Ryde Hospital Redevelopment Microbat Survey

TSA Management

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DOCUMENT TRACKING

Project Name	Ryde Hospital Redevelopment Microbat Survey
Project Number	23GWS-5996
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Status	**Final**
Version Number	**V1**
Last saved on	**11 August 2023**

This report should be cited as 'Eco Logical Australia 2023. *Ryde Hospital Redevelopment Microbat Survey*. Prepared for TSA Management.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Dr. Rod Armistead

Template 2.8.1

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Abbreviations

Abbreviation	Description
ABLV	Australian Bat Lyssavirus
BC Act	*Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
ELA	Eco Logical Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
LGA	Local Government area
PCT	Plant Community Type
SSD	State Significant Development

1. Introduction

1.1. Background

Eco Logical Australia (ELA) have been engaged by TSA Management to undertake a microbat survey to determine the presence of threatened microbats prior to the proposed demolition of three buildings under the Ryde Hospital Redevelopment. This redevelopment is identified as a State Significant Development (SSD36778089) in accordance with NSW Environmental Planning and Assessment Act 1979 (EP&A Act).

The development area is located at 241 Ryedale Road, Denistone (Lot 11 DP 1183279) within the City of Ryde Local Government Area (LGA). The site is bound by Denistone Road, Ryedale Road, exotic and native vegetation along Florence Avenue and Fourth Avenue.

ELA prepared a Biodiversity Development Assessment Report (BDAR) in 2022 (ELA 2022), and as part of that BDAR a call detection effort of 16 nights was used to assess if threatened microbats such as the *Miniopterus australis* (Little Bent-wing Bat) and *Myotis macropus* (Southern Myotis) were present. During the 2022 survey, the presence of Little Bent-winged Bats within the development area was confirmed. The BDAR concluded that the buildings within the development area were not suitable potential habitat and rather these microbats had been roosting within the adjacent vegetation or commuting over the site.

However, due to high mobility of most microbat species and since no surveys were completed within the development footprint, the consent conditions provided by Department Planning and Environment – Environmental and Heritage Group (EHG) for the project state that*:*

> ***B9****: Prior to the demolition work in stage 1, surveys of potential threatened species habitat in human made structures to be demolished in Stage 1 must occur. The surveys must be carried out by a suitably qualified ecologist and the findings are to be submitted to the Department. Should any threatened* microbats *be identified within existing structures within Stage 1, a microbat management plan is to be prepared and submitted to EHG for review and comment. The plan must detail the findings of the survey and measures that will be implemented to minimise any adverse impacts prior to and during construction.*

The portion of the development area (subject site) (Figure 2) associated with SSD-36778089 and consists of the proposed demolition of the existing Buildings 11, 17 and 18 (Figure 1). The construction of new and upgraded care units will commence following the demolition of these buildings.

Table 1: Buildings proposed for demolition under SSD-36778089

Building Number	Building Description
Building 11	Older small brick dwelling
Building 17	Modern Metal building
Building 18	Older large brick building

Figure 1: Ryde Hospital map

Figure 2: Subject site

1.2. Objectives of the plan

This plan aims to identify microbats, including those threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), that are known to, or are likely to occur on the site that may be potentially impacted by works.

2. Potential for microbat habitat

The following sources were reviewed to identify microbat species with the likelihood of using Building 11, 17 and 18 as potential roosting habitat.

- BioNet/Atlas of NSW Wildlife 10 km radius database search (DPE 2023)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search tool 5km database search.
- Australasian Bat Society – BatMap (located at BatMap - Ausbats)

The result of the database review identified the following threatened microbat species as potentially occurring within the subject site. Although data suggests that *Chalinolobus gouldii* (Gould's Wattled Bat), *Ozimops ridei* (Ride's Free-tailed Bat) *Chalinolobus morio* (Chocolate Wattled Bat) and *Rhinolophus megaphyllus* (Eastern Horseshoe Bat) all have some degree of potentially utilising buildings within the subject site for roosting. These species have been considered within this survey.

Table 2: Threatened microbat species known to utilise building cavities as roosting habitat that have the potential to occur within the subject site

Common Name	Scientific name
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*
Little Bent-winged Bat	*Miniopterus australis**
Large Bent-winged Bat	*Miniopterus orianae oceanensis**
Southern Myotis	*Myotis macropus*
Yellow-bellied Sheath tail-bat	*Saccolai*mus flaviventris
Greater Broad-nosed Bat	*Scoteanax rueppellii*

*Bionet Atlas records show historical records of these species within 0.5km of the site

In addition, based on the age and design, the following buildings are considered to have potential to contain roosting habitat for microbats.

- Building 11
- Building 18

Building 17 is of modern design with external walls consisting of corrugated iron sheeting, with minimal potential to provide suitable microbat roosting habitat.

Table 3: Ecology and life history characteristics of eight threatened species known to occur within a 5km radius of the subject site and likelihood of impacts.

Scientific Name	Common Name	BC Act	EPBC Act	Distribution	Habitat requirements	Records within 10km	Roost preference	Likelihood of impact
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes.	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	1	Subterranean	Unlikely. Not known to roost in buildings
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western slopes of the Great Dividing Range.	Tall (greater than 20m) moist habitats.	1	Hollows/ Buildings (occasionally)	Potential.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	East-coast of NSW from south of Sydney into south-east Qld and east of the Great Dividing Range	Commonly occurs in dry eucalypt forests and woodlands east of the Great Dividing Range. Common on Cumberland Plain. Prefers open spaces in forest and woodland, more active on upper slopes of forested areas.	9	Hollows / Buildings / Telegraph poles / Exfoliating bark. Known to use bat boxes	Potential.
*Miniopterus australis**	Little Bent-winged Bat	V	-	East coast and ranges south to Wollongong in NSW.	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub.	23	Subterranean / Buildings occasionally. Known to use bat boxes placed in subterranean structures in small numbers.	Potential.
*Miniopterus orianae oceanensis**	Large Bent-winged Bat	V	-	In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga.	Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	151	Subterranean / artificial structures. Known to use bat boxes placed in subterranean structures in small numbers.	Potential.

Scientific Name	Common Name	BC Act	EPBC Act	Distribution	Habitat requirements	Records within 10km	Roost preference	Likelihood of impact
Myotis macropus	Southern Myotis	V	-	In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers.	Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m. Rarely roosts more than 200 m from water.	45	Subterranean / Hollows	Unlikely.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Wide-ranging species found across northern and eastern Australia	Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	15	Hollows / Buildings	Potential.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	In NSW found along the east coast spreading further inland to the Northern Tablelands.	Associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill 2008), tending to be more frequently located in more productive forests (Hoye & Richards 2008).	5	Hollow / buildings	Potential

V = Vulnerable

3. Survey methodology

Prior to the demolition of Buildings 11, 17 and 18, and any other building that would be subsequently demolished as part of the Ryde Hospital Redevelopment, the following microbat surveys were required to have been undertaken.

- A visual search of the outside of the building for entry and exit points into any potential roost habitats, as well as direct and indirect evidence of roosting microbats (**Section 3.1**).
- A physical and visual search of any roof and ground floor crawl floor spaces, if safe and practicable to do so, for direct and indirect evidence of roosting microbats (**Section 3.1**).
- Dusk to dawn ultrasonic call detection and identification surveys near to the buildings being demolished (**Section 3.3**).
- Emergence or 'fly-out' surveys undertaken at all entry/exit points using thermal imagery cameras and hand-held microbat call detectors over at least three nights (**Section 3.4**).

These targeted surveys have now been undertaken in accordance with EHG Condition of Consent B9 and the following section provides the results of the surveys that were undertaken at Building 11, 17 and 18.

3.1. Potential roost searches

A preliminary diurnal inspection of the three buildings proposed for demolition to identify potential microbat roosting habitat and access pathways into the building cavities. This survey was conducted on the 18 July 2023 for a period of four hours, by Microbat Specialist Dr Rodney Armistead assisted by ELA ecologist Kody Kemp. Dr Rodney Armistead has over eight years' experience in microbat surveys and mitigation/management, and they are both vaccinated against Australian Bat Lyssavirus (ABLV).

Roost searches were conducted at ground level from both internal ground floor and full perimeter of each building. In addition, the second floor and roof cavity of Building 18 were inspected accessed via the internal stairs. Photos were taken of each potential microbat entry/exit point.

The preliminary diurnal inspection of the site identified numerous (10) potential access pathways into the cavities of Building 11 and Building 18 with no suitable access pathways identified in Building 17. Suitable access pathways consisted of missing cladding or gaps in the roof tiles, chimneys, broken open vents providing access to the internal cavities of Buildings 11 and 18. Building 18 presented the highest potential for microbat roosting habitat with numerous large gaps in cladding of the building and a hole in a roof tile.

During this survey, four Anabat Swift detectors and two Song Meter Mini Bats were passively deployed at strategic locations where access pathways were present within the Buildings 11 and 18.

3.2. Weather

Microbat surveys are usually conducted between October and February where mild temperatures, calm conditions and limited rainfall is present. Unfortunately, due to development timeframes, surveys occurred during unfavourable conditions in July 2023 (low temperatures). Due to the presence of

unfavourable conditions, the survey effort was increased to eight survey nights of call data analysis and three emergence surveys conducted at least one night apart.

3.3. Ultrasonic detection surveys

During the potential roost search (18 July 2023), four Anabat swifts and two song meter mini bats were placed around the potential microbat entry/exit points. Ultrasonic detectors were placed in suitable locations on the ground or in elevated positions facing the potential roost entrances/exits. One Songmeter mini bat (set to night recording) was place at the only microbat entry/exit point of Building 11, one Anabat Swift (set to 24hr recording) was placed within the roof cavity of Building 18 and the remaining three Anabat swifts (set to night recording) and Songmeter mini bat (set to night recording) were placed around the perimeter of Building 18. The four Anabat Swift detectors and two Song Meter Mini Bats were allowed to passively record microbat activity over nine consecutive nights between 18 and 27 July 2023. A total ultrasonic survey effort for July 2023 were 54 nights. Call data was then collected on the 21 and 25 July 2023 and analysed prior to the dusk emergence surveys on the 21, 25 and 27 July 2023. Further detail on the ultrasonic survey effort is detailed in Appendix A.

3.4. Dusk emergence surveys

Dusk emergence or 'fly out' surveys were conducted on 21, 25 and 27 July 2023 utilising three ecologists, Dr Rod Armistead, Claire Plunkett and Kody Kemp. Dusk emergence surveys were conducted to determine if microbats were utilising the buildings via an 'active survey'. These were focused on Building 18 as it was considered to provide more likely potential roosting habitat than Building 11 and 17 were. This active survey was facilitated by the use of spotlights, head torches, a thermal imagery camera (FLIR T540) and Anabat swifts with headphones (for real time microbat activity recognition).

Thermal imagery camera was utilised during the emergence survey to enhance visual observations at strategic entry/exit locations. Thermal imaging was undertaken for two nights from 30 minutes prior to sunset until 1.5 hours after sunset, focussing on two locations that possessing the highest potential for microbat roost entry/exit points. The thermal camera was placed on a tripod for the duration of the emergence survey with the entry/exit points captured within the thermal camera screen. The thermal camera screen was set to display temperature in a rainbow colour palette. If a microbat was observed exiting or entering a potential roost, the ecologist triggered recording of images to the internal SD card.

ELA microbat specialist Rodney Armistead directed and analysed the thermal camera surveys.

3.5. Microbat call analysis

The data collected on the ultrasonic microbat call detector will was analysed by Microbat Specialist subconsultant Dr Rodney Armistead using the program Anabat Insight (v 2.0.7 Titley). Rodney has over eight years of experience in the identification of ultrasonic call recordings. Call identifications were made using regional based guides to the echolocation calls of microbats in New South Wales (Pennay et al 2004); and south-east Queensland and north-east New South Wales (Reinhold et al 2001) and the accompanying reference library of over 200 calls from Sydney Basin, NSW (which is available at http://www.forest.nsw.gov.au/research/bats/default.asp).

Bat calls are analysed using species-specific call profile parameters including call shape, characteristic frequency, initial slope and time between pulses (Reinhold et al. 2001). To ensure reliable and accurate results the following protocols (adapted from Lloyd et al 2006) are followed:

- Search phase calls are used in the analysis, rather than cruise phase calls or feeding buzzes (McKenzie et al 2002). Cruise phase or feeding calls are labelled as being unidentifiable.
- Recorded calls containing less than three pulses are not analysed and these sequences are labelled as unidentifiable, being too short to confidently determine the identity of the species making the call (Law et al 1999)
- For those calls that are useful to identify the species making the call, two categories of confidence are used (Mills et al 1996):
    - Present in the study area – the Fc, quality, and structure of the call profile features (as per Pennay *et al.* 2004 and Rheinhold *et al.* 2001) are such that the identity of the microbat species making the call can be determined with a relatively high degree of confidence.
    - Potentially present in the study area – the quality and structure of the call profile are such that there is some uncertainty about the identity of the species making the call, or there is some likelihood of confusion with another species that produces a similar call profile.
- Calls made by bats which cannot be used for identification purposes such as social calls, short and low-quality calls, cruise and approach phase calls are labelled as unidentifiable.
- Sequences labelled as unidentifiable are of inferior quality and therefore not able to be identified to any microbat species, they can however be used as an indicator of microbat activity at the site.
- Sequences not attributed to microbat echolocation calls (e.g. insect buzzes, wind, human movement) were dismissed from the analysis.

4. Survey results

4.1. Potential roost survey

No direct or indirect evidence of roosting microbat species was observed during the potential roost survey of Buildings 11, 17, 18.

4.2. Ultrasonic call results and analysis

A total of 6,250 WAV sound files were submitted for analysis. Non-microbat noise files were excluded from the analysis through using a generic noise filter within Anabat Insight (Version 2.0.7-g3e26022, updated March 2023 (Titley Scientific)). Each microbat call that passed through this filter was then subject to a Decision Tree (DT) Analysis to separate microbat call profiles into 5 to 10 kHz increments based on the average Fc. These calls were then matched to the representative species or species complex that could be responsible for the call. Following this automated process, the recorded microbat calls were manually reviewed in Anabat Insight by Rodney Armistead. This process entailed the comparison of features present on the recorded calls to published call parameters in several reference materials.

This analysis resulted in the confident identification of two microbat species and the potential identification of two other microbat species within the study area (Table 4).

Table 4: Microbat species present or potentially present within the study area

Species name	Common name	Conservation status		Present / potentially present
		EPBC Act 1999	BC Act 2016	
Chalinolobus gouldii	Gould's Wattled Bat	-	-	Present
Miniopterus orianae oceanensis	Large Bent-winged Bat	-	Vulnerable	Present
Ozimops ridei	Ride's Free-tailed Bat	-	-	Potentially present
Vespadelus regulus	Southern Forest Bat	-	-	Potentially present

Microbat activity throughout the study area was very low with only 24 call sequences being recorded. Microbat calls were recorded between 5:27 p.m. to 11:33 p.m and 4:18 a.m to 4:27 a.m., with no calls being recorded between 11:33 p.m. and 4:18 a.m. Approximately fifty percent of the recorded microbat calls were identified as Large Bent-winged bat calls. However, due to the close proximity of the ultrasonic recorders it is possible that the same call was recorded across multiple detectors thus inflating the activity levels.

Two Large Bent-winged Bat call sequences were recorded between 5:27 p.m. and 5:35 p.m. on July 18, 2023. These two calls were recorded twenty to thirty minutes after sunset, thus indicating that this microbat species could potentially be roosting nearby the subject site or within other buildings of the Ryde hospital complex.

An additional survey was completed at Building 19 on July 27 due to previous observations of microbat species flying over the building during emergence surveys on the 21 and 25 July. No call sequences were

recorded during the emergence survey of building 17. A song meter mini bat detector (SYDSM06) was placed in the carpark adjacent to building 18 to record activity from 5 p.m. to 6 p.m. on July 27, 2023.

This additional survey resulted in the potential identification of several Ride's Free-tailed Bat call sequences between 5:21 p.m. and 5:30 p.m. These call sequences suggest that Ride' Free-tailed bats are potentially roosting nearby or within the hospital complex.

4.3. Emergence surveys

No microbats were visually observed or recorded on the thermal camera leaving the potential entry/exit points surveyed. No microbat call sequences were recorded during the emergence surveys that would indicate a microbat had emerged from these potential entry/exit points.

4.4. Survey limitations

- A microbat species was only confirmed as being present when all recorded call characteristics matched those described in Pennay et al (2004) and Reinhold et al. (2001). In the Sydney Basin Biogeographic region of NSW there are several species with overlapping call profiles. If recorded calls overlapped species these calls were labelled as a species complex.
- Within the calls recorded, call overlap occurred between Gould's Wattled Bat and Ride's Free-tailed Bat, then again between Large Bent-winged Bat and Southern Forest Bat.
- Due to overlapping calls being recorded, species were labelled as being potentially present, to confirm presence or absence further survey efforts in the form of mist or harp trapping would be required.
- Surveys were undertaken during less than favourable conditions (e.g., winter, when microbats are less active) to monitor microbat activity.

Table 5: Call sequence records from the detectors set near Buildings 11 and 18

Species names	Common names	Building number, entry/exit points surveyed, and the detector that was used						
		Building 18					Building 11	
		Roof Cavity	9	8	7	2, 3, 4, 5 and 6	10	Total calls
		BRI-13	SUT04	SUT05	SYD01	SYDSM06	SYDSM01	
Species only								
Chalinolobus gouldii	Gould's Wattled Bat	0	0	3	1	5	0	**9**
*Miniopterus orianae oceanensis**	Large Bent-winged Bat	0	0	2	1	6	4	**13**
Species complexes								
*Miniopterus orianae oceanensis** / *Vespadelus regulus*	Large Bent-winged Bat / Large Forest Bat / Southern Forest Bat	0	0	1	1	0	0	**2**
Total calls		**0**	**0**	**6**	**3**	**11**	**4**	**24**

Table 6: Dusk Emergence survey results

Date	Climatic conditions	Start and finish time, Climatic conditions	People and location	Bats and other fauna observed seen or heard
Friday 21 July 2023	Friday 21 July Minimum daytime temperature 5.0° Celsius, maximum daytime temperature was 19.8 ° Celsius, Wind. SW 19 km/hr (at 3 p.m.), but there little to no wind during the survey.	1640 (4:40 p.m.) - 1820 (6:20 p.m.)	Claire Plunkett Entry/exit points 2, 3, 4, 5 and 6 Thermal camera and handheld microbat detector	No microbats were observed emerging form this entry/exit point.

Date	Climatic conditions	Start and finish time, Climatic conditions	People and location	Bats and other fauna observed seen or heard
	Clear night sky, very scattered clouds that was perfect for perfect for fauna /emergence surveys.		Rod Armistead Entry/exit point 7 Handheld microbat detector	No microbats were observed emerging form this entry/exit point. One BTP was seen on the roof of Building 18, and animals were heard moving about in the roof cavity of Building 18.
			Curtis Belalis Entry/exit point 8 Handheld microbat detector	No microbats were observed emerging form this entry/exit point.
Tuesday 25 July 2023	Tuesday 25 July Minimum daytime temperature 5.0° Celsius, maximum daytime temperature was 19.8 ° Celsius, Wind. SW 19 km/hr (at 3 pm), but there little to no wind during the survey. Clear night sky, very scattered clouds that was perfect for perfect for fauna /emergence surveys.	1640 (4:40 p.m.) - 1820 (6:20 p.m.)	Claire Plunkett Entry/exit points 2, 3, 4, 5 and 6 Handheld microbat detector	No microbats were observed emerging form this entry/exit point.
			Rod Armistead Entry/exit point 7 handheld microbat detector	No microbats were observed emerging form this entry/exit point.
Thursday 27 July 2023	Friday 21 July Minimum daytime temperature 5.0° Celsius, maximum daytime temperature was 19.8 ° Celsius, Wind. SW 19 km/hr (at 3 p.m.), but there little to no wind during the survey. Clear night sky, very scattered clouds that was perfect for perfect for fauna /emergence surveys.	1640 (4:40 p.m.) - 1820 (6:20 p.m.)	Kody Kemp Entry/exit points 2, 3, 4, 5 and 6 Handheld microbat detector	No microbats were observed emerging form this entry/exit point. One BTP was observed in trees outside building 18.
			Rod Armistead Entry/exit point 7 handheld microbat detector	No microbats were observed emerging form this entry/exit point.
			Kaitlyn Furze	No microbats were observed emerging form this entry/exit point.

5. Conclusion

Microbat surveys including roost survey, ultrasonic call analysis and emergence surveys of Buildings 11, 17 and 18 of the Ryde Hospital complex found low activity of threatened and non-threatened microbats around the buildings. Due to the unfavourable survey conditions (e.g., cooler nighttime temperatures that are typical of winter) it is expected that microbat activity in general is greater than what was observed.

Prior to survey, Buildings 11 and 18 were considered to have potential to contain roosting habitat for microbats based on their age and construction. In addition, the species identified during survey are known to roost in buildings. Finally, the presence of potential entry points into buildings 11 and 18 were confirmed during survey works, however no microbat species were recorded exiting or entering these buildings.

As such, based on the ultrasonic survey, threatened microbats known to roost in buildings are present in the area. However, based on emergence surveys, it can only be concluded that Buildings 11 and 18 contains potential threatened microbat habitat.

The survey results are summarised in Table 7.

Table 7: Summary of results of microbat survey

Building	Direct or indirect evidence of microbats	Potential microbat habitat
11	No	Yes
17	No	No
18	No	Yes

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Appendix A Ultrasonic survey efforts

Ultrasonic survey efforts

Site	Building	Detector	Description
Potential Microbat Roost Habitat 1	18	Anabat Swift BRI-13	Within the roof cavity of Building 18. This area is relatively wide-open void consisting of timber beams and a layer of asbestos insulation. The roof is covered in ceramic tiles with small entry/exit points present between the tiles (determined by small beams of light entering the void). According to maintenance staff this void contains large entry/exit points allowing *Trichosurus vulpecula* (Brush-tailed Possum) to inhabit this area. During summer this void could become quite hot due to the lack of insulation, however during winter it may provide a relatively cool micro-climate suitable for Large Bent-winged Bats. It was deemed unsafe to enter the roof cavity to conduct a thorough assessment due to the presence of dust, asbestos and BTF urine and faeces. Due to the limited inspection, an ultrasonic detector was placed inside the manhole(**Table 5**).
Entry/Exit Point 2, 3, 4, 5 and 6	18	Song Meter Mini SYDSM06	Four entry/exit points were located on the southern side of the main entryway of Building 18. Of these five potential entry/exit points: • Three entry/exit points lead to the roof cavity. • Two entry/exit points lead to the crawl space beneath the building. • An ultrasonic detector was placed below these structures to determine use.
Entry/Exit Point 7	18	Anabat Swift SYD01	A linear entry/exit point that is approximately 150cm in length and about 5cm wide were the trim had fallen off from the building eave. This entry/exit point was located on the southern side of Building 18 between Building 18 and 17. This entry/exit point would allow bats to drop freely from the roost to fly off at night while the brick wall would provide them with a suitable landing area when entering the roost. An ultrasonic detector was placed below this point to determine use.
Entry/Exit Point 8	18	Swift SUT05	An entry/exit point was located at the northern side of the main entryway to Building 18 allowing access into the roof cavity, similar to entry/exit points 2-6 An ultrasonic detector was placed below this point to determine use.
Entry/Exit Point 9	18	Swift SUT04	A chimney was located at the northern side of Building 18 accompanied by small holes in the eaves of the building. An ultrasonic detector was placed below these structures to determine use.
Entry/Exit Point 10	11 Cleaner's building	Song Meter Mini SYDSM01	Entry/exit points were identified to be present in Building 11 at the top of the roller door. these points then opened into an open roof cavity. No direct or indirect evidence of roosting microbats was observed within this building. A ultrasonic sensor was placed outside the building.

Roost habitat Quality

Roost habitat - likelihood or quality of habitat value	Criteria	Presence/Absence of Potential Habitats identified in Building 11 and 18
High	Known to provide breeding habitat for threatened species; or Known to provide non-breeding roosting habitat for large numbers (ie.>50) of threatened species (e.g. known to support large numbers of Bent-wing-bats over winter); or Supports one or more of the federally listed threatened species	No. Surveys for this report did not record any threatened species breeding habitat in cavities of Buildings 11, 17 and 18. There was no evidence to suggest that large numbers of bats (>50) use the cavities within the buildings. No federally listed microbat species were recorded during surveys and there is no suitable habitat present for the only federally listed species known to occur within a 10 km radius of the Subject site.
Medium	Does not satisfy the high conservation/ habitat value category; and Provides non-breeding roosting habitat for small numbers (ie. <50) of threatened species; or Medium to large guano accumulations and/ or stains present indicative of the occurrence of moderate numbers of microbats or medium to long-term usage (threatened/ non-threatened status unknown); or Supports protected cavities providing good potential long-term roosting habitat; however, no bats or evidence of roosting bats present; and/or In proximity to open surface water, however provides mainly exposed roosting opportunities (e.g. cavities <50 mm deep, or rough concrete), offering limited potential for breeding roosting; and/or Supports a known breeding colony of non-threatened microbats.	No. Surveys of the identified potential habitat did not meet the criteria of medium quality habitat. Small amounts of guano were not confidently identified as bat guano. Site is not in proximity to surface water. However, buildings 18 and 11 provide protected cavities for potential long-term roosting habitat and non-breeding habitat for small numbers of threatened species.

Roost habitat - likelihood or quality of habitat value	Criteria	Presence/Absence of Potential Habitats identified in Building 11 and 18
Low	Does not satisfy high or medium conservation/ habitat value categories; and Individual microbats or very small numbers of non-breeding microbats (e.g. <5) present; or Small guano accumulations and/ or stains present indicative of the occurrence of small numbers of microbats or short-term usage; or Provides mainly exposed roosting opportunities (e.g. cavities <50 mm deep, or rough concrete) offering limited potential for use as breeding habitat; or Not in proximity to open water. Roosting habitat of similar value is locally common.	Yes, potential microbat roost habitat entry/exit point 1-10 because they all satisfy the criteria to be considered as having low habitat value.

Potential Entry/Exit points

Entry/Exit point	Building	Photo	Habitat quality
1	18		Low
2	18		Low

Entry/Exit point	Building	Photo	Habitat quality
3	18		Low
4	18		Low
5	18		Low

Entry/Exit point	Building	Photo	Habitat quality
6	18		Low
7	18		Low

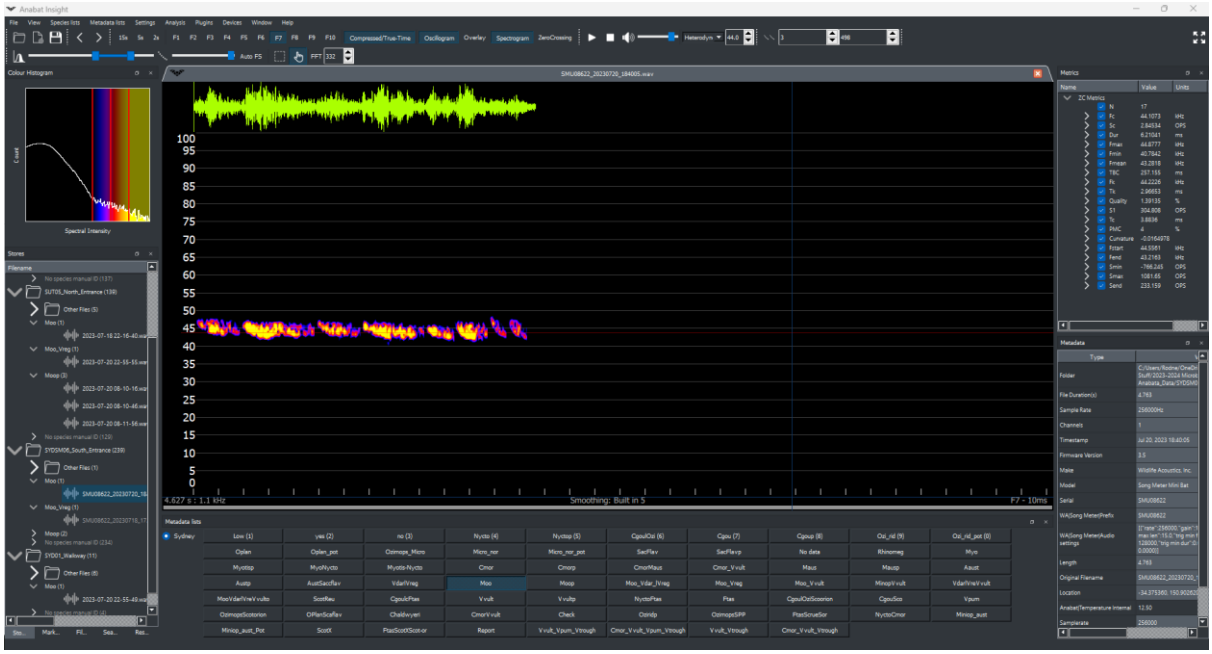
Entry/Exit point	Building	Photo	Habitat quality
8	18		Low
9	18		Low
10	11		Low

Entry/Exit point	Building	Photo	Habitat quality
			
11	17		Low Small hole leading to beneath Building 17. Hole covered with spiderwebs suggesting this is not used as an entry/exit point.

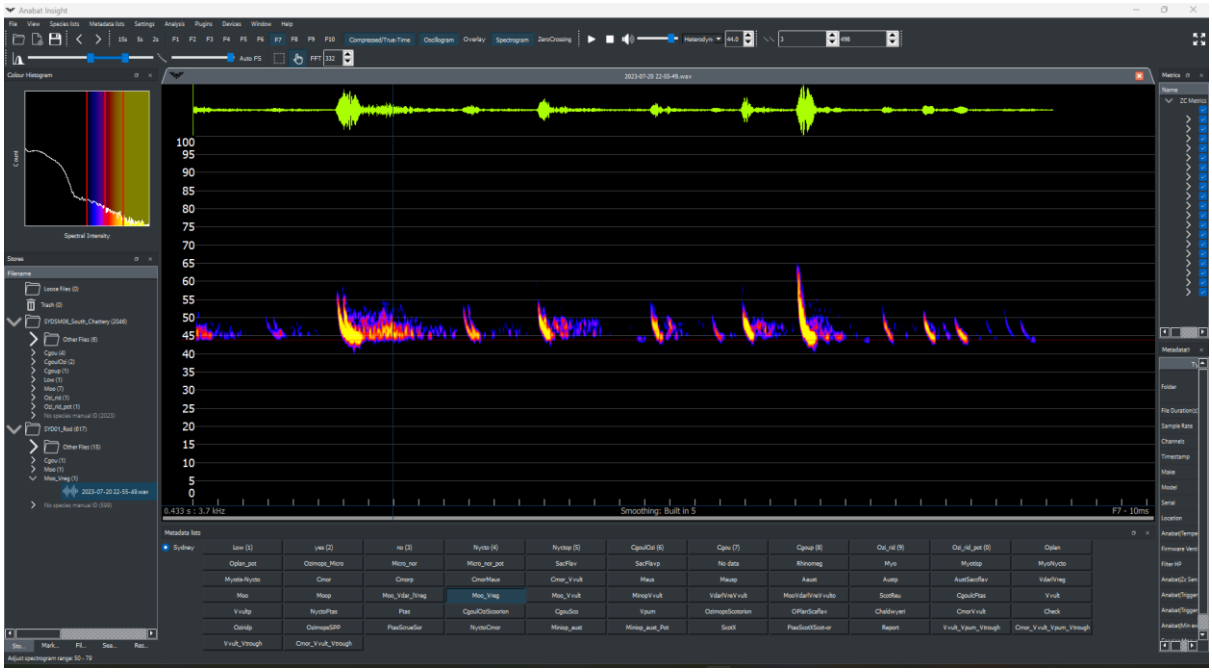
Entry/Exit point	Building	Photo	Habitat quality
Chimneys	18	 	Low Unknow if these chimneys were sealed off from the internal cavities of the building.

Ultrasonic detector, emergence survey, potential habitat locations

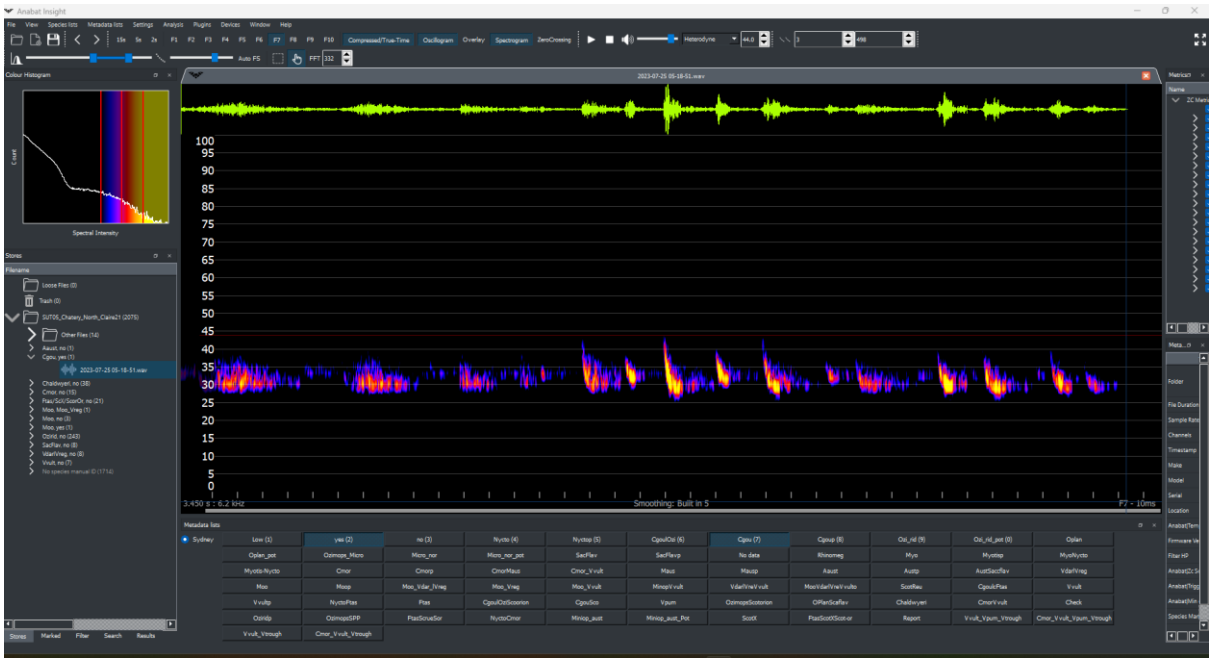
Appendix B Ultrasonic Survey Call sequences



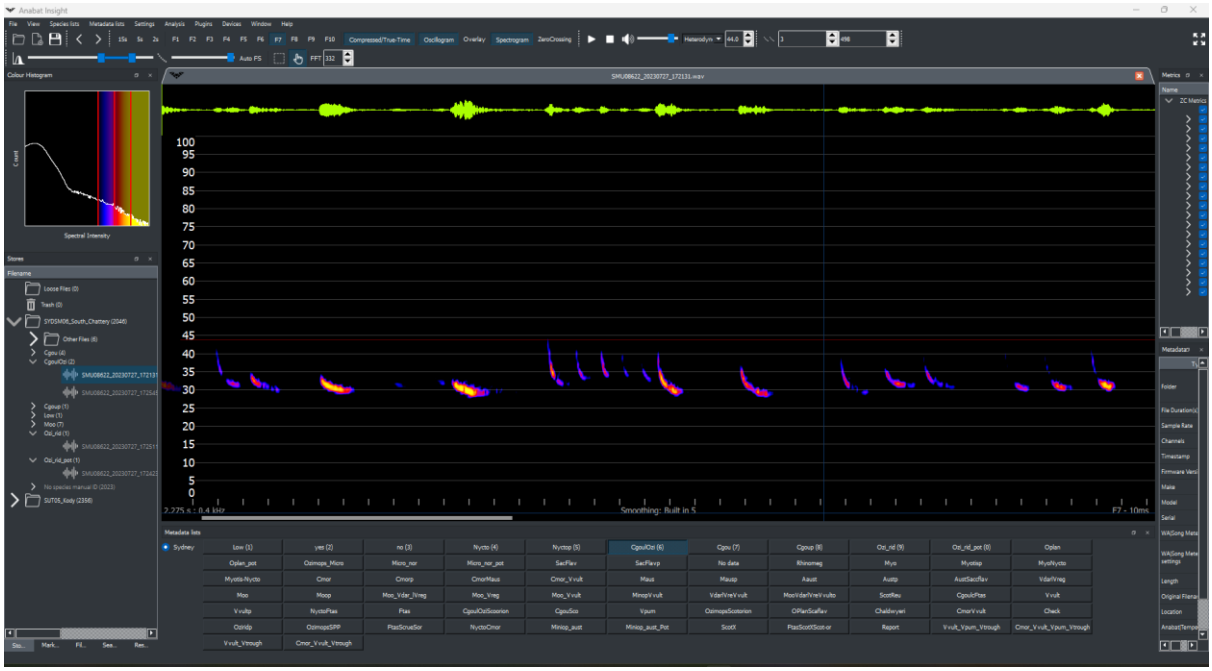
Recorded call sequence of *Miniopterus orianae oceanensis* (Large Bent-winged Bat)



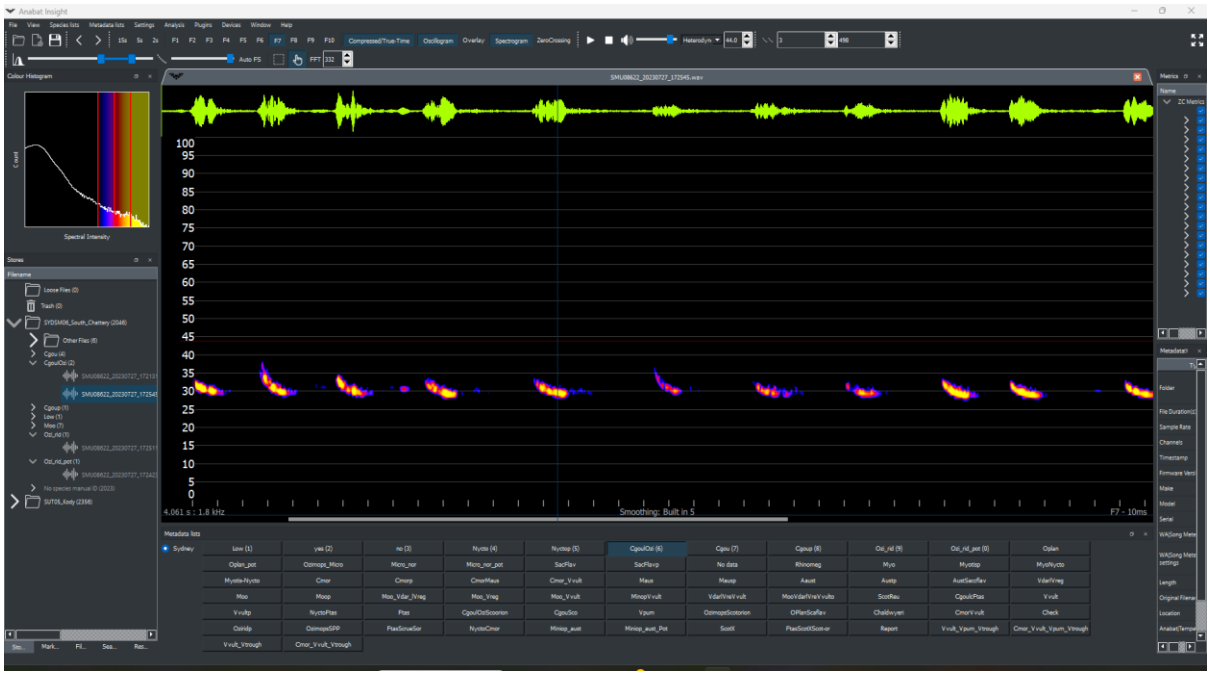
Recorded call sequence of *Miniopterus orianae oceanensis* (Large Bent-winged Bat) or *Vespadelus regulus* (Southern Forest Bat)



Recorded call sequence of *Chalinolobus gouldii* (Gould's Wattled Bat)



Recorded *Chalinolobus gouldii* (Gould's Wattled Bat) or *Ozimops ridei* (Ride's Free-tailed Bat) call sequence



Potential recorded call sequence of *Ozimops ridei* (Ride's Free-tailed Bat)

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