

# Fauna Survey of the Mater Dei Property, Cobbity 2016



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Published by:

Office of Environment and Heritage  
59 Goulburn Street, Sydney NSW 2000  
PO Box A290, Sydney South NSW 1232  
Phone: +61 2 9995 5000 (switchboard)  
Phone: 1300 361 967 (national parks, general environmental enquiries, and publications requests)  
Fax: +61 2 9995 5999  
TTY users: phone 133 677, then ask for 1300 361 967  
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967  
Email: [info@environment.nsw.gov.au](mailto:info@environment.nsw.gov.au)  
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## Abbreviations

|          |   |
|----------|---|
| BC Act   | <i>Biodiversity Conservation Act 2016</i> (NSW)   |
| CPW      | Cumberland Plain Woodland in the Sydney Basin Bioregion   |
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)   |
| OEH      | Office of Environment and Heritage  |
| RFEF     | River-flat Eucalypt Forest on the Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions |
| SHW      | Shale Hills Woodland  |
| SPW      | Shale Plains Woodland   |

# 1. Introduction

## 1.1 Project aims

This report records the results of a fauna survey undertaken at the Mater Dei property, Cobbitty, between April and June 2016. The survey was undertaken by the NSW Office of Environment and Heritage (OEH) as part of a collaborative arrangement with the landowner, the Trustees of the Sisters of the Good Samaritan, to establish management for a second biobank site on the property. The purpose of the survey was to collect baseline fauna data for the bushland areas within the property. This information is intended as a resource for future management of the bushland areas and also as an educational resource that will promote the rich biodiversity heritage of the property.

The specific objectives of the survey were to:

- document, review and collate existing fauna data
- collate baseline fauna data
- identify broadscale patterns in fauna occurrence.

## 1.2 Background

The Mater Dei property is located at 229 Macquarie Grove Road, Cobbitty, in the local government area of Camden (**Figure 1** and **Figure 2**). The 244-hectare property (Lot 100 DP 1159926) is owned by the Trustees of the Sisters of the Good Samaritan. It is located on the Nepean River and contains extensive areas of bushland and pasture, heritage buildings, a school and a residential area.

The Mater Dei property has been demarcated into a number of areas to support the different land uses on site (**Figure 2**). The residential area in the north-east is currently being developed as part of the Wivenhoe Residential Development Project. The heritage conservation area through the centre of the property (not shown in **Figure 2**) supports Wivenhoe Historic House. There is an area to the south of the heritage conservation area containing the Mater Dei Special School and areas of pasture. Remaining areas are bushland. These are comprised of three distinct parts: a bushland conservation area and two registered biobank sites, known as the Stage 1 and Stage 2 Mater Dei biobank sites.

The bushland conservation area was established in February 2009 under a voluntary planning agreement between the Trustees of the Sisters of the Good Samaritan and Camden Council. The voluntary planning agreement relates to the Wivenhoe Residential Development Project in the northern part of the property. The bushland conservation area lies directly adjacent to the Wivenhoe Residential Development Project and is approximately 80 hectares. The Stage 1 Mater Dei biobank site was registered in May 2012. It lies directly adjacent to the bushland conservation area in the south-west of the property and is approximately 26 hectares. The Stage 2 Mater Dei biobank site was established in May 2016. It lies to the south of the Stage 1 Mater Dei biobank site and is approximately 58 hectares.

## 1.3 Environment

The Mater Dei property is located entirely within the Cumberland Subregion of the Sydney Basin bioregion (Thackway & Creswell 1994) in the Hawkesbury–Nepean major catchment area. It is located within three Mitchell landscapes: the Cumberland Plain, Hawkesbury–Nepean Channel and Floodplains, and Hawkesbury–Nepean Terrace and Gravels

landscapes, although the majority of the property lies on the Cumberland Plain Mitchell landscape.

Blacktown soil landscapes underlie the majority of the property, with Theresa Park and Luddenham soil landscapes also present. The property lies on the banks of the Nepean River which is classified as a seventh-order stream using the Strahler system. A number of first- and second-order streams and local wetlands (farm dams) are also located on the property.

## 1.4 Vegetation

Two vegetation communities, Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW) and River-flat Eucalypt Forest on the Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (RFEF), have been validated as present in the south of the property within the registered and proposed biobank sites (OEH 2012, 2016). These vegetation communities have also been mapped during broadscale mapping of the Cumberland Plain (NPWS 2002) in the centre and north of the property within the heritage and bushland conservation areas, although mapped boundaries of vegetation communities were found to differ on the ground during this survey and were modified slightly (**Figure 3**). CPW and RFEF are both listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) as threatened ecological communities. CPW is listed as a critically endangered ecological community, while RFEF is listed as an endangered ecological community. CPW is also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest.

CPW in the property is present as two subcommunities: Shale Hills Woodland (SHW) and Shale Plains Woodland (SPW), and is located upslope and away from the Nepean River. It is generally dominated by forest red gum (*Eucalyptus tereticornis*) and grey box (*E. moluccana*), although the canopy is much reduced or absent in some areas. An open grassy understorey dominated by *Themeda triandra* and *Microlaena stipoides* is present in those parts of the property where the mid storey is not dominated by the woody weed African olive (*Olea europaea* var. *cuspidata*). *Bursaria spinosa* is the only native shrub species consistently recorded from this vegetation type in the property.

RFEF occurs in those parts of the property that are close to the Nepean River and first- and second-order streams. Canopy species present include forest red gum, cabbage gum (*E. amplifolia*), blue box (*E. baueriana*), rough-barked apple (*Angophora floribunda*), and broad-leaved apple (*A. subvelutina*). River peppermint (*E. elata*) is also present in areas immediately adjacent to the Nepean River. Most of the RFEF present is heavily infested by the woody weed, African olive. Where present, the native understorey is dominated by grasses and herbs in areas away from the river, and becomes increasingly shrub-dominated closer to the river.

## 1.5 Land use and disturbance history

The Mater Dei property has been grazed by domestic stock, and portions of the bushland areas in the south have been used recreationally, with old 'ropes courses' still evident. Built-up areas where the historic house and school are located have been used continuously since 1834.

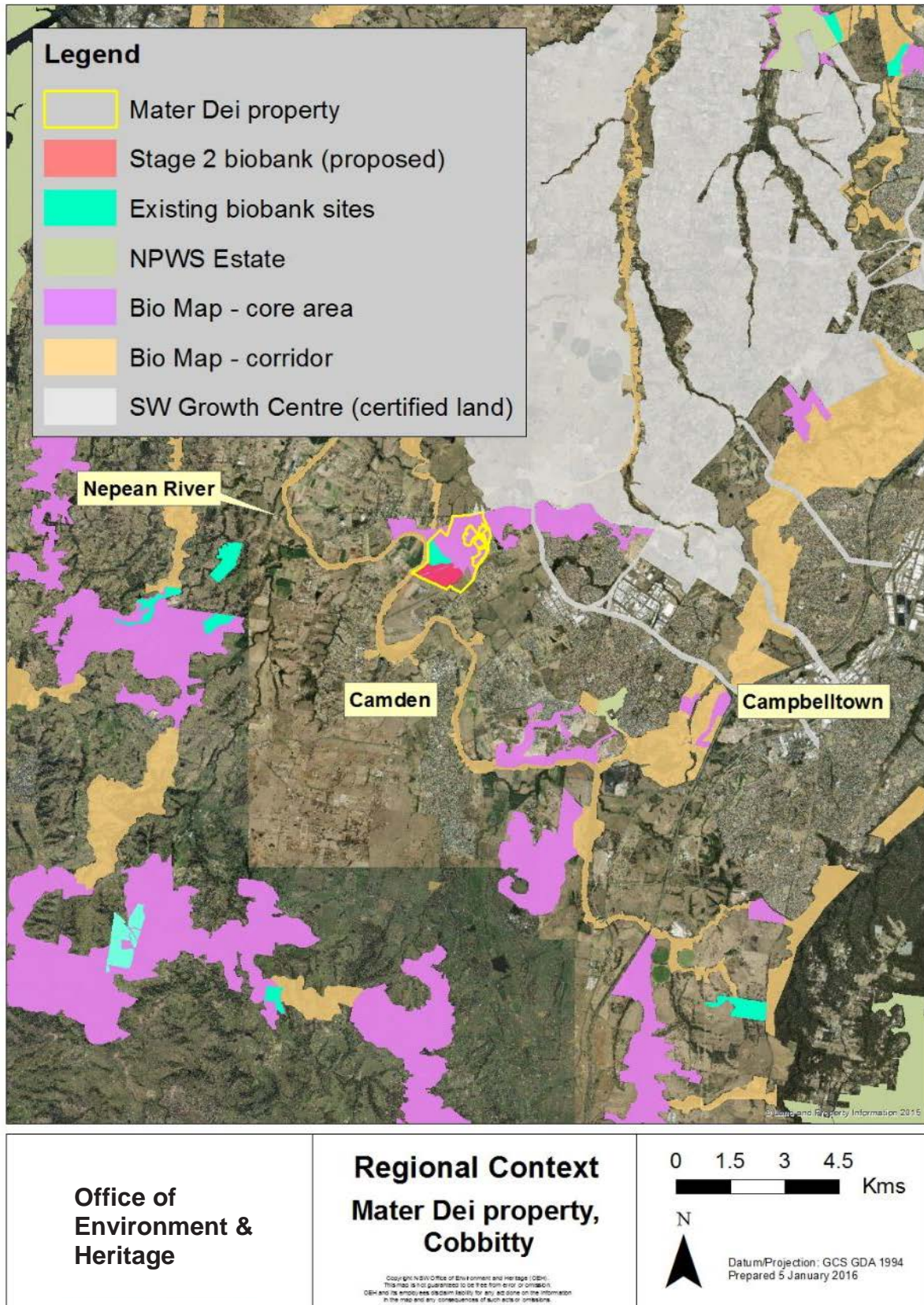


Figure 1 Regional context of the Mater Dei property

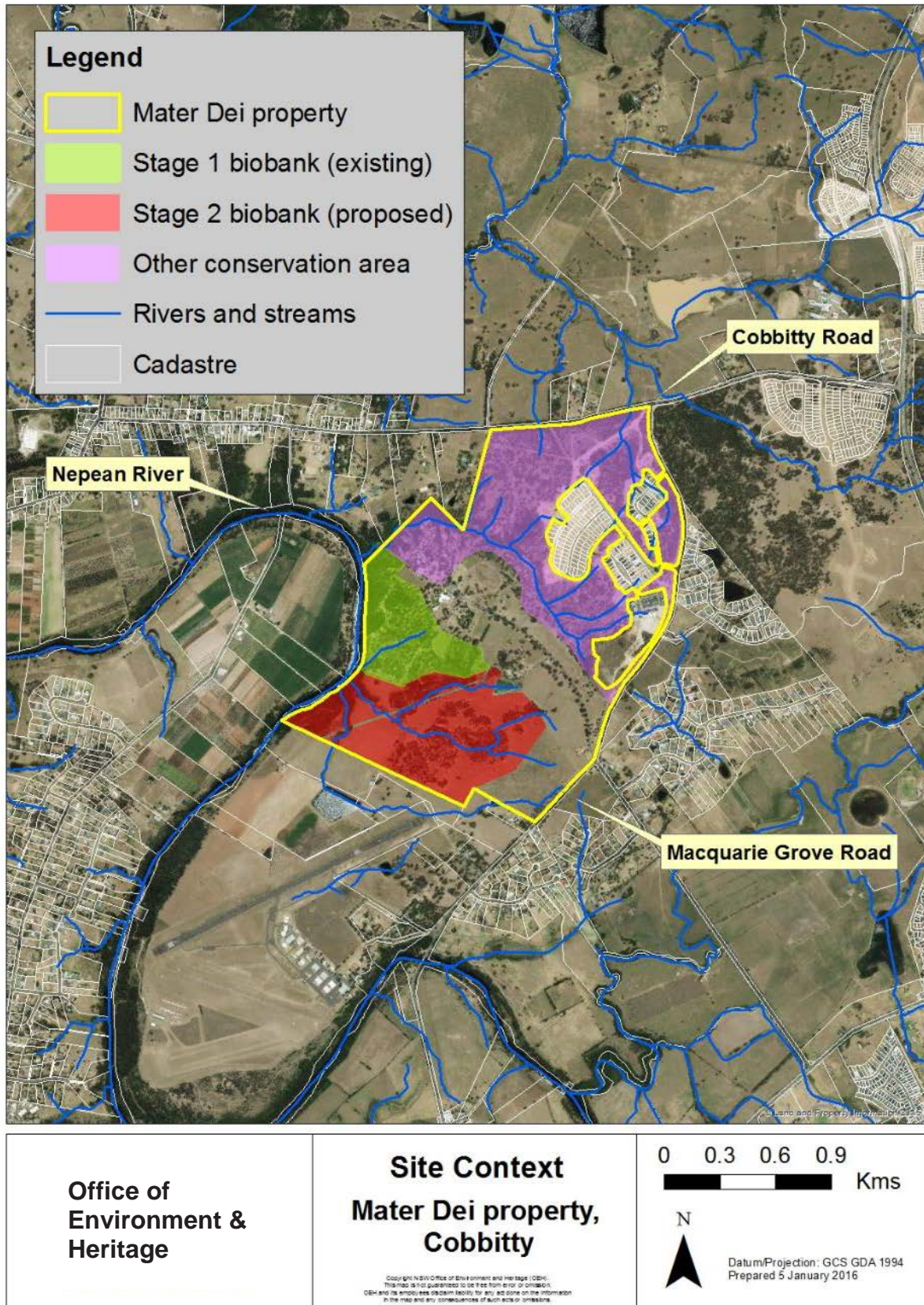


Figure 2 Biobank, conservation and heritage areas within the Mater Dei property



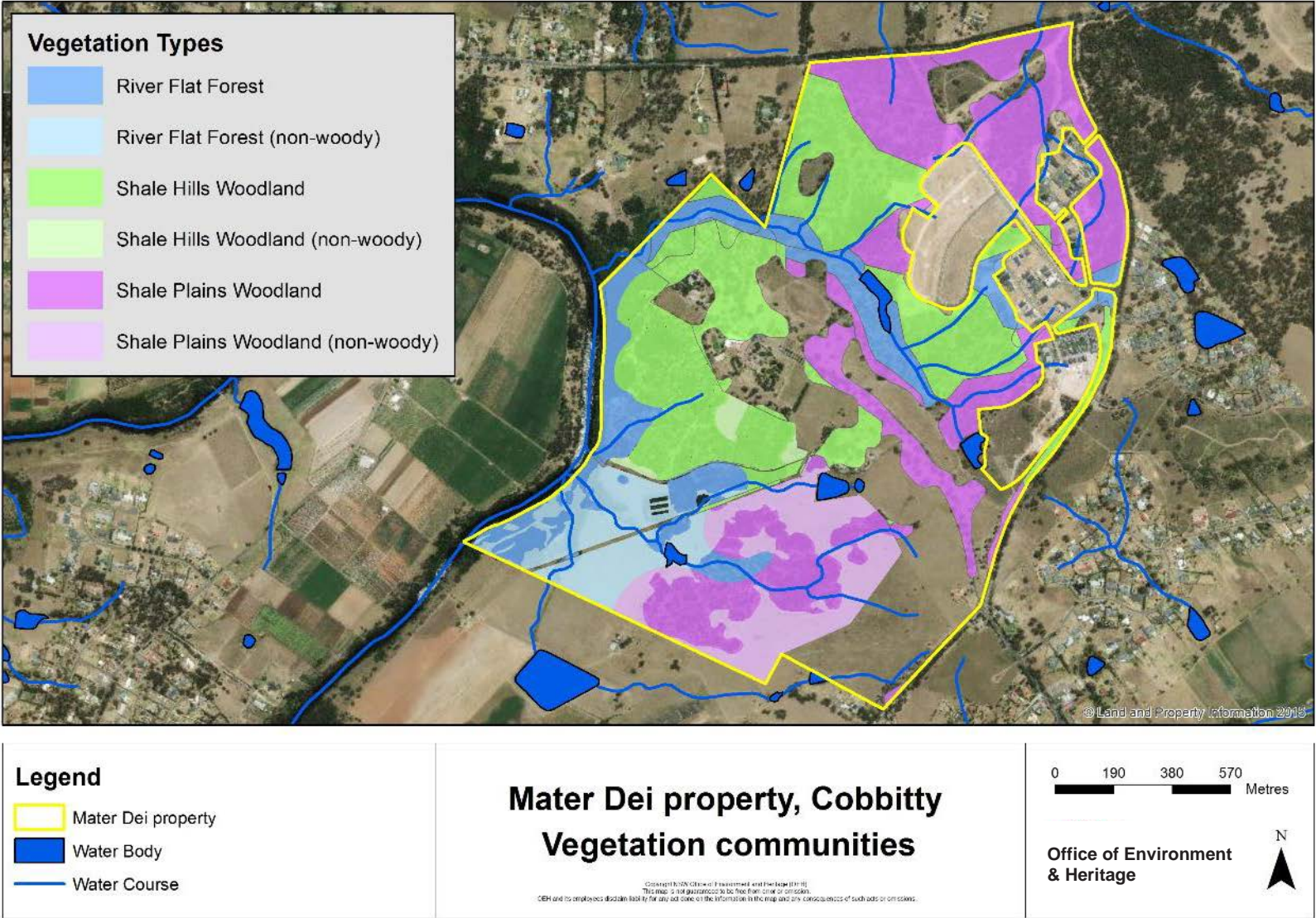


Figure 3 Vegetation communities in the Mater Dei property

## 2. Methods

### 2.1 Survey stratification and site selection

No systematic fauna survey is known to have been undertaken at the Mater Dei property (although one previous survey investigating the fauna values of the Nepean area, including Mater Dei, was undertaken in 2005; unpublished report by Martin Shultz). As such, the fauna survey did not need to consider any previous survey locations in selecting sites.

The primary stratification used for site selection was vegetation type, followed by landscape features (dams, creeks). Three vegetation types were considered: the two subcommunities of CPW (SHW and SPW) and RFEF.

Three vegetation community map layers were used to stratify survey sites: the two vegetation map layers from the surveys for the registered and proposed biobank sites, verified by OEH (2012, 2016) and the broadscale vegetation layer for the Cumberland Plain, western Sydney (NPWS 2002). Using the biobank survey map layers, fauna survey sites were considered only within vegetation types mapped as being in moderate to good condition supporting a canopy, other than where there were landscape features such as dams present. Using the broadscale vegetation map layer for the Cumberland Plain, only vegetation types mapped outside the development area were considered.

Survey sites were initially selected in ArcMap using vegetation maps, information gained from biometric plots from the surveys undertaken for the registered and proposed biobank sites, contour maps and access trail maps. Areas in the vicinity of plots with high numbers of hollow-bearing trees and amounts of fallen logs (data extracted from biometric plot data) were selected, with areas near trails chosen where possible for ease of access. Areas that were disturbed were avoided e.g. areas directly adjacent to the development areas and high-density weed areas. This was because these areas were less likely to support fauna or were difficult to access. In the field, the proposed survey site locations were ground-truthed to ensure they were representative of the mapped vegetation communities and had not been significantly affected by disturbance. If these criteria were not met, alternative locations were selected.

**Table 1** presents the area of mapped vegetation types and the corresponding survey effort for each fauna survey technique. Areas and proportions of vegetation within the property may appear higher than the effort expended since the extent of vegetation includes areas lacking a canopy and disturbed areas. **Figure 4**, **Figure 5**, and **Figure 6** show the location of fauna survey sites against the distribution of vegetation types in the property. **Appendix A** details the specific location, vegetation type and survey techniques undertaken at each survey site.

**Table 1** Areas of vegetation types within the Mater Dei property and allocation of surveys

| Vegetation type / landscape feature | Area of vegetation in the Mater Dei property (ha) | Proportion of vegetation in the Mater Dei property (%) | No. of remote camera sites | No. of ultrasonic bat detector sites * | No. of diurnal bird survey sites <sup>^</sup> | No. of reptile survey sites | No. of frog census sites | No. of spotlighting sites <sup>^</sup> | No. of call playback sites <sup>#</sup> |
|-------------------------------------|---|--|----------------------------|--|---|-----------------------------|--------------------------|--|---|
| Shale Hills Woodland                | 63.08   | 33.95  | 2                          | 2                                      | 5   | 3                           | -                        | 5                                      | 3                                       |
| Shale Plains Woodland               | 79.87   | 42.99  | 2                          | -                                      | 1   | 1                           | -                        | -                                      | -                                       |
| River-flat Eucalypt Forest          | 42.83   | 23.05  | 7                          | 5                                      | 3   | 3                           | 2                        | 1                                      | -                                       |
| Dam                                 | -   | -  | -                          | 1                                      | -   | -                           | -                        | -                                      | -                                       |
| Total                               | 185.78  | 100  | 11                         | 8                                      | 9   | 7                           | 2                        | 6                                      | 3                                       |

\* Note that some sites recorded less than 4 nights of data.

<sup>^</sup> Some transects covered more than one vegetation type. The vegetation type where the majority of the transect occurred is listed.

<sup>#</sup> Some transects/sites were located between vegetation types, so the more representative vegetation type is listed.

## 2.2 Survey methods

The fauna survey methods used were based on those developed by the NSW National Parks and Wildlife Service (NPWS) Biodiversity Survey Coordination Unit (NPWS 1997). The techniques described below were used to sample diurnal and nocturnal birds, bats, arboreal and ground-dwelling mammals, amphibians and reptiles. Consistency in the use of these techniques allows comparison between fauna species detected across different vegetation types within the property. Further, it will allow comparisons with future surveys of the property.

Field survey staff used proforma data sheets to facilitate comprehensive, consistent recording of field data and increase accuracy and efficiency of data entry into the OEH database: [the Wildlife BioNet Atlas](#). The names of observers were noted on data sheets to aid data verification and entry. All search times provided in Sections 2.2.3 to 2.2.7 are for two observers. Where there was a single observer, search times were extended to be equivalent to the search time for two surveyors.

### 2.2.1 Remote camera surveys

Remote camera surveys involved setting 10 motion-activated cameras, trained on baited hair tubes, at 11 sites. (One camera, at site 3, was moved from one site to another [site 11] following disturbance to this camera at the first site.) The bait in the hair tubes, used to attract fauna, was either a mixture of rolled oats, peanut butter and honey, or a mixture of rolled oats, peanut butter, honey and tinned sardines. A honey and water mixture was also used in conjunction with the baits, and was sprayed liberally around the vicinity of the hair tubes.

Remote cameras were set over a period of two days (7 and 8 April 2016), with the camera at site 3 relocated to site 11 on 21 April 2016 when it was found knocked to the ground by stock. Nine cameras were configured to take a single shot and a five-second video, while one camera (at site 10) was configured to take five rapid-fire single shots on detecting movement. Cameras were left undisturbed for 34 to 35 nights. The type of bait used at the sites, and the numbers of detection nights are detailed in **Table 2**.

**Table 2** Details of baits used and detection nights for remote camera surveys

| Site number                      | Vegetation type            | Bait used                         | Number of detection nights |
|----------------------------------|----------------------------|-----------------------------------|----------------------------|
| 1                                | Shale Hills Woodland       | Rolled oats mixture with sardines | 1                          |
| 2                                | River-flat Eucalypt Forest | Rolled oats mixture with sardines | 33                         |
| 3                                | River-flat Eucalypt Forest | Rolled oats mixture               | 2                          |
| 4                                | Shale Hills Woodland       | Rolled oats mixture               | 34                         |
| 5                                | River-flat Eucalypt Forest | Rolled oats mixture               | 35                         |
| 6                                | River-flat Eucalypt Forest | Rolled oats mixture with sardines | 35                         |
| 7                                | Shale Hills Woodland       | Rolled oats mixture with sardines | 26                         |
| 8                                | River-flat Eucalypt Forest | Rolled oats mixture               | 34                         |
| 9                                | Shale Plains Woodland      | Rolled oats mixture with sardines | 30                         |
| 10                               | Shale Hills Woodland       | Rolled oats mixture               | 34                         |
| 11                               | River-flat Eucalypt Forest | Rolled oats mixture               | 21                         |
| Total number of detection nights |                            |                                   | 285                        |

### 2.2.2 Ultrasonic bat detector surveys

Microbats were surveyed using anabat detectors equipped with recording devices, which were housed in plastic boxes and plastic snap-lock bags for weather protection, with microphones mounted approximately 1 metre off the ground by way of an extension cable. Anabat detectors were left at seven sites for four nights per site (although stock interfered with the anabat unit at site 3 on the first night so this was moved to site 11 for three nights, and only three nights were recorded at site 2), and were set to record from 1800 hours to 0600 hours.

Anabat calls were downloaded and analysed by Dr Martin Shultz (independent bat call analysis expert and fauna specialist). Analysis assigned bat calls to four levels of confidence: definite, probable, possible, and unknown, based on Martin's previous experience in analysing data, use of reference calls, and discussion with other field workers.

### 2.2.3 Diurnal bird surveys

Diurnal bird surveys comprised approximately 20-minute observation and listening searches within a 2-hectare (100 metre x 200 metre) area at nine sites. Surveys were undertaken during the early morning in conditions of reasonable detectability (e.g. calm, low wind conditions). All bird species seen or heard were recorded, with records made of whether birds were within or outside the 2-hectare search area and weather conditions at the time of survey. Abundance data were not collected as abundance cannot be accurately determined from calls and individuals may be double-counted.

### 2.2.4 Nocturnal frog surveys

Nocturnal frog surveys comprised approximately 30-minute listening surveys at two suitable wetlands (mostly standing water bodies). All frogs identified by call within the time period were recorded, together with the weather conditions at the time of survey.

### 2.2.5 Spotlighting surveys

Spotlighting surveys comprised searching for arboreal mammals and nocturnal birds using 50-watt spotlights along 200-metre transects over approximately 15-minute intervals at six sites. Spotlight surveys involved scans of trees with the spotlights to detect reflected eye shine, with surveyors also listening intently for fauna calls during survey periods.

### 2.2.6 Call playback surveys

Call playback surveys involved broadcasting the calls of three owl species and one mammal at three sites. The owl species were powerful owl (*Ninox strenua*), masked owl (*Tyto novaehollandiae*), and barking owl (*Ninox connivens*), while the mammal species was koala (*Phascolarctos cinereus*). Calls were pre-recorded and were amplified through a megaphone. Calls were broadcast for approximately five minutes.

Prior to broadcasts, the surrounding area was searched by spotlight for five minutes to detect any fauna in the immediate vicinity. A 10-minute listening period for calls followed broadcasts.

### 2.2.7 Reptile surveys

Reptile searches comprised approximately 30-minute active searches for reptiles amongst leaf litter and under debris at seven sites. Surveys occurred during afternoon hours in conditions of reasonable detectability (e.g. calm and sunny) to maximise detection. All species of reptile seen and their abundance were recorded.

### 2.2.8 Opportunistic surveys

All incidental observations of fauna and signs of fauna in the Mater Dei property, seen while moving through the property and while undertaking surveys, were recorded.

## 2.3 Survey period and survey teams

Field surveys were mainly undertaken between 7 and 15 April 2016 (autumn), although remote cameras were left on the Mater Dei property until 12 May 2016. An opportunistic survey was undertaken on 9 June 2016 (winter) to detect any additional species, particularly since heavy rains fell subsequent to the main autumn survey period.

Surveys were led by Debbie Andrew. Debbie was supported by Kathryn Collins, Enhua Lee, Derek Steller and Martin Bremner. Six volunteers took part in nocturnal surveys on 11 and 15 April 2016. The one-day opportunistic survey in June was undertaken by Martin Schulz.

## 2.4 Weather conditions during surveys

Weather conditions were fine and unseasonably warm leading up to and during the main part of the survey, with some rain recorded in the lead-up to the main survey, and calm conditions and sunny weather generally recorded during the main survey. **Table 3** summarises the weather conditions in the week leading up to the survey and during the main survey, as recorded at nearby Camden Airport.

Note that weather conditions during the remote camera surveys and the one-day June survey are not presented; however, conditions were similar to those recorded during the main survey, with slightly lower maximum temperatures. Significant rain fell following the main survey. A total of 289.6 millimetres were recorded in the week leading up to the opportunistic winter survey undertaken on 9 June 2016 (BOM 2016).

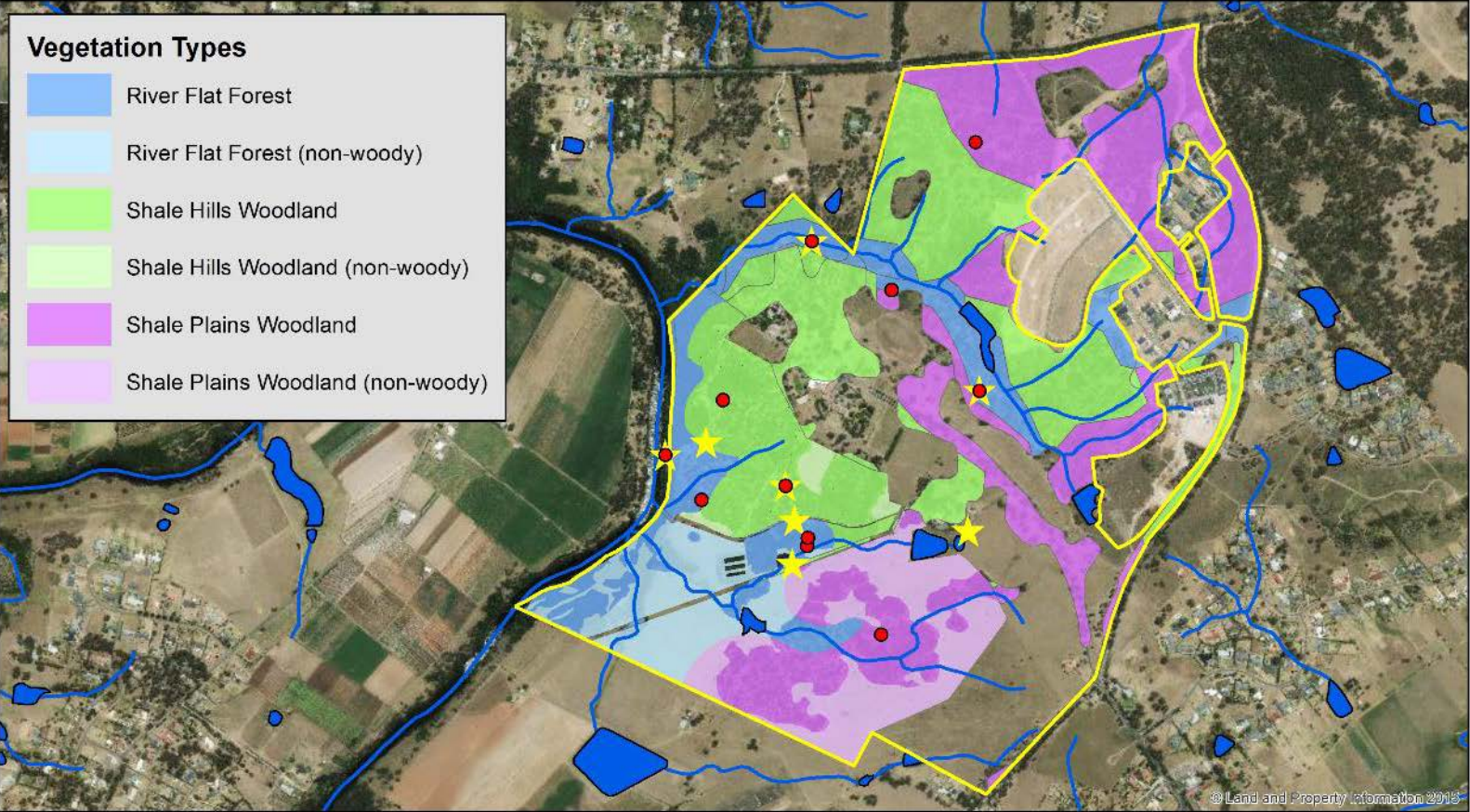
**Table 3 Weather conditions leading to and during the main survey**  
(excludes the survey period for remote cameras)

| Survey period      | Date     | Maximum temperature (°C) | Minimum temperature (°C) | Rain (mm) |
|--------------------|----------|--------------------------|--------------------------|-----------|
| Leading to survey  | 1/04/16  | 12.8                     | 28.1                     |           |
|                    | 2/04/16  | 12.9                     | 30.6                     |           |
|                    | 3/04/16  | 14.7                     | 25.3                     |           |
|                    | 4/04/16  | 17.5                     | 25.5                     | 1.6       |
|                    | 5/04/16  | 14.9                     | 30.7                     |           |
|                    | 6/04/16  | 13.0                     | 36.3                     |           |
| During main survey | 7/04/16  | 18.0                     | 20.7                     |           |
|                    | 8/04/16  | 16.2                     | 21.2                     |           |
|                    | 9/04/16  | 10.9                     | 26.9                     |           |
|                    | 10/04/16 | 9.5                      | 29.9                     |           |
|                    | 11/04/16 | 7.6                      | 27.1                     |           |
|                    | 12/04/16 | 15.8                     | 23.0                     | 5.8       |
|                    | 13/04/16 | 13.4                     | 24.6                     |           |
|                    | 14/04/16 | 11.5                     | 23.6                     |           |
|                    | 15/04/16 | 12.3                     | 28.4                     |           |

Data from Camden Airport: station 068192 (BOM 2016)

## 2.5 Survey limitations

Survey was undertaken outside the optimum survey time, which is generally spring or summer, for many species. As such, the full suite of species that may be present at the site may not have been recorded. Activity levels (calls) for frogs were particularly low during the main survey, and it is likely that surveys during spring or summer would detect more frog species.



**Legend**

Remote cameras Mater Dei property

Anabats Water Body

Water Course

**Mater Dei property, Cobbitty**  
**Survey effort (cameras and anabats)**

0 190 380 570 Metres

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N

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Figure 4 Location of cameras and anabats in the Mater Dei property

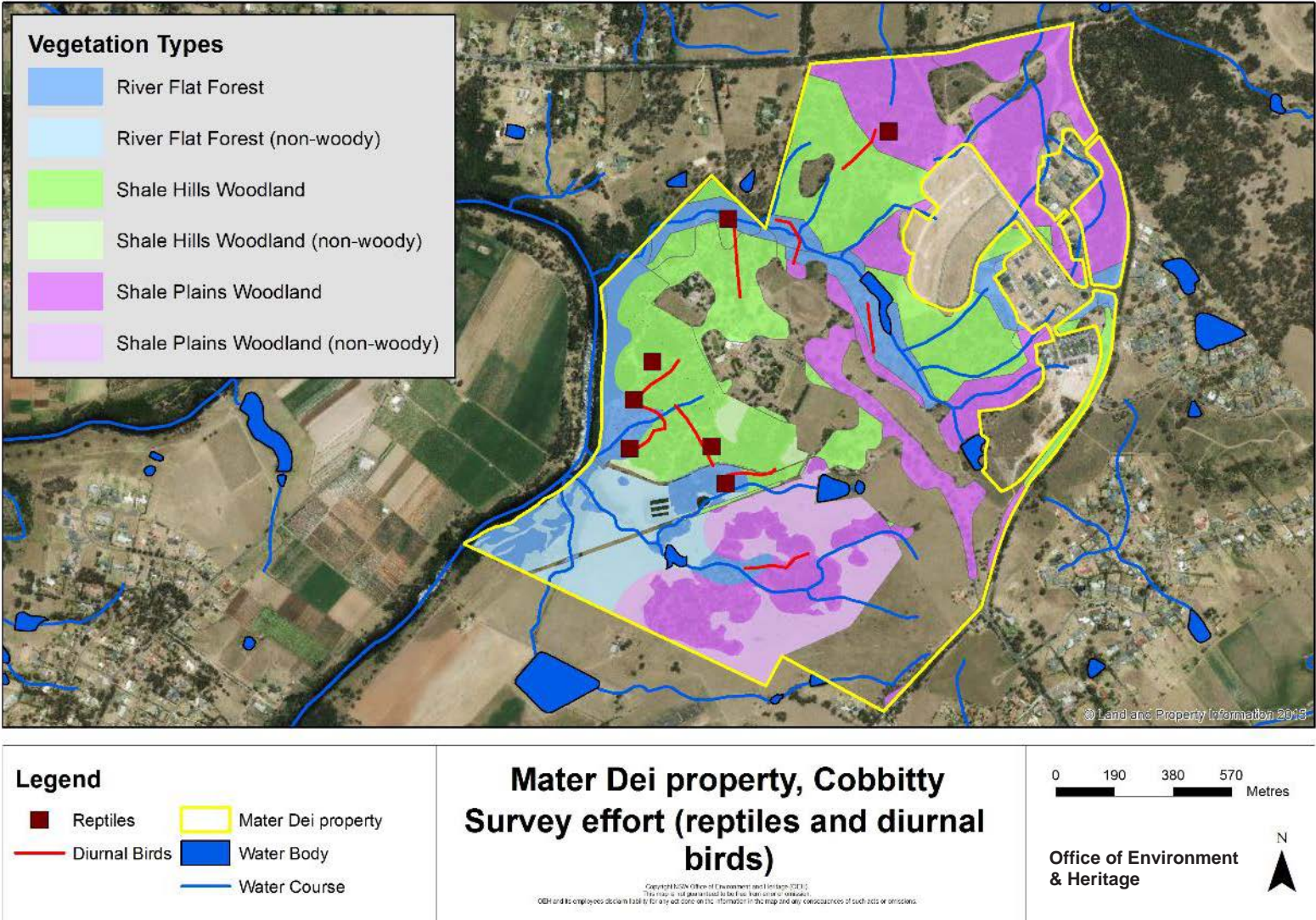


Figure 5 Location of reptile sites and diurnal bird transects in the Mater Dei property



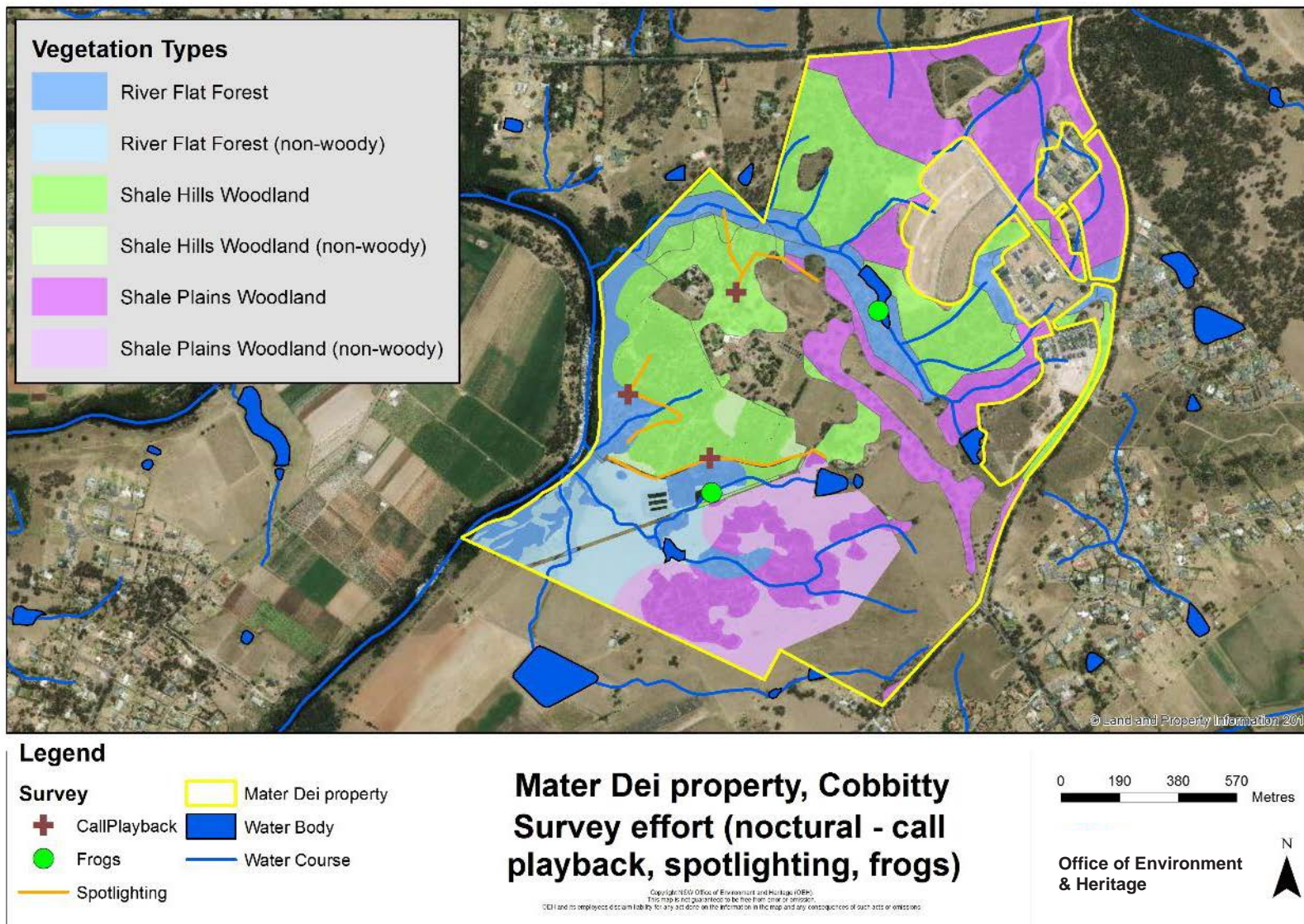


Figure 6 Location of frog census and call playback sites, and spotlighting transects in the Mater Dei property

### 3. Results and discussion

A total of 149 vertebrate fauna species were recorded during the survey (**Appendix B**). Of the species recorded, the majority were birds (104 species), followed by mammals (27 species), reptiles (11 species) and frogs (7 species). Native species dominated, with 137 native species recorded (99 birds, 20 mammals, 11 reptiles and 7 frogs) compared with 12 exotic species (5 birds and 7 mammals). Invertebrates were not comprehensively surveyed, although 2 snails (one native and one exotic) were recorded during survey, bringing the total number of fauna species recorded to 151 species.

#### 3.1 Birds

Of the 104 bird species recorded, the majority of species (75) were woodland/forest birds, although some species (9) were restricted to woodlands, or were wetland birds (20 species) (**Appendix C**). This reflected the vegetation and habitat types (e.g. dams, creeks/river) present on or adjacent to the Mater Dei property.

Woodland/forest and woodland species were a mixture of insect-eating, seed-eating, fruit-eating, and nectar-eating birds, as well as predators, with some species eating a combination of foods. Insect-eating birds were the most commonly recorded birds (29 species), followed by species with a mixed diet (24 species), waterbirds (17 species), predators (15 species), seed-eaters (14 species), fruit-eaters (3 species), and nectar-eaters (2 species) (**Appendix C**).

Seven threatened bird species were recorded on the Mater Dei property: powerful owl (*Ninox strenua*), little lorikeet (*Glossopsitta pusilla*), speckled warbler (*Chthonicola sagittata*), little eagle (*Hieraaetus morphnoides*), dusky woodswallow (*Artamus cyanopterus cyanopterus*), white-bellied sea-eagle (*Haliaeetus leucogaster*) and varied sittella (*Daphoenositta chrysoptera*) (**Figure 7**). The latter three species were recorded during the opportunistic winter survey following heavy rainfall rather than during the main autumn survey. A previous survey of the Mater Dei property by Martin Shultz in 2005 (unpublished report investigating the fauna values of the Nepean area) also recorded powerful owl and speckled warbler.

Other than the little eagle which was recorded once on the junction between the Stage 1 biobank site and the proposed Stage 2 biobank site, all threatened bird species were recorded in the north of the property within the bushland conservation area. Powerful owl was recorded during two nocturnal surveys at three nearby locations in this area. Little lorikeet was recorded once during diurnal bird surveys. A total of 11 individuals of speckled warbler were recorded at five locations where dense understorey was present (either *Bursaria spinosa* or eucalypt saplings) within grassy woodland. Two individual varied sittellas were recorded at one location where dense understorey was present (at the same location as two speckled warblers).

Little eagle, powerful owl and little lorikeet are wide ranging and likely to use the property and general area on an occasional basis. Varied sittella is also likely to range widely, but would be more restricted to the remaining woodland and riverine forest areas within and adjacent to the Mater Dei property. Speckled warbler does not range widely and has specific habitat preferences. As such, the population recorded is of particular significance. The Mater Dei property is one of the few remaining known localities for this species in the Cumberland Plain. However, much of the Mater Dei property is unsuitable for this species due either to the presence of dense stands of African olive or extensive areas which have been cleared with no shrub-layer vegetation present. The species has not been recorded from the biobank patches of woodland within the southern section of the Mater Dei property and this area is currently unsuitable for the species due to the extensive areas of dense African olive, the limited patches of bursaria and other dense, native, low-shrubland vegetation, and a general

absence of logs and other woody debris. The small population size present, recent clearing of suitable habitat in residential areas, and the surrounding busy roads effectively isolating the area from nearby remnant habitat suggest that the speckled warbler will become locally extinct from this area in the near future without active management.

With regard to other threatened species, BioNet Atlas contains records of hooded robin (*Melanodryas cucullata cucullata*) and diamond firetail (*Stagonopleura guttata*) within the property, with swift parrot (*Lathamus discolor*) recorded just outside the property by bush regenerators from Toolijoa (2 May 2016), and brown treecreeper (*Climacteris picumnus victoriae*) recorded within 1 kilometre of the property. Although not recorded in the current survey, it is likely that swift parrot uses the property when present on the mainland given the proximity of the recent sighting to the Mater Dei property and the winter-flowering resources present. There is potential that hooded robin, diamond firetail and brown treecreeper may still occur within the property or use the property on an occasional basis. Future surveys would need to confirm these species as records are over 10 years old.

Besides threatened species, two noteworthy birds were recorded. The Pacific baza (*Aviceda subcristata*) and rufous fantail (*Rhipidura rufifrons*). Pacific baza is mostly found in tropical and subtropical forest and woodland in northern and eastern Australia and rarely occurs south of Sydney i.e. the species is an infrequent visitor. Rufous fantail is found in northern and eastern coastal Australia, being more common in the north. It is generally found in wetter areas although occurs in more open habitats or urban areas when migrating. It is listed as migratory under State and Commonwealth legislation.

## 3.2 Mammals

Mammals recorded were mostly native microbats, although three native macropod species, three native arboreal species and two native ground species were recorded along with a number of introduced species. Some example bat calls recorded by anabat are provided in **Appendix D**.

Three of the microbat species recorded are threatened species. These were eastern bentwing-bat (*Miniopterus schreibersii oceanensis*), eastern freetail-bat (*Mormopterus norfolkensis*), and large-eared pied bat (*Chalinolobus dwyeri*). One additional threatened species, little bentwing-bat (*Miniopterus australis*) may have been recorded, but the call recorded may have been very high frequency signals of juvenile chocolate wattled bat (*Chalinolobus morio*) as no calls were detected greater than 60 kilohertz. Threatened bats recorded are likely to use the whole Mater Dei property.

BioNet Atlas has records of grey-headed flying-fox (*Pteropus poliocephalus*) within the property, with southern myotis (*Myotis macropus*) recorded within 1 kilometre of the property. Greater broad-nosed bat (*Scoteanax rueppellii*) has been recorded within 10 kilometres. Although not recorded in the current survey, it is likely these species use the property on an occasional basis. Future surveys would need to confirm these species.

Given the isolated location of the Mater Dei property from other patches of woodland and presence of exotic mammal species (seven species including fallow deer, *Dama dama*), the number and diversity of native mammals recorded on site (other than bats which can remain common in isolated patches) was surprising. Populations of grey kangaroo (*Macropus giganteus*), common wallaroo (*Macropus robustus*), swamp wallaby (*Wallabia bicolor*) and wombat (*Vombatus ursinus*) persist on site and appear healthy.

### 3.3 Reptiles

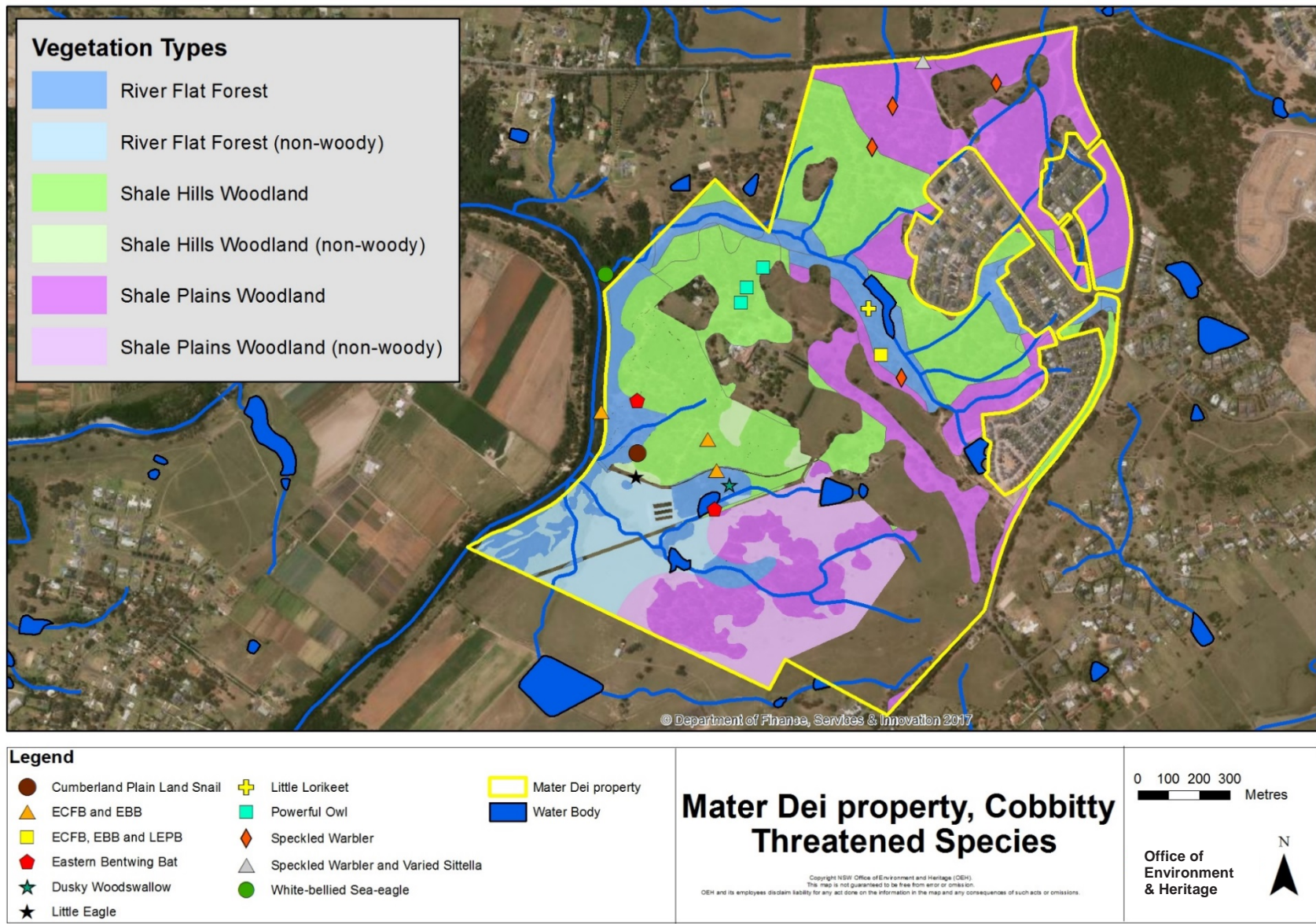
Reptiles recorded were composed mostly of skinks, although two snakes, a turtle, a dragon (eastern water dragon, *Intellagama lesueurii*) and a blue-tongue (eastern blue-tongue, *Tiliqua scincoides*) were recorded. No geckos were recorded but could be present on site. Future surveys would need to confirm these species.

### 3.4 Frogs

Seven species of frogs were recorded, with no threatened species located. Survey within the summer months could record more frog species.

### 3.5 Invertebrates

Two species of snails were recorded opportunistically. One species was potentially the threatened Cumberland Plain land snail (*Meridolum corneovirens*), but this could not be positively confirmed. This species has previously been recorded on the property by Martin Shultz in 2005 (unpublished report investigating the fauna values of the Nepean area).



**Figure 7 Threatened species recorded in the Mater Dei property**  
 ECFB = eastern freetail-bat; EBB = eastern bentwing-bat; LEPB = large-eared pied bat

## 4. Recommendations

The following recommendations are provided as guidance for the future management of the bushland areas on the property. These areas comprise the bushland conservation area in the north of the property and the two registered biobank sites.

While the bushland areas are currently being managed for conservation, the following recommendations are provided specifically to maintain and enhance habitat for the speckled warbler population that occurs on the property:

- Retain and restore the remaining grassy woodland areas in the bushland conservation area between the school and Cobbitty Road.
- Avoid clearing areas supporting bursaria or dense eucalypt regeneration.
- As a priority, plant out areas which have recently been cleared with bursaria and other ground-layer vegetation.
- Avoid removing logs and other wooden debris and, if feasible, reinstate logs to the bushland area. The speckled warbler requires logs and woody debris both for foraging and nesting (i.e. it is a ground nester).
- Regularly undertake fox and feral cat control.

As stated in Section 3.1.1, the Mater Dei property is one of the few remaining known localities for the speckled warbler in the Cumberland Plain, and implementing these actions may help this local and significant population to survive.

## References

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## Appendix A Survey site locations, vegetation types and survey techniques

| Site no. | Vegetation type            | Easting | Northing | Remote camera | Ultrasonic bat detector | Diurnal bird survey | Reptile survey | Nocturnal frog census | Spotlighting survey | Call playback |
|----------|----------------------------|---------|----------|---------------|-------------------------|---------------------|----------------|-----------------------|---------------------|---------------|
| C1       | Shale Hills Woodland       | 287097  | 6232729  | ✓             |                         |                     |                |                       |                     |               |
| C2       | River-flat Eucalypt Forest | 286931  | 6232569  | ✓             |                         |                     |                |                       |                     |               |
| C3       | River-flat Eucalypt Forest | 287341  | 6232306  | ✓             |                         |                     |                |                       |                     |               |
| C4       | Shale Hills Woodland       | 287278  | 6232480  | ✓             |                         |                     |                |                       |                     |               |
| C5       | River-flat Eucalypt Forest | 287841  | 6232755  | ✓             |                         |                     |                |                       |                     |               |
| C6       | River-flat Eucalypt Forest | 287586  | 6233047  | ✓             |                         |                     |                |                       |                     |               |
| C7       | Shale Plains Woodland      | 287830  | 6233476  | ✓             |                         |                     |                |                       |                     |               |
| C8       | River-flat Eucalypt Forest | 287354  | 6233188  | ✓             |                         |                     |                |                       |                     |               |
| C9       | Shale Plains Woodland      | 287555  | 6232048  | ✓             |                         |                     |                |                       |                     |               |
| C10      | River-flat Eucalypt Forest | 287034  | 6232439  | ✓             |                         |                     |                |                       |                     |               |
| C11      | River-flat Eucalypt Forest | 287343  | 6232329  | ✓             |                         |                     |                |                       |                     |               |
| A1       | River-flat Eucalypt Forest | 286931  | 6232569  |               | ✓                       |                     |                |                       |                     |               |
| A2       | River-flat Eucalypt Forest | 287299  | 6232254  |               | ✓                       |                     |                |                       |                     |               |
| A3       | Shale Hills Woodland       | 287278  | 6232480  |               | ✓                       |                     |                |                       |                     |               |
| A4       | River-flat Eucalypt Forest | 287841  | 6232755  |               | ✓                       |                     |                |                       |                     |               |
| A5       | River-flat Eucalypt Forest | 287305  | 6232380  |               | ✓                       |                     |                |                       |                     |               |
| A6       | River-flat Eucalypt Forest | 287354  | 6233188  |               | ✓                       |                     |                |                       |                     |               |



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| Site no. | Vegetation type  | Easting | Northing | Remote camera | Ultrasonic bat detector | Diurnal bird survey | Reptile survey | Nocturnal frog census | Spotlighting survey | Call playback |
|----------|--|---------|----------|---------------|-------------------------|---------------------|----------------|-----------------------|---------------------|---------------|
| A7       | Pasture adjacent to dam                                | 287808  | 6232349  |               | ✓                       |                     |                |                       |                     |               |
| A8       | Shale Hills Woodland                                   | 287049  | 6232605  |               | ✓                       |                     |                |                       |                     |               |
| B1       | Shale Hills Woodland, some River-flat Eucalypt Forest  | 287034  | 6232441  |               |                         | ✓                   |                |                       |                     |               |
| B2       | Shale Hills Woodland                                   | 287064  | 6232616  |               |                         | ✓                   |                |                       |                     |               |
| B3       | Shale Hills Woodland                                   | 287305  | 6232380  |               |                         | ✓                   |                |                       |                     |               |
| B4       | Shale Plains Woodland, some River-flat Eucalypt Forest | 287617  | 6232102  |               |                         | ✓                   |                |                       |                     |               |
| B5       | River-flat Eucalypt Forest                             | 287818  | 6232758  |               |                         | ✓                   |                |                       |                     |               |
| B6       | Shale Hills Woodland                                   | 287389  | 6232935  |               |                         | ✓                   |                |                       |                     |               |
| B7       | River-flat Eucalypt Forest                             | 287571  | 6233042  |               |                         | ✓                   |                |                       |                     |               |
| B8       | Shale Hills Woodland, some Shale Plains Woodland       | 287723  | 6233345  |               |                         | ✓                   |                |                       |                     |               |
| B9       | River-flat Eucalypt Forest, some Shale Hills Woodland  | 287336  | 6232345  |               |                         | ✓                   |                |                       |                     |               |
| R1       | River-flat Eucalypt Forest                             | 287034  | 6232439  |               |                         |                     | ✓              |                       |                     |               |
| R2       | River-flat Eucalypt Forest                             | 287355  | 6233184  |               |                         |                     | ✓              |                       |                     |               |
| R3       | Shale Hills Woodland                                   | 287049  | 6232597  |               |                         |                     | ✓              |                       |                     |               |
| R4       | Shale Hills Woodland                                   | 287108  | 6232720  |               |                         |                     | ✓              |                       |                     |               |
| R5       | River-flat Eucalypt Forest                             | 287347  | 6232325  |               |                         |                     | ✓              |                       |                     |               |
| R6       | Shale Hills Woodland                                   | 287301  | 6232446  |               |                         |                     | ✓              |                       |                     |               |
| R7       | Shale Plains Woodland                                  | 287875  | 6233468  |               |                         |                     | ✓              |                       |                     |               |

Fauna Survey of the Mater Dei Property, Cobbity

| Site no.              | Vegetation type  | Easting | Northing | Remote camera | Ultrasonic bat detector | Diurnal bird survey | Reptile survey | Nocturnal frog census | Spotlighting survey | Call playback |
|-----------------------|--|---------|----------|---------------|-------------------------|---------------------|----------------|-----------------------|---------------------|---------------|
| F1                    | River-flat Eucalypt Forest                                     | 287306  | 6232275  |               |                         |                     |                | ✓                     |                     |               |
| F2                    | River-flat Eucalypt Forest                                     | 287846  | 6232864  |               |                         |                     |                | ✓                     |                     |               |
| S1                    | Shale Hills Woodland,<br>some River-flat Eucalypt Forest       | 287034  | 6232439  |               |                         |                     |                |                       | ✓                   |               |
| S2                    | Shale Hills Woodland   | 287037  | 6232595  |               |                         |                     |                |                       | ✓                   |               |
| S3                    | Between Shale Hills Woodland and<br>River-flat Eucalypt Forest | 286976  | 6232388  |               |                         |                     |                |                       | ✓                   |               |
| S4                    | Shale Hills Woodland   | 287301  | 6232387  |               |                         |                     |                |                       | ✓                   |               |
| S5                    | Shale Hills Woodland   | 287384  | 6232935  |               |                         |                     |                |                       | ✓                   |               |
| S6                    | Shale Hills Woodland,<br>some Shale Plains Woodland            | 287651  | 6232962  |               |                         |                     |                |                       | ✓                   |               |
| CP1                   | Between Shale Hills Woodland and<br>River-flat Eucalypt Forest | 287035  | 6232594  |               |                         |                     |                |                       |                     | ✓             |
| CP2                   | Between Shale Hills Woodland and<br>River-flat Eucalypt Forest | 287301  | 6232387  |               |                         |                     |                |                       |                     | ✓             |
| CP3                   | Shale Hills Woodland   | 287386  | 6232924  |               |                         |                     |                |                       |                     | ✓             |
| Total sites/transects |  |         |          | 11            | 8                       | 9                   | 7              | 2                     | 6                   | 3             |

\* One night of data only.

^ Three nights of data rather than four.

## Appendix B Fauna species recorded

| Family       | Scientific name                | Common name               | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |
|--------------|--------------------------------|---------------------------|---------------------------|-------------------------------------|--------------------------------|
| <b>Birds</b> |                                |                           |                           |                                     |                                |
| Acanthizidae | <i>Acanthiza nana</i>          | Yellow thornbill          | P                         | x                                   | x                              |
|              | <i>Acanthiza pusilla</i>       | Brown thornbill           | P                         | x                                   | x                              |
|              | <i>Gerygone mouki</i>          | Brown gerygone            | P                         | x                                   | x                              |
|              | <i>Chthonicola sagittata</i>   | Speckled warbler          | V                         |                                     | x                              |
|              | <i>Sericornis frontalis</i>    | White-browed scrubwren    | P                         | x                                   | x                              |
|              | <i>Smicronis brevirostris</i>  | Weebill                   | P                         | x                                   | x                              |
| Accipitridae | <i>Accipiter fasciatus</i>     | Brown goshawk             | P                         |                                     | x                              |
|              | <i>Aquila audax</i>            | Wedge-tailed eagle        | P                         | x                                   |                                |
|              | <i>Aviceda subcristata</i>     | Pacific baza              | P                         | x                                   |                                |
|              | <i>Elanus axillaris</i>        | Black-shouldered kite     | P                         |                                     | x                              |
|              | <i>Haliaeetus leucogaster</i>  | White-bellied sea-eagle   | V                         |                                     | x                              |
|              | <i>Haliastur sphenurus</i>     | Whistling kite            | P                         | x                                   |                                |
|              | <i>Hieraaetus morphnoides</i>  | Little eagle              | V                         |                                     | x                              |
| Aegothelidae | <i>Aegotheles cristatus</i>    | Australian owlet-nightjar | P                         | x                                   |                                |
| Alcedinidae  | <i>Ceyx azureus</i>            | Azure kingfisher          | P                         |                                     | x                              |
|              | <i>Dacelo novaeguineae</i>     | Laughing kookaburra       | P                         | x                                   | x                              |
| Anatidae     | <i>Anas gracilis</i>           | Grey teal                 | P                         |                                     | x                              |
|              | <i>Anas superciliosa</i>       | Pacific black duck        | P                         | x                                   | x                              |
|              | <i>Aythya australis</i>        | Hardhead                  | P                         |                                     | x                              |
|              | <i>Chenonetta jubata</i>       | Australian wood duck      | P                         | x                                   | x                              |
| Anhingidae   | <i>Anhinga novaehollandiae</i> | Australasian darter       | P                         |                                     | x                              |
| Ardeidae     | <i>Ardea pacifica</i>          | White-necked heron        | P                         | x                                   | x                              |
|              | <i>Bubulcus coromandus</i>     | Eastern cattle egret      | P                         |                                     | x                              |

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| Family        | Scientific name                           | Common name                  | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |
|---------------|---|------------------------------|---------------------------|-------------------------------------|--------------------------------|
|               | <i>Egretta novaehollandiae</i>            | White-faced heron            | P                         | x                                   | x                              |
| Artamidae     | <i>Artamus cyanopterus cyanopterus</i>    | Dusky woodswallow            | V                         | x                                   |                                |
|               | <i>Cracticus tibicen</i>                  | Australian magpie            | P                         | x                                   | x                              |
|               | <i>Cracticus torquatus</i>                | Grey butcherbird             | P                         | x                                   | x                              |
|               | <i>Strepera graculina</i>                 | Pied currawong               | P                         | x                                   | x                              |
| Cacatuidae    | <i>Cacatua galerita</i>                   | Sulphur-crested cockatoo     | P                         | x                                   | x                              |
|               | <i>Cacatua sanguinea</i>                  | Little corella               | P                         | x                                   | x                              |
|               | <i>Calyptorhynchus funereus</i>           | Yellow-tailed black-cockatoo | P                         |                                     | x                              |
|               | <i>Eolophus roseicapillus</i>             | Galah                        | P                         |                                     | x                              |
| Campephagidae | <i>Coracina novaehollandiae</i>           | Black-faced cuckoo-shrike    | P                         | x                                   | x                              |
| Charadriidae  | <i>Vanellus miles</i>                     | Masked lapwing               | P                         |                                     | x                              |
| Climacteridae | <i>Cormobates leucophaea</i>              | White-throated treecreeper   | P                         |                                     | x                              |
| Columbidae    | <i>Geopelia humeralis</i>                 | Bar-shouldered dove          | P                         | x                                   | x                              |
|               | <i>Geopelia striata</i>                   | Peaceful dove                | P                         | x                                   | x                              |
|               | <i>Macropygia amboinensis phasianella</i> | Brown cuckoo-dove            | P                         |                                     | x                              |
|               | <i>Ocyphaps lophotes</i>                  | Crested pigeon               | P                         | x                                   | x                              |
|               | <i>Phaps chalcoptera</i>                  | Common bronzewing            | P                         | x                                   | x                              |
|               | <i>Streptopelia chinensis</i>             | Spotted turtle-dove          | Exotic                    |                                     | x                              |
| Corcoracidae  | <i>Corcorax melanorhamphos</i>            | White-winged chough          | P                         | x                                   |                                |
| Corvidae      | <i>Corvus coronoides</i>                  | Australian raven             | P                         | x                                   | x                              |
| Cuculidae     | <i>Cacomantis flabelliformis</i>          | Fan-tailed cuckoo            | P                         | x                                   | x                              |
|               | <i>Chalcites lucidus</i>                  | Shining bronze-cuckoo        | P                         | x                                   |                                |
| Estrildidae   | <i>Neochmia temporalis</i>                | Red-browed finch             | P                         | x                                   | x                              |
|               | <i>Taeniopygia bichenovii</i>             | Double-barred finch          | P                         |                                     | x                              |
| Falconidae    | <i>Falco cenchroides</i>                  | Nankeen kestrel              | P                         | x                                   | x                              |
|               | <i>Falco longipennis</i>                  | Australian hobby             | P                         | x                                   | x                              |

Fauna Survey of the Mater Dei Property, Cobbity

| Family          | Scientific name                     | Common name                | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |   |
|-----------------|-------------------------------------|----------------------------|---------------------------|-------------------------------------|--------------------------------|---|
| Hirundinidae    | <i>Hirundo neoxena</i>              | Welcome swallow            | P                         | x                                   | x                              |   |
| Maluridae       | <i>Malurus cyaneus</i>              | Superb fairy-wren          | P                         | x                                   | x                              |   |
|                 | <i>Malurus lamberti</i>             | Variiegated fairy-wren     | P                         | x                                   | x                              |   |
| Meliphagidae    | <i>Acanthorhynchus tenuirostris</i> | Eastern spinebill          | P                         | x                                   | x                              |   |
|                 | <i>Anthochaera carunculata</i>      | Red wattlebird             | P                         |                                     | x                              |   |
|                 | <i>Caligavis chrysops</i>           | Yellow-faced honeyeater    | P                         | x                                   | x                              |   |
|                 | <i>Manorina melanocephala</i>       | Noisy miner                | P                         | x                                   | x                              |   |
|                 | <i>Manorina melanophrys</i>         | Bell miner                 | P                         | x                                   | x                              |   |
|                 | <i>Meliphaga lewinii</i>            | Lewin's honeyeater         | P                         | x                                   | x                              |   |
|                 | <i>Melithreptus brevirostris</i>    | Brown-headed honeyeater    | P                         | x                                   | x                              |   |
|                 | <i>Melithreptus lunatus</i>         | White-naped honeyeater     | P                         |                                     | x                              |   |
|                 | <i>Myzomela sanguinolenta</i>       | Scarlet honeyeater         | P                         |                                     | x                              |   |
|                 | <i>Philemon corniculatus</i>        | Noisy friarbird            | P                         |                                     | x                              |   |
|                 | Monarchidae                         | <i>Grallina cyanoleuca</i> | Magpie-lark               | P                                   | x                              | x |
|                 |                                     | <i>Myiagra inquieta</i>    | Restless flycatcher       | P                                   | x                              |   |
| Nectariniidae   | <i>Dicaeum hirundinaceum</i>        | Mistletoebird              | P                         |                                     | x                              |   |
| Neosittidae     | <i>Daphoenositta chrysoptera</i>    | Varied sittella            | V                         |                                     | x                              |   |
| Oriolidae       | <i>Oriolus sagittatus</i>           | Olive-backed oriole        | P                         | x                                   | x                              |   |
| Pachycephalidae | <i>Colluricincla harmonica</i>      | Grey shrike-thrush         | P                         | x                                   | x                              |   |
|                 | <i>Falcunculus frontatus</i>        | Crested shrike-tit         | P                         | x                                   | x                              |   |
|                 | <i>Pachycephala pectoralis</i>      | Golden whistler            | P                         | x                                   | x                              |   |
| Pardalotidae    | <i>Pardalotus punctatus</i>         | Spotted pardalote          | P                         | x                                   | x                              |   |
|                 | <i>Pardalotus striatus</i>          | Striated pardalote         | P                         | x                                   | x                              |   |
| Petroicidae     | <i>Eopsaltria australis</i>         | Eastern yellow robin       | P                         | x                                   | x                              |   |
|                 | <i>Microeca fascinans</i>           | Jacky winter               | P                         |                                     | x                              |   |
|                 | <i>Petroica rosea</i>               | Rose robin                 | P                         | x                                   | x                              |   |

Fauna Survey of the Mater Dei Property, Cobbity

| Family            | Scientific name                    | Common name                  | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |
|-------------------|------------------------------------|------------------------------|---------------------------|-------------------------------------|--------------------------------|
| Phalacrocoracidae | <i>Microcarbo melanoleucos</i>     | Little pied cormorant        | P                         | x                                   | x                              |
|                   | <i>Phalacrocorax carbo</i>         | Great cormorant              | P                         |                                     | x                              |
|                   | <i>Phalacrocorax sulcirostris</i>  | Little black cormorant       | P                         |                                     | x                              |
|                   | <i>Phalacrocorax varius</i>        | Pied cormorant               | P                         | x                                   |                                |
| Podargidae        | <i>Podargus strigoides</i>         | Tawny frogmouth              | P                         | x                                   | x                              |
| Podicipedidae     | <i>Tachybaptus novaehollandiae</i> | Australasian grebe           | P                         | x                                   | x                              |
| Psittacidae       | <i>Alisterus scapularis</i>        | Australian king-parrot       | P                         | x                                   | x                              |
|                   | <i>Glossopsitta concinna</i>       | Musk lorikeet                | P                         | x                                   | x                              |
|                   | <i>Glossopsitta pusilla</i>        | Little lorikeet              | V                         | x                                   |                                |
|                   | <i>Platycercus elegans</i>         | Crimson rosella              | P                         |                                     | x                              |
|                   | <i>Platycercus eximius</i>         | Eastern rosella              | P                         | x                                   | x                              |
|                   | <i>Psephotus haematonotus</i>      | Red-rumped parrot            | P                         | x                                   | x                              |
|                   | <i>Trichoglossus haematodus</i>    | Rainbow lorikeet             | P                         | x                                   | x                              |
| Psophodidae       | <i>Psophodes olivaceus</i>         | Eastern whipbird             | P                         | x                                   | x                              |
| Ptilonorhynchidae | <i>Ptilonorhynchus violaceus</i>   | Satin bowerbird              | P                         | x                                   | x                              |
| Pycnonotidae      | <i>Pycnonotus jocosus</i>          | Red-whiskered bulbul         | Exotic                    | x                                   | x                              |
| Rallidae          | <i>Gallinula tenebrosa</i>         | Dusky moorhen                | P                         | x                                   | x                              |
|                   | <i>Porphyrio porphyrio</i>         | Australasian/purple swamphen | P                         |                                     | x                              |
| Rhipiduridae      | <i>Rhipidura albiscapa</i>         | Grey fantail                 | P                         | x                                   | x                              |
|                   | <i>Rhipidura leucophrys</i>        | Willie wagtail               | P                         | x                                   | x                              |
|                   | <i>Rhipidura rufifrons</i>         | Rufous fantail               | P                         | x                                   |                                |
| Strigidae         | <i>Ninox boobook</i>               | Southern boobook             | P                         | x                                   | x                              |
|                   | <i>Ninox strenua</i>               | Powerful owl                 | V                         | x                                   |                                |
| Sturnidae         | <i>Sturnus tristis</i>             | Common myna                  | Exotic                    | x                                   | x                              |
|                   | <i>Sturnus vulgaris</i>            | Common starling              | Exotic                    | x                                   | x                              |
| Threskiornithidae | <i>Platalea regia</i>              | Royal spoonbill              | P                         | x                                   |                                |

Fauna Survey of the Mater Dei Property, Cobbity

| Family               | Scientific name                 | Common name                 | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |
|----------------------|---------------------------------|-----------------------------|---------------------------|-------------------------------------|--------------------------------|
|                      | <i>Threskiornis molucca</i>     | Australian white ibis       | P                         | x                                   |                                |
| Timaliidae           | <i>Zosterops lateralis</i>      | Silvereye                   | P                         | x                                   | x                              |
| Turdidae             | <i>Turdus merula</i>            | Eurasian blackbird          | Exotic                    | x                                   | x                              |
| <b>Frogs</b>         |                                 |                             |                           |                                     |                                |
| Hylidae              | <i>Litoria dentata</i>          | Bleating tree frog          | P                         |                                     | x                              |
|                      | <i>Litoria fallax</i>           | Eastern dwarf tree frog     | P                         | x                                   |                                |
|                      | <i>Litoria peronii</i>          | Peron's tree frog           | P                         | x                                   | x                              |
|                      | <i>Litoria verreauxii</i>       | Verreaux's frog             | P                         | x                                   | x                              |
| Myobatrachidae       | <i>Crinia signifera</i>         | Common eastern froglet      | P                         | x                                   | x                              |
|                      | <i>Limnodynastes dumerilii</i>  | Eastern banjo frog          | P                         |                                     | x                              |
|                      | <i>Limnodynastes peronii</i>    | Brown-striped frog          | P                         | x                                   | x                              |
| <b>Invertebrates</b> |                                 |                             |                           |                                     |                                |
| Camaenidae           | <i>Meridolum corneovirens</i>   | Cumberland Plain land snail | E1                        | x                                   |                                |
| Helicidae            | <i>Cantareus aspersa</i>        | Garden snail                | Exotic                    | x                                   |                                |
| <b>Mammals</b>       |                                 |                             |                           |                                     |                                |
| Canidae              | <i>Vulpes vulpes</i>            | Fox                         | Exotic                    | x                                   | x                              |
| Cervidae             | <i>Dama dama</i>                | Fallow deer                 | Exotic                    | x                                   | x                              |
| Felidae              | <i>Felis catus</i>              | Feral cat                   | Exotic                    |                                     | x                              |
| Leporidae            | <i>Lepus capensis</i>           | Brown hare                  | Exotic                    | x                                   |                                |
|                      | <i>Oryctolagus cuniculus</i>    | Rabbit                      | Exotic                    | x                                   | x                              |
| Macropodidae         | <i>Macropus giganteus</i>       | Eastern grey kangaroo       | P                         | x                                   | x                              |
|                      | <i>Macropus robustus</i>        | Common wallaroo             | P                         | x                                   | x                              |
|                      | <i>Wallabia bicolor</i>         | Swamp wallaby               | P                         | x                                   | x                              |
| Molossidae           | <i>Austronomus australis</i>    | White-striped freetail-bat  | P                         | x                                   |                                |
|                      | <i>Mormopterus norfolkensis</i> | Eastern freetail-bat        | V                         | x                                   |                                |
|                      | <i>Mormopterus ridei</i>        | Ride's freetail-bat         | P                         | x                                   |                                |

## Fauna Survey of the Mater Dei Property, Cobbity

| Family           | Scientific name                            | Common name                  | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |
|------------------|--|------------------------------|---------------------------|-------------------------------------|--------------------------------|
| Muridae          | <i>Mus musculus</i>                        | House mouse                  | Exotic                    |                                     | x                              |
|                  | <i>Rattus rattus</i>                       | Black rat                    | Exotic                    | x                                   | x                              |
| Petauridae       | <i>Petaurus breviceps</i>                  | Sugar glider                 | P                         |                                     | x                              |
| Phalangeridae    | <i>Trichosurus</i> sp.                     | Brushtail possum             | P                         | x                                   | x                              |
| Pseudocheiridae  | <i>Pseudocheirus peregrinus</i>            | Common ringtail possum       | P                         |                                     | x                              |
| Tachyglossidae   | <i>Tachyglossus aculeatus</i>              | Short-beaked echidna         | P                         |                                     | x                              |
| Vespertilionidae | <i>Chalinolobus dwyeri</i>                 | Large-eared pied bat         | V                         | x                                   |                                |
|                  | <i>Chalinolobus gouldii</i>                | Gould's wattled bat          | P                         | x                                   |                                |
|                  | <i>Chalinolobus morio</i>                  | Chocolate wattled bat        | P                         | x                                   |                                |
|                  | <i>Miniopterus australis</i>               | Little bentwing-bat          | V                         | possible                            |                                |
|                  | <i>Miniopterus schreibersii oceanensis</i> | Eastern bentwing-bat         | V                         | x                                   |                                |
|                  | <i>Nyctophilus</i> sp.                     | Long-eared bat               | P                         | x                                   |                                |
|                  | <i>Scotorepens orion</i>                   | Eastern broad-nosed bat      | P                         | x                                   |                                |
|                  | <i>Vespadelus darlingtoni</i>              | Large forest bat             | P                         | possible                            |                                |
|                  | <i>Vespadelus vulturnus</i>                | Little forest bat            | P                         | x                                   |                                |
| Vombatidae       | <i>Vombatus ursinus</i>                    | Common wombat                | P                         | x                                   | x                              |
| <b>Reptiles</b>  |  |                              |                           |                                     |                                |
| Agamidae         | <i>Intellagama lesueurii</i>               | Eastern water dragon         | P                         |                                     | x                              |
| Chelidae         | <i>Chelodina longicollis</i>               | Eastern snake-necked turtle  | P                         |                                     | x                              |
| Elapidae         | <i>Pseudechis porphyriacus</i>             | Red-bellied black snake      | P                         |                                     | x                              |
| Scincidae        | <i>Cryptoblepharus pulcher</i>             | Elegant Snake-eyed Skink     | P                         |                                     | x                              |
|                  | <i>Eulamprus quoyii</i>                    | Eastern water-skink          | P                         | x                                   |                                |
|                  | <i>Eulamprus tenuis</i>                    | Barred-sided skink           | P                         |                                     | x                              |
|                  | <i>Lampropholis delicata</i>               | Dark-flecked garden sunskink | P                         | x                                   | x                              |
|                  | <i>Lampropholis guichenoti</i>             | Pale-flecked garden sunskink | P                         | x                                   | x                              |



Fauna Survey of the Mater Dei Property, Cobbity

| Family      | Scientific name           | Common name          | Conservation status (NSW) | Species recorded during main survey | Species recorded during winter |
|-------------|---------------------------|----------------------|---------------------------|-------------------------------------|--------------------------------|
|             | <i>Saiphos equalis</i>    | Three-toed skink     | P                         | x                                   |                                |
|             | <i>Tiliqua scincoides</i> | Eastern blue-tongue  | P                         |                                     | x                              |
| Typhlopidae | <i>Anilius nigrescens</i> | Blackish blind snake | P                         |                                     | x                              |

\* P = Protected; V = Vulnerable; E1 = Endangered; Exotic = introduced species

## Appendix C Details of birds recorded

| Family       | Scientific name                        | Common name               | Habitat         | Foraging guild |
|--------------|--|---------------------------|-----------------|----------------|
| Acanthizidae | <i>Acanthiza nana</i>                  | Yellow thornbill          | Woodland        | CI             |
|              | <i>Acanthiza pusilla</i>               | Brown thornbill           | Woodland/Forest | CI             |
|              | <i>Gerygone mouki</i>                  | Brown gerygone            | Woodland/Forest | CI             |
|              | <i>Chthonicola sagittata</i>           | Speckled warbler          | Woodland/Forest | GI             |
|              | <i>Sericornis frontalis</i>            | White-browed scrubwren    | Woodland/Forest | GI             |
|              | <i>Smicrornis brevirostris</i>         | Weebill                   | Woodland        | CI             |
| Accipitridae | <i>Accipiter fasciatus</i>             | Brown goshawk             | Woodland/Forest | P              |
|              | <i>Aquila audax</i>                    | Wedge-tailed eagle        | Woodland/Forest | P              |
|              | <i>Aviceda subcristata</i>             | Pacific baza              | Woodland/Forest | P              |
|              | <i>Elanus axillaris</i>                | Black-shouldered kite     | Woodland/Forest | P              |
|              | <i>Haliaeetus leucogaster</i>          | White-bellied sea-eagle   | Wetland         | P              |
|              | <i>Haliastur sphenurus</i>             | Whistling kite            | Woodland/Forest | P              |
|              | <i>Hieraaetus morphnoides</i>          | Little eagle              | Woodland/Forest | P              |
| Aegothelidae | <i>Aegotheles cristatus</i>            | Australian owlet-nightjar | Woodland/Forest | AI             |
| Alcedinidae  | <i>Ceyx azureus</i>                    | Azure kingfisher          | Wetland         | P              |
|              | <i>Dacelo novaeguineae</i>             | Laughing kookaburra       | Woodland/Forest | P              |
| Anatidae     | <i>Anas gracilis</i>                   | Grey teal                 | Wetland         | Waterbird      |
|              | <i>Anas superciliosa</i>               | Pacific black duck        | Wetland         | Waterbird      |
|              | <i>Aythya australis</i>                | Hardhead                  | Wetland         | Waterbird      |
|              | <i>Chenonetta jubata</i>               | Australian wood duck      | Wetland         | Waterbird      |
| Anhingidae   | <i>Anhinga novaehollandiae</i>         | Australasian darter       | Wetland         | Waterbird      |
| Ardeidae     | <i>Ardea pacifica</i>                  | White-necked heron        | Wetland         | Waterbird      |
|              | <i>Bubulcus coromandus</i>             | Eastern cattle egret      | Wetland         | Waterbird      |
|              | <i>Egretta novaehollandiae</i>         | White-faced heron         | Wetland         | Waterbird      |
| Artamidae    | <i>Artamus cyanopterus cyanopterus</i> | Dusky woodswallow         | Woodland/Forest | AI             |
|              | <i>Cracticus tibicen</i>               | Australian magpie         | Woodland/Forest | GI/P           |
|              | <i>Cracticus torquatus</i>             | Grey butcherbird          | Woodland/Forest | P              |
|              | <i>Strepera graculina</i>              | Pied currawong            | Woodland/Forest | Fruiteater/P   |

Fauna Survey of the Mater Dei Property, Cobbity

| Family        | Scientific name                           | Common name                  | Habitat         | Foraging guild |
|---------------|---|------------------------------|-----------------|----------------|
| Cacatuidae    | <i>Cacatua galerita</i>                   | Sulphur-crested cockatoo     | Woodland/Forest | GS/CS          |
|               | <i>Cacatua sanguinea</i>                  | Little corella               | Woodland/Forest | GS             |
|               | <i>Calyptorhynchus funereus</i>           | Yellow-tailed black-cockatoo | Woodland/Forest | GS/CS          |
|               | <i>Eolophus roseicapillus</i>             | Galah                        | Woodland/Forest | GS             |
| Campephagidae | <i>Coracina novaehollandiae</i>           | Black-faced cuckoo-shrike    | Woodland/Forest | CI             |
| Charadriidae  | <i>Vanellus miles</i>                     | Masked lapwing               | Wetland         | GI             |
| Climacteridae | <i>Cormobates leucophaea</i>              | White-throated treecreeper   | Woodland/Forest | CN/CI          |
| Columbidae    | <i>Geopelia humeralis</i>                 | Bar-shouldered dove          | Woodland/Forest | GS             |
|               | <i>Geopelia striata</i>                   | Peaceful dove                | Woodland        | GS             |
|               | <i>Macropygia amboinensis phasianella</i> | Brown cuckoo-dove            | Woodland/Forest | Fruiteater     |
|               | <i>Ocyphaps lophotes</i>                  | Crested pigeon               | Woodland        | GS             |
|               | <i>Phaps chalcoptera</i>                  | Common bronzewing            | Woodland        | GS             |
|               | <i>Spilopelia chinensis</i>               | Spotted turtle-dove          | Woodland        | GS             |
| Corcoracidae  | <i>Corcorax melanorhamphos</i>            | White-winged cough           | Woodland        | GI/P           |
| Corvidae      | <i>Corvus coronoides</i>                  | Australian raven             | Woodland/Forest | P              |
| Cuculidae     | <i>Cacomantis flabelliformis</i>          | Fan-tailed cuckoo            | Woodland/Forest | CI             |
|               | <i>Chalcites lucidus</i>                  | Shining bronze-cuckoo        | Woodland/Forest | CI             |
| Estrildidae   | <i>Neochmia temporalis</i>                | Red-browed finch             | Woodland/Forest | GS             |
|               | <i>Taeniopygia bichenovii</i>             | Double-barred finch          | Woodland/Forest | GS             |
| Falconidae    | <i>Falco cenchroides</i>                  | Nankeen kestrel              | Woodland/Forest | P              |
|               | <i>Falco longipennis</i>                  | Australian hobby             | Woodland/Forest | P              |
| Hirundinidae  | <i>Hirundo neoxena</i>                    | Welcome swallow              | Woodland/Forest | AI             |
| Maluridae     | <i>Malurus cyaneus</i>                    | Superb fairy-wren            | Woodland/Forest | GI             |
|               | <i>Malurus lamberti</i>                   | Variogated fairy-wren        | Woodland/Forest | GI             |
| Meliphagidae  | <i>Acanthorhynchus tenuirostris</i>       | Eastern spinebill            | Woodland/Forest | CN/CI          |
|               | <i>Anthochaera carunculata</i>            | Red wattlebird               | Woodland/Forest | CN/CI          |
|               | <i>Caligavis chrysops</i>                 | Yellow-faced honeyeater      | Woodland/Forest | CN/CI          |

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| Family            | Scientific name                    | Common name             | Habitat         | Foraging guild   |
|-------------------|------------------------------------|-------------------------|-----------------|------------------|
|                   | <i>Manorina melanocephala</i>      | Noisy miner             | Woodland/Forest | CN/CI            |
|                   | <i>Manorina melanophrys</i>        | Bell miner              | Woodland/Forest | CN/CI            |
|                   | <i>Meliphaga lewinii</i>           | Lewin's honeyeater      | Woodland/Forest | CN/CI/fruiteater |
|                   | <i>Melithreptus brevirostris</i>   | Brown-headed honeyeater | Woodland/Forest | CN/CI            |
|                   | <i>Melithreptus lunatus</i>        | White-naped honeyeater  | Woodland/Forest | CN/CI            |
|                   | <i>Myzomela sanguinolenta</i>      | Scarlet honeyeater      | Woodland/Forest | CN/CI            |
|                   | <i>Philemon corniculatus</i>       | Noisy friarbird         | Woodland/Forest | CN/CI            |
| Monarchidae       | <i>Grallina cyanoleuca</i>         | Magpie-lark             | Woodland/Forest | GI               |
|                   | <i>Myiagra inquieta</i>            | Restless flycatcher     | Woodland/Forest | CI/AI            |
| Nectariniidae     | <i>Dicaeum hirundinaceum</i>       | Mistletoebird           | Woodland/Forest | CN/CI            |
| Neosittidae       | <i>Daphoenositta chrysoptera</i>   | Varied sittella         | Woodland/Forest | CI               |
| Oriolidae         | <i>Oriolus sagittatus</i>          | Olive-backed oriole     | Woodland/Forest | Fruiteater       |
| Pachycephalidae   | <i>Colluricincla harmonica</i>     | Grey shrike-thrush      | Woodland/Forest | CI/P             |
|                   | <i>Falcunculus frontatus</i>       | Crested shrike-tit      | Woodland/Forest | CI               |
|                   | <i>Pachycephala pectoralis</i>     | Golden whistler         | Woodland/Forest | CI               |
| Pardalotidae      | <i>Pardalotus punctatus</i>        | Spotted pardalote       | Woodland/Forest | CI               |
|                   | <i>Pardalotus striatus</i>         | Striated pardalote      | Woodland/Forest | CI               |
| Petroicidae       | <i>Eopsaltria australis</i>        | Eastern yellow robin    | Woodland/Forest | CI/GI            |
|                   | <i>Microeca fascinans</i>          | Jacky winter            | Woodland        | AI               |
|                   | <i>Petroica rosea</i>              | Rose robin              | Woodland/Forest | CI               |
| Phalacrocoracidae | <i>Microcarbo melanoleucos</i>     | Little pied cormorant   | Wetland         | Waterbird        |
|                   | <i>Phalacrocorax carbo</i>         | Great cormorant         | Wetland         | Waterbird        |
|                   | <i>Phalacrocorax sulcirostris</i>  | Little black cormorant  | Wetland         | Waterbird        |
|                   | <i>Phalacrocorax varius</i>        | Pied cormorant          | Wetland         | Waterbird        |
| Podargidae        | <i>Podargus strigoides</i>         | Tawny frogmouth         | Woodland/Forest | AI/P             |
| Podicipedidae     | <i>Tachybaptus novaehollandiae</i> | Australasian grebe      | Wetland         | Waterbird        |

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| Family            | Scientific name                  | Common name                  | Habitat         | Foraging guild   |
|-------------------|----------------------------------|------------------------------|-----------------|------------------|
| Psittacidae       | <i>Alisterus scapularis</i>      | Australian king-parrot       | Woodland/Forest | Fruiteater/CS    |
|                   | <i>Glossopsitta concinna</i>     | Musk lorikeet                | Woodland/Forest | CN/Fruiteater    |
|                   | <i>Glossopsitta pusilla</i>      | Little lorikeet              | Woodland/Forest | CN               |
|                   | <i>Platycercus elegans</i>       | Crimson rosella              | Woodland/Forest | GS/CS            |
|                   | <i>Platycercus eximius</i>       | Eastern rosella              | Woodland/Forest | CS               |
|                   | <i>Psephotus haematonotus</i>    | Red-rumped parrot            | Woodland/Forest | GS               |
|                   | <i>Trichoglossus haematodus</i>  | Rainbow lorikeet             | Woodland/Forest | CN               |
| Psophodidae       | <i>Psophodes olivaceus</i>       | Eastern whipbird             | Woodland/Forest | GI/P             |
| Ptilonorhynchidae | <i>Ptilonorhynchus violaceus</i> | Satin bowerbird              | Woodland/Forest | Fruiteater/GS    |
| Pycnonotidae      | <i>Pycnonotus jocosus</i>        | Red-whiskered bulbul         | Woodland/Forest | Fruit eater      |
| Rallidae          | <i>Gallinula tenebrosa</i>       | Dusky moorhen                | Wetland         | Waterbird        |
|                   | <i>Porphyrio porphyrio</i>       | Australasian/purple swamphen | Wetland         | Waterbird        |
| Rhipiduridae      | <i>Rhipidura albiscapa</i>       | Grey fantail                 | Woodland/Forest | CI/AI            |
|                   | <i>Rhipidura leucophrys</i>      | Willie wagtail               | Woodland/Forest | GI/AI            |
|                   | <i>Rhipidura rufifrons</i>       | Rufous fantail               | Woodland/Forest | AI               |
| Strigidae         | <i>Ninox boobook</i>             | Southern boobook             | Woodland/Forest | P                |
|                   | <i>Ninox strenua</i>             | Powerful owl                 | Woodland/Forest | P                |
| Sturnidae         | <i>Sturnus tristis</i>           | Common myna                  | Woodland/Forest | GI               |
|                   | <i>Sturnus vulgaris</i>          | Common starling              | Woodland        | GI/fruiteater    |
| Threskiornithidae | <i>Platalea regia</i>            | Royal spoonbill              | Wetland         | Waterbird        |
|                   | <i>Threskiornis molucca</i>      | Australian white ibis        | Wetland         | Waterbird        |
| Timaliidae        | <i>Zosterops lateralis</i>       | Silvereeye                   | Woodland/Forest | CN/CI/fruiteater |
| Turdidae          | <i>Turdus merula</i>             | Eurasian blackbird           | Woodland/Forest | GI/fruiteater    |

AI = aerial insectivore; CI = canopy insectivore; CN = canopy nectar-eater; CS = canopy seed-eater; GI = ground insectivore; GS = Ground seed-eater; P = Predator

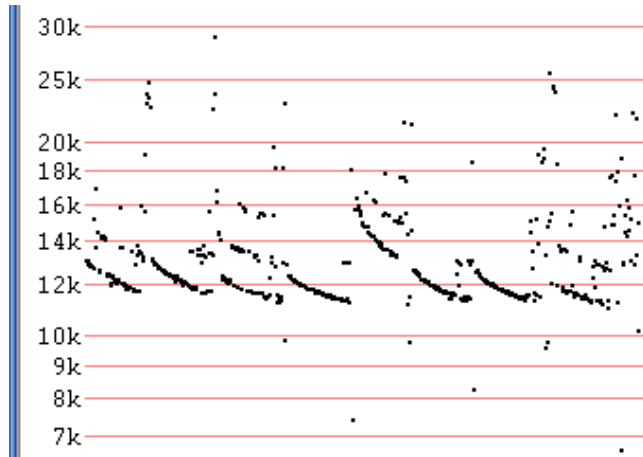
## Appendix D Example bat calls

Units shown on the y-axis denote kilohertz.

Analysis assigned bat calls to four levels of confidence: definite, probable, possible and unknown, based on the previous experience of bat call analysis expert, Dr Martin Schultz, in analysing data, use of reference calls and discussion with other field workers.

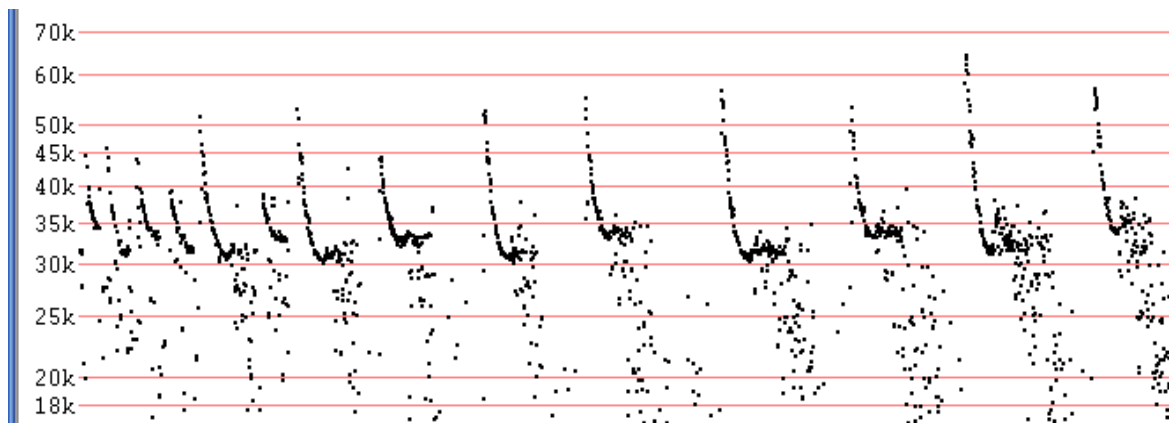
### 1 White-striped freetail-bat *Austronomus australis*

*Definite:*



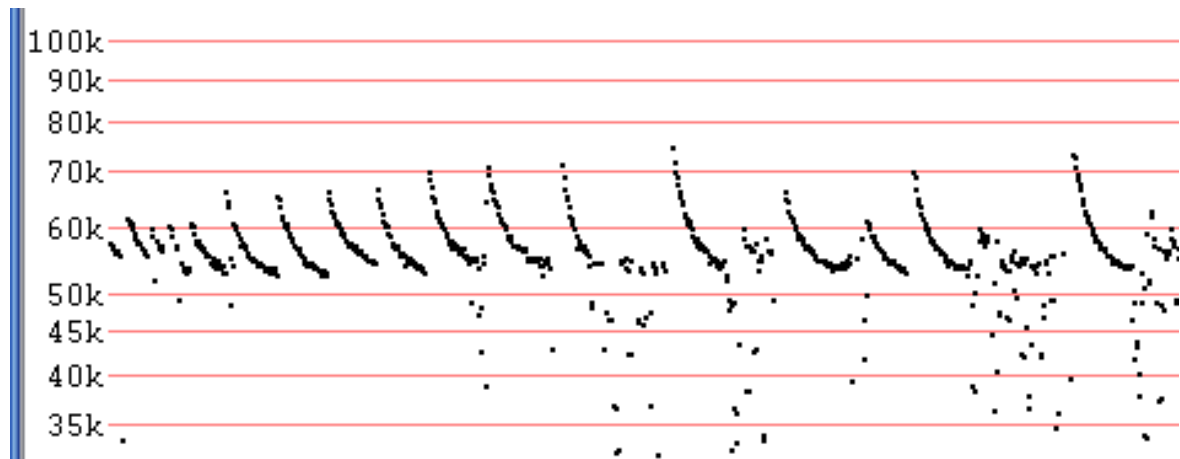
### 2 Gould's wattled bat *Chalinolobus gouldii*

*Definite:*



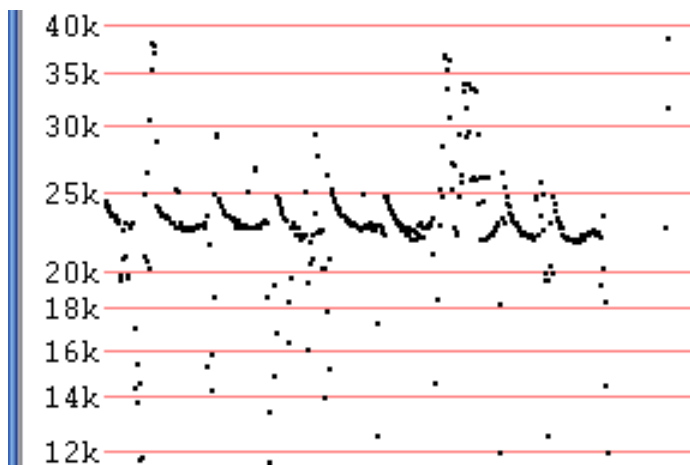
3 Chocolate wattled bat *Chalinolobus morio*

Definite:



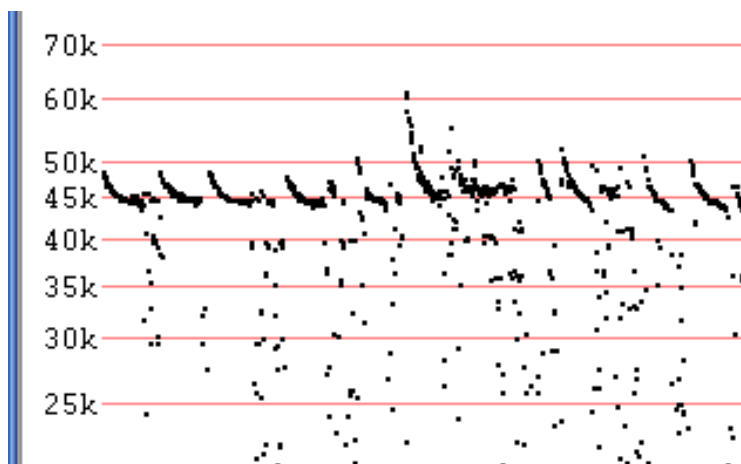
4 Large-eared pied bat *Chalinolobus dwyeri*

Definite:



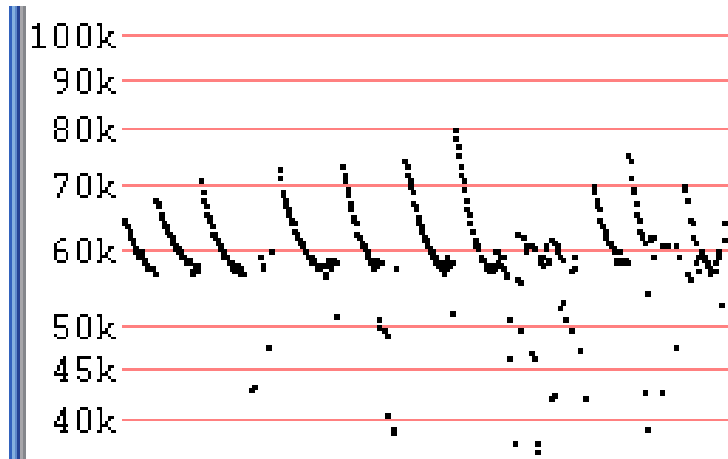
5 Eastern bentwing-bat *Miniopterus schreibersii oceanensis*

Definite:



6 Little bentwing-bat *Miniopterus australis*

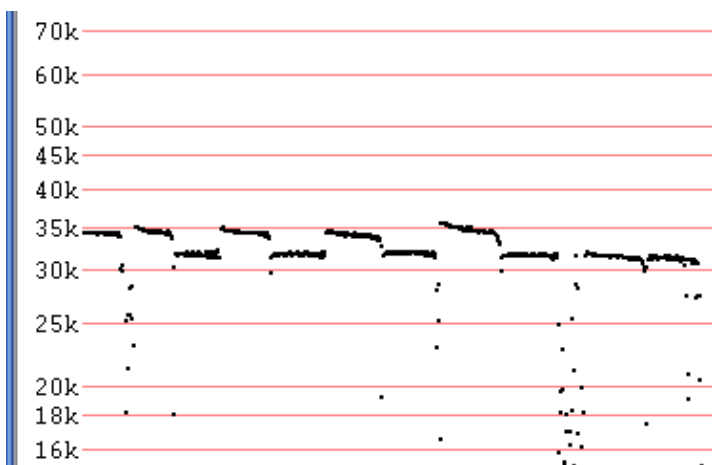
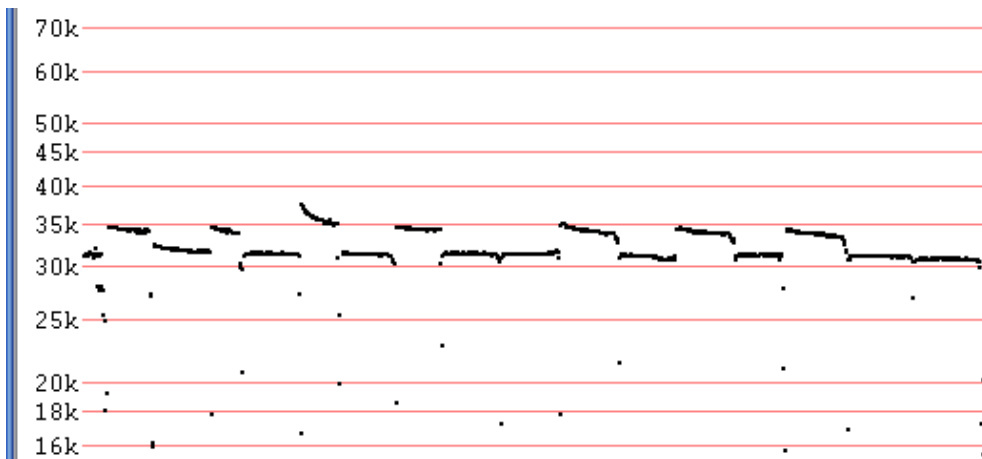
Possible:



Alternatively, a high frequency juvenile *C. morio* signal as no signals over 60kHz were seen.

7 Eastern freetail bat *Mormopterus norfolkensis*

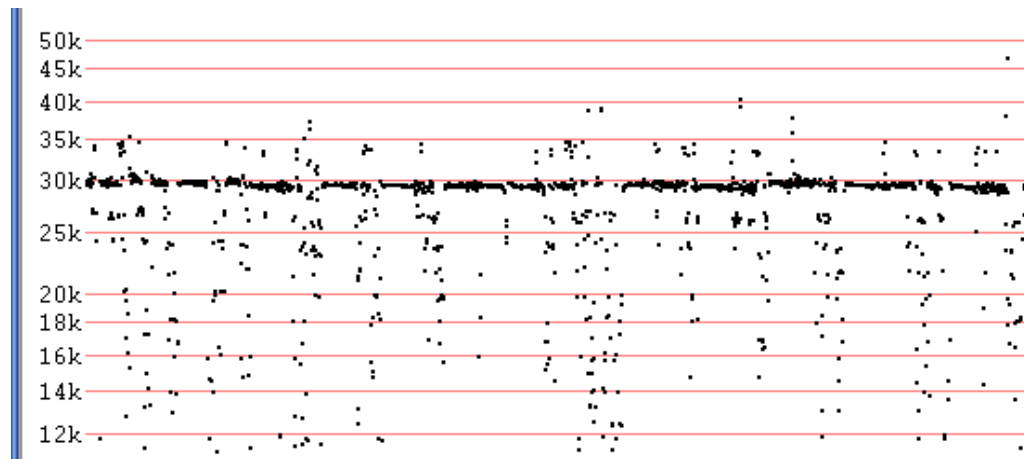
Definite:





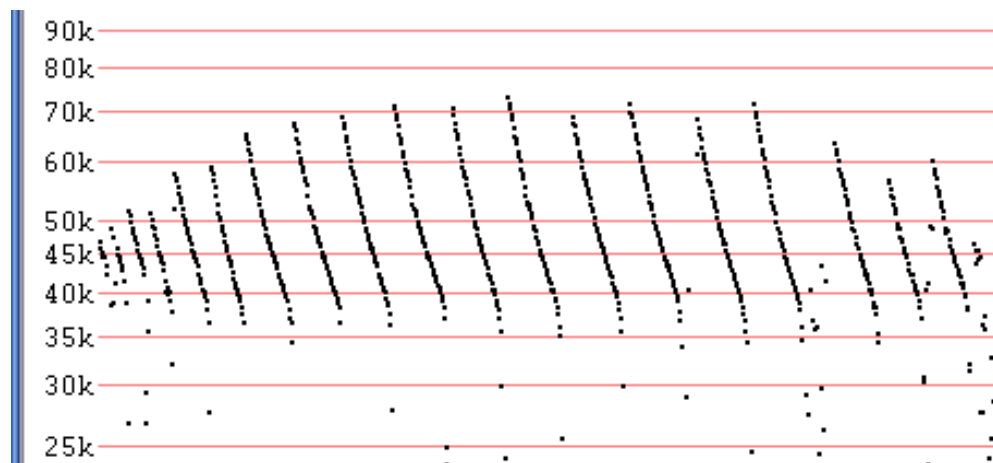
**8 Ride's free-tail bat *Mormopterus ridei***

*Definite:*



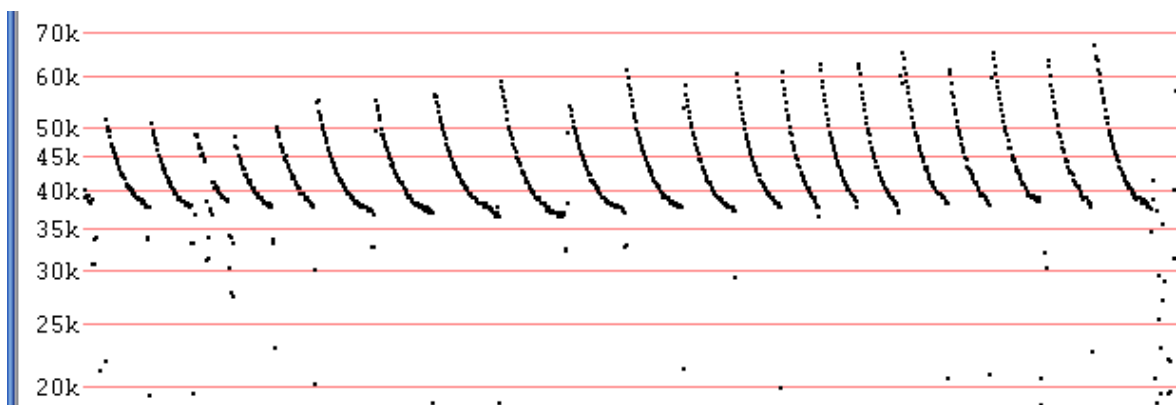
**9 Long-eared bat *Nyctophilus* sp.**

*Definite:*



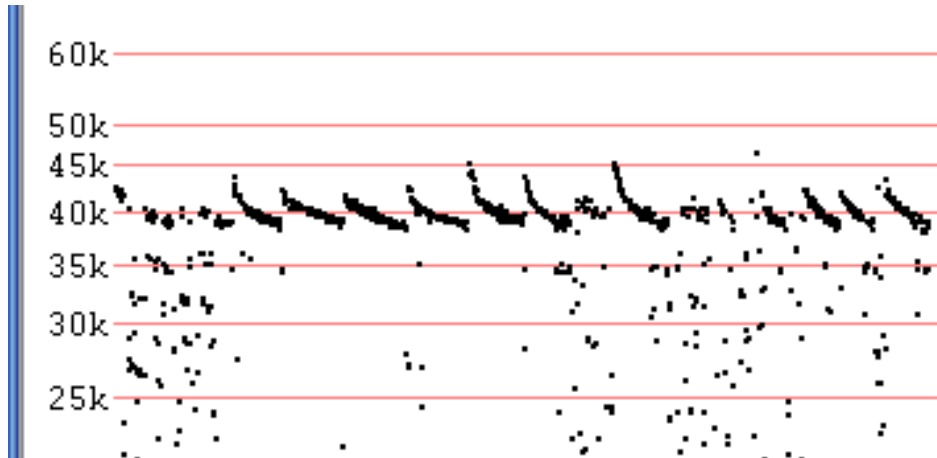
**10 Eastern broad-nosed bat *Scotorepens orion***

*Definite:*



11 Large forest bat *Vespadelus darlingtoni*

Possible:



12 Little forest bat *Vespadelus vulturnus*

Definite:

