



Royal Hobart Hospital

Helicopter Noise Monitoring at Glebe

Prepared for
Department of Health

Client representative
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Rev 0



Table of Contents

1.	Introduction	2
1.1	Background	2
2.	Noise Monitoring	3
2.1	Noise Measurement Result Indicators	3
2.2	Noise Logging Arrangements	4
2.3	Ambient Noise Results	4
2.4	Helicopter Noise Results	6
2.5	Comparison of Results with Noise Assessment Criteria	8
3.	Conclusions	9

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Executive Summary

This report documents noise monitoring undertaken in the Hobart suburb of Glebe, to identify the noise levels from emergency air ambulance helicopter flights travelling to and from the Royal Hobart Hospital (RHH) between the 8th and 18th of January 2024.

Noise impacts from helicopter operations were assessed in the Acoustic Design Report, prepared by AECOM in December 2017, prior to the implementation of Stage1 of the RHH Redevelopment Plan, which included the construction of the helipad. This report included an assessment of noise levels at locations close to the hospital, but did not include locations further afield, such as the nearest residential suburb of Glebe.

The Department of Health has commissioned this report in order to better understand the level of noise in Glebe, from helicopters arriving at and departing from the RHH.

The helicopter air ambulance service is operated by *Roto-Lift Aviation* which is based at the Hobart Airport. Helicopters typically approach the RHH helipad, either from the southeast or from the northwest, along Campbell Street. Outgoing helicopters typically continue away from the hospital on the same heading, climbing quickly after take-off to reduce noise impact.

Unattended noise monitoring was undertaken opposite 1 Aberdeen Street, and at the northern end of Allambee Crescent. 13 flights to the hospital occurred during the monitoring period. Seven of the flights occurred during periods of high background noise and were not suitable for analysis.

Helicopter noise levels of $L_{Aeq,5min}$ (Hel) results ranged between 49.2 and 64.9 dB(A) and L_{Amax} (Hel) results ranged from 60.8 to 82.0 dB(A).

While these noise levels are sufficiently high that helicopter noise will be distinctively audible under most conditions, the levels are low enough to comply with the Victorian EPA noise guidelines for helicopter operations. (There are no specific Tasmanian guidelines for assessing helicopter noise.)

As expected, the noise levels are significantly lower than those predicted in the AECOM Acoustic Design Report for the RHH helipad, as a result of the greater distance from Glebe to helicopter flight path.

1. Introduction

1.1 Background

This report documents noise monitoring undertaken in the Hobart suburb of Glebe, to identify the noise levels from emergency air ambulance helicopter flights travelling to and from the Royal Hobart Hospital (RHH) between the 8th and 18th of January 2024.

Noise impacts from helicopter operations were assessed in the Acoustic Design Report, prepared by AECOM in December 2017, prior to the implementation of Stage 1 of the RHH Redevelopment Plan, which included the construction of the helipad. This report included an assessment of noise levels inside the hospital itself and at a number of nearby noise sensitive receivers including the Hotel Collins, the Theatre Royal and various residential apartments in an area bounded by Campbell Street, Collins Street, Liverpool Street and Brooker Avenue. The results presented did not include locations further afield, such as the nearest residential suburb of Glebe.

The Department of Health has commissioned this report in order to better understand the level of noise in Glebe, from helicopters arriving at and departing from the RHH.

The helicopter air ambulance service is operated by *Roto-Lift Aviation* which is based at the Hobart Airport. Helicopters typically approach the RHH helipad, either from the southeast or from the northwest, travelling nominally along Campbell Street. Outgoing helicopters typically continue away from the hospital on the same heading, climbing quickly after take-off to reduce noise impact. Helicopters departing to the northwest, do not turn east to head back to the airport, until they are well past Glebe, and do not directly overfly the suburb.

The typical helicopter flight path and the two noise monitoring locations used for this report are shown in Figure 1 below.



Figure 1 – Left: Typical helicopter flight path, including Glebe (yellow boundary), Right: Aerial Imagery of Glebe (yellow boundary) and surrounding area, including noise monitoring locations (red) and the Royal Hobart Hospital Helipad. Base map source: theList

2. Noise Monitoring

2.1 Noise Measurement Result Indicators

A variety of different calculated results are used to quantify different aspects of noise, based on noise monitoring data measured over a period of time.

General Noise Measures

Noise measures for general environmental noise assessment, most commonly relating to industrial, commercial and traffic noise include:

- The L_{eq} , which is the “equivalent continuous noise level” and can be thought of as the average noise level over a specific period of time¹,
- The L_{max} or maximum noise level recorded in a specific period of time, and

¹ Noise levels measured in decibels are averaged logarithmically.

- The L_{90} or “the background noise level”, which is defined as the noise level that is exceeded by 90% of the noise levels measured in a specific time period. In locations where there are many variable noise sources, the L_{90} gives an indication of the level of more constant noise sources within the mix.

Helicopter Noise Measures

The Tasmanian DEPHA Noise Measurement Procedures Manual, 2008 includes specific procedures for measuring noise related to helicopter operations, based on *Australian Standard AS 2363 Acoustics – Assessments of noise from helicopter landing sites*. The Manual specifies two noise measures:

- The $L_{Aeq,T}$ (Hel), which is the average noise level measured while the helicopter noise is within 10dB(A) of the maximum helicopter noise level. The time period (T) is the time that the helicopter operation is audible and within this noise level range, and
- The L_{Amax} (Hel), which is the average of the maximum noise levels recorded for each mode of helicopter operation (i.e., take-off, flight and landing).

Other guidance documents use L_{eq} where the noise from the helicopter is averaged over different time periods such as 12 hours or 24 hours or the entire daily operating period of a helipad (i.e. the time from the first flight to the last flight of the day).

2.2 Noise Logging Arrangements

Two unattended noise loggers were used, to continuously monitor ambient noise between the 8th and 18th of January 2024. During this time 13 helicopter flights occurred. The two locations were:

- Location 1: Opposite 1 Aberdeen Street, and
- Location 2: Northern end of Allambee Crescent

These locations are shown in Figure 1 above.

Location 1 is at the southern end of Glebe and provides a relatively unobstructed line of site to the helicopter's flight path to the south and west, including the helipad itself. Aberdeen Street is exposed to some general traffic noise from wider Hobart but is the more affected of the two locations, by local traffic noise and residential activities, resulting in a higher average noise level during the daytime and evening, and lower night-time noise levels.

Location 2 is at the northern end of the suburb with an unobstructed view of the helicopter flight path to the west, and northwest, where the helicopters turn over the northern end of the Queen's Domain to head back to the airport. Allambee Crescent is a no through road, resulting in less local traffic noise, however, it is closer to Brooker Avenue and as a result has a higher background noise but a lower average noise level than Location 1.

A Ngara and a Rion noise logger were used at Locations 1 and 2 respectively, both noise loggers were setup and operated in accordance with the *Tasmanian DEPHA Noise Measurements Procedures Manual, 2008*. Audio sound recording was enabled on the Ngara noise logger at Location 1. By listening to the recording, the times when helicopter noise was audible could be confirmed. (The Rion noise logger did not have this capability.)

2.3 Ambient Noise Results

Weather during the noise monitoring period was generally fine, with temperatures between 12 and 31 degrees Celsius. There were several periods of strong wind between 20 and 30km/h, and one period of high rainfall on the 17th of January.

Noise levels recorded at the two locations are graphed for the entire monitoring period in Figure 2, below, with aggregated results for the monitoring period presented in Table 1 below. These results exclude results affected by inclement weather conditions, which are shaded blue in Figure 2.

Ambient noise at Glebe is mostly dominated by local and general traffic noise from Brooker Avenue. Other noise includes traffic noise from the Tasman Highway as well as noise from nearby sporting venues (the Domain Tennis Centre and

T.C.A. Ground), environmental noise (i.e. birds, insects and wind blowing through trees) and noise from general residential activities. Analysis of the audio recordings at Location 1, determined that the peaks above 90dB(A) were all associated with rain or strong winds blowing across the microphone. The peak on the 15th of January was associated with council workers working close to the noise logger.

The results follow the typical daily trend for urban areas, where noise levels rise from low levels in the early morning, remain high during the day then slowly drop again over the course of the evening.

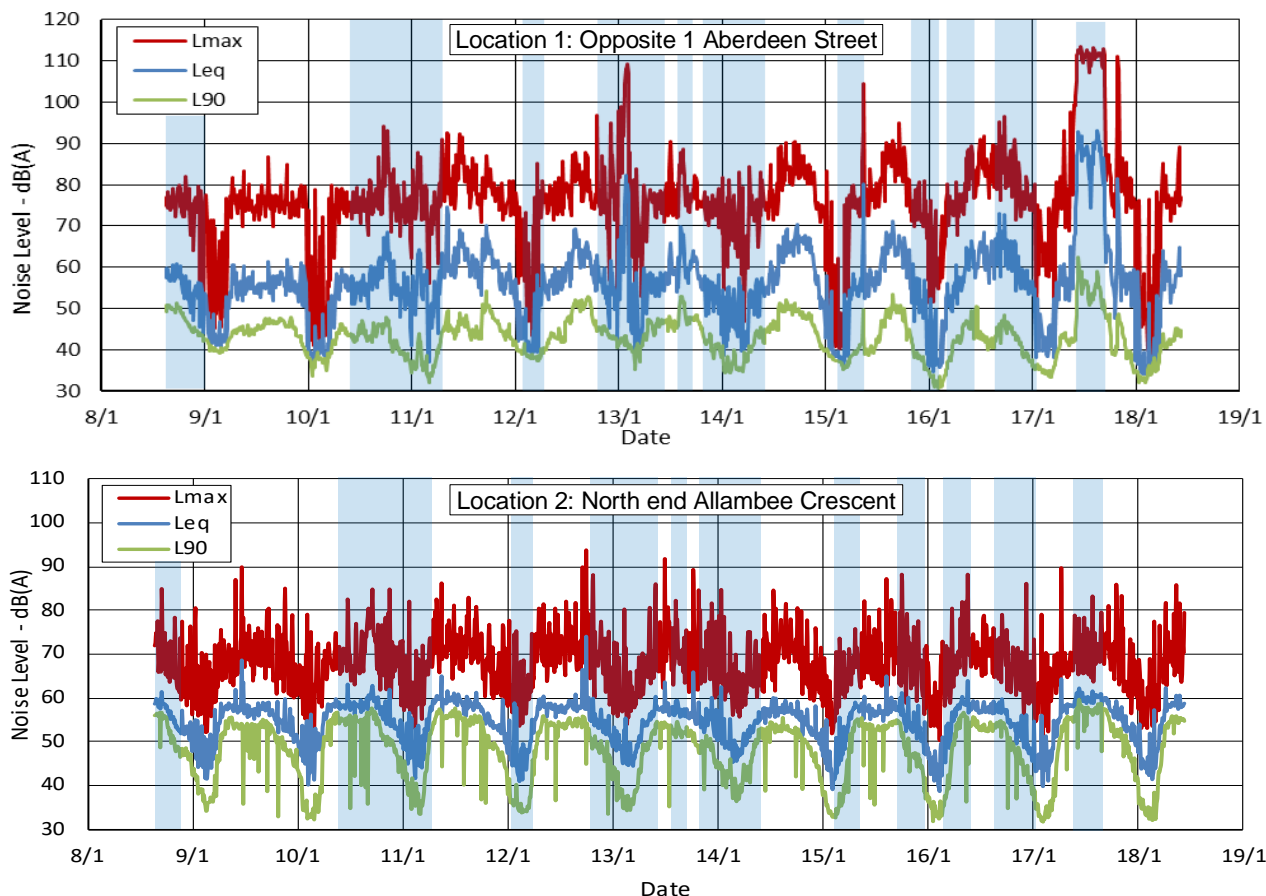


Figure 2 – Noise monitoring results for Location 1 (Top) and Location 2 (Bottom), periods of inclement weather shaded blue.

Table 1 - Aggregated noise results, excluding periods of inclement weather.

Time Period	Location 1: Opposite 1 Aberdeen St			Location 2: North End Allambee Cres		
	L _{eq} – dB(A)	L ₉₀ – dB(A)	L _{max} – dB(A)	L _{eq} – dB(A)	L ₉₀ – dB(A)	L _{max} – dB(A)
Day	62.1	49.4	97.7	58.6	54.6	93.9
Evening	60.1	45.8	96.7	53.1	49.7	89.8
Night	52.4	40.7	85.2	52.5	47.4	86.2

Average daytime and evening noise levels (L_{eq}) at the Aberdeen Street site were between 5 and 7 dB(A) higher than at Allambee Crescent, although night time levels are quite similar. This is most likely due to higher levels of local traffic at Aberdeen Street, and a greater exposure to commercial activities in the CBD. The higher background noise level (L₉₀) at Allambee Crescent, is most likely due to it being closer to Brooker Avenue, which is a relatively constant source of traffic noise.

2.4 Helicopter Noise Results

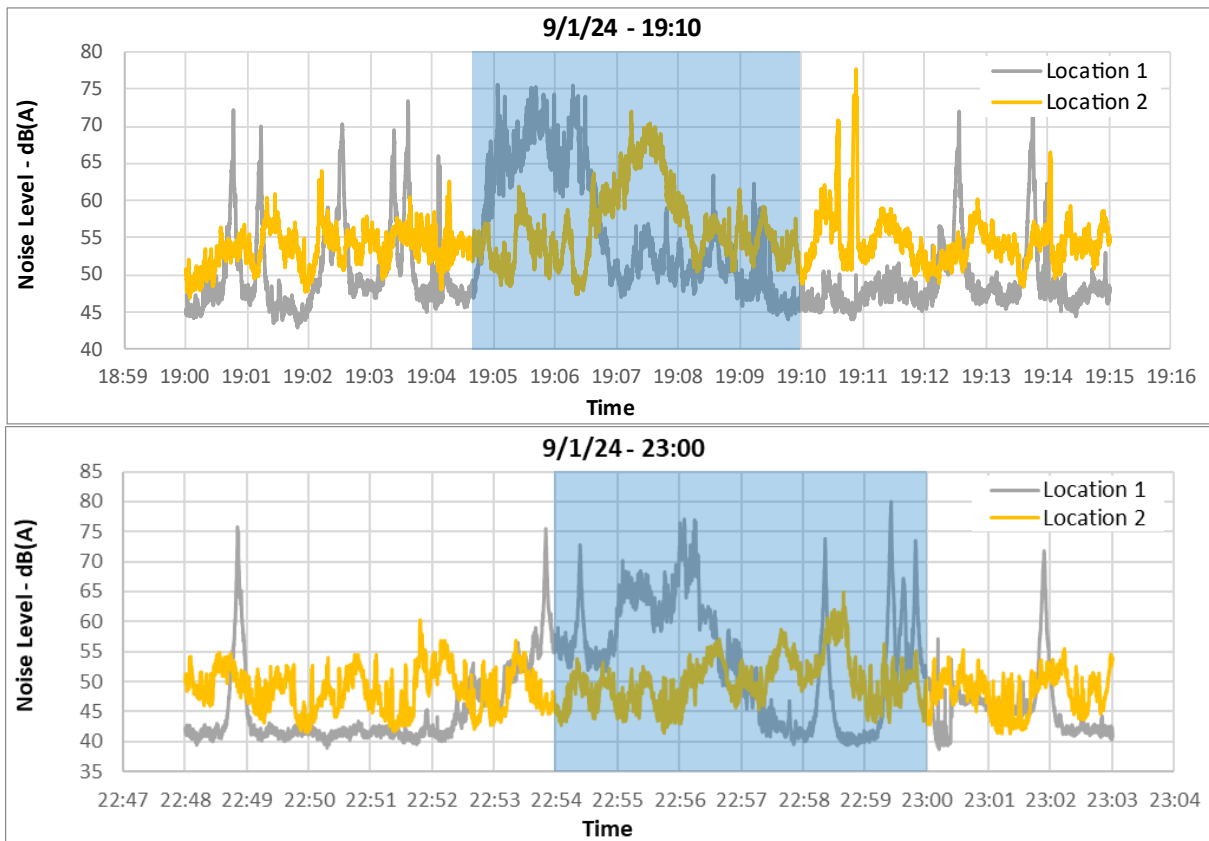
Rotor-Lift, advised that between the 8th and 18th of January, 13 helicopter flights to the RHH occurred at the following times and dates:

- 9/01/2024 - 19:10
- 9/01/2024 - 23:00
- 10/01/2024 - 15:15
- 10/01/2024 - 18:50
- 11/01/2024 - 3:30
- 12/01/2024 - 14:28
- 12/01/2024 - 18:23
- 13/01/2024 - 14:52
- 15/01/2024 - 19:30
- 16/01/2024 - 9:40
- 16/01/2024 - 20:34
- 17/01/2024 - 10:41
- 17/01/2024 - 23:24

Of the 13 flights, seven occurred during periods of stronger winds, rain or other high background noise levels, where the noise from the helicopter was heavily distorted or masked by the conditions such that it was difficult to separate the noise from the helicopter from other ambient noise. This left six flights where the helicopter noise could be clearly distinguished, and for which useful results could be obtained. Results for these flights are presented below.

Typically, the helicopter flights were audible for five minutes, gradually increasing in volume over the first minute before peaking whilst the helicopter passed Glebe and decreasing back to a lower level over one to two minutes as the helicopter lands on the helipad. Helicopters produce a distinctive noise due to the combination of the sound of the propeller blades rotating, the engine and aerodynamic noise.

Plots from the six assessed helicopter flights, including the 5 minutes before and after the helicopter was audible, are shown in Figure 3 below, with the periods that the helicopter was audible, shaded blue. The figures show that typically the Aberdeen Street location was more exposed to helicopter noise than the Allambee Crescent location, with a small delay between the helicopter noise peaking at the two locations. The short, thin noise “spikes” on each plot, typically between 70 to 75dB(A), are associated with cars passing close to the noise loggers.



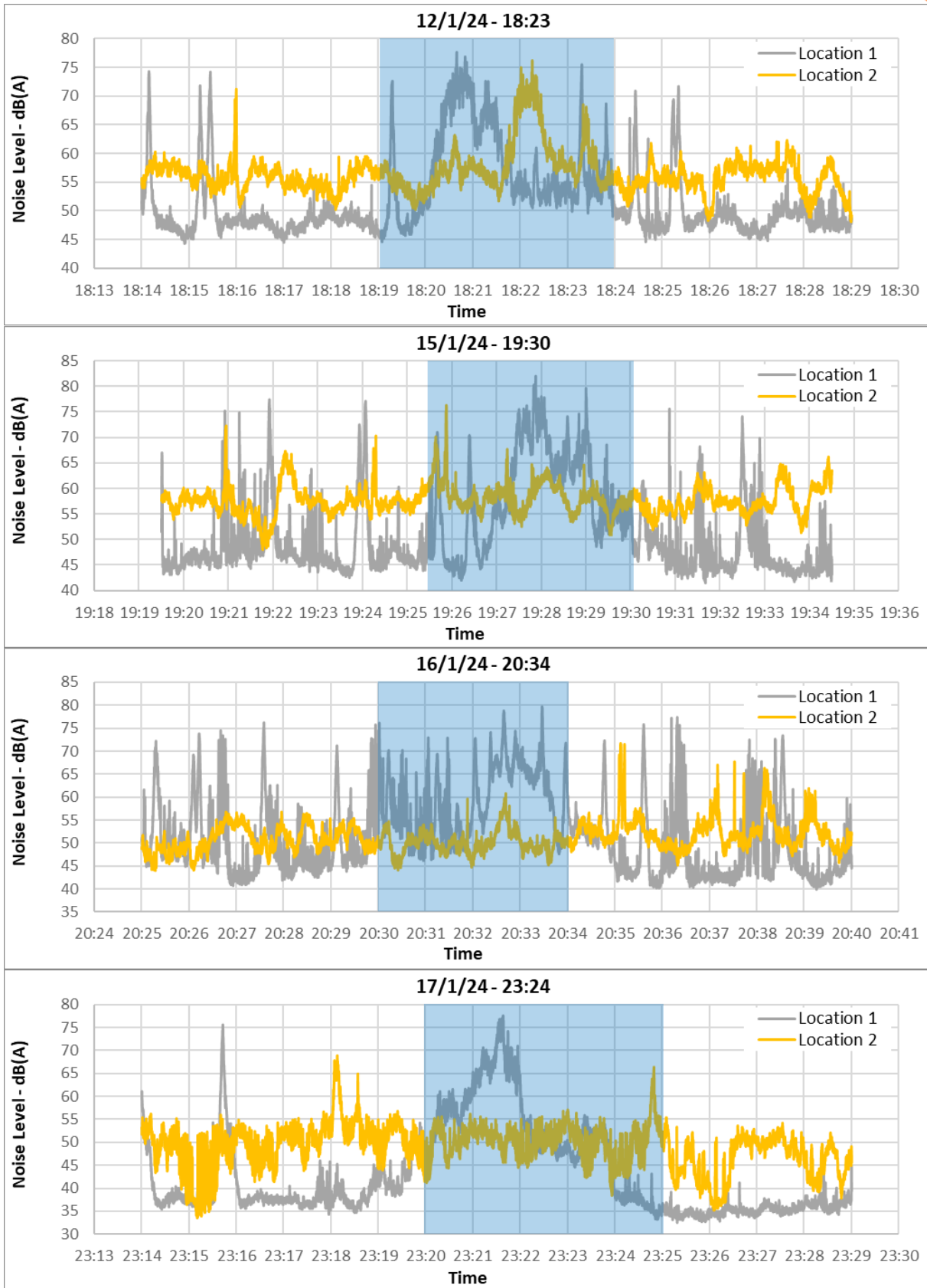


Figure 3 – Recorded noise levels for the six assessed helicopter flights at Locations 1 and 2, including the 5 minutes before and after the helicopter was audible.

Calculated Indicator Results

The $L_{Aeq,T}$ (Hel) and L_{Amax} (Hel) noise levels for the six assessed helicopter flights, each calculated over a 5 minute time period, are given in Table 2, below.

Table 2 - L_{Aeq} and L_{Amax} noise levels for identified helicopter flights.

Flight Time	Location 1: Opposite 1 Aberdeen St		Location 2: North End Allambee Cres	
	$L_{Aeq, 5min}$ (Hel) – dB(A)	L_{Amax} (Hel)– dB(A)	$L_{Aeq, 5min}$ (Hel) – dB(A)	L_{Amax} (Hel) – dB(A)
9/1/24 – 19:10	63.5	75.6	58.7	72.0
9/1/24 – 23:00	61.0	77.1	49.8	58.7
12/1/24 – 18:23	63.3	77.6	60.6	76.1
15/1/24 – 19:30	64.6	82.0	53.4	76.3
16/1/24 – 20:34	61.9	79.7	49.2	60.8
17/1/24 – 23:24	61.0	77.6	50.4	57.1

$L_{Aeq,5min}$ (Hel) results for each flight range between 49.2 and 64.9 dB(A). L_{Amax} (Hel) results range from 60.8 to 82.0 dB(A).

If we conservatively assume that there are three helicopter flights in a day and use the highest $L_{Aeq,5min}$ (Hel) result of 64.9 dB(A). The $L_{Aeq, 12hr}$ would be 48.1 dB(A) and the $L_{Aeq, 24hr}$ 45.1 dB(A) for the helicopter noise.

2.5 Comparison of Results with Noise Assessment Criteria

There are no Tasmanian noise criteria or guidelines providing recommended limits, specifically for noise emissions from helicopters or helipads, so reference is made to the *Victorian EPA Noise Guidelines* (which does include helicopter noise), *Australian Standard AS2363-1999, Acoustics – Measurement of noise from helicopter operations*² and the *New South Wales EPA Noise Control Manual*³. These noise guidelines are primarily intended to address commercial use of helicopters, but they do contain various allowances or exemptions for essential, emergency services operations.

General guideline acoustic indicator levels, from the current *Tasmanian Environmental Protection Policy (Noise)* are also reproduced below for reference. These refer to maximum levels of ambient noise (i.e. noise from all sources) that would ideally be achieved at residences and other sensitive receivers, in order to provide good residential amenity and health outcomes.

Victorian EPA Noise Control Guidelines – Publication 1254.2, 2021

Section 16 of the guidelines provides conditions for assessing helicopter noise, reproduced below. The 2017 AECOM Acoustic Design Report used this criteria to assess helicopter noise level, at residential apartments near the hospital.

The criteria comprise three separate components, each of which should be satisfied at the affected buildings:

- The measured $L_{Aeq,T}$ (measured over the entire daily operating time of the helipad)⁴ shall not exceed 55dB(A) for a residence.
- The measured maximum noise level L_{Amax} shall not exceed 82dB(A) at the nearest residential premises⁵
- Operation outside the hours between 7am and 10pm shall not be permitted except for emergency flights.

Australian Standard AS2363-1999, Acoustics – Measurement of noise from helicopter operations

The AS2363 limits for night-time helicopter noise at residential areas, are $L_{Aeq,12hour}$ 50 dB(A) and L_{Amax} 80 dB(A), with slightly higher limits indicated for daytime operations. The standard notes that special consideration may be given to the operation of aerial ambulances, namely that the L_{Aeq} limits should be met, but the L_{Amax} limits may be exceeded by aerial ambulances.

² This standard has been withdrawn and there is no comparable replacement.

³ The *New South Wales EPA Noise Control Manual* has been superseded by the *NSW Noise Policy for Industry*, but unfortunately the policy document does not include specific guidance for helicopter noise.

⁴ For the hospitals, 24 hour per day operation is required.

⁵ The guidelines note that “These levels will generally be met by a separation between the landing site and the residential premises of 150m for helicopters of less than two tonnes all-up-weight, and 250m for helicopters of less than 15 tonnes all-up-weight.”

New South Wales EPA Noise Control Manual

The noise control manual presents the following requirements for helicopters:

- The measured $L_{Aeq,24}$ should not exceed 55 dB(A) at a residence. Where the existing ambient L_{eq} is greater than the criteria an increase of 2dB(A) above the existing ambient L_{eq} is acceptable.
- The measured maximum noise level L_{Amax} should not exceed 82 dB(A) at the nearest residential premises, or 85 dB(A) at the nearest commercial building.
- Operation outside the hours of 7am to 10pm should not be permitted except for emergency flights.

Comparison of Noise Monitoring Results to Helicopter Noise Guidelines

The $L_{Aeq, 24hr}$ 45.1 dB(A) , $L_{Aeq, 24hr}$ 48.1 dB(A) and L_{Amax} of 82.0 dB(A) results determined from the noise monitoring at Glebe, meet all of the helicopter noise guidelines discussed above.

Comparison of Monitoring Results at Glebe to the AECOM Acoustic Design Report Results

The AECOM report predicted a helicopter noise $L_{Aeq, 24hr}$ of 54 dB(A) and an L_{Amax} of 92 dB(A) at the nearest residential apartments to the helipad, in Campbell Street. These levels compare well to the $L_{Aeq, 24hr}$ 48.1 dB(A) and L_{Amax} of 82.0 dB(A) determined from the noise monitoring at Glebe, which would be expected to be lower due to the greater average distance from Glebe to the helicopter flight path.

Tasmanian Environmental Protection Policy (Noise)

The *Tasmanian Environmental Protection Policy (Noise) 2009 (EPP)* provides guideline acoustic indicator levels for various noise sensitive activities, based on World Health Organisation research. The indicators relate to the total ambient noise levels at a receiver (i.e., the noise source of concern + all other ambient noise). Typical measures for residential areas are:

- | | |
|---|---|
| • Inside Bedrooms (Sleep disturbance, windows closed, night-time) | 30 dB(A) $L_{eq,8hours}$, 45 dB(A) L_{max} |
| • Outside Bedrooms (Sleep disturbance, windows open, night-time) | 45 dB(A) $L_{eq,8hours}$, 60 dB(A) L_{max} |
| • Outdoor Living Areas (Serious annoyance, daytime and evening) | 55 dB(A) $L_{eq,16hours}$ |
| • Outdoor Living Areas (Moderate annoyance, daytime and evening) | 50 dB(A) $L_{eq,16hours}$ |

The prevailing ambient outdoor noise levels at Glebe exceed the EPP indicator levels for sleep disturbance and outdoor living. This is not unexpected for an inner-city location close to a major arterial road. The contribution of the helicopter noise to the L_{eq} levels is negligible, due to the short duration of each flight. The measured L_{max} of the helicopters is similar in magnitude to noise peaks from local traffic, but much less frequent.

3. Conclusions

The noise monitoring undertaken, has determined typical noise levels for air ambulance helicopter flights to and from the Royal Hobart Hospital helipad, at Glebe.

Helicopter noise levels of $L_{Aeq,5min}$ (Hel) results ranged between 49.2 and 64.9 dB(A) and L_{Amax} (Hel) results ranged from 60.8 to 82.0 dB(A). A conservative $L_{Aeq, 24hr}$ of 48.1 dB(A) was determined, assuming three helicopter flights in one day, each with a $L_{Aeq,5min}$ of 64.9 dB(A).

While these noise levels are sufficiently high, that helicopter noise will be distinctively audible at Glebe under most weather conditions, the levels are low enough to comply with the Victorian EPA noise guidelines for helicopter operations.

As expected the noise levels are significantly lower than those predicted in the AECOM Acoustic Design Report for the RHH helipad, as a result of the greater distance from Glebe to the helicopter flight path.



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Helicopter Noise Monitoring at Glebe

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