept, the loading dock will be located at the northern side of the Stadium, access will be through the service road under the concourse. Vibration from heavy trucks using smooth roads at grade (without discontinuities such as speed bumps) typically generates low vibration levels below 0.2mm/s at 20 metres away. Considering the distance to the Royal Engineer Building is over 50 metres, the vibration level would likely be dissipated to an insignificant level. Sensitive receptors beyond the boundary of the site are unlikely to perceive this level of vibration.

Vibration generated by people walking on grade typically does not induce sufficient energy for the vibration to propagate beyond the immediate area surrounding said person. High vibration could be generated via synchronised walking by a large crowd (e.g.: marching), which is an unlikely scenario in this setting. In rare events, the patrons could be jumping/dancing to the same rhythm during a concert or sporting event, the generated vibration would likely be short-term and contained within the Stadium structure. This dynamic vibration would be addressed by the structural engineering design of the Stadium which addresses resonant frequencies for rhythmic vibration.

Consequently, the cumulative vibration from the above activities are unlikely to propagate beyond the Stadium building due to their low vibration levels and the fact that sources are located in different parts of the Stadium with significant differences in vibration characteristics, the risk of vibration resonance between these activities are highly improbable.

In all scenarios, the likelihood of operational vibrations from the Stadium affecting adjacent sensitive receptors is minimal. As such, operational vibration has not been further assessed within this Report.

9.0 Impact on Fauna

Noise from events within the Stadium has the potential to have an adverse impact on terrestrial fauna and birds. Elevated noise levels near existing habitats could potentially impact behavioural patterns such as feeding and mating for noise sensitive species.

Australia has no specific regulatory process that provides noise and vibration conditions considered suitable for protecting wildlife amenities. It is acknowledged that there is likely to be a wide range of sensitivity to noise from various species. However, for the purpose of this assessment the effect of noise and vibration is assumed to have similar effects to those observed in humans.

In the case of the sporting events and music concerts, it is expected that species adjacent to the Stadium may be temporarily displaced if the noise levels from a newly introduced noise source are distressing. Less noise sensitive species would likely remain close to the proposed Project Site. It is noted that there is little vegetation on the Project Site, the majority of the vegetation is located in the Royal Hobart Regatta Grounds to the north of the Project Site, and as such, it is not expected that any existing fauna will be displaced due to the proposed Stadium. According to correspondence provided by North Barker, it is understood that there is no critical habitat for protected or threatened species in the vicinity of the Project Site.

10.0 Construction Noise and Vibration

10.1 Construction noise

Construction noise generated at any time of the day or night may be determined as unreasonable. This includes noise outside the 'Prohibited Hours of Use' specified in Schedule 1 of the Noise Regulations 2016 and noise from equipment that is not listed in the Regulations.

The following factors are considered when assessing whether a noise is unreasonable and may be causing an environmental nuisance:

- its volume, intensity or duration
- the time, place and other circumstances in which it is emitted
- whether it is, or is likely to be, audible in a habitable room in any other residential premises.

10.1.1 Construction hours

The use of portable equipment, which is defined as any equipment that can be demounted and transported without major disassembly, such as a power tool, gas or air compressor, generator, pump or cement mixer, is prohibited during the following periods if the noise emitted by the equipment, or machine, is, or is likely to be, audible in a habitable room in any residential premises whether or not the doors and windows are open:

- Monday to Friday Before 7 a.m. and after 6 p.m.
- Saturday Before 8 a.m. and after 6 p.m.
- Sunday or Public Holiday Before 10 a.m. and after 6 p.m.

10.1.2 Indicative Construction Noise Levels

Table 30 below presents an example of a construction noise impact assessment for the nearest sensitive noise receptors to demonstrate the magnitude of noise levels that can be expected from typical activities that produce high noise levels, i.e. piling and excavation. Potential mitigation measurements are discussed in Section 11.2.

Table 30 Example of Construction Noise Impact Assessment

Activity	Sound Power Level dB(A)	Receptor Location	Distance to Receptor	Predicted Noise Levels L_{eq}, dB(A)
CFA piling at the southwest boundary of the Project Site	111	R2 – Zero Davey Apartments	69m	66
		R6 - TSO	77m	65
20T excavator at the southwest boundary of the Project Site	113	R2 – Zero Davey Apartments	69m	68
		R6 - TSO	77m	67

10.2 Construction vibration

There are no existing statutory requirements or guidelines for assessing or managing vibration from the construction of major infrastructure in Tasmania.

Recent major impact assessments in Australia have used criteria from British or German standards or from the International Standards Organisation (ISO). Accordingly, the human amenity criteria adopted herein are based on British Standard BS6472-1:2008 and the German Standard DIN 4150-3:2016 is adopted when considering potential structural damage impacts.

Note that blasting is not expected to be part of the construction methodology for this Project and therefore has not been discussed.

10.2.1 British Standard BS6472-1:2008

British Standard BS6472-1:2008 "*Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*" (BS6472-1:2008) includes Vibration Dose Value (VDV) ranges for workshops, offices, residences (daytime and evening).

These ranges highlight the values where adverse vibration impacts for most persons could be expected. The vibration dose values for these building types are presented in Table 31. For offices and workshops, multiplying factors of two and four respectively would be applied to the VDV ranges for a 16-hour day.

Table 31 Vibration dose value ranges for residential buildings (BS6472-1:2008)

Place and time	Low probability of adverse comment $ms^{-1.75}$	Adverse comment possible $ms^{-1.75}$	Adverse comment probable $ms^{-1.75}$
Residential buildings 16-hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8-hour night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
Offices	0.4 to 0.8	0.8 to 1.6	1.6 to 3.2
Workshops	0.8 to 1.6	1.6 to 3.2	3.2 to 6.4

See section 10.2.3 for further information about the applicability of the dose values presented in Table 31 when managing vibration from construction.

10.2.2 DIN4150-3:2016

German Standard DIN 4150-3 "*Structural vibration in buildings – Effects on structures*" (DIN 4150-3) outlines 'safe limits' as Peak particle velocity (PPV) levels up to which no damage due to vibration effects have been observed for particular classes of buildings.

Damage is defined as anything from minor non-structural effects such as superficial cracking in cement render to the separation of partitions or intermediate walls from load bearing walls. Safe limits applied to vibration levels of a short duration are summarised in Table 32.

Table 32 Structural damage 'safe limits' for construction short-term vibration on structures (DIN 4150-3)

Group	Type of structure	Peak particle velocity (PPV) in mm/s		
		At foundation at a frequency of:		
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz[1]
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50
2	Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. heritage-listed)	3	3 to 8	8 to 10

1 For frequencies above 100 Hz, the higher values in the 50 Hz to 100 Hz column would be used.

The more stringent values shown in Table 33 can be applied when evaluating the effects of long-term or continuous vibration on structures.

Table 33 Structural damage 'safe limits' for construction vibration for long-term vibration impacts on structures

Group	Type of structure	Guideline values for velocity (mm/s) of Vibration at horizontal plane of highest floor (All frequencies)
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	10
2	Dwellings and buildings of similar design and/or occupancy	5
3	Structures that, because of their sensitivity to vibration, cannot be classified under lines 1 and 2 and are of intrinsic value (e.g. Heritage buildings)	2.5

10.2.3 Vibration descriptors relevant to construction

The dose values outlined in in 10.2.1 are a measure of the weighted spectral vibration experienced over a specified period whereas construction vibration is often measured as a PPV.

Peak particle vibration criteria are generally preferable as they allow for an immediate review of discrete events that exceed a pre-determined threshold. The PPV can be described as the rate at which a particle of ground is moving, i.e. a measure of ground vibration, in millimetres per second.

Furthermore, PPV is considered the simplest indicator of both perceptibility and the risk of damage to structures. British Standard BS5228-2:2009 suggests that:

> *…..for construction it is considered more appropriate to provide guidance in terms of the PPV (peak particle velocity), since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage, Furthermore, since many of the empirical vibration predictors yield results in terms of PPV, it is necessary to understand what the consequences might be of any predicted levels in terms of human perception and disturbance.*

A reasonable approach that has been adopted for other projects in Australia is to convert the human amenity vibration dose values to a representative PPV value.

By setting criteria that are readily understood and measurable, the communications between stakeholders can be quickly advanced leading to prompt adjustments to construction practices if required.

10.2.4 Underground assets

Vibration from construction works has the potential to cause structural damage to underground services. Consultation with asset owners will be required to define specific criteria for individual asset types.

11.0 Environmental Noise and Vibration Mitigation Strategies

Embedding noise mitigation strategies in the design of the Stadium is a crucial component in the future acoustic environment surrounding the Stadium. A well-considered design implements a combination of design features, operational plans and administrative measures that specifically address the noise and vibration sources identified in this Report.

The following operational and construction mitigation strategies will be explored during the design process to determine the most appropriate and effective form of noise control.

11.1 Operational Noise and Vibration Mitigation

Noise emissions associated with the operation of the Stadium, including event and non-event days, will be mitigated by the implementation of the following measures where applicable and/or necessary.

- Stadium façade to comprise a built-form along the western side to create an acoustic buffer between the Stadium bowl and nearby noise-sensitive receptors. Examples of built-form include the positioning of function room facilities, hospitality suites, broadcast and coaching boxes, along the western end of the Stadium.
- Applying solid cladding to openings within the Stadium envelope that are not required for Stadium access or ventilation purposes, including sections along lower and upper façades. Solid cladding materials shall be selected according to the areas of application and their sound attenuation properties, and may take the form of glass, metal cladding, or similar products.
- Use of acoustically absorptive finishes within internal areas of the Stadium, including the concourse, to minimise the build-up of noise throughout the Stadium and thus reducing the noise transmission to the external environment.
- The Stadium will be entirely covered with a roof structure comprising predominately an ETFE construction, with solid cladding around the perimeter. Whilst the ETFE is limited in providing sound isolation of low frequency noise (e.g. bass sounds for concerts), it does provide a benefit in sound reduction of mid to high frequency noise within the stadium bowl, including moderating noise emissions from sporting events and crowds from within the Stadium.
- Acoustic attenuation to all building services plant and services plantrooms within the Stadium, including any district energy facilities. Acoustic attenuation should be applied in the form of the following engineering controls:
  - Acoustic enclosures and screening for all major building plant, such as generators, cooling towers, chillers, air handling plant.
  - Design of sound isolation to plantrooms, including acoustic rated walls, acoustic louvres, acoustic doors, insulated ceilings and floors, to reduce noise transmission from plantrooms.
  - Vibration isolation of all building plant to control potential vibration transmission, including vibration isolation mounts of major plant and equipment (e.g. pumps, generators, heat rejection plant) that is prone to generating vibration.
  - Configurable BMS that enables plant to operate at a reduced capacity ('quiet' mode) during periods of low-load (e.g. night-time) to limit noise emissions during the most sensitive period of the day.
- Temporary generators shall be located in positions that are favourable for reducing noise emission to sensitive areas. Approval for use of temporary generators should be accordance with any noise emissions requirements that apply, with the operator informed of any restrictions that may affect their procurement or installation of temporary generators.
- Scheduling of waste collections during normal daytime working hours to minimise disturbance.
- Locating the loading dock within an enclosed or shielded space to reduce noise emissions to the external environment for operations such as event bump-ins, stadium deliveries, and service and maintenance vehicles.

- Establish noise emission targets for major concert events that limit the noise levels at nearby residences, achieved by implementing the following options or combination of:
  - setting maximum noise limits at mixing desks for operators that correspond to acceptable music noise emissions
  - establish appropriate start and finishing times for concerts, including post-event patron and transport management, to minimise impact to surrounding residences
- Implementation of a Stadium/Event Management Plan than enables the operator to successfully organise and manage events and their potential noise impact to the surrounding environment. The Event Management Plan shall establish the protocols and any operational restrictions that must be followed to ensure the noise requirements are satisfied.

11.2 Construction Noise and Vibration Mitigation

The impact of construction noise and vibration to the surrounding environment of the Stadium will need to be mitigated through the implementation of a Construction Noise and Vibration Management Plan.

MPDC has a current Construction Noise Management Plan (DOC/21/4634 dated June 2021) covering existing activities on site. It is expected that the Managing Contractor for the Project will develop a comprehensive Construction Noise and Vibration Management Plan (CNVMP) specific to the construction methodology and program of works for the Stadium. The CNVMP shall include appropriate protocols for managing construction noise and vibration.

The following general good practice techniques and potential mitigation measures are taken from EPA Victoria Publication 1834.1 "*Civil construction, building and demolition guide*" and NSW *"Interim Construction Noise Guideline"* and are presented to provide a preview of the types of measures that will be considered for the noise mitigation strategy for the Project.

- Undertake preparatory work off site where there is low potential for impacting people (e.g. formwork, cutting or prefabrication of materials off site prior to transporting to the construction site)
- Connect to the electricity network as early as possible to avoid the use of diesel generators.
- Restrict areas where mobile plant can operate so that it is away from people who could be affected by noise.
- Locate site vehicle access and waiting areas away from people who could be affected by noise.
- Plan vehicle movements to avoid manoeuvres and idling at location nearest to nearby people.
- Select low noise equipment or construction methods.
- Behaviour training to minimise noise.
- Use effective alternatives to 'beeper' alarms (e.g. broadband alarms, proximity sensors).
- Avoid using reversing alarms by designing site layout to avoid reversing (e.g. drive-through for parking and deliveries).
- Maintenance of equipment to ensure good working order.
- Limit noise caused by people on site. This may include procedures to avoid yelling and shouting on site, minimising the use and volume of any electrical amplified sound-reproducing equipment, for example radios, stereos, televisions, or public address systems.
- Plan transport and haulage routes to minimise the number of trucks/vehicles. Where there are large numbers of truck movements, consider truck route and truck waiting protocols (e.g. engines on/off and restart requirements).
- Implement substitute methods taking into consideration alternatives to rock-breaking work methods, such as hydraulic splitters for rock and concrete, hydraulic jaw crushers, chemical rock and concrete splitting, and controlled blasting such as penetrating cone fractures. The suitability of alternative methods will be considered on a case-by-case basis, including what potential risks they involve.
- Consider localised enclosure for fixed equipment, maximise shielding by locating noisy activities behind large structures.
- Implement a traffic management plan that details processes for deliveries and access, such as combining loads to reduce noise and congestion in surrounding streets, promoting good driving behaviour to prevent sudden acceleration and unjustified use of engine brakes.
- In the early stages of planning, identify and assess those potentially impacted by noise, then document and maintain the information for the duration of the project or activities.
- Engage community to keep them informed, for example community meetings with community and workers.
- Consultation with affected parties, schedule works and deliveries to minimise impact, offer respite if the work cannot be reasonably avoided.
- Notify community before and during construction, communicating information such as dates and times, type of noise, contact details for information and real-time responses, explanation of what is happening and why.
- Consider using media such as a project-related website, letter box drops, meetings, individual contacts and notify in languages other than English where appropriate; follow an agreed time period to contact community/residents regarding planned work outside normal working hours; offering alternative accommodation for affected residents when unavoidably noisy works will occur at night.
- Install and maintain a site information board at the front of the site with contact details, hours of operations, after hours emergency contact details, and regular information updates. Locate the board so it's visible from the outside boundary.
- Maintain a process for managing complaints.

12.0 Summary

AECOM has prepared this document on behalf of the Macquarie Point Development Corporation (MPDC) in support of a development application for the Macquarie Point Multipurpose Stadium.

The purpose of this Report is to address the requirements relating to noise and vibration from the operation of the proposed Stadium as required by the Tasmanian Planning Commission's Guidelines for the Project of State Significance (PoSS), dated 16 February 2024.

The Report provides an overview of the potential noise and vibration impacts associated with the proposed Macquarie Point Multipurpose Stadium.

AECOM has conducted a site visit to undertake attended noise and vibration measurements to supplement existing site monitoring data provided by MPDC. The site survey identified the relevant existing noise sources and noise receptors that are considered in the noise and vibration assessment.

The report assesses the noise impacts from the potential event types for the Stadium, informed by the Project User Brief prepared by Stadiums Tasmania. Noise sources associated with each event type are based on inputs from both PMY in-bowl acoustic modelling and AECOM data.

The predicted noise levels of each Stadium event were assessed for duration and characteristics to determine impacts such as tonality and impulsiveness. In addition, the predicted noise levels were compared with the existing noise environment in the vicinity of the Project.

A review was conducted to examine the noise restrictions on other major stadiums comparable in size and type in Australia and New Zealand. A summary of the noise restrictions for other stadia has been provided in the Report. Together with the predicted noise levels, it aims to aid the decision makers in establishing appropriate acoustic planning provisions and noise criteria.

A high-level review of construction noise and vibration impact has been prepared to ensure a comprehensive account of all noise and vibration impacts associated with the Stadium, during both construction and operation, are considered.

A range of potential mitigation measures have been provided for the Stadium to enable noise and vibration impacts to be moderated as far as practicable. These include design features such as the built-form of the Stadium façade and roof, operational restrictions for events, and construction management practices.

The assessment demonstrates that with appropriate mitigation measures, the noise and vibration impacts from the Macquarie Point Multipurpose Stadium can be effectively managed to minimise disruption to the surrounding community. The recommendations provided will assist in achieving a balance between the Stadium's operational needs and the preservation of environmental quality and community well-being.

Ongoing engagement with stakeholders, continuous monitoring, and adaptive management strategies will be essential to address any emerging issues promptly and ensure the Stadium's successful integration into the Hobart landscape.

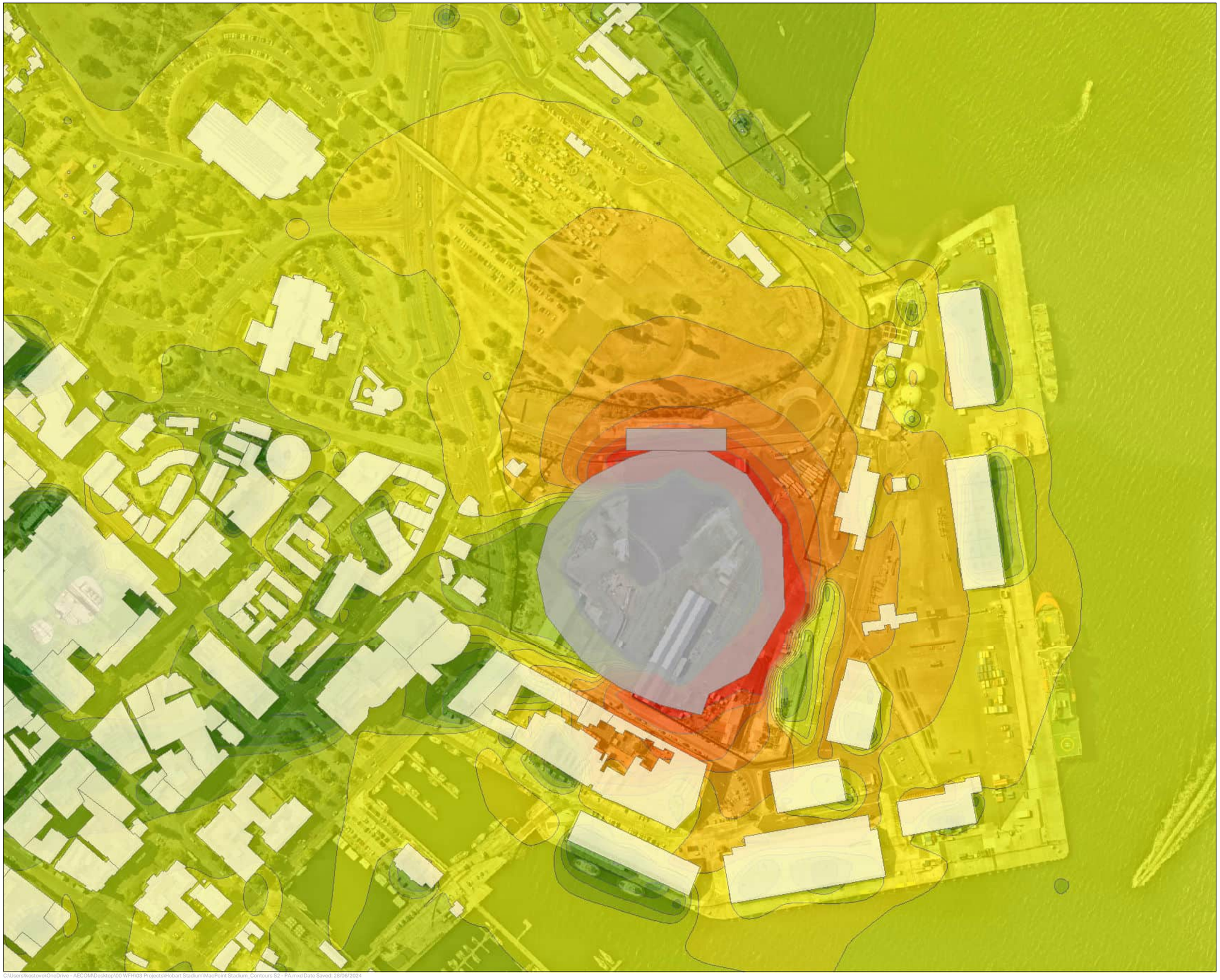
13.0 References

1. Allianz Stadium, Consent Conditions (SSD 9835, Condition 48)
2. British Standard BS6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting
3. Christchurch City Council, Amendments to the Christchurch Central Recovery Plan in respect of the Canterbury Multi-Use Arena, June 2021
4. Dunedin City Council, Dunedin City District Plan, Spectator Events & Education Zone, 2007
5. EPA Tasmania, Environment Protection Policy (Noise) 2009
6. EPA Tasmania, Noise Measurement Procedures Manual (NMPM), Second Edition, July 2008
7. EPA Victoria, Publication 1826.4 "Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues"
8. EPA Victoria, Publication 1834.1 Civil construction, building and demolition guide
9. German Standard DIN 4150-3 "Structural vibration in buildings – Effects on structures"
10. Macquarie Point Development Corporation, Construction Noise Management Plan, DOC/21/4634, June 2021
11. Macquarie Point Development Corporation, Mac Point Draft Precinct Plan, October 2023
12. Macquarie Point Development Corporation, Smartform, Multipurpose Stadium Hobart, Initial Functional Design Brief, 29 April 2024
13. NSW Department of Environment & Climate Change Interim Construction Noise Guideline, July 2009
14. Queensland Government, Major Sports Facilities Regulation 2014, current version December 2022
15. Stadiums Tasmania, Macquarie Point Stadium, User Brief, Initial Draft April 2024
16. Tasmanian Government, Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2016
17. Tasmanian Government, Environmental Management and Pollution Control Act 1994
18. Tasmanian Planning Commission, Guidelines for the Project of State Significance, 16 February 2024
19. Western Australia Environmental Protection (Noise) Regulations 1997, version January 2017

Appendix A

Noise Contours

Revision 1 – 21-Aug-2024
Prepared for – Macquarie Point Development Corporation – ABN: 92 657 409 841



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

PA System Noise Contours

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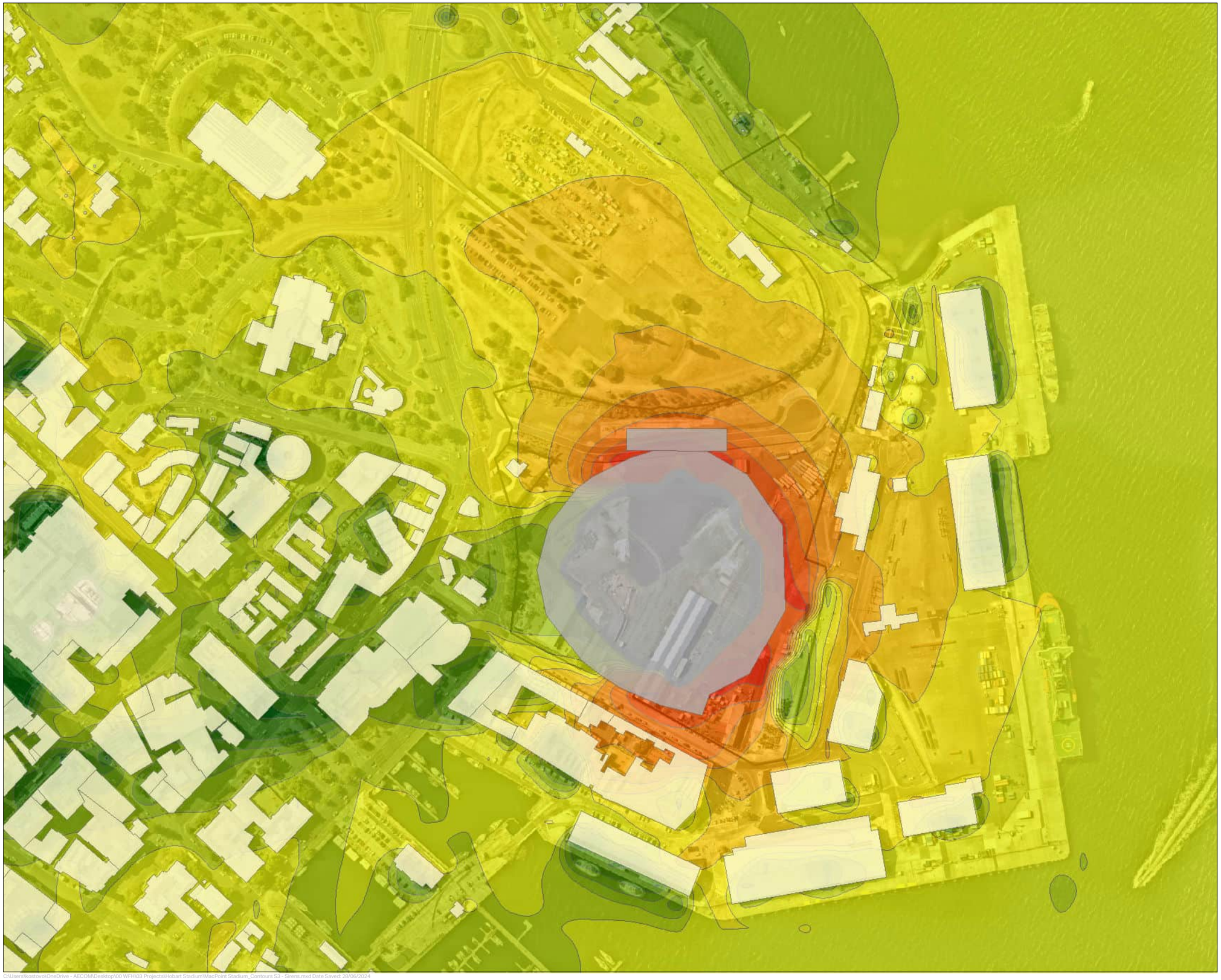

AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Lmax dB(A)

- < 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- 69 - 72
- 72 - 75
- 75 - 78
- 78 - 81
- > 81

Noise contours have been calculated at 2m above ground.

Game Siren Noise Contours

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AECOM

N

Meters
0 50 100

Legend

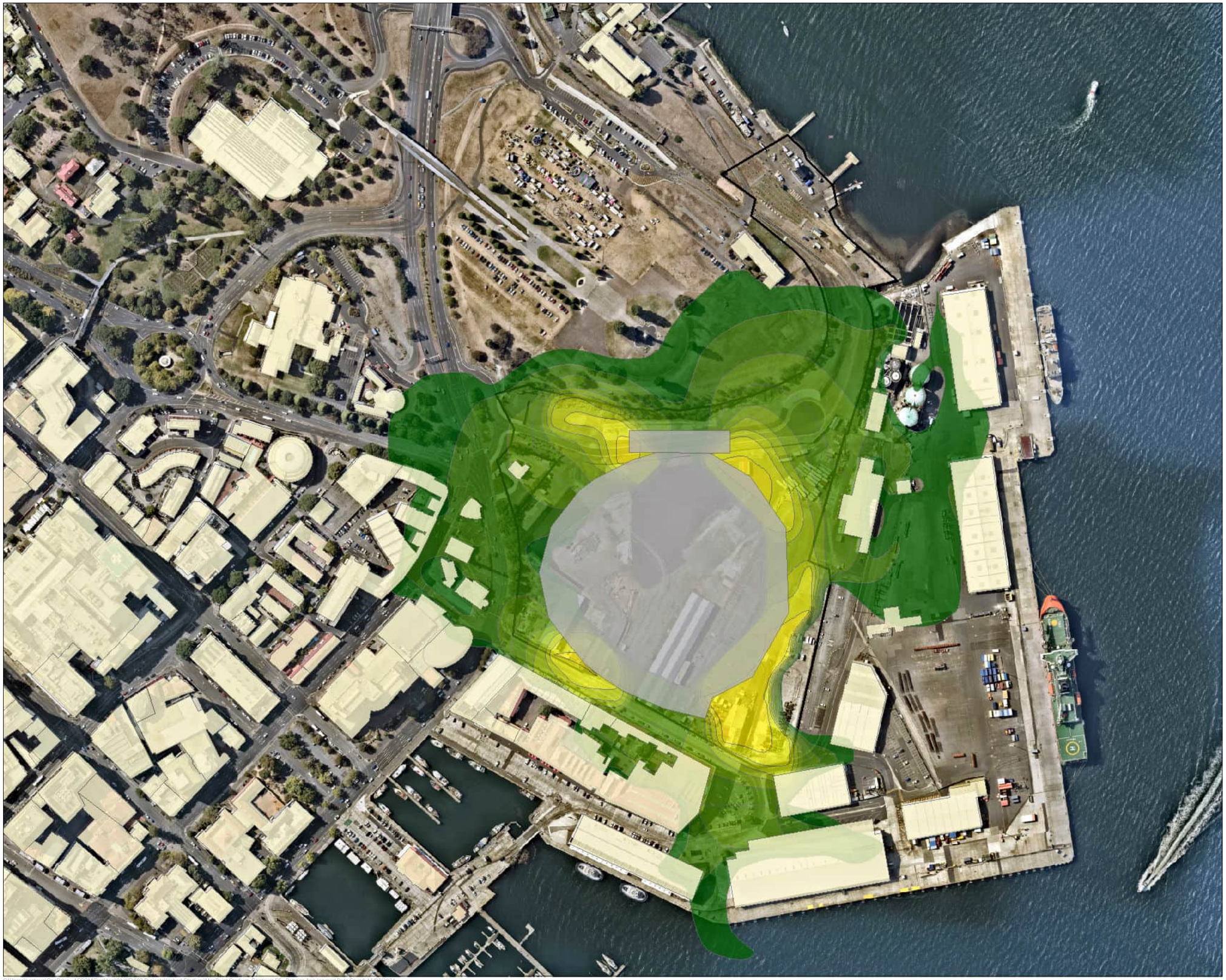
- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Crowds (In Bowl) Noise Contours



AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Patrons Arriving/Departing Noise Contours

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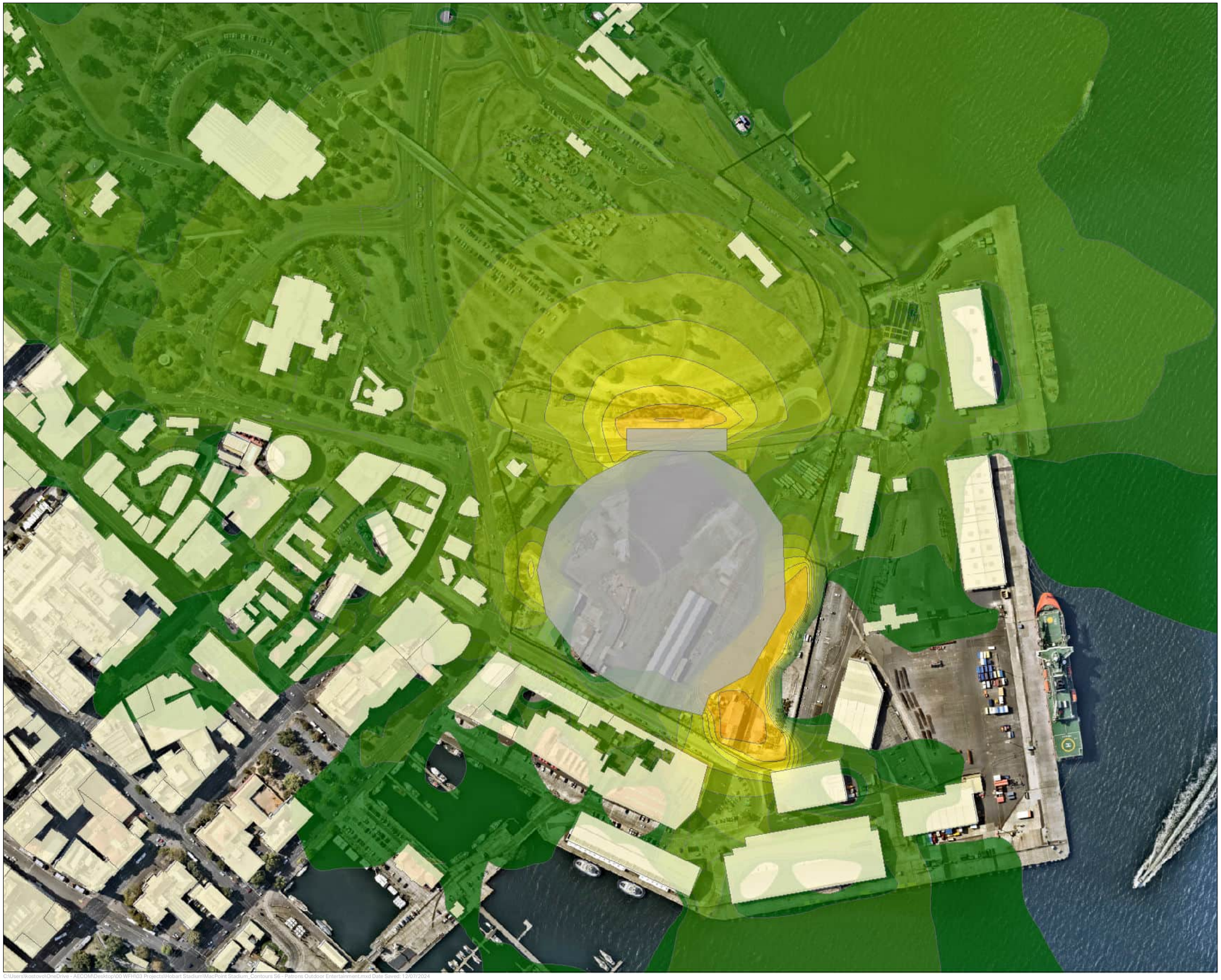

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 -51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Patrons Outdoor Entertainment Noise Contours

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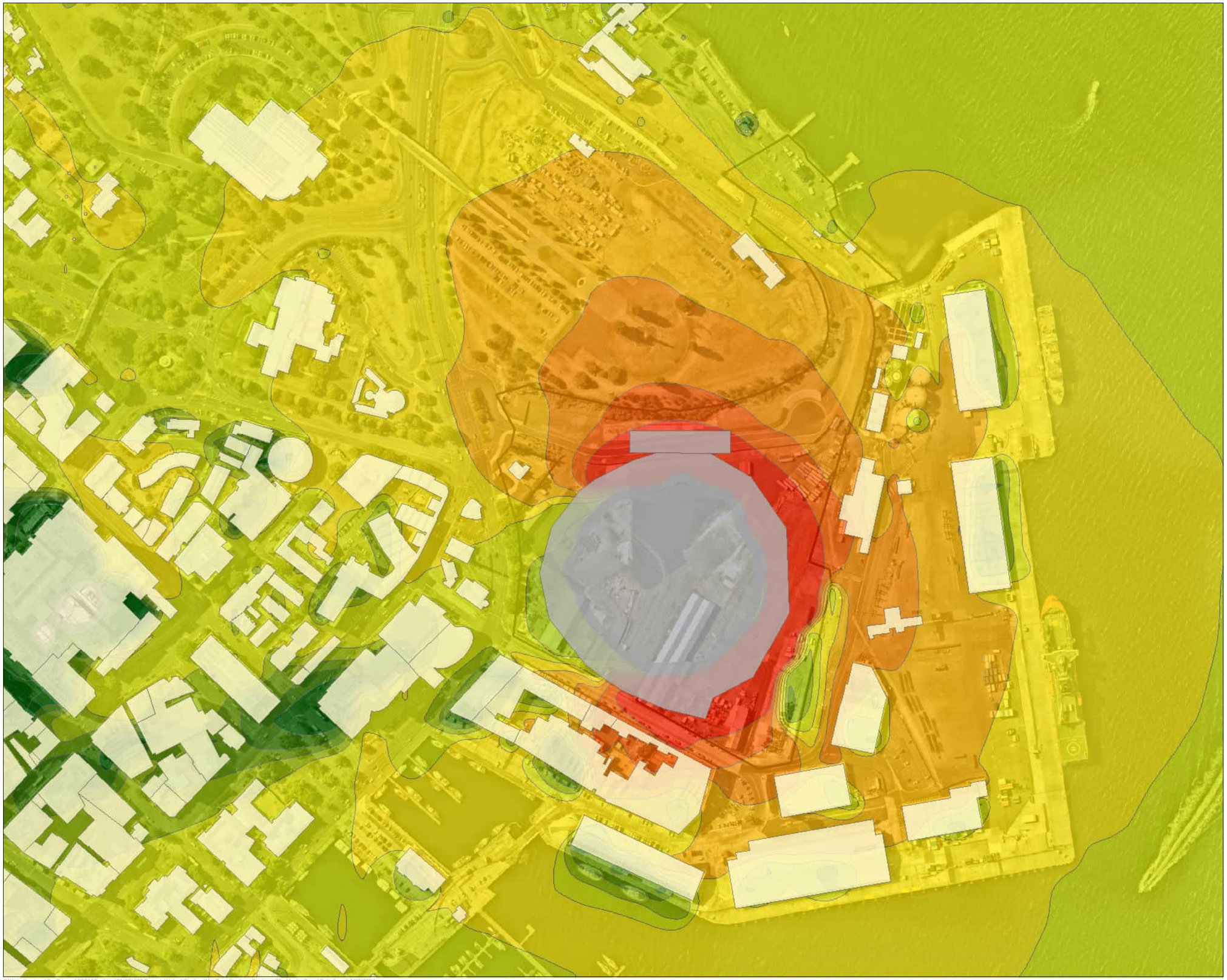

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- 69 - 72
- 72 - 75
- 75 - 78
- 78 - 81
- > 81

Noise contours have been calculated at 2m above ground.

Music Concert Noise Contours (Potential worst-case scenario)

AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Building Services Noise Contours

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Bus Hub Noise Contours

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AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Loading Dock and Waste Collection
Noise Contours

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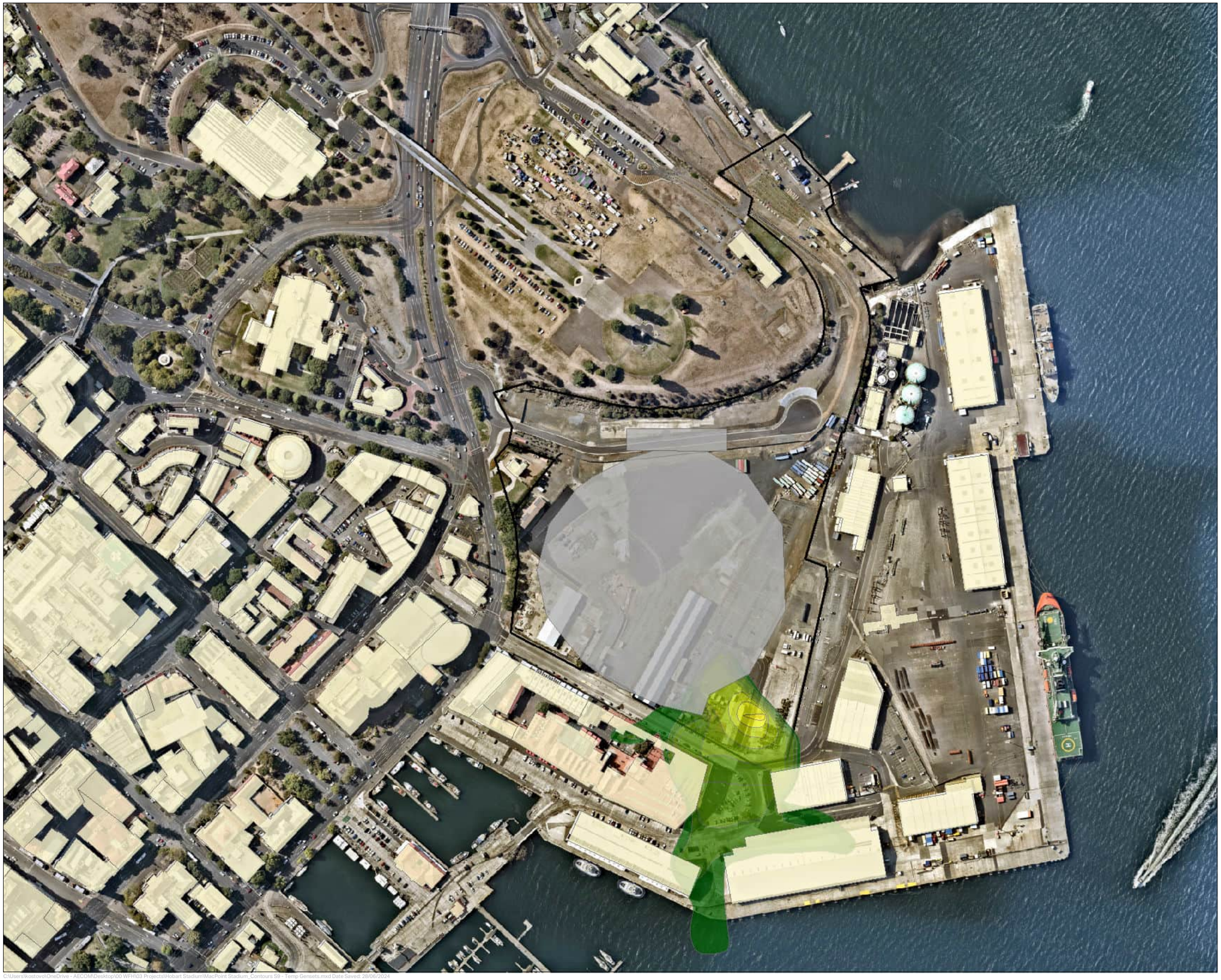

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Temp Gensets Noise Contours

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Appendix B

Curricula Vitae

Johnny Zhang Noise and Vibration Lead

Principal Acoustic Engineer

Qualifications

Bachelor of Mechanical Engineering (Honours)

Location

Melbourne, VIC

Profile

Johnny has 13 years' experience working as an acoustic consultant on projects in Australia's private and public sectors. His experience extends over a large variety of sectors, including healthcare, residential, education, correctional, transport, commercial and industrial. He is skilled in providing environmental assessment for large-scale projects with a high level of complexity. He also has considerable experience in providing advice for building acoustic design, building services noise and vibration, and acoustic reverberation.

Johnny is adept at leading the acoustic design on major projects. He will draw on his vast infrastructure acoustics experience to address complex noise and vibration issues that arise across the project, including specific acoustic design requirements for stadiums.

Relevant Experience

North East Link – M80 Ring Road Upgrade Project

Level Crossing Removal Project (Technical Advisor)

M80 Upgrade Project

METRONET Perth - ALXR – Level Crossing Removal Project

Victorian Comprehensive Cancer Centre

Deakin University Specialised Indoor Exercise and Sport Science Teaching Building

Burwood Brickworks (Sustainable retail centre)

Pathway to 144 Mental Health Beds Expansion

Simon McHugh Noise and Vibration Reviewer

Principal Acoustic Engineer

Qualifications

Bachelor of Acoustics, University of Salford, UK

Member of the Australian Acoustical Society

Location

Melbourne, VIC

Summary

Simon has significant experience in planning stage environmental noise projects which include noise modelling for major industrial facilities, residential subdivisions, and large mixed-use developments. Recent projects include North-East Link Tender, Noise and Vibration Lead (2019-2020), Banool Avenue development, Yarraville, and Melbourne Metro Rail Infrastructure Alliance.

Simon has made over 10 appearances at the Victorian Civil and Administrative Tribunal (VCAT) and presented expert evidence to four Panel hearings to-date, including the Melbourne Metro Tunnel IAC hearings. As a result, he understands and appreciates that the effects of noise and vibration are not widely understood in the community and has developed the ability to explain complex concepts in a straightforward manner. He has also been involved in community consultations with respect to noise.

Projects

Rail Infrastructure Alliance (Melbourne Metro Tunnel)
METRONET Perth - ALXR – Level Crossing Removal Project
METRONET Perth – Thornlie-Cockburn Link and Yanchep Rail Extension
LXRP – Level crossing Removals Program
North East Link Primary Package Tender
Melbourne Airport Rail (Sunshine to Albion)

Danny Boglev Noise and Vibration Lead Verifier

Technical Director, Acoustics Lead, Australia New Zealand

Consulting and Technology Practice Lead, Victoria

Qualifications

Bachelor of Engineering (Mechatronics)
Bachelor of Computer Science (Honours), The University of Melbourne

MIEAust CPEng NER

MAAS

Location

Melbourne, VIC

Profile

Danny is a Technical Director of AECOM and leads AECOM's Acoustic practice in Australia and New Zealand. He has over 19 years of experience specialising in building acoustics, architectural and room acoustics, building services noise and vibration, and environmental noise.

Danny has a passion for performing the acoustic design of complex buildings and environments. He has a design-led mentality that enables him to collaborate successfully with architects and designers.

Danny owns extensive experience across all sectors including healthcare, aviation, education, commercial, arts and sports, and public buildings

Relevant Experience

Melbourne Airport International Terminal Expansion

Melbourne Exhibition Centre Expansion

Geelong Football Club, Premiership Stand, Kardinia Park

Essendon Football Club, NEC Hanger

Collins Square, Docklands

Victorian Heart Hospital

Geelong Convention and Event Centre

Melbourne School of Design, University of Melbourne

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Prepared for
Macquarie Point Development Corporation
ABN: 92 657 409 841

Macquarie Point Multipurpose Stadium

Noise Assessment Supplementary Report

31-Jan-2025

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Delivering a better world

Macquarie Point Multipurpose Stadium

Noise Assessment Supplementary Report

Client: Macquarie Point Development Corporation

ABN: 92 657 409 841

Prepared by

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ABN 20 093 846 925

31-Jan-2025

Job No.: 60731376

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Quality Information

Document Macquarie Point Multipurpose Stadium

Ref 60731376-RPT-AC-02

Date 31-Jan-2025

Originator Johnny Zhang

Checker/s Simon McHugh

Verifier/s Danny Boglev

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
0	31-Jan-2025	Response to TPC Comments	Danny Boglev Technical Director	

Table of Contents

1.0 Introduction

AECOM prepared a Noise and Vibration Assessment Report in 2024[1] on behalf of the Macquarie Point Development Corporation (MPDC) in support of a development application for the Macquarie Point Multipurpose Stadium, Project of State Significance (PoSS).

The purpose of this supplementary report is to address the comments from the Tasmania Planning Commission (TPC) following the review of the PoSS Noise and Vibration Assessment report.

The main matters addressed in this report are:

- Additional noise monitoring on site, focusing on noise due to local traffic and the operations of the port.
- A high-level construction noise assessment based on the preliminary program.
- Comparison of the existing noise environment to the predicted noise levels from the Stadium construction and operation.
- Update the noise model to include vertical noise maps (i.e. noise levels at each floor of a building) of the predicted levels at nearby sensitive receptors.

1.1 Tasmanian Planning Commission Comments

The Tasmanian Planning Commission (TPC) has provided the following comments following the submission of the PoSS noise and vibration assessment report. This report presents a response to each of the matters raised by TPC, with reference to the relevant report section given in Table 1.

Table 1 TPC Comment

Ref No.	Matters Raised	How comments are addressed and relevant sections in the Report
B.6.1	Further analysis and evidence would assist to understand the effects of proposed uses on existing uses in the vicinity of the project site and proposed management and programming regimes relating to the proposed uses and their effects on surrounding uses (including effects relating to traffic, parking, noise and pedestrian movement) (section 7.0 of the Guidelines).	- Additional monitoring has been conducted to understand the existing noise environment, particularly the operation of the Macquarie Wharves, including the departure and arrival of cruise ships. - In the absence of measured helicopter noise from the Royal Hobart Hospital, a noise model has been constructed to understand the noise impact from the operation of the emergency helicopter to nearby receptors. - Provided additional commentary and analysis comparing the potential noise from the operation of the Stadium with the existing noise environment in the precinct. - A high-level construction noise assessment has been based on the preliminary construction program. Relevant Report Sections: - Section 2.1 - Section 2.5 - Section 3.4
B.7.5	Reports relating to noise should consider noise levels at all levels of multistorey buildings and include an analysis of whether receivers on the Eastern Shore should be	- Clarified that predicted operational noise levels in the PoSS report have considered multistorey buildings, and the presented levels represent the worst-case for each receptor. - Included additional sensitive receptors in the suburbs of Rosnyand Bellerive across Ross Bay.

[1] *Macquarie Point Multipurpose Stadium Noise and Vibration Assessment Report* dated 21 August 2024

Ref No.	Matters Raised	How comments are addressed and relevant sections in the Report
	considered in the assessment (section 8.4 of the Guidelines).	- Conducted additional noise modelling to include noise levels on multistorey building façades. Relevant Report Sections: - Section 2.1 (Table 3) - Section 3.1 (Table 9) - Appendix A - Appendix B

1.2 Limitations and Clarifications

This supplementary report is to be read in conjunction with the Macquarie Point Multipurpose Stadium Noise and Vibration Assessment Report dated 21 August 2024 prepared as part of the PoSS submission.

The predicted noise levels for music concerts, PA system, game sirens and in-bowl crowd presented in this Supplementary Noise Assessment Report differ slightly from the PoSS Report. This is due to design development and refinement of the Stadium facade resulting in smaller openings compared to the Stadium model used in the PoSS Report. This reduction in facade opening has resulted in lower noise level emissions of up to 2dB. At this stage of the project, the façade design is not expected to change significantly. Therefore, further changes to the predicted noise levels are not anticipated.

2.0 Existing Noise environment

The Project Site is approximately 10 hectares of former industrial rail yard, located between the Royal Hobart Regatta grounds and the Macquarie Wharves in Hobart.

Significant noise-generating operations, including freight handling activities (TasRail and Toll Transport), Boral's concrete batching plant and the Hobart Cold Storage Centre, have ceased operation on the Project Site since 2009.

Table 2 summarises the existing noise environment in the vicinity of the Site.

Table 2 Existing Noise Environment

Location	Description
North of the Site	Potential future developments include public ferry services and a storage/display centre for historic trams. The Huon Quays site has been closed and may be developed commercially. The existing Domain slipway facility will continue boat maintenance. The parcel of land adjacent to the Domain boat ramp may be subject to future residential developments. The Royal Hobart Regatta Grounds, including the Cenotaph, is adjacent to the north. It is crucial to ensure the operation of the Stadium does not impact the events at the Cenotaph, such as the Dawn Service, Last Post Ceremony or any other memorial services.
Southeast of the Site	The Macquarie Wharves makes up the majority of the land to the southeast and takes in both passenger cruise ships and commercial cargo operations. A parcel of the land includes a water treatment plant, owned and operated by TasWater. The plant is scheduled for decommissioning by the end of 2025.
West of the Site	Davey Street and Tasman Highway bound the Site to the west. There are a number of noise sensitive receptors beyond these roads, including Baha'I Centre of Learning, ABC Broadcast Centre and residential apartments.
South of the Site	The majority of the noise sensitive receptors are located to the south of the Site, including residential apartments, hotels, and the School of Creative Arts. Federation Concert Hall is also a significant sensitive receptor located to the southwest of the Site at the corner of Davey Street and Evans Street.

AECOM has previously conducted attended noise measurements surrounding the Site. However, previous measurements were conducted outside of cruise ship season. As a result, additional long-term noise monitoring, as well as supplementary attended measurements, were undertaken in January 2025 in order to capture the noise from the port activities.

2.1 Nearest Noise Sensitive Receptors

The noise sensitive receptors surrounding the Stadium remain largely unchanged from the PoSS assessment, with the exception of the addition of residential receptors in the suburbs of Rosny and Bellerive across Ross Bay to the east of the Stadium. The receptors are included following comments from the TPC for completeness.

The table below presents the nearest noise sensitive receptors surrounding the Project Site.

Table 3 Noise Sensitive Receptor Locations

Receptor Reference	Location Description	Approximate Distance to the Stadium[1]
R1	Sullivans Cove Apartments	40 metres to the south
R2	Zero Davey Boutique Apartments	40 metres to the south
R3	University of Tasmania School of Creative Arts and Media	70 metres to the south
R4	MACq 01 Hotel	115 metres to the south
R5	IXL, Henry Jones Hotel	80 metres to the south
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)	40 metres to the southwest
R7	Hotel Grand Chancellor	110 metres to the southwest
R8	7 Macquarie Street apartments	70 metres to the west
R9	The Old Woolstore Apartment Hotel	110 metres to the west
R10	Baha'I Centre of Learning	150 metres to the west
R11	ABC Broadcast Centre	230 metres to the west
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development	180 metres to the north
R13	Royal Hobart Regatta Grounds (The Cenotaph)	90 metres to the north
R14	One Collins Apartment	200 metres to the west
R15	Royal Hobart Hospital	320 metres to the west
R16	Residential Apartments (1 Creswells Row)	250 metres to the southwest
R17	Residential Apartments (1-9 Ragged Lane)	180 metres to the west
R18	Residential Apartments (1-15 Terminus Row)	220 metres to the southwest
R19	Residential Dwellings in the suburb of Rosny	1300 metres to the east
R20	Residential Dwellings in the suburb of Bellerive	2000 metres to the east

Note 1: The distance to the receptor is measured from the outer edge of the Stadium.

Figure 1 and Figure 2 overleaf provides an overview of the Project Site and identifies the nearest noise sensitive receptors.

AECOM

Meters
0 50 100

Legend

- Macquarie_Wharf
- Receptors
- Site Boundary

Receptor	Location Description
R1	Sullivans Cove Apartments
R2	Zero Davey Boutique Apartments
R3	University of Tasmania School of Creative Arts and Media
R4	MACq 01 Hotel
R5	IXL, Henry Jones Hotel
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)
R7	Hotel Grand Chancellor
R8	7 Macquarie Street apartments
R9	The Old Woolstore Apartment Hotel
R10	Baha'I Centre of Learning
R11	ABC Broadcast Centre
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development
R13	Royal Hobart Regatta Grounds (The Cenotaph)
R14	One Collins Apartment
R15	Royal Hobart Hospital
R16	Residential Apartments (1 Creswells Row)
R17	Residential Apartments (1-9 Ragged Lane)
R18	Residential Apartments (1-15 Terminus Row)
R19	Residential Dwellings in the suburb of Rosny
R20	Residential Dwellings in the suburb of Bellerive

Figure 1: Overall Site Map

AECOM

N

Meters
0 50 100

Legend

- Receptors
- Macquarie Wharf
- Site Boundary

Receptor	Location Description
R1	Sullivans Cove Apartments
R2	Zero Davey Boutique Apartments
R3	University of Tasmania School of Creative Arts and Media
R4	MACq 01 Hotel
R5	IXL, Henry Jones Hotel
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)
R7	Hotel Grand Chancellor
R8	7 Macquarie Street apartments
R9	The Old Woolstore Apartment Hotel
R10	Baha'i Centre of Learning
R11	ABC Broadcast Centre
R12	The land parcel adjacent to Domain Boat Ramp, potential future residential development
R13	Royal Hobart Regatta Grounds (The Cenotaph)
R14	One Collins Apartment
R15	Royal Hobart Hospital
R16	Residential Apartments (1 Creswells Row)
R17	Residential Apartments (1-9 Ragged Lane)
R18	Residential Apartments (1-15 Terminus Row)

Figure 2: Site Map (Macquarie Point)

2.2 Noise Measurement Durations and Locations

Unattended noise monitors were placed on site at two locations between 21st January 2025 and 28th January 2025.

Supplementary attended measurements were conducted on the 21st January 2025.

For clarity, noise measurements were previously conducted in June 2025 as part of the PoSS submission. Refer to the PoSS Noise and Vibraiton Assessment Report for details.

The measurement locations are shown in Figure 3 overleaf.

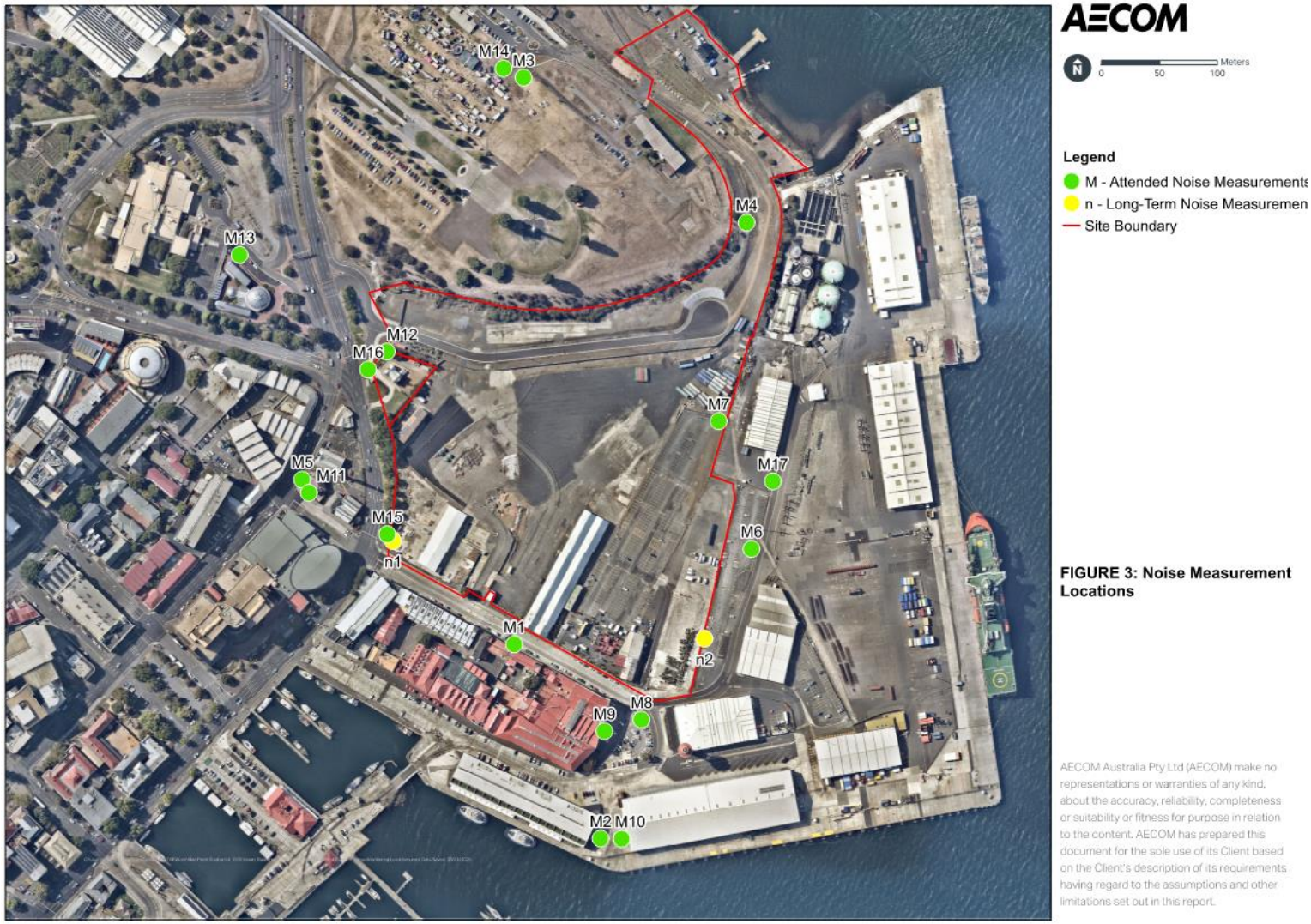


Figure 3: Noise Measurement Locations

2.3 Attended Noise Measurements

The specifications and details of the instrumentation used to conduct the attended measurements are presented in Table 4. All instrumentation has been laboratory calibrated and was calibrated for on-site use.

Table 4 Instrumentation (Attended Noise Measurements)

Instrument	Model	Serial Number
Sound Level Meter	Rion NL52	1010744
Sound Level Meter	B&K 2270	3029627

The measured noise levels are presented in Table 5.

Table 5 Attended Noise Measurement Results

ID	Measured Noise Levels, dB	Details
M1	L_{Aeq}: 50 L_{A90}: 45	• Location: Evans Street • Observations: Dominated by Davey Street Traffic. Distant traffic audible. • Date: 12/06/2024 22:22 • Duration: 10 minutes
M2	L_{Aeq}: 48 L_{A90}: 44	• Location: The Story Bar • Observations: Dominated by Seagulls • Date: 12/06/2024 22:49 • Duration: 10 minutes
M3	L_{Aeq}: 44 L_{A90}: 40	• Location: Domain Boat Ramp • Observations: Dominated by Tasman Highway Traffic. Hum from port building services just audible. • Date: 12/06/2024 23:18 • Duration: 10 minutes
M4	L_{Aeq}: 47 L_{A90}: 45	• Location: Water Treatment Plant • Note: This will be decommissioned as part of the Project • Observations: Dominated by water treatment plant noise • Date: 12/06/2024 23:30 • Duration: 10 minutes
M5	L_{Aeq}: 61 L_{A90}: 48	• Location: Corner Evans Street and Macquarie Street • Observations: Dominated by traffic on Macquarie Street • Date: 12/06/2024 23:44 • Duration: 10 minutes
M6	L_{Aeq}: 58 L_{A90}: 51	• Location: TasPorts Car Park • Observations: Dominated by excavator moving timber in port. Seagulls and distant traffic audible. • Date: 13/06/2024 09:10 • Duration: 5 minutes
M7	L_{Aeq}: 56 L_{A90}: 52	• Location: Macquarie Point Car Park • Observations: Dominated by excavator moving timber in port, Macquarie Point Construction and Seagulls. • Date: 13/06/2024 09:45 • Duration: 5 minutes
M8	L_{Aeq}: 59 L_{A90}: 48	• Location: Hunter Street Car Park • Observations: Dominated by Hunter / Evans Street traffic and Macquarie Point construction. Excavator moving timber in port just audible. • Date: 13/06/2024 10:00 • Duration: 5 minutes
M9	L_{Aeq}: 55 L_{A90}: 48	• Location: UTAS School of Creative Arts Façade • Observations: Dominated by UTAS loading dock activity and Hunter / Evans Street traffic. • Date: 13/06/2024 10:07

ID	Measured Noise Levels, dB	Details
		• Duration: 5 minutes
M10	L_{Aeq}: 51 L_{A90}: 47	• Location: The Story Bar • Observations: Dominated by Hunter Street traffic. Distant traffic audible. • Date: 13/06/2024 10:13 • Duration: 10 minutes
M11	L_{Aeq}: 71 L_{A90}: 64	• Location: Corner Evans Street and Macquarie Street • Observations: Dominated by traffic on Macquarie Street. Macquarie Point construction (rock breaker) audible. • Date: 13/06/2024 10:35 • Duration: 10 minutes
M12	L_{Aeq}: 65 L_{A90}: 58	• Location: Royal Engineers Building • Observations: Dominated by Davey and Macquarie Street traffic. Macquarie Point construction not audible • Date: 13/06/2024 11:10 • Duration: 10 minutes
M13	L_{Aeq}: 58 L_{A90}: 53	• Location: Baha'I Learning Centre Car Park • Observations: Dominated by Tasman Highway traffic. • Date: 13/06/2024 11:27 • Duration: 10 minutes
M14	L_{Aeq}: 52 L_{A90}: 49	• Location: Domain Boat Ramp • Observations: Dominated by Tasman Highway traffic. • Date: 13/06/2024 12:01 • Duration: 10 minutes
M15	L_{Aeq}: 67 L_{A90}: 60 L_{Amax}: 80	• Location: Corner of Evans Street and Davey Street • Observations: Dominated by Davey Street Traffic • Date: 28/01/2025 10:10 • Duration: 15 minutes
M16	L_{Aeq}: 63 L_{A90}: 55 L_{Amax}: 85	• Location: Corner of Davey Street and Brooker Avenue outside of the Royal Engineering Building • Observations: Dominated by Davey Street Traffic • Date: 28/01/2025 10:35 • Duration: 15 minutes
M17	L_{Aeq}: 68 L_{A90}: 62 L_{Amax}: 84	• Location: East boundary of the Site • Observations: Dominated by activities on dock (truck passbys) and bird noise • Date: 28/01/2025 11:04 • Duration: 15 minutes

2.4 Unattended Noise Measurements

Two unattended noise monitors were deployed on site in January 2025 at the locations indicated in Figure 3.

The specifications of the monitors are detailed in Table 6 below. All monitors have been laboratory calibrated and were calibrated in the field before and after the measurement period, no significant drift in calibration level was observed.

Weather conditions during the survey were generally acceptable with the exception of the 22nd January 2025, when there was a brief period of 1mm rainfall. The affected data has been excluded.

Table 6 Instrumentation (Unattended noise monitoring)

Instrument	Model	Serial Number
Sound Level Meter	Rion NL52	01010779
Sound Level Meter	Rion NL52	00410186

The measurement results are presented in Table 7. In addition, brief explanations of the noise descriptors used in the measurements are provided below.

- L_{Aeq} - The 'A'-weighted Equivalent Continuous Sound Pressure Level, commonly referred to as the average Sound Pressure Level recorded for all noise events over a given time period.
- L_{A90} - The value of 'A'-weighted Sound Pressure Level which is exceeded for 90 percent of the measurement period. L_{A90} Sound Pressure Levels are commonly used to represent background noise levels.
- L_{Amax} - The maximum 'A'-weighted Sound Pressure Level measured during a given time period. The L_{Amax} would typically represent the maximum noise level occurring during short term events such as a truck passing, sirens or foghorns. L_{Amax} is a relevant descriptor in determining the likelihood of sleep disturbance and general annoyance.

Table 7 Long-term Noise Monitoring Results

Location	Period	Measured Noise Levels		
		$L_{Aeq, 1hr}$ dB	$L_{A90, 1hr}$ dB	L_{Amax} dB
Corner of Evans Street and Davey Street (n1)	Day (7am to 6pm)	66	58	73 – 91
	Evening (6pm to 10pm)	64	54	71 – 91
	Night (10pm to 7am)	61	42	64 – 87
Southeast corner of the Site (n2)	Day (7am to 6pm)	55	47	62 – 82
	Evening (6pm to 10pm)	53	46	60 – 79
	Night (10pm to 7am)	51	43	55 – 80

2.5 Observations

The following observations were made during the noise surveys conducted in January 2025.

West and Southwest of the Site

Based on the monitoring results and on site observations, the general noise environment to the south and southeast of the Stadium is dominated by traffic noise from the Tasman Highway, Davey Street and Macquarie Street. Davey Street and Macquarie Street are the main thoroughfares through Hobart CBD, carrying a large volume of vehicles and heavy trucks throughout the day. As evidenced by the measured noise levels at Monitor Location n1, the ambient noise levels (L_{eq}) remain relatively consistent through day, evening and night. While the high maximum noise levels (L_{max}) are driven by heavy truck passbys.

South and East of the Site

The noise environment in these areas is driven by the activities on the dock, including plant machinery operating in the timber yard, trucks on Hunter Street and Evans Street, bird noise and cruise ships arriving and departing Macquarie Wharf. The measured upper range of the maximum noise levels (L_{max}) in Table 7 are primarily caused by truck passbys and cruise ship horns.

Cruise Ships

It was noted during the observations of the cruise ships that the departing and arriving of the ships do not generate significant noise over the ambient level. However, the loudest aspect of the cruise ships is the foghorn (measured at 79dB(A)L_{max} at monitor location n2) which lasts for around 5 seconds, and is clearly audible.

North of the Site

There is no significant noise source on the site of the Stadium. The ambient noise environment is dominated by traffic along Tasman Highway.

2.6 Helicopter Noise from Royal Hobart Hospital

Emergency helicopter noise is a regular occurrence in Hobart CBD following the completion of the Royal Hobart Hospital. It forms a part of the existing acoustic ambience in the area. In order to understand the helicopter noise impact on the surroundings, this additional assessment has been undertaken.

An emergency helipad is located on the roof of Building K at the Royal Hobart Hospital (RHH), at an elevation of approximately 65 metres above ground level. No helicopter operation was recorded during the attended and long-term noise measurements as helicopter movements are infrequent and generally unscheduled. As such, a helicopter noise model has been constructed to determine the noise impact on the surrounding areas. AECOM was involved in the design of the RHH, including assessing the helicopter noise impact, and the information regarding the helipad has been obtained from AECOM's previous work on RHH.

2.6.1 Approach / Take-off

It has been advised that the approach of helicopters to the RHH Helipad will typically be from the southeast, and take-off will typically be toward the northwest.

2.6.2 Type of Helicopter

It has been advised that the helicopters using the helipads may include BK117-B2, Bell 412EP, and AW139.

The Bell 412EP type helicopter is noted to be the loudest of the three helicopters under consideration for both approach and take-off. Therefore, the noise assessment has been based on a Bell 412EP helicopter to represent the worst-case scenario.

Measurements undertaken by AECOM of the Bell 412EP helicopter have been used to derive the source noise levels for this assessment, which are presented in Table 8.

Table 8 Sound Power Level of Bell 412EP Helicopter

Event	Sound Power Level dB							Overall dB(A)
	63	125	250	500	1k	2k	4k	
Approach	146	141	135	139	137	134	128	141
Take-off	143	141	132	136	134	131	125	138

2.6.3 Predicted Helicopter Noise Levels

Based on the above, the predicted L_{max} helicopter noise levels are presented in Figure 4.

The areas directly under the helicopter flight would experience noise levels between 85-94 dB L_{Amax}. The areas to the northeast and southwest of the flight path would experience noise levels between 78-90 dB L_{Amax}.

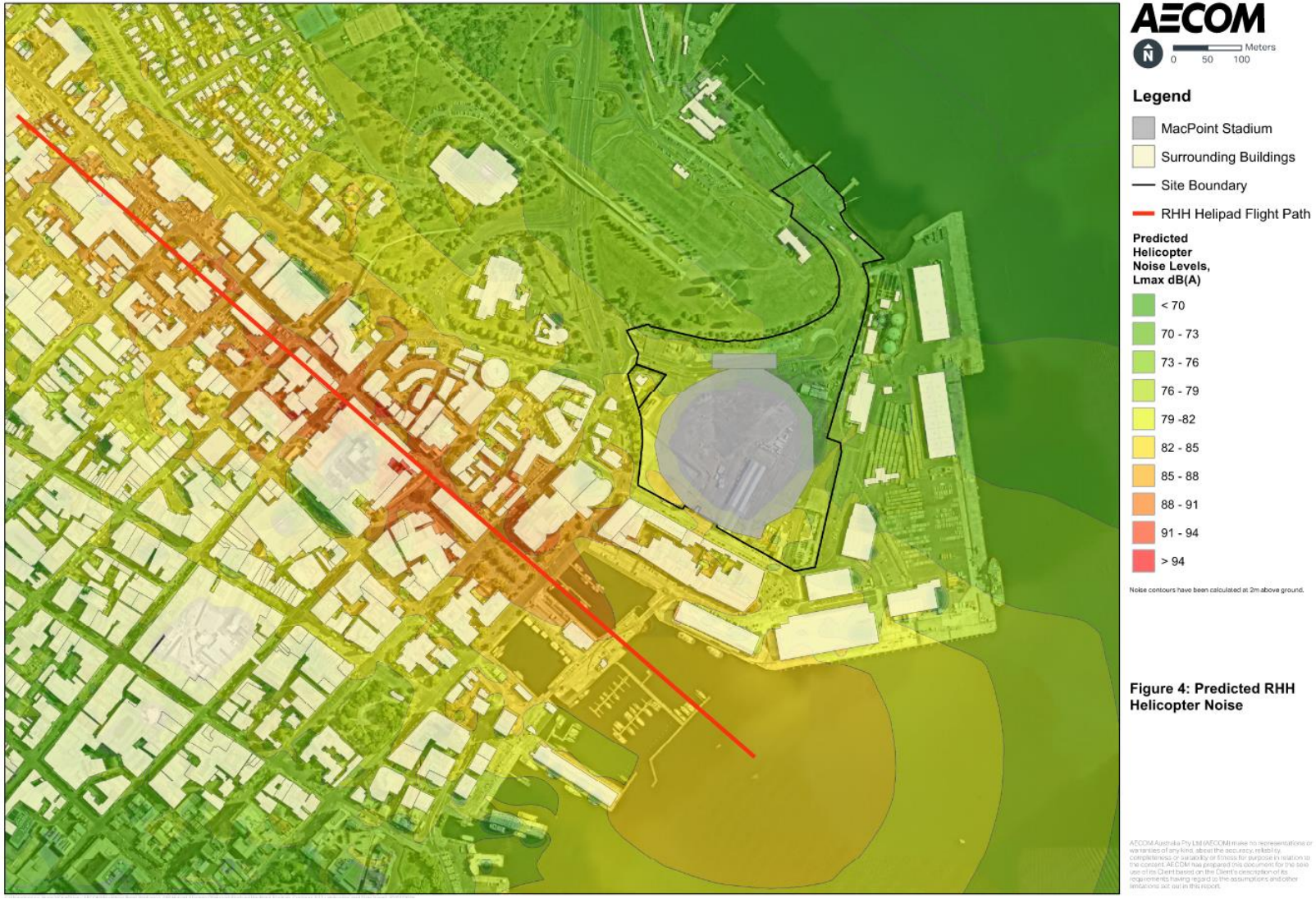


Figure 4: Predicted RHH Helicopter Noise

Figure 4: Predicted RHH Helicopter Noise

3.0 Comparison of Existing and Future Noise Environment

The following sections provide a comparison between the existing noise environment and the predicted noise levels following the development of the stadium.

3.1 Noise due to Stadium operations

The PoSS noise assessment provides detailed noise modelling and results of the Stadium operations. Through the course of subsequent design phases, there has been refinement to the Stadium facade, including reduction of facade openings, which has resulted in a reduction of noise emission levels. The results of the noise modelling for the updated Stadium model and its operations are presented in Table 9.

Additional modelling has been undertaken for the residential receptors in Rosny and Bellerive. Noise contours for operational noise associated with the Stadium have been provided in Appendix A.

The noise model has considered all habitable levels of the noise sensitive receptors and the presented noise levels are for the worst-case for each receptor. An additional set of façade noise maps has been provided in Appendix B, which illustrate how the predicted levels change with height.

Table 9: Predicted Environmental Noise Levels

Receptors	Predicted Noise Levels (External)									
	Concerts L_{eq}, dB(A)[2]	PA System L_{eq}, dB(A)	Sirens L_{max}, dB(A)	Crowd Noise (In Bowl) L_{eq}, dB(A)	Patrons Arriving / Departing L_{eq}, dB(A)	Patrons at F&B L_{eq}, dB(A)	Bus Plaza L_{eq}, dB(A)	Permanent Building Services L_{eq}, dB(A)	Temporary Generators L_{eq}, dB(A)	Loading Dock and Waste Collections L_{eq}, dB(A)
R1	58 – 76	56	67	53	47	39	Negligible	31	Negligible	32
R2	54 – 73	53	64	49	41	40	Negligible	31	Negligible	22
R3	63 – 81	65	76	61	40	44	Negligible	38	37	28
R4	57 – 75	56	67	52	34	38	Negligible	25	31	23
R5	57 – 74	55	66	51	30	36	Negligible	27	26	21
R6	53 – 73	53	63	48	36	39	Negligible	30	Negligible	23
R7	61 – 78	59	71	55	31	35	Negligible	22	Negligible	20
R8	57 – 74	54	65	50	33	41	Negligible	27	Negligible	28
R9	53 – 71	50	61	46	26	36	Negligible	23	Negligible	Negligible
R10	55 – 73	53	64	49	31	42	Negligible	22	Negligible	26
R11	55 – 72	52	63	48	27	40	Negligible	Negligible	Negligible	20
R12	53 – 71	44	54	39	Negligible	31	33	Negligible	Negligible	Negligible
R13	62 – 78	58	68	54	30	51	29	Negligible	Negligible	35
R14	55 – 73	54	67	51	28	38	Negligible	20	Negligible	24
R15	56 – 74	54	67	50	25	33	Negligible	Negligible	Negligible	Negligible
R16	49 – 67	45	56	41	25	33	Negligible	21	Negligible	Negligible
R17	53 – 71	49	60	45	26	35	Negligible	Negligible	Negligible	22
R18	53 – 71	49	60	45	25	34	Negligible	21	Negligible	20
R19	46 – 64	46	58	42	Negligible	28	Negligible	Negligible	Negligible	Negligible
R20	43 – 61	43	56	38	Negligible	23	Negligible	Negligible	Negligible	Negligible

Comparison to Existing Noise Environment										
Comments	Music noise from rock concerts (worst case) would be audible over the existing ambient level and be the dominant noise source in the vicinity of the Stadium during concerts. Music levels would be less noticeable for mid-intensity concerts (pop, RnB) due to high existing traffic noise levels.	Noise from the PA system would likely be just noticeable for receptors adjacent to the Stadium. The use of PA system is intermittent in nature. The continuous traffic noise would likely still be the dominant noise source.	Sirens would be clearly audible over the existing ambient noise levels. However, it is comparable to a cruise ship's foghorn during departure and arrival. With cruise ships, multiple arrivals and departures would occur throughout the week. The game sirens would only occur on game days.	It would likely be just noticeable for receptors adjacent to the Stadium. The continuous traffic noise is expected to still be the dominant noise source.	The predicted levels are below the measured existing ambient noise levels. They are unlikely to be noticeable for the majority of the receptors except the apartments directly across Evans Street.	Patron noise will be limited to the Southern Plaza and is unlikely to be noticeable for the majority of the receptors.	The predicted levels are significantly lower than the existing ambient levels. Unlikely to be noticeable and be further mitigated through practical management controls.	Unlikely to be noticeable over the existing ambient noise levels. Noise mitigations to the services plant will be designed and implemented.	Unlikely to be noticeable over the existing ambient noise levels. Practical management controls and mitigation can be implemented as necessary.	The loading dock is located internally within the Stadium. Noise levels from trucks on public roads are unlikely to be noticeable over existing ambient levels.

Note:

1. Where results are noted as negligible, it indicates that the predicted level is less than 20 dB(A), which is not noticeable above background noise
2. Concert music noise levels are presented as a range, representing a potential worst-case scenario for a rock concert and mid-intensity concerts with lower music levels.
3. Operations from the bus plaza, permanent building services, temporary generators, loading dock and waste collections are predicted to comply with the TAS EPA Noise environment indicator levels with noise controls designed accordingly.

Comparing the predicted RHH helicopter noise levels with the potential Stadium operation noise levels, the helicopter noise would still be the dominant noise source during flyby events.

The predicted helicopter noise levels are more than 10dB higher than the predicted worst-case concert noise levels.

4.0 Construction Noise Assessment

The following sections provide a high-level assessment of potential noise due to the construction of the Stadium.

4.1 Applicable Guidelines

MPDC has previously engaged Hanson Associates to prepare a Construction Noise and Vibration Management Plan (CNVMP), ref R02 dated 10 October 2024. The CNVMP utilises the NSW Department of Environment and Climate Change Interim Construction Noise Guideline (ICNG) 2009.

The ICNG provides guidance on how a quantitative assessment should be conducted and provides construction noise management levels (NML) for various receptors.

Table 10 sets out the management level for noise at residences and how they are to be applied. Table 11 provides management levels for other sensitive land uses.

The rating background level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA 2000).

As a guide, the difference between the internal and external noise levels is typically 10 dB with windows open for adequate ventilation.

Table 10 ICNG Noise Management Levels (Residences)

Time of day	Management level $L_{Aeq\ (15min)}$	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Table 11 ICNG Noise Management Levels (Other Sensitive Uses)

Land Use	Management Level, $L_{Aeq\ (15min)}$ (applies when properties are being used)
Classrooms at schools and other education institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

4.2 Noise Management Levels

Due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories. The external noise levels should be assessed at the most-affected occupied point of the premises:

- industrial premises: 75 dB $L_{Aeq\ (15\ min)}$
- offices, retail outlets: 70 dB $L_{Aeq\ (15\ min)}$
- other businesses that may be very sensitive to noise are discussed below.

The CNVMP has undertaken a separate body of work to identify the specific sensitivities of operations critical to the Tasmanian Symphony Orchestra (TSO).

The performance, recording and rehearsal spaces in the TSO facilities have been identified as having a heightened sensitivity to noise that is not suitably reflected by the broad noise management level guidance in the ICNG.

Project-specific NMLs for these spaces have been derived from baseline noise monitoring conducted within those spaces (refer to AEN Advisory and Design Services Report R01 dated June 2024).

Project NMLs for various receptors have been derived based on previous noise monitoring conducted on site by MPDC. They are summarised in Table 12 .

Table 12 Project Noise Management Levels

Receptor Type	NML, dB $L_{Aeq\ (15min)}$
Residential	
Residences in the suburb of Glebe	55 (external)
Evans Street (Zero Davey Apartments, the Sullivans Cove Apartments and the IXL Apartments)	62 (external)
Hotel Grand Chancellor	61 (external)
Henry Jones Art Hotel	55 (external)

Receptor Type	NML, dB $L_{Aeq\ (15min)}$
Other sensitive land uses	
Classrooms at schools and other educational institutions: UTAS School of Creative Arts and Media	45 (internal)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation): Cenotaph	60 (external)
Industrial Premises: TasPorts Macquarie Wharf	75 (external)
Offices, Retails Outlets: All Davey Street, Hunter Street, Evans Street commercial premises, including TSO general office Evans Street South Side mixed residential / commercial	70 (external)
Project Specific High Sensitivity Receivers[1]	
Federation Hall (music concert / rehearsal)	dBLAmax 30 (internal)
Federation Hall (conference, HGC functions), TSO Studio, ABC audio mastering room	30 (internal)

Note 1: the TSO spaces are included here for completeness but are not included in this high-level assessment, they will be addressed in a separate report.

4.3 Noise Modelling Methodology

The following sections describe the methodology adopted to model the potential noise impact from the construction of the proposed Stadium.

4.3.1 Noise Model

Modelling was conducted using SoundPlan Version 8.2 environmental noise modelling software, which implements the CONCAWE prediction methodology. The CONCAWE method was chosen to enable the worst-case meteorological conditions noted in Modelling Inputs, Assumptions and Limitations be applied to the prediction model.

The following propagation effects were included in the noise model:

- Attenuation of noise with distance, including geometrical spreading and air absorption
- Reflections from buildings and other acoustically-reflective structures
- Barrier effects due to obstructions between noise sources and residential receptors
- Ground absorption
- Local topographical changes
- Meteorological conditions

4.3.2 Modelling Inputs, Assumptions and Limitations

The inputs and assumptions used in the acoustic model are detailed in Table 13.

Table 13 Noise Modelling Inputs and Limitations

Inputs	Comment
Inputs	The following inputs were included in the noise model: • Construction program provided by MPDC • Possible roof erection sequence dated 16 Dec 2024 • Macquarie Point Stadium Construction Management Plan August 2024 Based on the above, construction fleets, works locations and noise levels were developed by AECOM.

Inputs	Comment
Topography	A mixture of supplied survey and internet sourced data was used to determine the topography of the assessment area: • Survey: *306246 D01 R0 Macquarie Point (MGA2020 GRID).dwg* • Elvis – Elevation and Depth (*elevation.fsdf.org.au*)
Receptor Locations	Noise sensitive buildings were identified via Nearmap and Google Earth aerial studies of the project site, and via a site visit on 13 June 2024. The predicted noise level for each receptor was calculated at a height of 1.5 metres above each habitable level, and one metre from the centre of the most exposed façade.
Ground absorption	Ground absorption has been assumed as follows: • An absorption coefficient of 0.0 (hard ground) has been assumed for residential and built-up areas. • An absorption coefficient of 0.5 (medium soft ground) has been assumed for parks. • An absorption coefficient of 0.0 (hard ground) has been assumed for water surface
Rounding	Noise levels are rounded to the nearest whole number.
Meteorological Conditions	Worst-case meteorological conditions have been assumed for the assessment: • Pasquil stability class F • Wind speed of 3m/s blowing directly from sources to receivers This represents a worst-case scenario for the acoustic modelling in which the noise is carried by the wind from the source to the receptor direction constantly. Increasing the wind speed above 3m/s in the noise model would not change the predicted results. Based on the historical data for the Hobart climate, this condition could be experienced more than 50% of the time throughout the day. However, it should be noted that in reality only receptors in the downwind direction are affected, whilst the assessment assumes all receptors are affected regardless of wind directions.
Building data	The building data has been provided by AECOM GIS team, the data is based on the existing Lidar of the area.

4.3.3 Modelling Scenarios

The Project proposes a construction period for the Stadium of up to 42 months between the hours of 7am to 6pm Monday to Friday and 8am to 3pm Saturday.

Table 14 presents the indicative construction program for the Project.

Table 14 Stadium Indicative Construction Activity Schedule

Stage	Construction Month													
	0-3	3-6	6-9	9-12	12-15	15-18	18-21	21-24	24-27	27-30	30-33	33-36	36-39	39-42
Bulk Excavation														
Piling														
Substructure														
Roof Structure														
Stand Construction														
Façade and Fitout														
Ground Playing Areas														

The construction equipment and associated noise levels for each construction stage are shown in Table 15. The equipment noise levels were based on the following references:

- AECOM Database for fixed and mobile plant,
- AS2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites*,
- BS 5228-1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*, and
- Manufacturer specifications.

The highest sound power level noted in the table is not a sum of all plant identified within each phase, as not all plant would be located on-site at the same time and not all plant would be located within the same area at all times.

Table 15 Equipment Sound Power Levels for Construction Stages

Plant Type	Model / Detail	Quantity	Noise Level, L_{WA} dB	Highest Noise Level for Stage, L_{WA} dB
Bulk Excavation				
Excavator	20T	1	113	121[1]
Excavator with Rock Breaker	20T	1	121	
Dump Truck	-	2	106	
Water cart	-	1	93	
Piling				
Bored Piling Rig	-	2	111	113
Excavator	20T	1	113	
Concrete Pump	-	1	106	
Concrete Agitator	-	1	103	
Substructure				
Excavator	20T	1	113	113
Backhoe	-	1	96	
Skid Steer Loader	-	1	107	
Concrete Pump	-	1	109	
Concrete Agitator	-	1	109	
Dump Truck	-	1	106	
Roof Structure				
Tower Crane	300T	4	106	106
Welding Equipment	-	2	93	
Hand tools	-	4	93	
Angle Grinder	-	2	102	
Stand Construction				

Plant Type	Model / Detail	Quantity	Noise Level, L_{WA} dB	Highest Noise Level for Stage, L_{WA} dB
Tower Crane	300T	4	106	110[1]
Hand tools	-	4	93	
Impact drill	-	2	106	
Concrete Saw	-	1	110	
Power Trowel	-	1	97	
Concrete Pump	-	1	106	
Concrete Agitator		1	106	
Façade and Fitout				
Mobile Crane	-	2	109	109
Hand tools	-	4	93	
Impact Drill	-	2	106	
Angle grinder	-	2	102	
Ground Playing Areas				
Excavator	20T	2	113	113
Roller	-	2	113	
Dump Truck	-	2	106	
Hand Tools	-	2	93	

Note 1: In accordance with TfNSW Construction Noise and Vibration Guideline, the overall SWL has been increased by 5 dBA to account for special audible characteristics from rock breaking and concrete sawing.

The following worst-case construction noise scenarios have been developed based on the proposed construction program and equipment. The scenarios take into account the potential overlapping of construction stages and the cumulative impacts of the construction activities.

Table 16 Modelled Construction Scenarios

Construction Scenario (CS)	Included Stages
CS1	Bulk Excavation Piling
CS2	Piling Substructure Stand Construction
CS3	Roof Structure Stand Construction Façade and Fitout
CS4	Roof Structure Façade and Fitout
CS5	Façade and Fitout Ground Playing Areas

For each scenario, construction works were modelled as occurring across the expected work area such that the highest predicted noise level for works in any location in the modelled work area could be determined for each noise-sensitive location.

For Construction Scenario 5, it is assumed that the stadium envelope will provide a barrier effect from construction works to surrounding receptors. As such, the built form has been included in the noise model.

4.4 Noise Modelling Results

Table 18 presents predicted noise levels and compares them to the Noise Management Levels (NML) for the identified receptors.

In addition, noise levels have been rated in accordance with Table 9 of the Transport for NSW *Construction Noise and Vibration Guideline* (CNVG). Whilst the CNVG is not specifically referenced in the CNVMP, it provides a good reference in regard to the likely noise impact on the receptors.

Noise level ratings are based on the predicted noise levels relative to the NMLs, as follows.

Table 17 Noise Level Ratings

Font Colour	Description	Noise Level
	Noticeable	At NML
	Clearly Audible	10 dB above NML
	Moderately Intrusive	10-20 dB above NML
	Highly Intrusive	More than 20 dB above NML
	Highly Noise Affected	> 75 dB(A)

If the predicted noise levels are not coloured, the predicted levels are below NML.

Table 18 Indicative Noise Levels from Construction Scenarios

Ref	Receptor	NML dB(A)	CS1	CS2	CS3	CS4	CS5
Residential Receptors							
R1	Sullivans Cove Apartments	62	87	74	74	68	54
R2	Zero Davey Boutique Apartments	62	83	74	70	64	52
R4	MACq 01 Hotel	55	68	66	47	41	37
R5	IXL, Henry Jones Hotel	55	64	63	49	45	43
R7	Hotel Grand Chancellor	61	72	61	61	55	54
R8	7 Macquarie Street apartments	61	75	56	63	57	45
R9	The Old Woolstore Apartment Hotel	61	66	55	55	51	39
R14	One Collins Apartment	61[1]	68	53	57	51	47

Ref	Receptor	NML dB(A)	CS1	CS2	CS3	CS4	CS5
R16	Residential Apartments (1 Creswells Row)	61[1]	67	43	46	40	36
R17	Tramway on Collins Apartments (1-9 Ragged Lane)	61[1]	55	43	43	37	36
R18	Residential Apartments (1-15 Terminus Row)	61[1]	50	39	39	33	36
Non-residential Receptors[2]							
R3	University of Tasmania School of Creative Arts and Media	45 (Internal)	89	69	74	68	52
R6	Federation Concert Hall (Tasmanian Symphony Orchestra)[3]	30 (internal)	79	63	67	61	50
R10	Baha'i Centre of Learning	45 (Internal)	71	55	59	53	44
R11	ABC Broadcast Centre	30 (Internal)	68	54	56	50	43
R13	Royal Hobart Regatta Grounds (The Cenotaph)	60	73	53	62	56	57
R15	Royal Hobart Hospital	45 (Internal)	66	53	55	49	54
Comparison to Existing Noise Environment							
Comments			This is expected to be the loudest stage of construction due to rock breaking, which could last up to a month. The noise environment would be highly impacted during this stage of the construction.	The receptors adjacent to the Stadium will be the most impacted due to the works associated with the substructure and stand. Receptors further away would receive lower noise impact due to shielding from buildings in front.	These stages involve up to four cranes operating. The noise is expected to travel further due to the source height. However, noise levels are not expected to exceed ambient levels significantly except for receptors directly adjacent to the Stadium. The noise impact at this stage of construction is limited to local areas surrounding the Stadium.		The building structure and façade would provide significant noise attenuation for internal construction works. As such, noise levels during this stage are not expected to be noticeable over the existing ambient levels.

Note 1: NMLs for these receptors have not been included in the CNVMP. They are based on NML of the nearest receptor (Hotel Grand Chancellor).

Note 2: For non-residential receptors with an internal NML, additional assessment of the building façade performance should be condcuted by the contractor to determine the actual noise impacts on internal spaces.

Note 3: A separate assessment will be undertaken to address the construction noise impact to internal spaces of the TSO.

4.5 Mitigation Measures

The CNVMP provides guidelines on potential noise mitigation, monitoring procedures, community engagement and a complaints procedure.

In addition, the Managing Contractor for the Project is expected to develop a comprehensive Construction Noise and Vibration Management Plan (CNVMP) specific to the construction methodology and program of works for the Stadium.

The CNVMP shall include appropriate protocols for managing construction noise and vibration. The following mitigation measures are recommended to be adopted by the contractor:

- Community notification and engagement
- Project specific noise management measures
- Site inductions and behavioural practices
- Scheduling and respite of works
- Selection of quieter construction methods or equipment
- Non-tonal reversing alarms
- Noise monitoring and model verification
- Noise barriers

Based on the predicted levels presented in Table 18 and guidance provided in the CVNMP and TfNSW Construction Noise & Vibration Guideline, the following indicative noise mitigation measures have been developed. These are to be used as a guide, and should be reviewed and expanded during the development of the comprehensive CNVMP.

Table 19 Indicative Noise Management Measures for Construction

Working Hours	Construction Scenario	Included Stages	Periodic Notification	Verification Noise Monitoring	Specific Notification
			Receptors > 20 dB(A) above NML	Receptors > 10-20 dB(A) above NML	Receptors > 75 dB(A)
Standard Hours Monday-Friday 7am-6pm Saturday 8am-3pm	CS1	Bulk Excavation Piling	R1, R2, R4, R6, R7, R8	R1, R2, R4, R6, R7, R8	R1, R2, R3, R6
	CS2	Piling Substructure Stand Construction	R1, R2, R4, R6	R1, R2, R4, R6	Nil
	CS3	Roof Structure Stand Construction Façade and Fitout	R1, R6	R1, R6	Nil
	CS4	Roof Structure Façade and Fitout	R6	R6	Nil
	CS5	Façade and Fitout Ground Playing Areas	R6	R6	Nil

Table 20 presents indicative actions that may be undertaken for the identified receptors based on the suggested management measures provided in Table 19.

Table 20 Indicative Actions under each Noise Management Measure

Action	Management Measures
Periodic Notification	A notification is produced and distributed to stakeholders via letterbox drop or distributed to the Project postal and/or email mailing lists. Periodic notifications provide an overview of current and upcoming work across the Project and other topics of interest. The objective is to engage, inform and provide project-specific messages. Advanced warning of potential disruptions (e.g., traffic changes or noisy works) can assist in reducing the impact on stakeholders. The approval conditions for projects specify requirements for notification to sensitive receivers where work may impact them.
Verification monitoring	Verification monitoring of noise during construction may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver has been identified). Monitoring can be in the form of either unattended logging or operator attended surveys (i.e., for specific periods of construction noise). Verification must be undertaken by a suitably qualified, trained and experienced personnel using appropriate equipment and methodology, with reference to AS1055. The purpose of monitoring is to confirm that: • Construction noise from the Project is consistent with the predictions in the noise assessment. • Mitigation and management of construction noise is appropriate for receivers affected by the work. • Where noise monitoring finds the actual noise levels exceed those predicted in the noise assessment then immediate refinement of mitigation measures may be required.
Specific Notification	Specific notifications are in the form of a personalised letter or phone call to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. In addition to Specific Notifications and letters communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities and provide an individual briefing. • Letters may be letterbox dropped, hand distributed or emailed. • Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and their specific needs. • Individual briefings are used to inform stakeholders about the impacts of noisy activities and mitigation measures that will be implemented. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the Project. • Specific notifications are used to support periodic notifications, or to advertise unscheduled or high impact work and must be approved by authority prior to implementation/distribution. Where impacts have already been captured in a Periodic Notification, a Specific Notification may not be required

The noise management measures provided in Table 20 should be supported by implementing all feasible and reasonable practices to reduce construction noise impacts.

Table 21 provides guidance on standard noise mitigation measures developed from guidance provided in the CVNMP and the TfNSW Construction Noise & Vibration Guideline.

Table 21 Standard Noise Mitigation Measures for Construction

Action	Mitigation Measures
Implementation of any Project specific mitigation measures required.	In addition to the measures set out in this table, any Project specific mitigation measures identified in the comprehensive CNVMP or approval or licence conditions must be implemented.
Stakeholder engagement	Periodic notification (monthly letterbox drop/email and website notification) detailing all upcoming construction activities delivered to sensitive receivers at least 7 days prior to commencement of relevant works. In addition to periodic notification, the following strategies may be adopted on a case-by-case basis: • Project-specific website • Project infoline • Construction response line • Email distribution list • Web-based surveys • Social media • Community and stakeholder meetings
Construction hours and scheduling	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating noise with special audible characteristics should be scheduled during less sensitive time periods.
Construction respite period	Noise with special audible characteristics (including jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling) may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block.
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant project specific and standard noise mitigation measures. • Relevant licence and approval conditions. • Permissible hours of work. • Any limitations on noise generating activities with special audible characteristics. • Location of nearest sensitive receivers. • Construction employee parking areas. • Designated loading/unloading areas and procedures. • Site opening/closing times (including deliveries). • Environmental incident procedures.
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors. No excessive revving of plant and vehicle engines. Controlled release of compressed air.
Plan worksites and activities to minimise noise	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Equipment selection	Use quieter construction methods where feasible and reasonable. For example, when piling is required, use of bored piles rather than impact-driven piles will minimise noise impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise benefits.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work, including delivery vehicles.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries is to occur *as far as possible* from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever

Action	Mitigation Measures
	possible.
Construction related traffic	Schedule vehicle movements during less sensitive times and route them away from sensitive receptors. Limit the speed of vehicles and avoid the use of engine compression brakes. Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.
Silencers on mobile plant	Where possible reduce noise from mobile plant through additional fittings including: • Residential grade mufflers • Damped hammers such as 'City' Model Rammer Hammers • Air Parking brake engagement is silenced.
Prefabrication of materials off-site	Where practicable, pre-fabricate and/or prepare materials off- site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation.
Engine compression brakes	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained original equipment manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.
Shield Stationary Noise Sources such as pumps, compressors, fans, etc.	Stationary noise sources should be enclosed or shielded wherever possible.

5.0 Summary

This report, prepared by AECOM for the Macquarie Point Development Corporation, serves as a supplementary assessment to the AECOM PoSS Noise and Vibration Assessment to address matters raised by the Tasmania Planning Commission (TPC). It provides additional analysis of the existing noise environment, potential noise impacts from stadium operations, and a high-level construction noise assessment.

The TPC comments are addressed in this report as follows:

- TPC comment 26: *Further analysis and evidence would assist to understand the effects of proposed uses on existing uses in the vicinity of the project site and proposed management and programming regimes relating to the proposed uses and their effects on surrounding uses (including effects relating to traffic, parking, noise and pedestrian movement) (section 7.0 of the Guidelines).*
    - Additional monitoring has been conducted to understand the existing noise environment, particularly the operation of the Macquarie Wharves, including the departure and arrival of cruise ships.
    - In the absence of measured helicopter noise from the Royal Hobart Hospital, a noise model has been constructed to understand the existing noise impact from the operation of the emergency helicopter to nearby receptors.
    - Provided additional commentary and analysis comparing the potential noise from the operation of the Stadium with the existing noise environment in the precinct.
    - A high-level construction noise assessment has been based on the preliminary construction program.
- TPC Comment 33: *Reports relating to noise should consider noise levels at all levels of multistorey buildings and include an analysis of whether receivers on the Eastern Shore should be considered in the assessment (section 8.4 of the Guidelines).*
    - Clarified that predicted operational noise levels in the PoSS report have considered multistorey buildings, and the presented levels represent the worst-case for each receptor.
    - Included additional sensitive receptors in the suburb of Rosny and Bellerive across Ross Bay.
    - Conducted additional noise modelling to include noise levels on multistorey building façades.

6.0 References

1. EPA Tasmania, Environment Protection Policy (Noise) 2009
2. EPA Tasmania, Noise Measurement Procedures Manual (NMPM), Second Edition, July 2008
3. Macquarie Point Development Corporation, Construction Noise and Vibration Management Plan, R02, 10 October 2024
4. NSW Department of Environment & Climate Change Interim Construction Noise Guideline, July 2009
5. Transport for NSW Construction Noise and Vibration Guideline, September 2023
6. Stadiums Tasmania, Macquarie Point Stadium, User Brief, Initial Draft April 2024
7. Tasmanian Government, Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2016
8. Tasmanian Government, Environmental Management and Pollution Control Act 1994
9. Tasmanian Planning Commission, Guidelines for the Project of State Significance, 16 February 2024

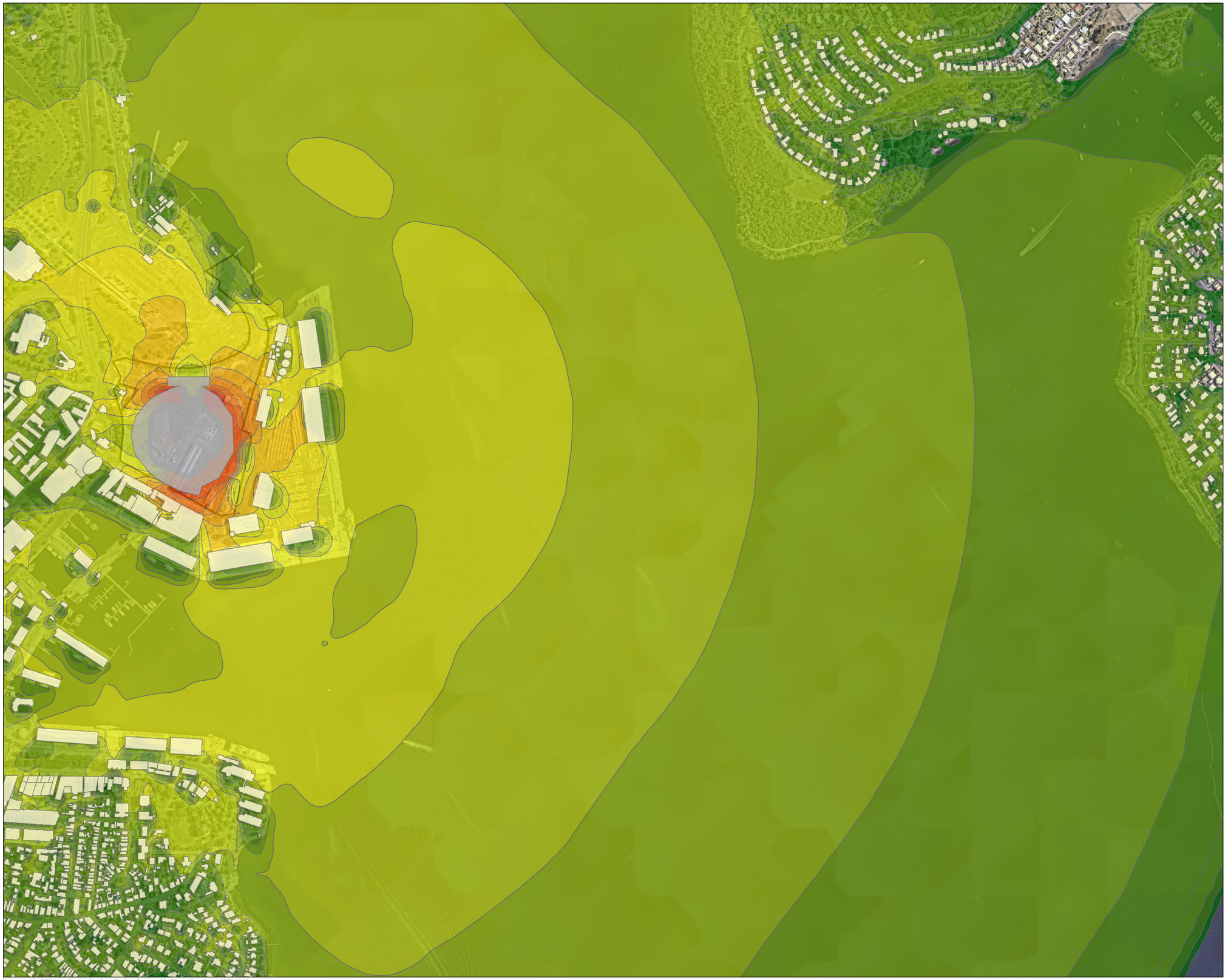
Glossary

Term	Definition	
'A' Weighted	Frequency filter designed to adjust the absolute sound pressure levels to correspond to the subjective response of the human ear. The A-weighting filter emphasises frequencies in the speech range (between 1 kHz and 4 kHz) which the human ear is most sensitive to.	
Ambient noise	The A-weighted equivalent continuous sound pressure level LAeq, is typically the descriptor used to describe ambient noise.	
Decibel [dB]	The measurement unit of sound.	
Decibel scale	A three decibel increase in the sound pressure level corresponds to a doubling in sound energy. An increase or decrease of three decibels is typically considered to be the smallest change in sound level that a listener can detect. A change of five decibels, however, is clearly noticeable. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. This increase is typically perceived to sound twice as loud. The table below shows the sound pressure level that would be typically experienced when exposed to different sources:	
	0 dB	Threshold of human hearing
	40 dB	Whisper in a library
	50 dB	Open office space
	60 dB	Normal conversation
	70 dB	Inside a car on a freeway
	80 dB	Outboard motor
	90 dB	Heavy truck pass-by
	100 dB	Pneumatic hammer
	110 dB	Rock concert
	120 dB	747 take off at 250 metres
L_{A90} (Background level)	The value of 'A'-weighted Sound Pressure Level which is exceeded for 90 percent of the time during a given measurement period. LA90 Sound Pressure Levels are commonly used to represent background noise levels. [Unit: dB]	
L_{Aeq}	The 'A'-weighted Equivalent Continuous Sound Pressure Level which is the constant Sound Pressure Level that, for a given duration, would be equivalent in sound energy to the time-varying Sound Pressure Level measured over the same duration. LAeq Sound Pressure Levels are commonly referred to as the average Sound Pressure Level. [Unit: dB]	
L_{Amax}	The maximum 'A'-weighted Sound Pressure Level measured during a given time period. The LAmax would typically represent the maximum noise level occurring during short noise events such as a noisy truck passing. LAmax is a relevant descriptor in determining the likelihood of sleep disturbance and general annoyance.	
Frequency [f]	Frequency is measured in Hertz (Hz). The frequency corresponds to the pitch of the sound: a high frequency to a high-pitched sound and a low frequency to a low-pitched sound.	

Term	Definition
Octave band	The International Standards Organisation has agreed upon preferred frequency bands for sound measurement and the octave band is the widest band for frequency analysis. The upper frequency limit is approximately twice the lower frequency limit and each band is identified by its band centre frequency. Typical Octave Band frequencies for environmental noise assessments are: 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz.
Sensitive receptor	Areas where the occupants, buildings or land use are potentially susceptible to the adverse effects of exposure to noise and vibration.
Sound Power Level	The sound power level (L_w) is a measure of the total acoustic energy emitted by a source. It is expressed in decibels (dB) and is a logarithmic measure of the sound power (P) relative to a reference sound power (P_0), typically set at 10^{-12} watts.
Sound Pressure Level	A measure of the magnitude of a sound wave (Unit: Decibels). Mathematically, it is twenty times the logarithm to the base ten of the ratio of the root mean square sound pressure at a point in a sound field, to the reference sound pressure; where sound pressure is defined as the alternating component of the pressure (Pa) at the point, and the reference sound pressure is 2x10-5 Pa.
Tonality	Noise is subjectively more annoying when it has a tonal component (a perceptible hum or whine). Tonality can be determined by subjective assessment or from one-third octave band analysis of the noise. Where a noise is tonal, an adjustment is made to allow for the additional annoyance caused by the tone.
Impulsive noise	Impulsive noise refers to short bursts of sound characterised by a sudden onset and a rapid decay, typically lasting less than one second. These sounds are often high in intensity and can be startling or disruptive due to their abrupt nature. Impulsive noises are generally distinct and easily recognisable from continuous or steady-state noises.
Intermittent noise	Intermittent noise is a type of sound that occurs at irregular intervals, characterised by periods of silence or significantly lower noise levels between louder noise events. Unlike continuous noise, which maintains a steady level over time, intermittent noise fluctuates, making it more variable and sometimes more disturbing.

Appendix A

Noise Contours for operational noise associated with the Stadium



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

PA Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S2 - PA.mxd Date Saved: 28/01/2025

AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Lmax dB(A)

- < 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- 69 - 72
- 72 - 75
- 75 - 78
- 78 - 81
- > 81

Noise contours have been calculated at 2m above ground.

Siren Noise Contours

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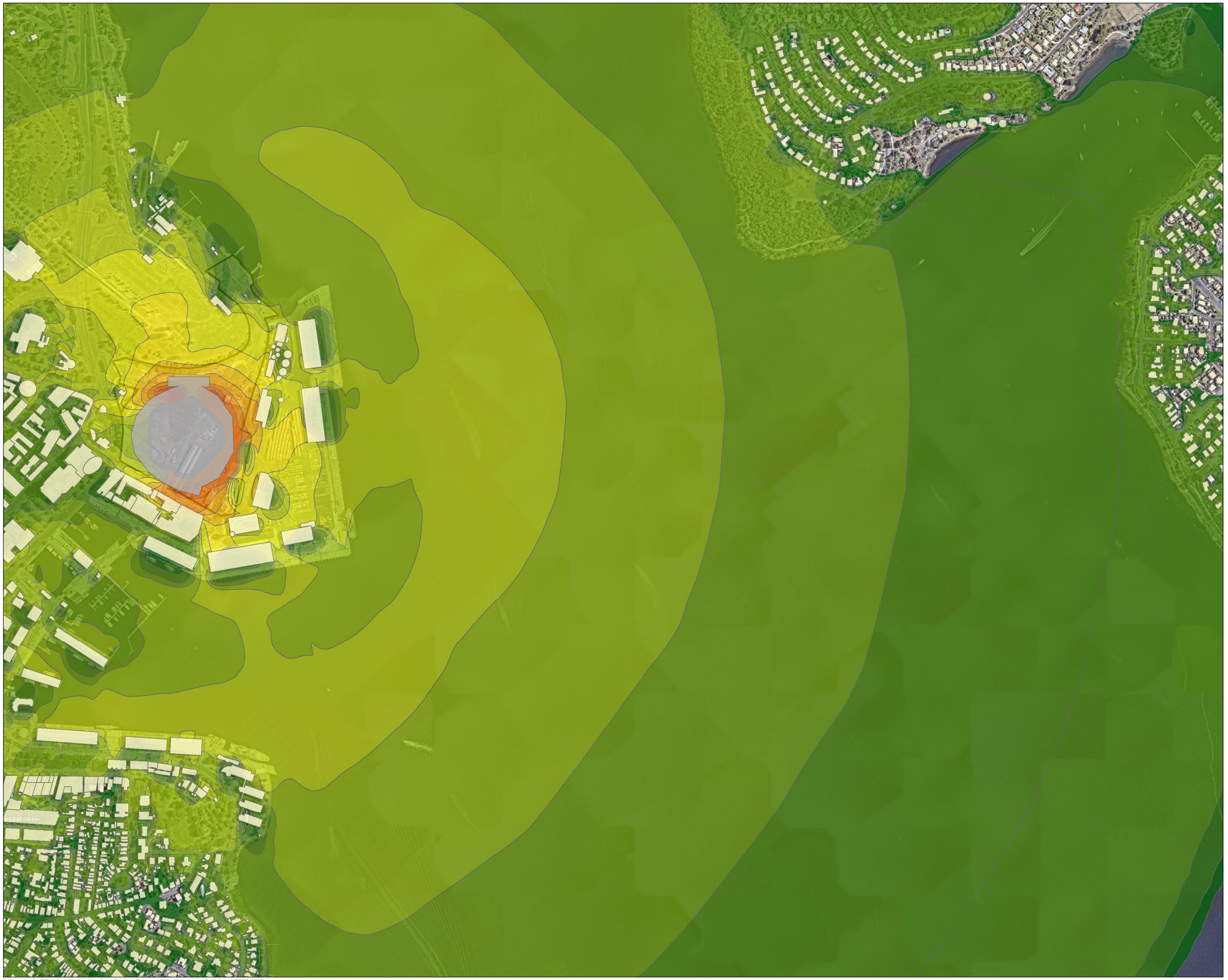


AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

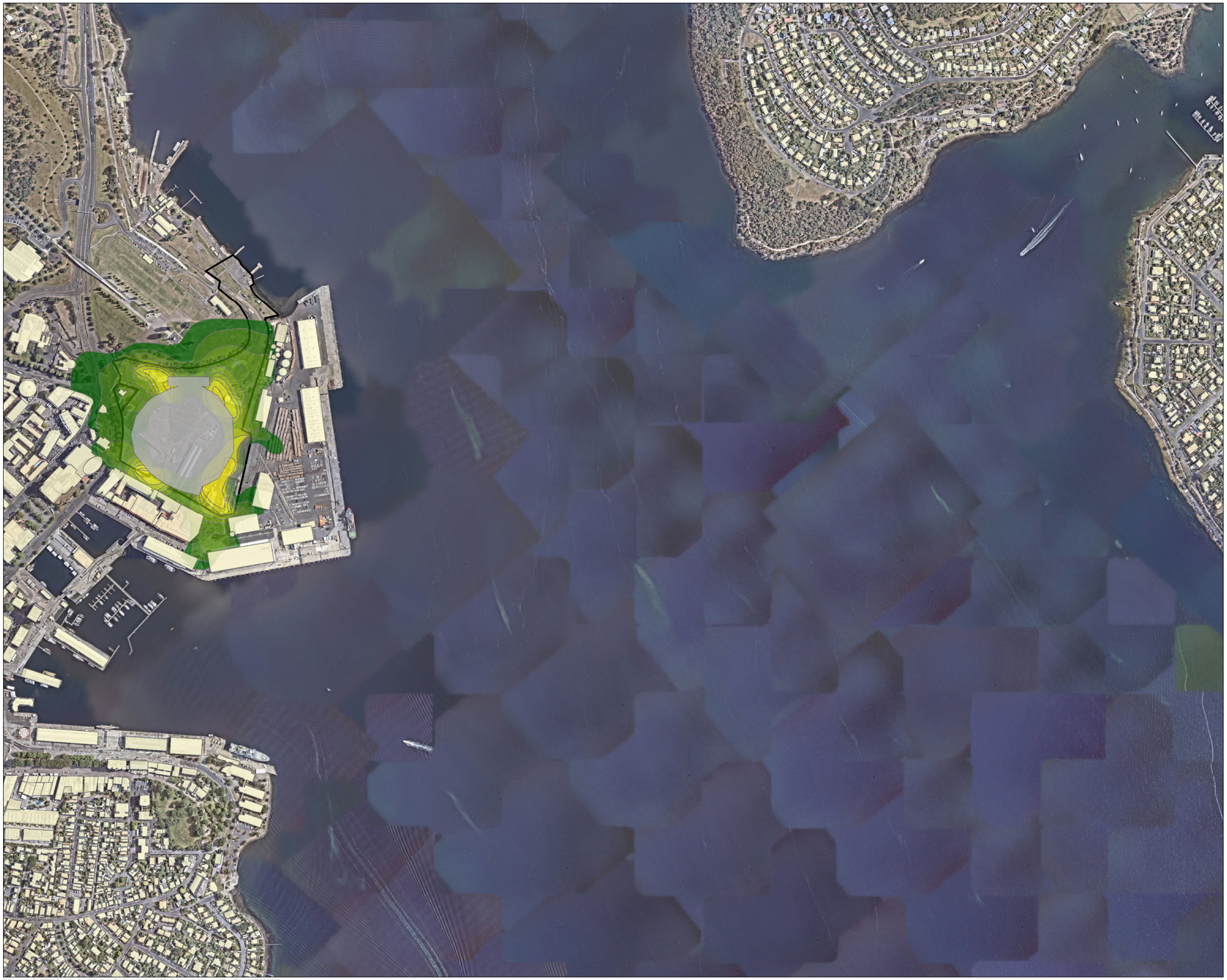
Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Crowds Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S10 - Crowds.mxd Date Saved: 28/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

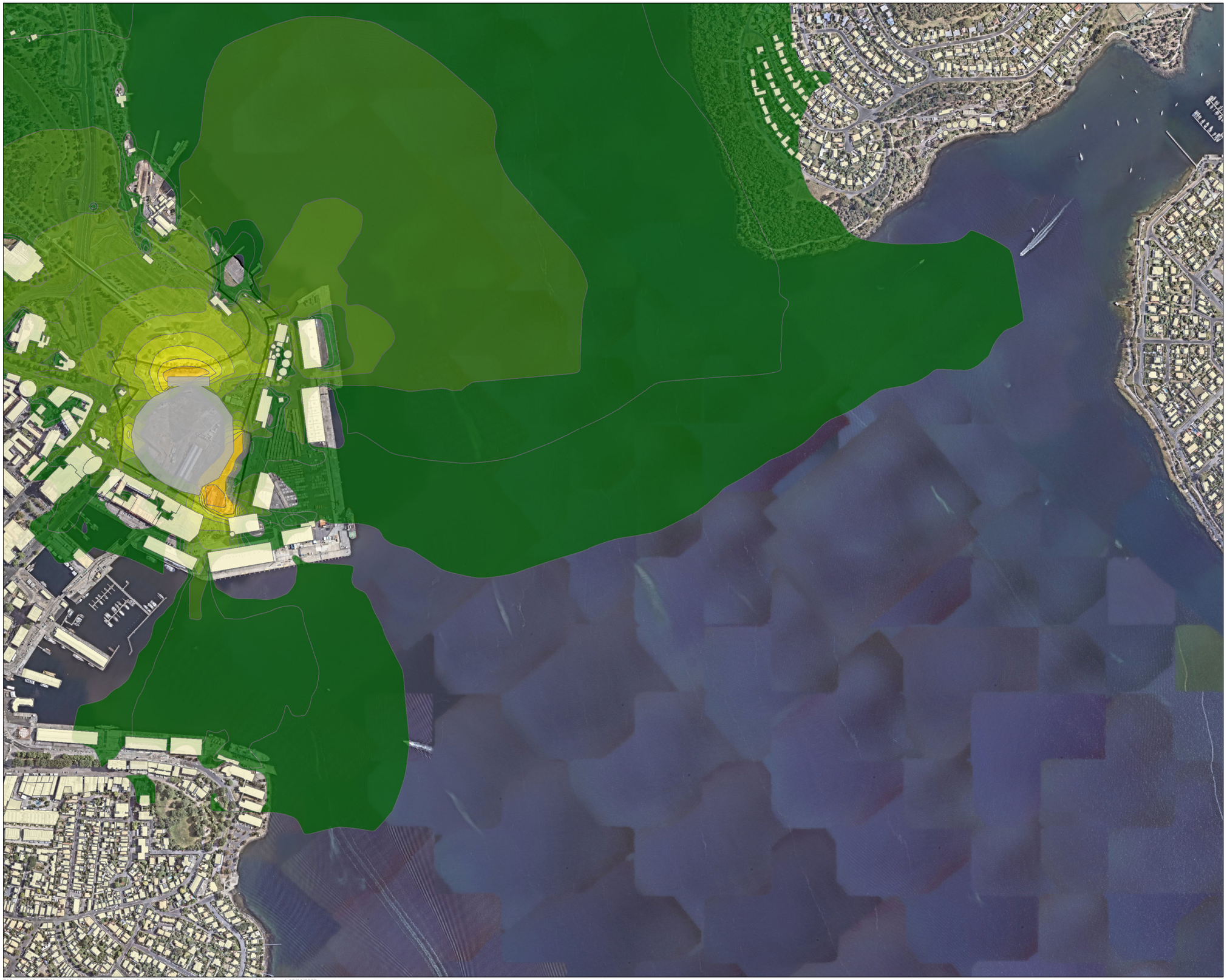
Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Patrons Arriving/Departing Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S5 - Patrons Arriving.mxd Date Saved: 28/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

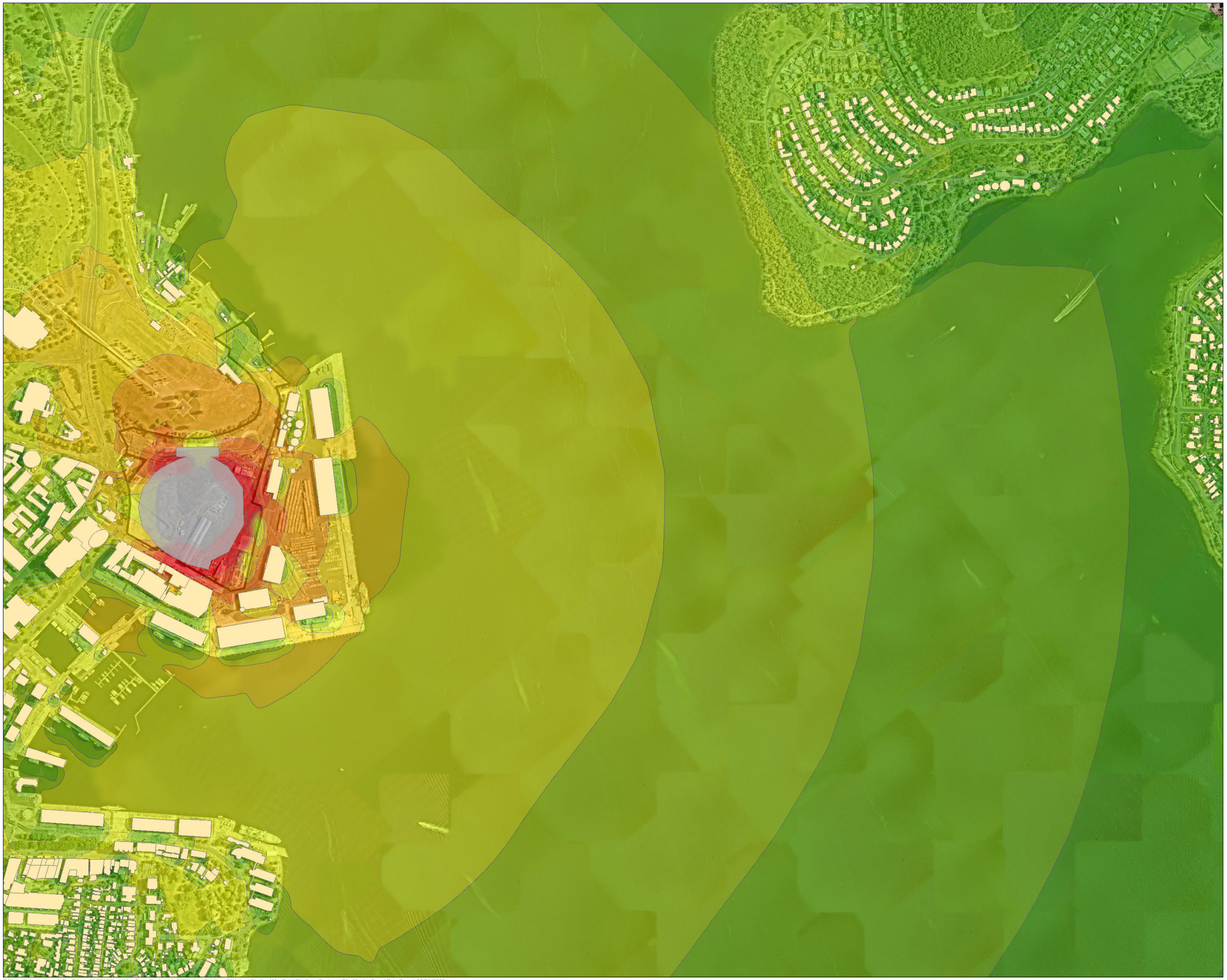
Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 -51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Patrons Outdoor Entertainment Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S6 - Patrons Outdoor Entertainment.mxd Date Saved: 28/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

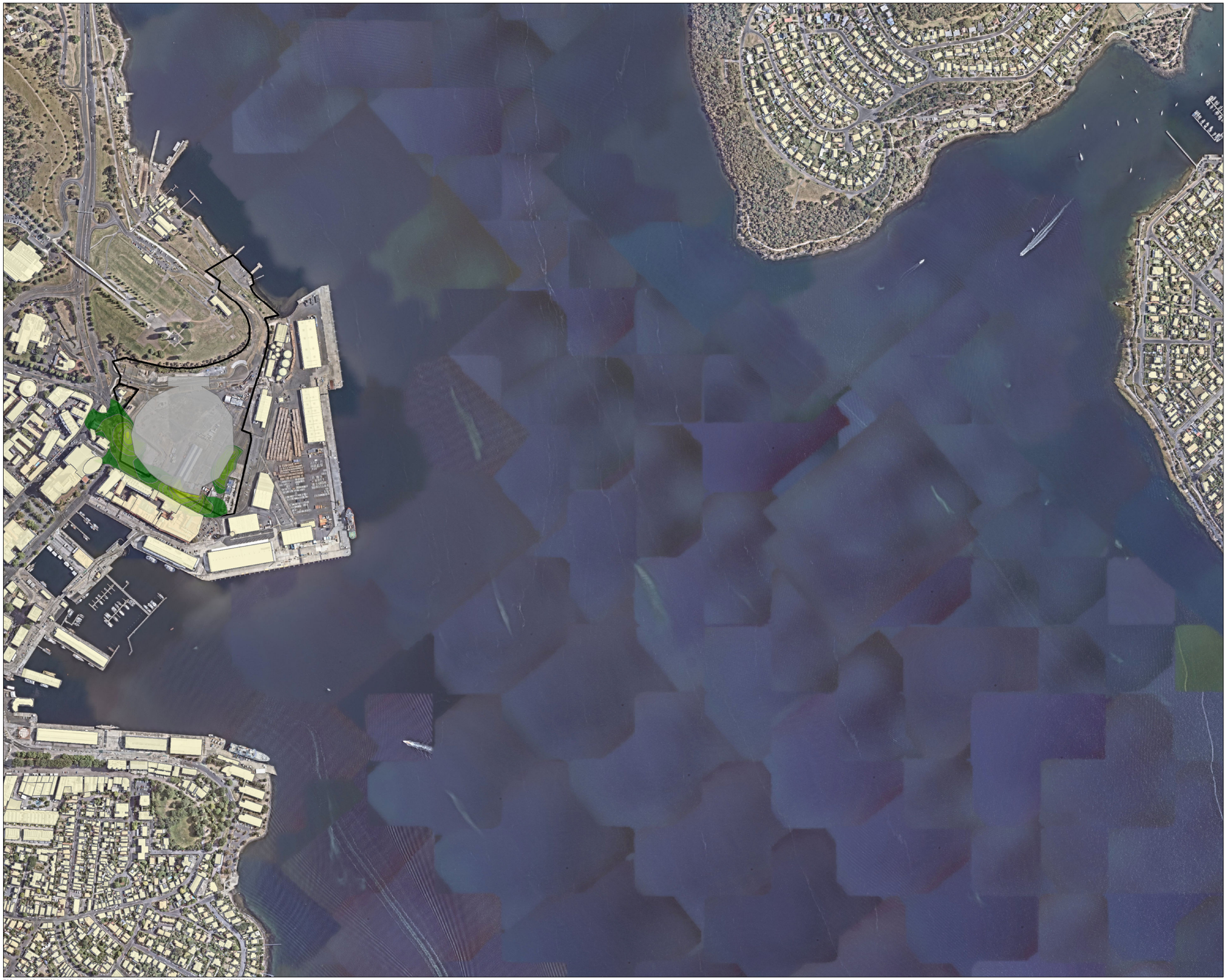
Predicted Noise Levels, Leq dB(A)

- <57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- 69 - 72
- 72 - 75
- 75 - 78
- 78 - 81
- > 81

Noise contours have been calculated at 2m above ground.

Music Concert Noise Contours (Potential worst-case scenario)

C:\Users\johnny.zhang1\OneDrive - AECOM\Work\Mac Point Stadium\4_GIS\Hobart Stadium (2)\Hobart Stadium\MacPoint Stadium_Contours S1 - Music v2.mxd Date Saved: 30/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

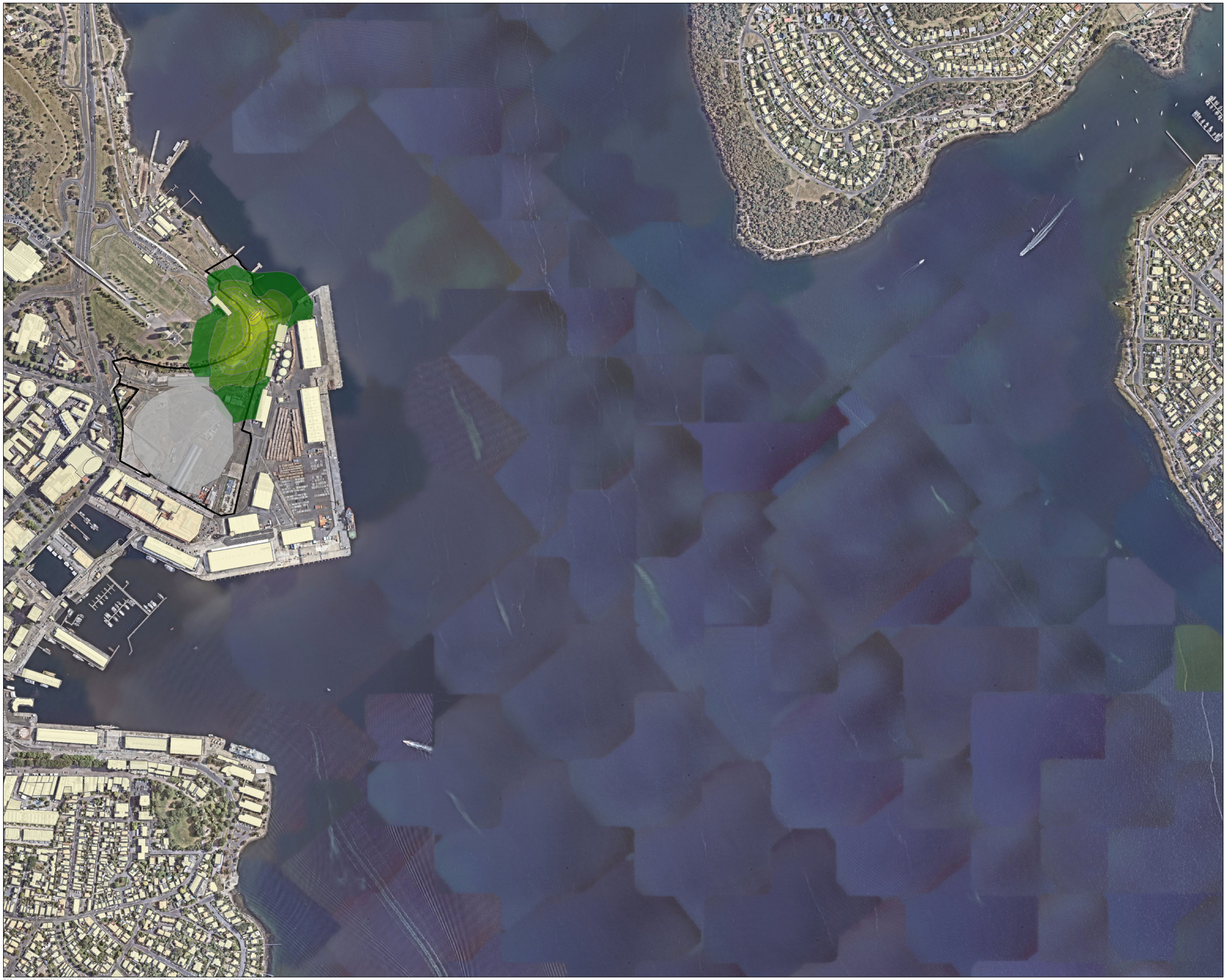
Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Mechanical Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S4 - Mech.mxd Date Saved: 28/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

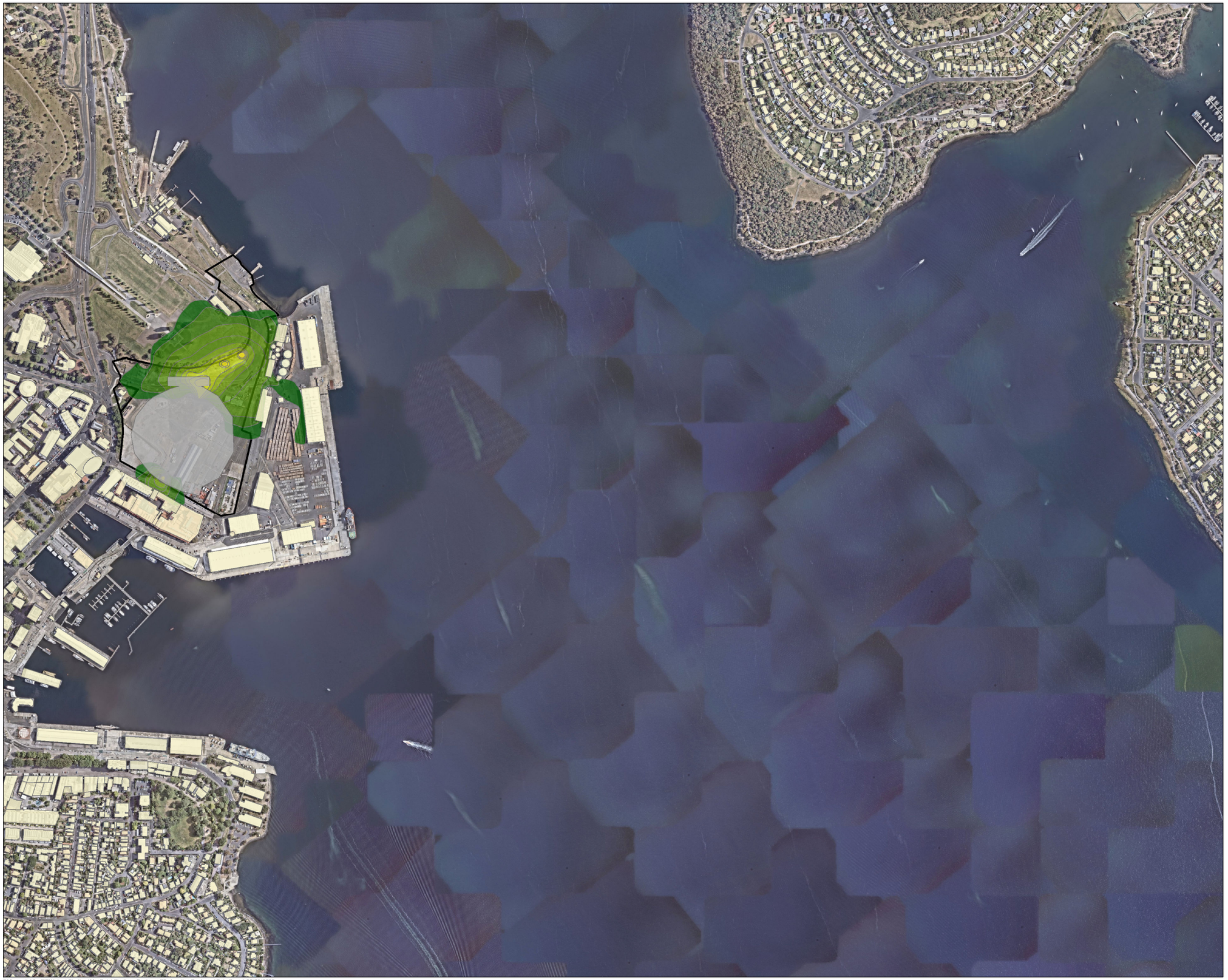
Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Bus Hub Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S7 - Bus Hub.mxd Date Saved: 30/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

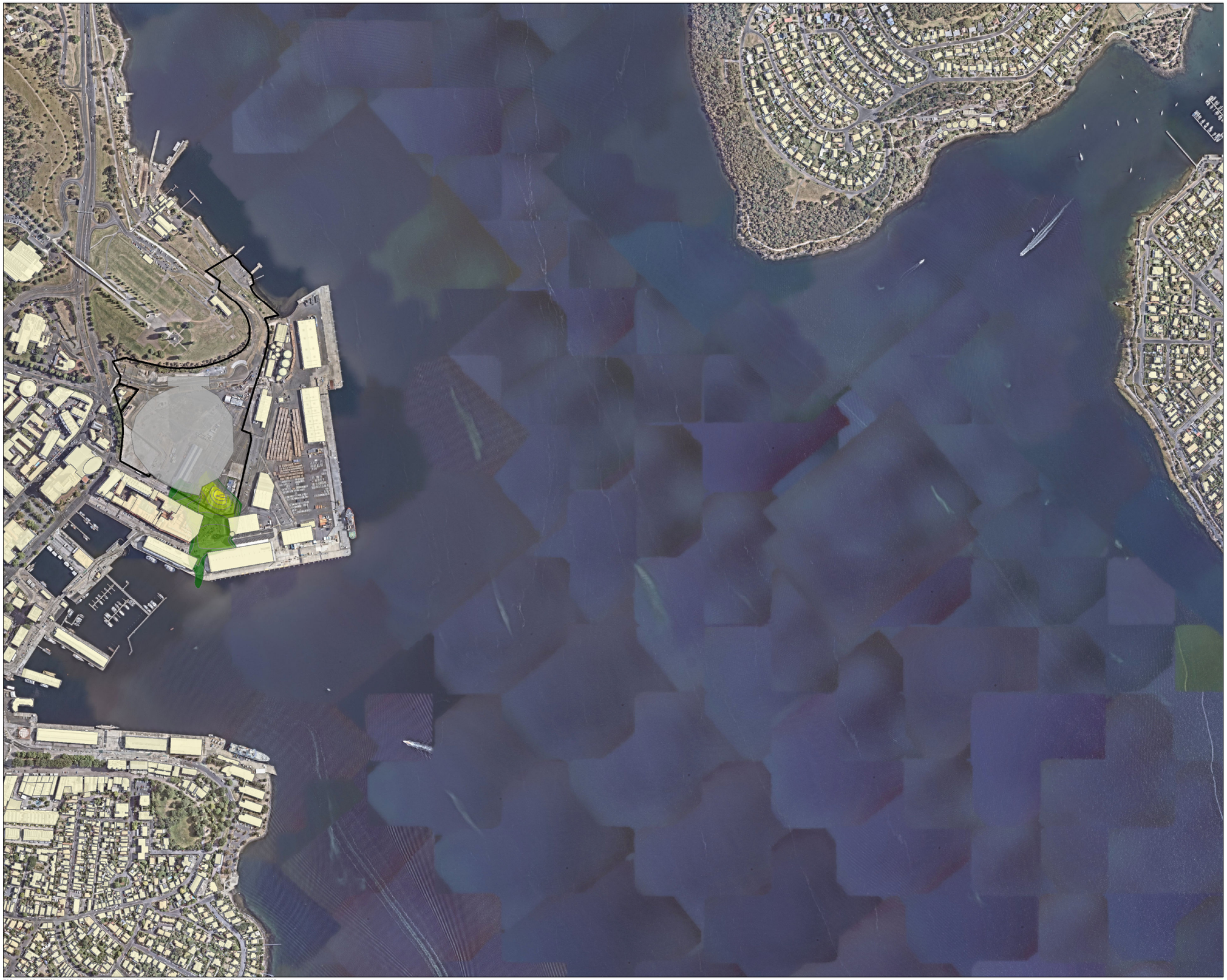
Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

Noise contours have been calculated at 2m above ground.

Loading Dock Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S8 - Loading Dock.mxd Date Saved: 28/01/2025



AECOM

N

Meters
0 50 100

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, Leq dB(A)

- < 30
- 30 - 33
- 33 - 39
- 39 - 42
- 42 - 45
- 45 - 48
- 48 - 51
- 51 - 54
- 54 - 57
- 57 - 60
- 60 - 63
- 63 - 66
- 66 - 69
- > 69

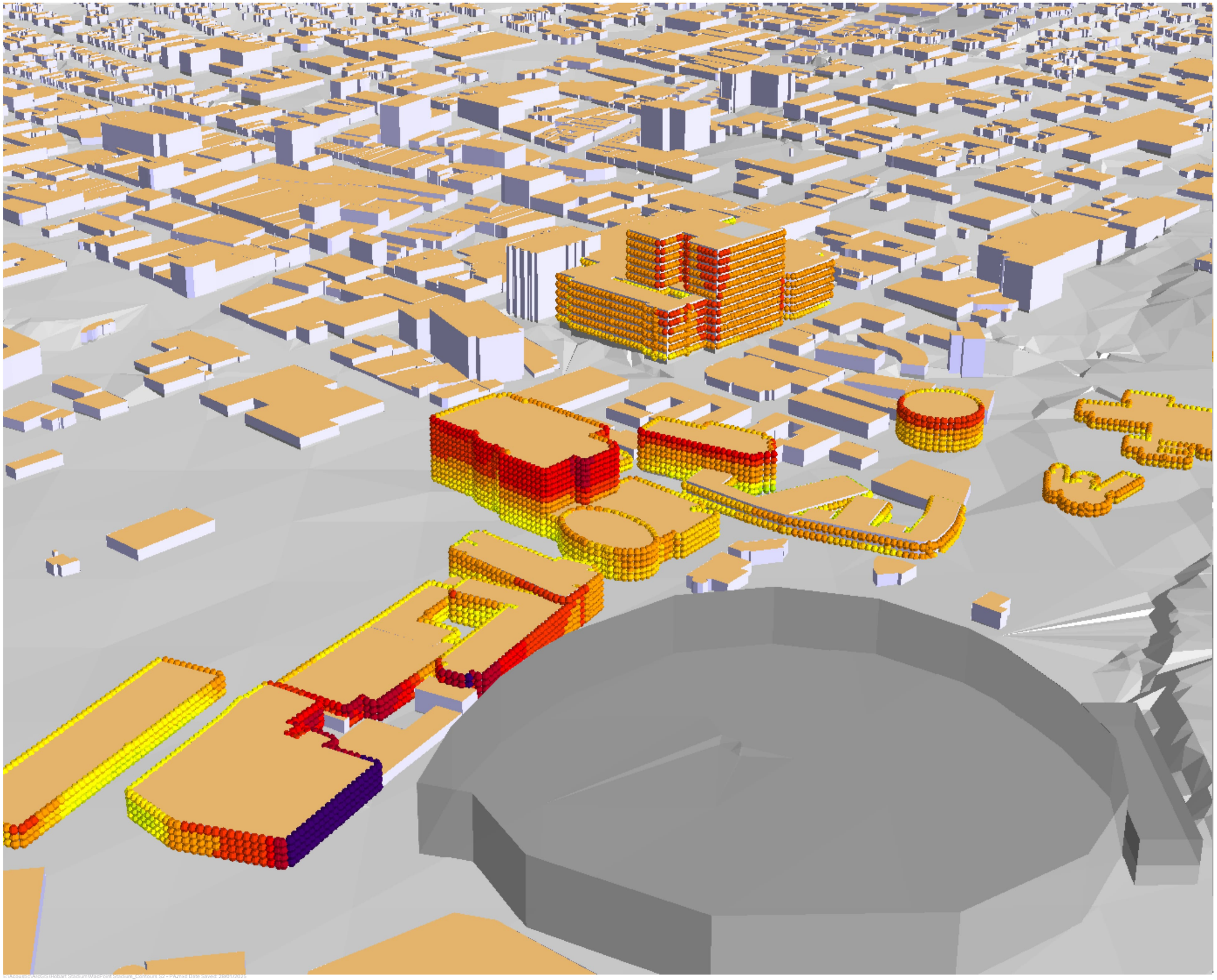
Noise contours have been calculated at 2m above ground.

Temp Gensets Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S9 - Temp Gensets.mxd Date Saved: 30/01/2025

Appendix B

Facade Noise Maps for operational noise associated with the Stadium



E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S2 - PA.mxd Date Saved: 28/01/2025

AECOM

Legend

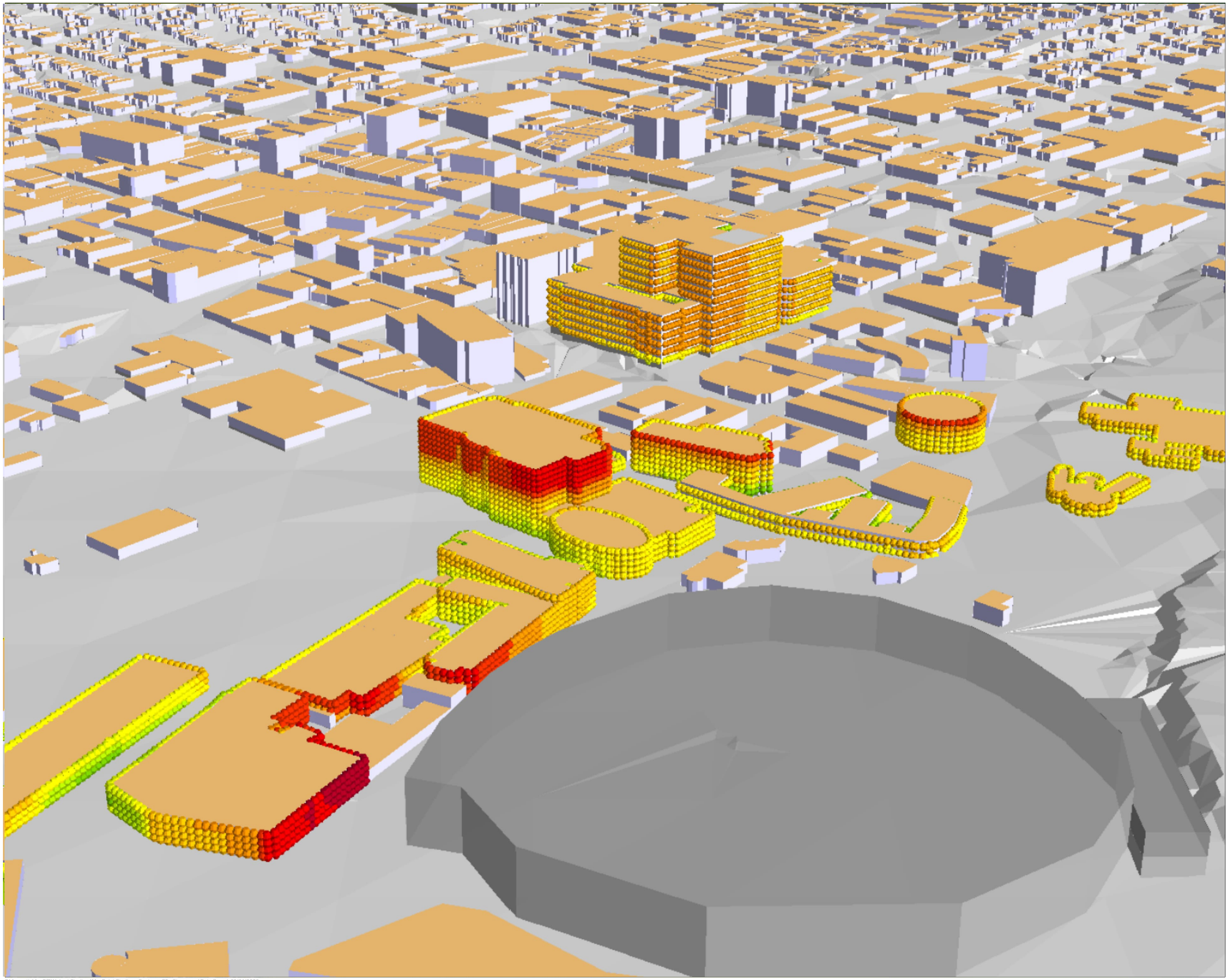
MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
> 66

The facade noise map is looking towards east of the Stadium

PA Noise Contours



E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S3 - Sirens.mxd Date Saved: 28/01/2025

AECOM

Legend

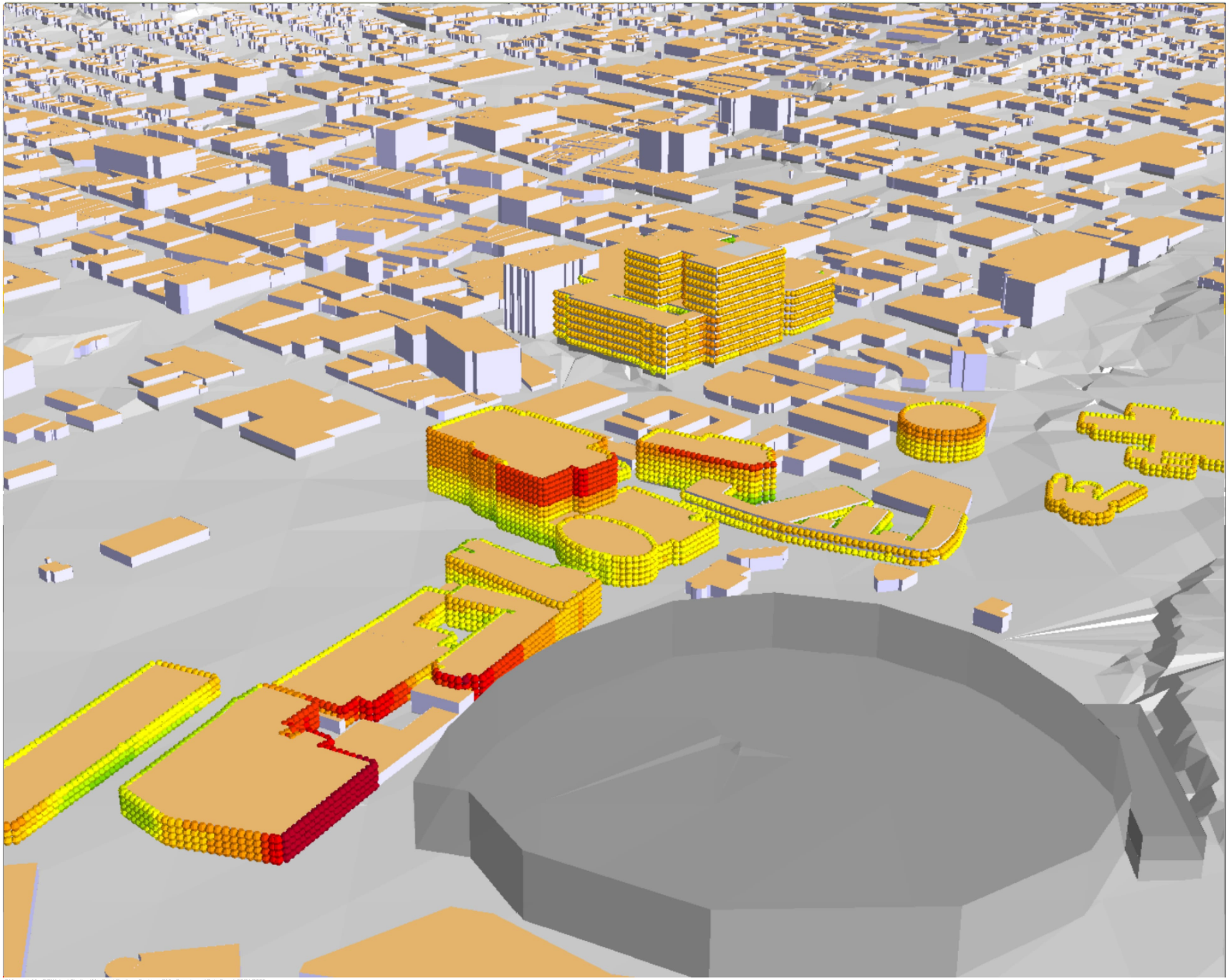
MacPoint Stadium

Predicted Noise Levels, Lmax dB(A)

<= 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
66 - 69
69 - 72
72 - 75
75 - 78
78 - 81
> 81

The facade noise map is looking towards east of the Stadium

Siren Noise Contours



E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S10 - Crowds.mxd Date Saved: 28/01/2025

AECOM

Legend

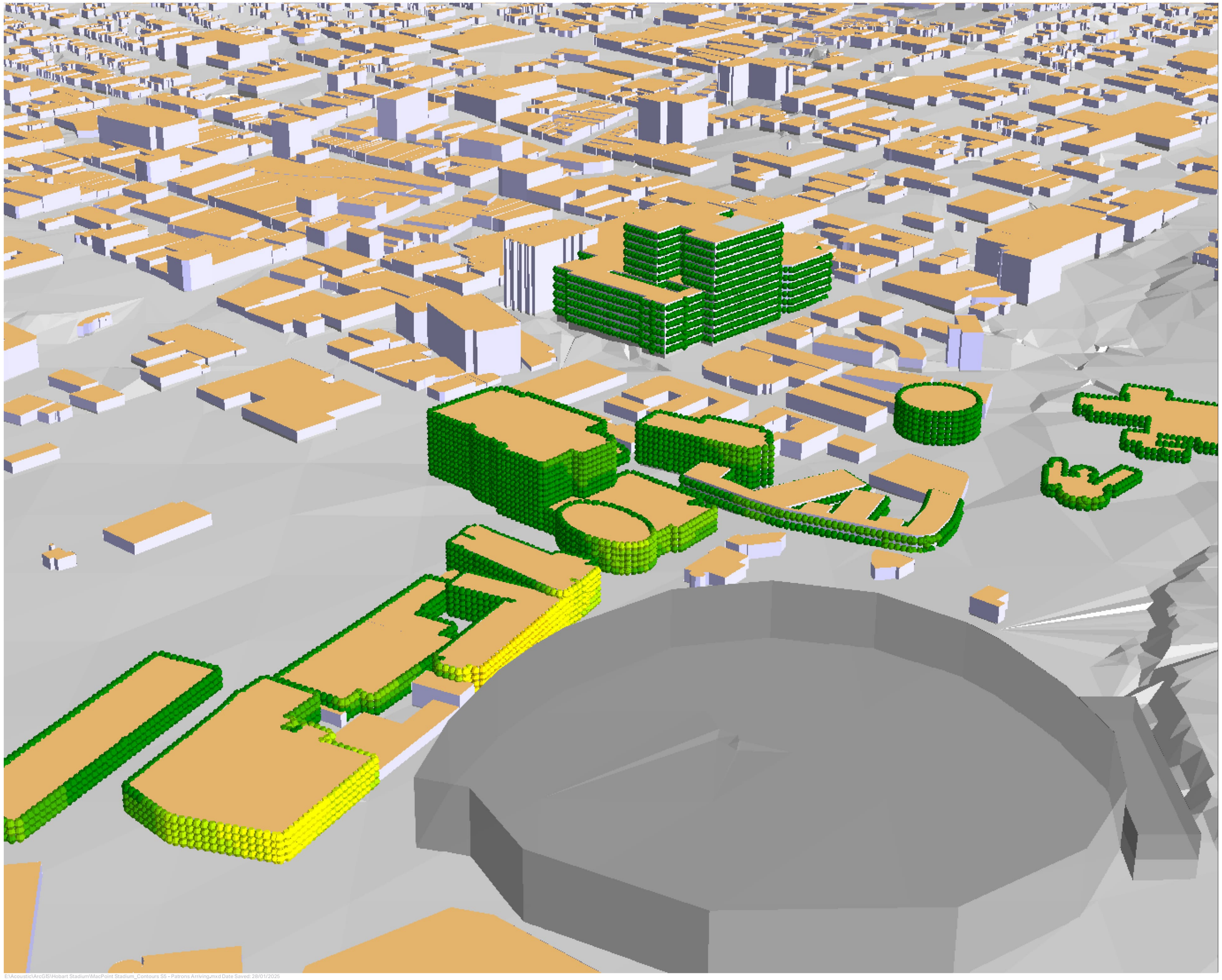
MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
> 66

The facade noise map is looking towards east of the Stadium

Crowds Noise Contours



AECOM

Legend

MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
> 66

The facade noise map is looking towards east of the Stadium

Patrons Arriving/Departing Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S5 - Patrons Arriving.mxd Date Saved: 28/01/2025

AECOM

Legend

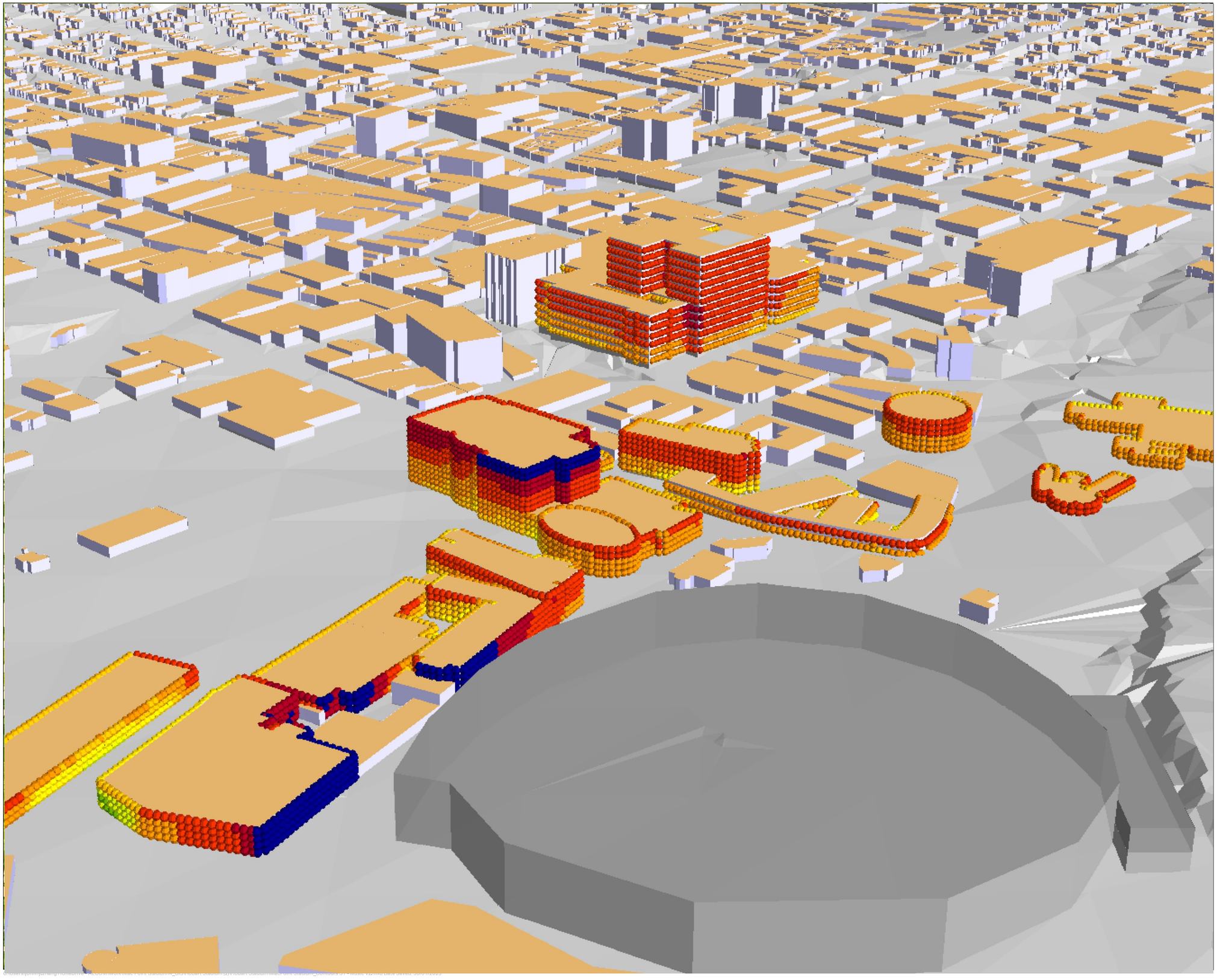
MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<=	30
30 -	33
33 -	36
36 -	39
39 -	42
42 -	45
45 -	48
48 -	51
51 -	54
54 -	57
57 -	60
60 -	63
63 -	66
>	66

The facade noise map is looking towards east of the Stadium

Patrons Outdoor Entertainment Noise Contours



AECOM

Legend

MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 57
57 - 60
60 - 63
63 - 66
66 - 69
69 - 72
72 - 75
75 - 78
> 78

The facade noise map is looking towards east of the Stadium

Music Concert Noise Contours (Potential worst-case scenario)

AECOM

Legend

MacPoint Stadium

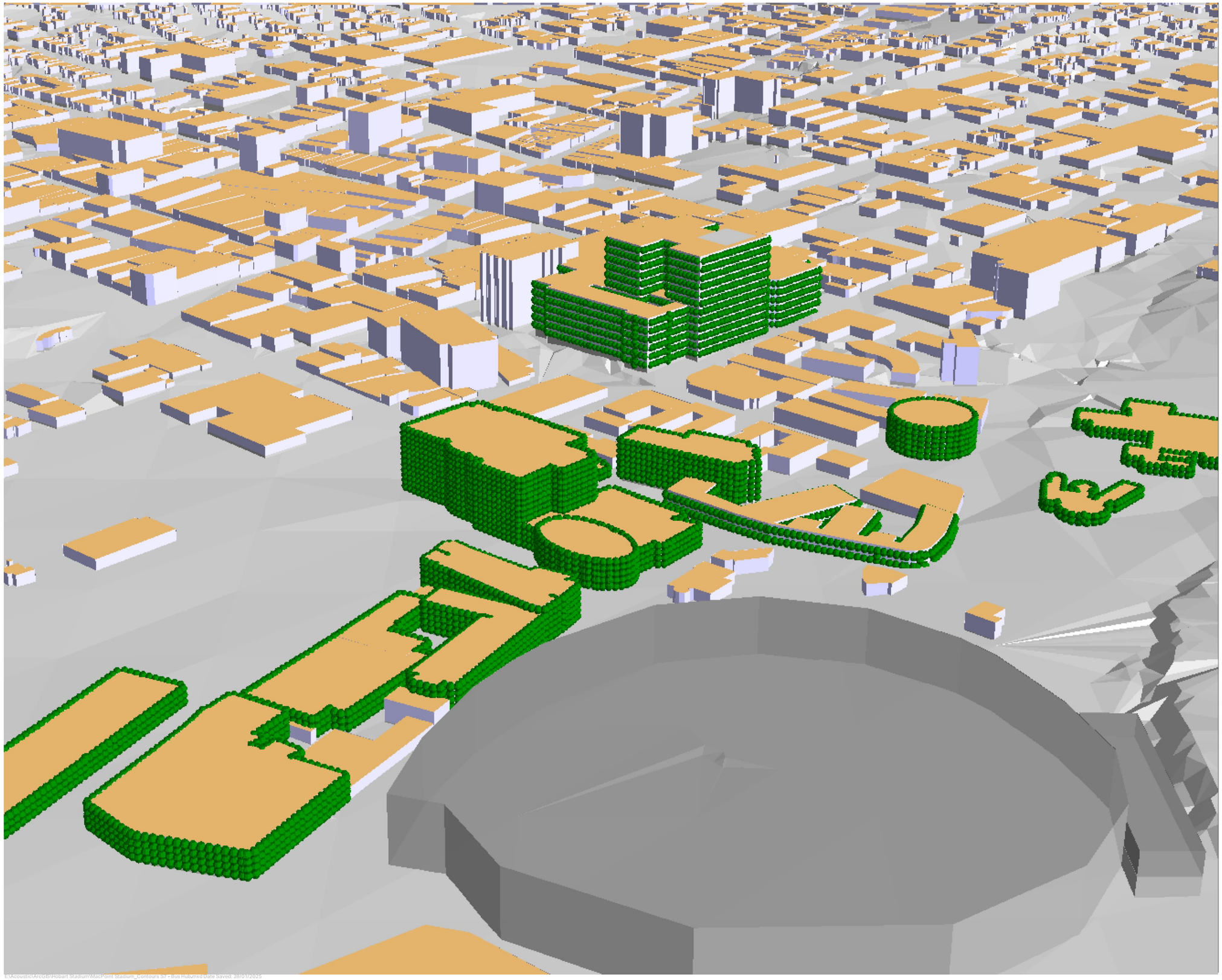
Predicted Noise Levels, Leq dB(A)

<=	30
30 -	33
33 -	36
36 -	39
39 -	42
42 -	45
45 -	48
48 -	51
51 -	54
54 -	57
57 -	60
60 -	63
63 -	66
>	66

The facade noise map is looking towards east of the Stadium

Mechanical Noise Contours

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S4 - Mech.mxd Date Saved: 28/01/2025



AECOM

Legend

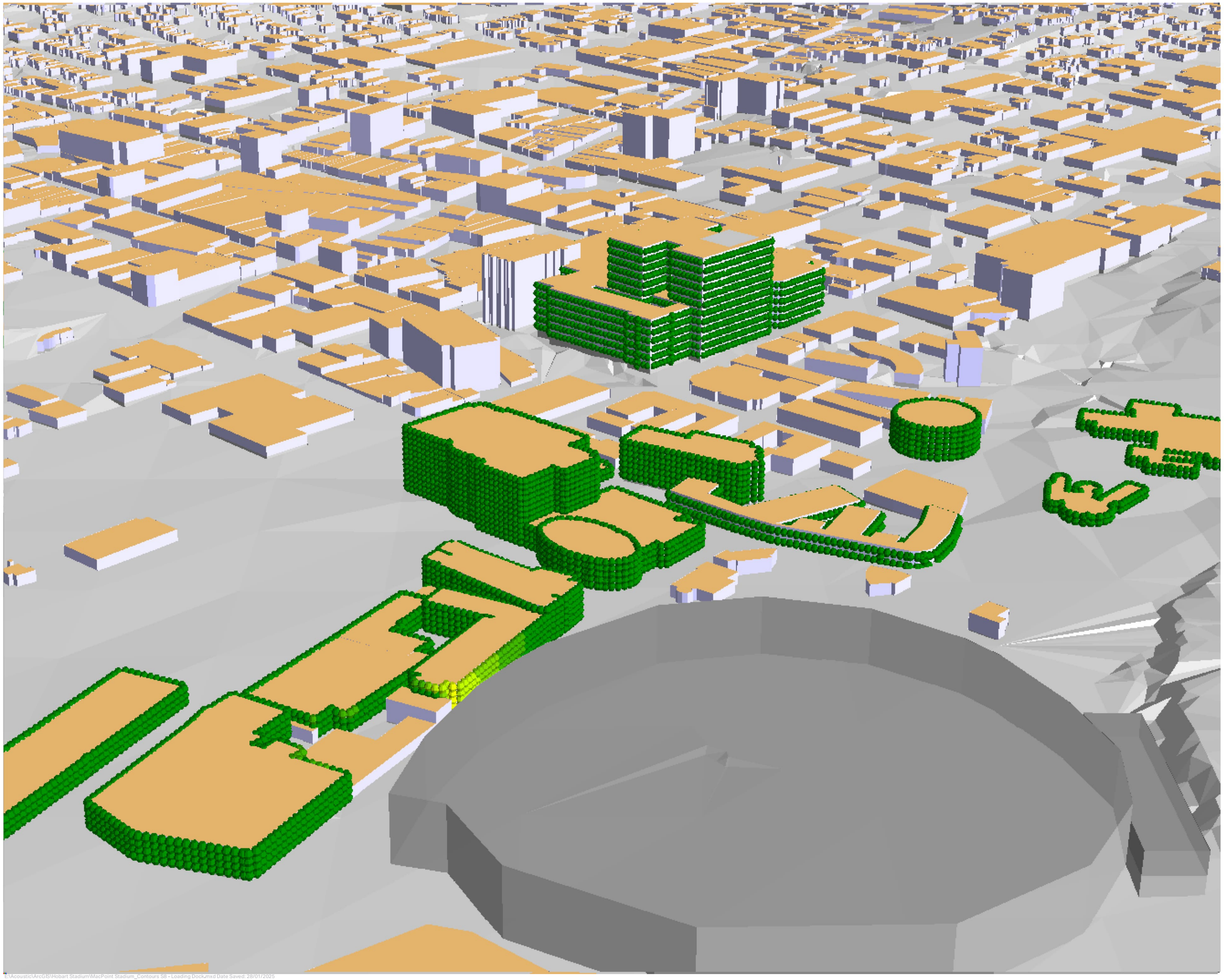
MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
> 66

The facade noise map is looking towards east of the Stadium

Bus Hub Noise Contours



AECOM

Legend

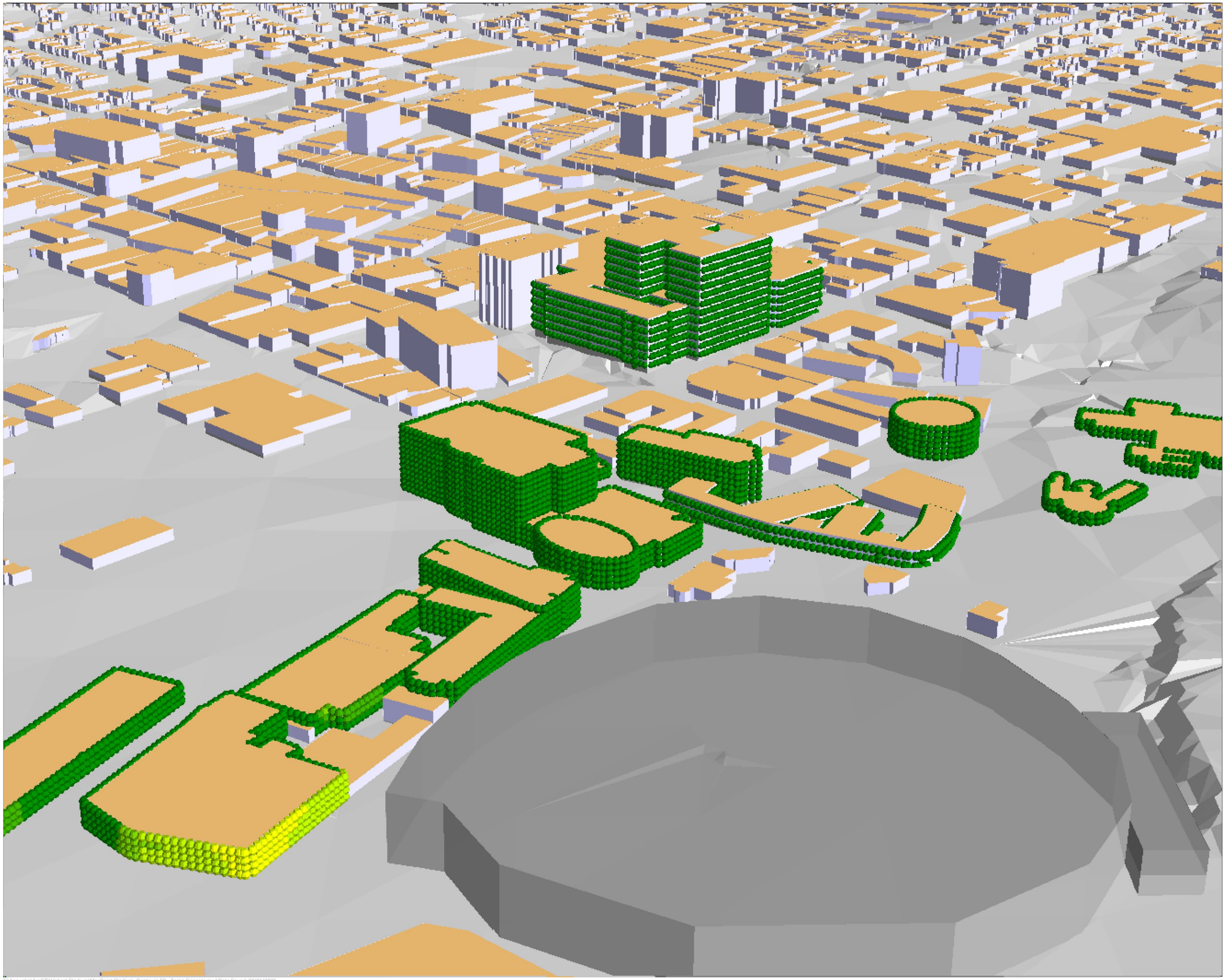
MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
> 66

The facade noise map is looking towards east of the Stadium

Loading Dock Noise Contours



E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S9 - Temp Gensets.mxd Date Saved: 28/01/2025

AECOM

Legend

MacPoint Stadium

Predicted Noise Levels, Leq dB(A)

<= 30
30 - 33
33 - 36
36 - 39
39 - 42
42 - 45
45 - 48
48 - 51
51 - 54
54 - 57
57 - 60
60 - 63
63 - 66
> 66

The facade noise map is looking towards east of the Stadium

Temp Gensets Noise Contours

Appendix C

Noise Contours for construction noise associated with the Stadium

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

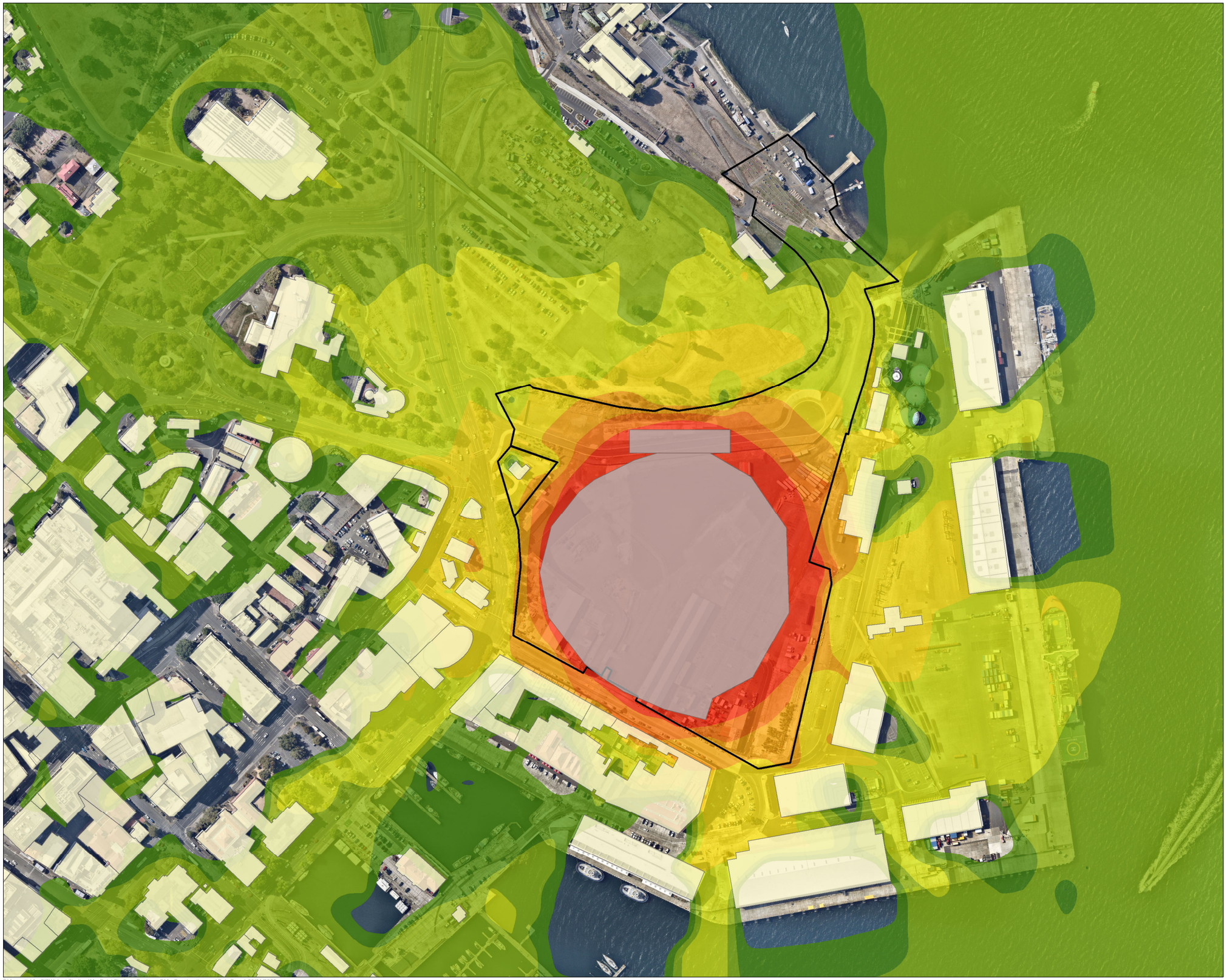
Predicted Noise Levels, L_{eq} dB(A)

- < 45 dB(A)
- 45 to 50 dB(A)
- 50 to 55 dB(A)
- 55 to 60 dB(A)
- 60 to 65 dB(A)
- 65 to 70 dB(A)
- 70 to 75 dB(A)
- > 75 dB(A)

Noise contours have been calculated at 2m above ground.

Construction Noise Contours
Construction Scenario 1 (CS1)

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S11 - Construction.mxd Date Saved: 30/01/2025



E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S11 - Construction.mxd Date Saved: 30/01/2025

AECOM

N

0 50 100 Meters

Legend

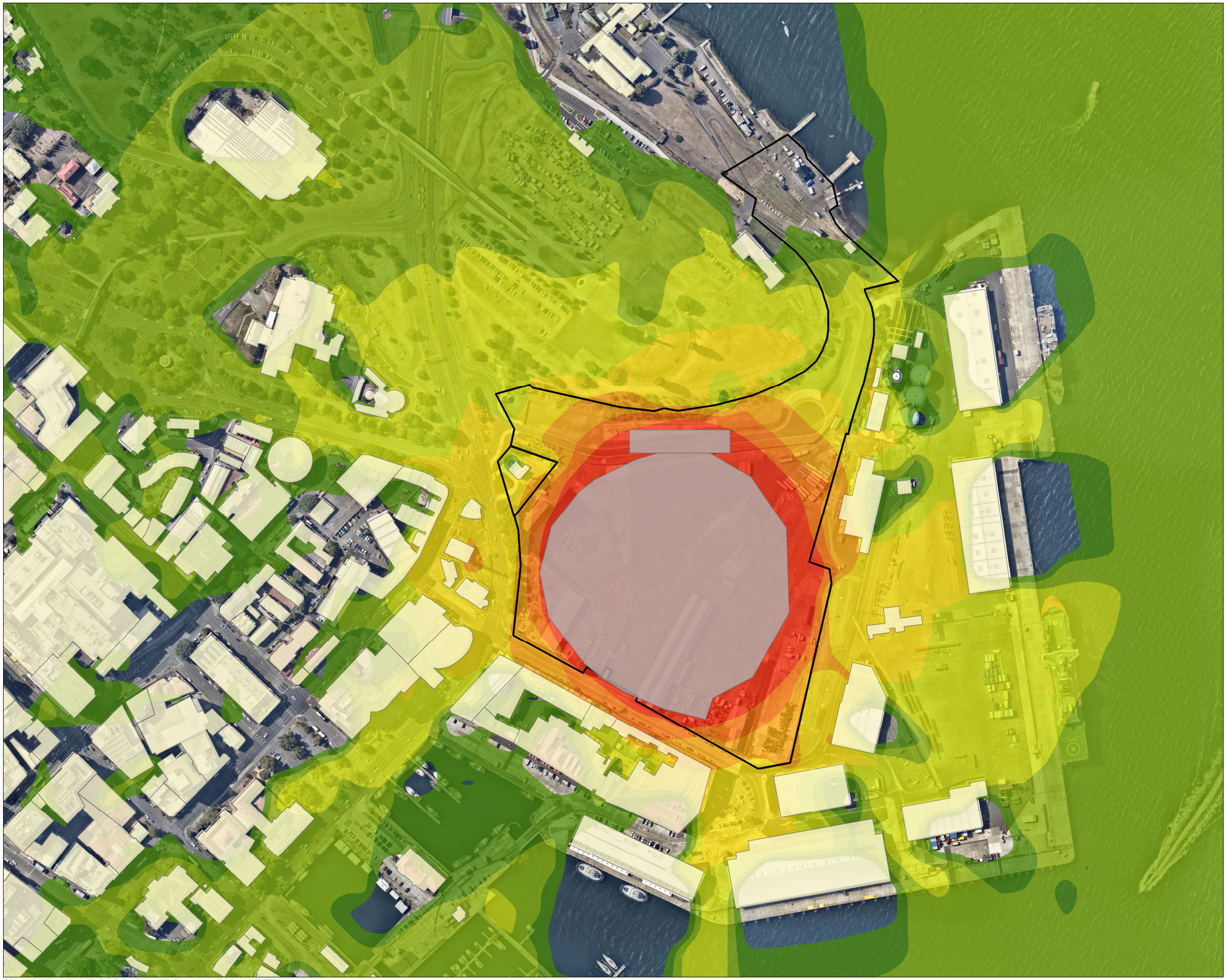
- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, L_{eq} dB(A)

- < 45 dB(A)
- 45 to 50 dB(A)
- 50 to 55 dB(A)
- 55 to 60 dB(A)
- 60 to 65 dB(A)
- 65 to 70 dB(A)
- 70 to 75 dB(A)
- > 75 dB(A)

Noise contours have been calculated at 2m above ground.

Construction Noise Contours
Construction Scenario 2 (CS2)



E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S11 - Construction.mxd Date Saved: 30/01/2025

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, L_{eq} dB(A)

- < 45 dB(A)
- 45 to 50 dB(A)
- 50 to 55 dB(A)
- 55 to 60 dB(A)
- 60 to 65 dB(A)
- 65 to 70 dB(A)
- 70 to 75 dB(A)
- > 75 dB(A)

Noise contours have been calculated at 2m above ground.

Construction Noise Contours
Construction Scenario 3 (CS3)

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, L_{eq} dB(A)

- < 45 dB(A)
- 45 to 50 dB(A)
- 50 to 55 dB(A)
- 55 to 60 dB(A)
- 60 to 65 dB(A)
- 65 to 70 dB(A)
- 70 to 75 dB(A)
- > 75 dB(A)

Noise contours have been calculated at 2m above ground.

Construction Noise Contours
Construction Scenario 4 (CS4)

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S11 - Construction.mxd Date Saved: 30/01/2025

AECOM

N

0 50 100 Meters

Legend

- MacPoint Stadium
- Surrounding Buildings
- Site Boundary

Predicted Noise Levels, L_{eq} dB(A)

- < 45 dB(A)
- 45 to 50 dB(A)
- 50 to 55 dB(A)
- 55 to 60 dB(A)
- 60 to 65 dB(A)
- 65 to 70 dB(A)
- 70 to 75 dB(A)
- > 75 dB(A)

Noise contours have been calculated at 2m above ground.

Construction Noise Contours
Construction Scenario 5 (CS5)

E:\Acoustic\ArcGIS\Hobart Stadium\MacPoint Stadium_Contours S11 - Construction.mxd Date Saved: 30/01/2025