Assessment of tree hollows for use by Masked Owl, *Tyto novaehollandiae castanops*, Ecclestone Road.

Prepared for North Barker by David James May 2023.

Summary

- No Masked Owl present during surveys.
- No physical evidence of Masked Owl use in any of the investigated hollows across site.
- High likelihood of Masked Owls roosting or nesting on nearby properties
- Some possibility suitable hollows may be used by Masked Owls for roosting in the future given proximity of regular Masked Owl presence.

Introduction

The Tasmanian Masked Owl, *Tyto novaehollandiae castanops,* is a large nocturnal raptor listed as Endangered in state (*Threatened Species Protection Act 1995*) and Vulnerable in federal (*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*) legislation. The Tasmanian Masked Owl is a forest dwelling and obligate hollow nesting species (Bell &Mooney 2002). Masked Owl abundance is greatest in the north and east of Tasmania and home range size may be as much as 1800–2500 hectares (Young, 2006). Masked Owl nest trees may be in forests, woodlands or sometimes isolated trees in paddocks (Mooney, 1997). Roosting may also occur in tree hollows but commonly in dense vegetation or occasionally in caves and rock over hangs (Bell & Mooney 2002).

Tree hollows are used by a range of fauna for shelter and nesting and may take over 100 years to form. Hollows large enough for Masked Owl nesting are likely to be found only in trees 150 years or older (Bell & Mooney 2002. Mooney, 1997). Hollows for Masked Owls must have an entrance diameter that allows efficient entry and exit and are deep enough to be secure from weather and predators. Suitable hollows also possess enough volume that an adult and chicks may be housed and contain a base suitable for egg laying and comfortable incubation.

Subdivision of a 37 hectare property at Ecclestone Road in Northern Tasmania is likely to involve the removal of hollow bearing trees. This work aims to confirm the presence or absence of Masked Owls in any tree hollows at the site and also the presence or absence of any signs of use by Masked Owl in hollows at the site potential suitability of the hollows encountered for Masked Owl use is also discussed.

Methods

Before Climbing

During ground surveys, North Barker Ecosystem Services identified 12 hollow bearing that may provide nesting or roosting habitat for Masked Owl. A marked aerial image was used to navigate the site and locate the 12 trees for climbing inspection. A rudimentary search for signs of Masked Owl activity including regurgitated pellets, prey remains, and whitewash around the base of each tree was conducted. Trees were assessed from the ground to identify safety hazards, potential hollows and senescence of interest to facilitate efficiency of climbing the tree and avoid missing hollows less easily seen when climbing. Diameter at Breast Height (DBH) measurements were recorded for each tree and GPS coordinates confirmed.

Climbing

A slingshot was used to pull a light line over a high branch in the tree. This enabled a climbing rope to be pulled over the branch and subsequently used to access the canopy. All large stems and branches were inspected for hollows, any branch surfaces (upper) and forks that may hide hollows to a viewer on the ground were given particular attention.

Inspecting Hollows

Hollows located were inspected directly with naked eye and supplementary light where possible. Mostly hollows were inspected via photos taken with a small digital camera (Sony RX100III). A potential 'chimney' hollow was low enough to be inspected via a Gopro camera fixed to a pole. Care was given to search as much of each cavity as possible.
The following details were recorded for each hollow

- Minimum and maximum entrance dimensions
- Hollow void dimensions and general void characteristics.
- Any hollow contents suggestive of fauna use.
- External and internal photographs.

Identifying Masked Owls Hollows

Limited information is available for the preferred characteristics for Masked Owl nesting hollows except that they select largest tree hollow cavities with entrance sizes greater than 150mm (FPA, Technical note. 17). As females may be up to 500mm long, internal cavities smaller than this may be uncomfortable for incubating and similarly, with potentially 2-3 maturing chicks and an attendant adult it is clear that very large hollows at least >450mm are required for successful breeding.

Potential Masked Owl roosting hollows were also defined by a >150mm entrance but hollows with narrower or less deep chambers were included. Roosting hollows require an internal size and shape that would allow a roosting Masked Owl to remain completely or mostly sheltered from weather, perch in at least subdued light and retain some privacy from diurnal birds. Hollow roosting is not obligatory for Masked Owls and these parameters are partly presumptive. Nonetheless without the need to incubate or house chicks, a wider range of hollows are presumably used.
Hollows significantly less than the suggested 150mm entrance size (FPA tech note) were generally not considered although near size hollows were generally measured due to caution and convenience.

Results

Of the 12 trees initially identified, 3 trees were not climbed due to a clear absence of large hollow entrances and or a clear lack of girth that could house a hollow large enough for Masked Owl use. Traversing the site, incidentally located an additional 3 trees and a tall dead stump for consideration. Two of these trees (Y & Z) were later determined as already identified by North Barker and a third appears as a new tree (Tree X). Map 1 shows the locations of each tree assessed at the property. In total 26 large hollow entrances were directly measured or estimated at the site (raw data is presented in Appendix E). Some smaller hollows clearly not suitable for Masked Owl, in various trees, were not assessed or inspected.

Map 1.


Trees Assessed for Masked Owl Use, Ecclestone Road
13
Y(8)
5
6
15
7
10
X
11
Z(12)
1
stump
9
2
16
3
4
Trees with potential hollows
Trees without potential hollows
Property Boundary
N
0
250
500 Meters

No hollows were occupied by Masked Owls and no regurgitated pellets, prey remains or likely Masked Owl guano were observed in any hollow or around the base of any tree assessed. Brushtail possums (*Trichorsurus vulpecula*) were the only fauna encountered in the hollows inspected.

Table 1. Summary of hollows with potential for use by Masked Owl.

Tree ID	Tree Spp.	Hollow #	Entrance Minimum (mm)	Entrance Maximum (mm)	Hollow depth (mm)	Chamber size (mm)	Potential MO use	Comments
1	*viminalis*	2	150	360	400	700x650	nesting?	x3 btp. Excavated, no signs.exposed.
3	dead	1	300	750	500	450x350	roosting	dead possum, excavated, no signs.
4	*viminalis*	1	180	250	950	300x250	roosting?	x2 btp flushed, green leaves, galah chewing
		2	240	270	1200	250x350	roosting?	btp scat. leaves
		3	240	300	1600	300x350	roosting?	btp scat, chamber has major hole in floor
5	*amygdalina*	1	160	300	1200	320x280	roosting?	duck shell and down. Only 2.2m off ground.
6	*amygdalina*	1	160	300	100	600x470	roosting?	No sign. 350mm headroom
X	*amygdalina*	1	320	1100	2200	450x370	roosting	btp present. Lots rotten stuff to fall down.

Table 1 shows the hollows encountered with entrances 150mm or greater and internal dimensions and characteristics large enough for potential Masked Owl use. No Masked Owls were seen and no signs of use detected.

Hollows considered usable by Masked Owls for roosting were found in Trees 1, 3, 4, 5, 6 and 'X'. (Table 1) Hollows in other trees were exclusive to any Masked Owl use. Either due to prohibitive entrance sizes or prohibitive internal characteristics like small void or too exposed (See Appendix E)
Hollow 1 in Trees 3, and X nearly reached the speculative minimum chamber floor for Masked Owl nesting (450mm). However in Tree 3 the hollow was very open to the elements with a large entrance and relatively shallow depth. Hollow 1 in Tree X might meet minimum possible nesting requirements with good depth and a large entrance (Photos 6,7&8, Appendix A). Hollow 1 in Tree 6 was found to have a large floor space 600x470mm but lacked sufficient 'headroom' (350mm) for nesting use. Only Tree 1 contained a hollow (hollow 2) that may currently be suitable for potential nesting based on measurements. Like other hollows, no signs of Masked Owl use were present in this hollow. (Photo 2, Appendix A) Excavation of the cavity contents did not reveal any hidden sign of previous Masked Owl use either.
Trees 9, 7, 13 and 15 were not climbed at all because they were considered very unlikely to have significant hollow development and or sufficient stem girth to contain a potential Masked Owl hollow. (Appendix E)
A tall stump inspected with a camera on a pole had a large upwards facing cavity that was too shallow and exposed to be used by Masked Owls.

A sample of photos are in Appendix A.

Discussion

Tree hollows are difficult to assess from the ground (Stojanovic, 2012). The entrance may be viewable but it can be difficult to assess its size, especially at greater height in the tree. The appearance of the entrance frequently does not suggest what the internal characteristics are. On close inspection appropriate looking hollows often reveal no cavity and conversely cryptic entrances may reveal cavities used by fauna. Ground based assessment can only identify tree features of interest such as entrances, broken branch stubs and dead limbs that require climbing investigation.

Potential Masked Owl Hollows
In this report, a "potential Masked Owl hollow" is one that has the potential to be used theoretically, not one suspected of being currently used.

Potential Nest Hollows
Limited data in the literature is available to characterise Masked Owl hollows and it is likely that entrance and internal dimensions larger than the minimum used in this study are preferred. For Masked Owl generally, Debus (2009) suggests entrances >20cm are required for Masked Owl with 45cm chamber dimensions and up to 5m deep. D'Ombrain (1902) measured 20cm by 45cm for a nest hollow entrance and 1.2m depth.

More recently a Masked Owl nest has been measured in the Margaret River region of Western Australia with internal dimensions of 95cm x 75cm, 65cm deep with an entrance size approx 25cm (Owl friendly Margaret River, 2020).This author measured a known Masked Owl hollow at Sandford after the tree had fallen finding an entrance 420 tall x 250 wide, 800mm deep with a floor approximately 600x500. These anecdotal and opportunistic measurements may not reflect the full range of hollows used and research has yet to reveal the minimum internal nest hollow dimensions used by Masked Owls.

Across the site only a single hollow (Hollow 2, Tree 1) at Ecclestone Rd appeared suitable for possible Masked Owl nesting. This hollow had a large level floor and relaxed void space for a hypothetical attendant adult and chicks. It was occupied by three brushtail possums on the day of inspection and no signs of use by Masked Owl were visible including after excavation of the top layer of material. This hollow had a large upwards facing entrance created by the major fork in which the hollow has formed. Upwards facing entrances are not prohibitive for Masked Owls per se but in this instance the large opening and the large sloping trunks are likely to create a catchment for undue rainwater collection in the hollow. Subsequently, this hollow may be less attractive for nesting and more appropriate for roosting.
Another hollow at the site (Hollow 1 in Tree 6) had a large floor space (600x470mm) but it is thought that a low ceiling (350mm) to the cavity would be sufficiently frustrating for these large owls that nesting would be excluded while the less demanding needs of roosting might be considered.
Using the 450mm chamber dimensions suggested by Debus (2009) two other hollows at the Ecclestone road site are close to suitable for nesting with other good attributes but this seems unlikely compared to known measured nesting hollows. These larger hollows may be more likely to be used for roosting than nesting.

At the Ecclestone Rd site, with the possible exception of Hollow 2 in Tree 1, hollows are unlikely to be selected for nesting by Masked Owl at least until further formation of the hollows has occurred, a slow and organic process.

Potential Roosting Hollows

Roosting hollow requirements are likely to be more flexible than for nesting hollows. This is partly demonstrated by Masked Owl roosting both in dense vegetation and occasionally under rock overhangs in addition to tree hollows (Bell & Mooney 2002). First principles suggest hollows used for roosting by either sex adult during the non breeding season or males at anytime of year are not required to protect eggs and chicks from predators or inclement weather. Similarly, hollows used for roosting need not have the internal shape and size needed for comfortable incubation by a female and growing chicks.

Dispersing juveniles that have left their natal area may opportunistically use hollows across the landscape like those found at Ecclestone Rd. However for resident adults it is likely that roosting sites are chosen within a spatial relationship with their partners roost location or the maternal nesting hollow (Young et al 2021). Young et al (2021) also suggest a preference may exist for hollow roosting where hollows are available. Despite greater flexibility, preferred roosting hollows are likely to be also large and importantly provide the first options in the recruitment cycle after a nest tree has fallen over due to old age or storm damage.

The hollows possibly suitable for nesting at this site, will by default, be suitable for roosting as well and the hollows mentioned for potential nesting above would be the first to be used for roosting at this site. Smaller hollows in Trees 4 and 5 would be more awkward or uncomfortable for any Masked Owl use but still hypothetically possible. Other hollows investigated would be prohibitive for roosting with insufficient space, prohibitive entrance sizes or too exposed (Appendix E).

Indications for Masked Owl Absence/Presence

Although cryptic from the exterior, close inspection of active or recently used nests hollows would be expected to reveal fur and skeletal remains of food, fed either to an incubating female or chicks, regurgitated pellets and whitewash (Hill, 1955, Kavanagh 1996, personal obs). The absence of this evidence at Ecclestone Rd is partly explained by inappropriate internal size and shape of some of the hollows with large entrances and also by the small entrance size of some hollows with large internal dimensions and more appropriate shape.

Absence of Masked Owls either in or flushed from hollows in the study area does not alone indicate their non-suitability. Masked Owls may not be present because inspection was undertaken outside of the breeding season and or Masked Owl were choosing to roost elsewhere at that time. In some cases nesting material introduced by other fauna may have obscured Masked Owl prey remains or pellets. Nonetheless the apparent absence of pellets, prey remains, or whitewash in hollows gives a strong indication of non use at Ecclestone Rd.

The timing of Masked Owl breeding varies considerably on the mainland and is more seasonal in Tasmania (Debus 2009). Most egg laying in Tasmania occurs in mid to late October (Mooney 1997) although egg laying has also been recorded at other times of year

(personal observation). These hollow inspections did not coincide with the most likely time of nesting which might have reduced the likelihood of finding Masked Owls in the respective hollows.
Hollows inspected in this study did not reveal the current presence of Masked Owls or evidence of previous use. The search effort included some excavation of detritus in the best hollow examples which would be expected to reveal Masked Owl nesting use from previous seasons as well as 2022. Although the habitat at Ecclestone Rd appears suitable for Masked Owls no recent regular use of the hollows is evident. A low population density means their physical presence is typically uncommon regardless of the availability of suitable hollow resources.

Acoustic work by North Barker consultants adds significant perspective on Masked Owl use of the area. In other Masked Owl survey work, low response rates to call playback are normal (Debus, 1995. Todd et a, 2017). In addition it is not uncommon for Masked Owls to be present yet silent in response, only being detected by visual detection with or without a spotlight.

North Barker elicited Masked Owl calls on 2 of 4 call playback nights and Masked Owl calls were passively detected on 8 of 9 days of acoustic recording (Appendices B,C)This suggests owls frequently use the area in a way that only suggests an active territory (not random dispersal) and some proximity to a regular roost which may also be a nest hollow. It could also be a vegetation roost. Much less consistent detection would be expected further away from a roost site or nest site.

Possibly, if an active nest site was located on the Ecclestone Rd property then an even more consistent and intense response to call playback might be expected during in November when the nesting is most likely. Call playback may also have drawn owls in from outside the property.

Across the landscape passive detection of Masked Owl calls is typically rare (Todd, et al, 2017. Debus, 1995) Masked Owl call mostly at dusk and dawn near their roost site and infrequently elsewhere (Young etal2021). Unsolicited calls can be more telling about Masked Owl use of a site than call playback. Passive detections by North Barker follow the pattern of dusk and dawn calling. Given the acoustic recorder used is unlikely to detect calls more than 500m away then a roost location in that radius is likely on the basis that the dusk calls are made soon after emergence. With some allowance given for possible movement from roost to location of dusk calling a more generous radius might be considered up to 1km but this would presume a pattern of regular movement from roost site through the Ecclestone rd property and return.

The Natural Values Atlas (NVA) has several Masked Owl records in a 5km radius (Appendix D) most of which are sightings only and mostly recorded over 20 years ago. A nest is recorded approximately 1.5km to the north west of the Ecclestone Rd site, near Corminston Creek, although apparently it is of dubious verification (J. Wiersma, pers comm.) and again, a decades old record. The current status of this ‘nest’ is unknown but if a nest remains active somewhere in that vicinity then the adults would easily range to Ecclestone Rd and may explain the detections above in timing relative to sunset and sunrise but explain more poorly the frequency.

More likely is that these calls are from an owl roosting at a location less than 1 km away and probably less than 500m. Given the investigations of tree hollows here, hollow roosting (or nesting) is more likely in adjacent properties. Alternatively, use of a roost in vegetation on the property is possible although this seems less likely given a probable preference for hollow roosting when hollows are available.

While hollows at Ecclestone Rd may occasionally be used by dispersing juveniles, and may hypothetically be recruited as roost or nesting sites in the longer term, the absence of any evidence of use suggests they are not currently a critical part of the local Masked Owl territory. Despite this, acoustic information suggests that a roost site or possible nest is close to the property.

Other Observations and Considerations

- This work makes no assessment of the Ecclestone Rd property in regard to other Masked Owl habitat requirements like hunting or prey availability. Only for presence or absence in hollows and or signs of use of hollows by Masked Owl.
- Many hollows had at least some signs of use by Brushtail Possums and they are likely to be present in some hollows if felling of any large trees occurs at either site. This would be most likely in hollows where this work has recorded possums although they often use different hollows on consecutive nights. 12 possums were recorded during this work.
- This study is primarily for 12 trees identified by North Barker consultants. Only incidental effort was made to locate additional significant hollow bearing trees with one additional tree and a tall stump located and inspected. Although unlikely to be present, no responsibility is taken for any undiscovered hollow bearing trees at Ecclestone Rd.

Conclusion

There is no evidence of current or recent use by Masked Owl in the trees climbed and inspected at Ecclestone Road.

Some trees simply did not have the girth capacity and or senescence required for large hollows. Most hollows inspected were not suitable for Masked Owl use but a selection of hollows appear suitable including for both nesting and roosting or just roosting.

Acoustic information suggests a regular roost is close to the site but no evidence of use could be found in hollows on the property. A vegetation roost is a possibility on the property but given the availability of preferred hollow roosts, a hollow close to the property is more likely being used.

Future use of the hollows investigated is possible if nearby owls select a new roost site and similar, dispersing juvenile owls may utilise the hollows opportunistically. Further senescence and decay in some of the near size hollows may make them more appealing to Masked Owls in the longer term and may form important options in the recruitment process as current nesting sites elsewhere inevitably succumb to old age or storms.

References

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Appendix A. Sample Photos.

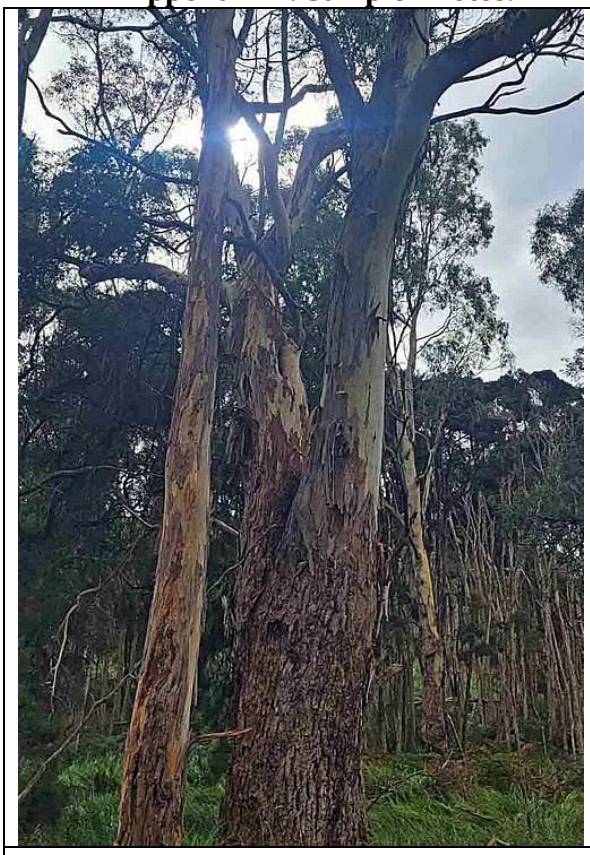


Photo 1: Tree 1

Photo 2: Hollow 2, Tree 1

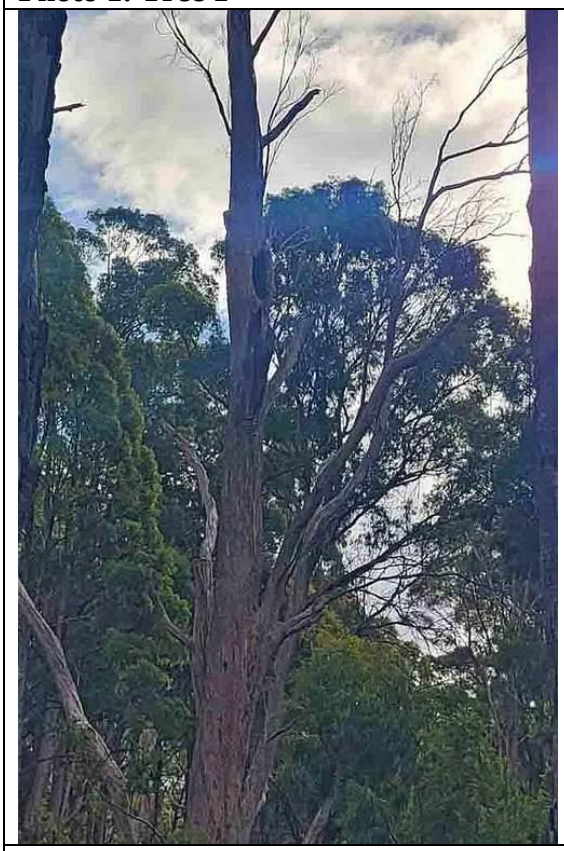


Photo 3: Tree 3

Photo 4: Entrance- Hollow 3, Tree 3

Photo 5: decomposing brushtail possum, Hollow 1 Tree 3

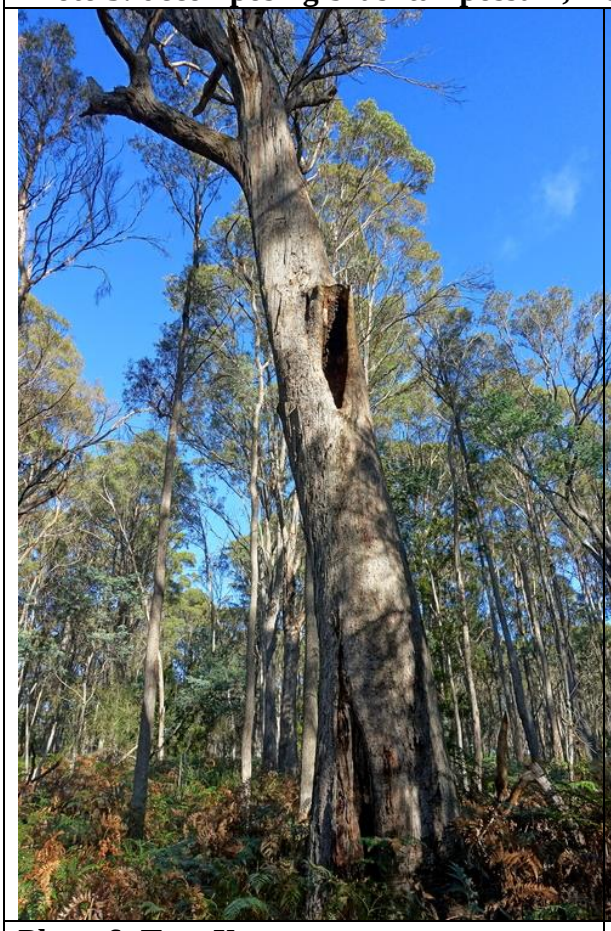


Photo 6: Tree X

Photo 7: Entrance-Hollow 1, Tree X

Photo 8: Brushtail Possum. 150mm steel ruler. Hollow 1, Tree X

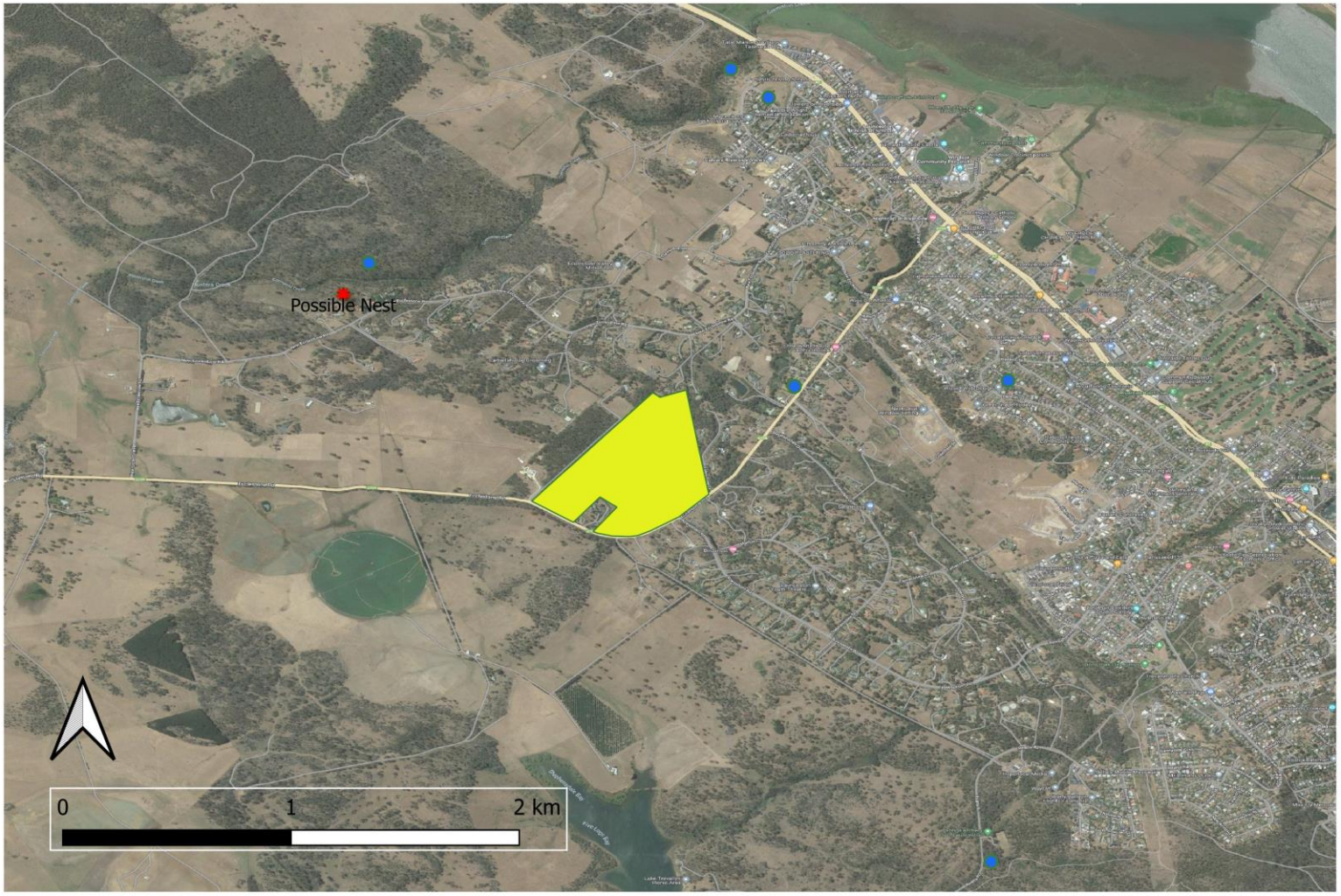
Appendix B. Call playback surveys for Masked Owls (North Barker Ecosystem Services)

DATE	START SURVEY (TIME)	UNELICITED CALLS	ELICITED CALLS	TIME OF CALL	SITE OF CALL	END SURVEY (TIME)	COMMENTS
2/11/2022	20:30	No	No	N/A	N/A	22:30	Tawny frogmouths and southern boobook observed (Plate 2)
3/11/2022	20:30	No	Yes	21:13	2	22:30	Each call event consisted of 2-3 separate 'screeches' followed by ~30 seconds to a minute of silence for a total of four times before going silent.Tawny frogmouths and southern boobook observed
21/11/2022	20:45	No	Yes	22:15	5	23:15	Two short 'screeches'. 30 seconds of silence between each screech.After ~2 minutes of playback
22/11/2022	3:30	No	No	N/A	N/A	5:30	No owl activity recorded

Appendix C. Acoustic recordings of Masked Owl calls (North Barker Ecosystem Services).

Date	Time	Relative distance	Period
14/02/2023	5:10	distant	Dawn
17/02/2023	4:38	close	Night
17/02/2023	22:25	distant	Dusk
18/02/2023	5:09	very close	Dawn
21/02/2023	21:45	distant	Dusk
22/02/2023	21:49	distant	Dusk
22/02/2023	21:55	mid distance	Dusk
23/02/2023	21:06	distant	Dusk

Appendix D. Natural Values Atlas Masked Owl records <5km from Ecclestone Rd



Appendix E. Raw data. All trees and hollows assessed at Ecclestone Rd.

Tree ID	Easting	Northing	Tree spp	DBH	Hollow#	Minimum mm	Maximum mm	Stem diameter mm	Hollow depth mm	Orientation	Hollow type	Chamber dimensions mm	Chamber comments
1	506539	5414470	*viminalis*	1592	1	90	460	900	950	s	slot	600x520	2 btp flushed. Large but entrance too small
					2	150	360	1800	400	up	fork	700x650	x3 btp. Excavated, no signs.exposed to rain
					3	90	140	900	1950	nw	trunk	see #1	second entrance to #1
2	506515	5414382	dead	1420	1	110	220	1100	300	nw	trunk	250x400	possum scat poor base
					2	120	270	1100	level	nw	trunk	see #1	second entrance to 1
					3	125	130	1100	level	nw	trunk	700x250	too small and level
3	506429	5414317	dead		1	300	750	500	500	e	trunk	450x350	dead possum?
4	506323	5414274	*viminalis*	1917	1	180	250	400	950	se	trunk	300x250	x2 btp flushed, little greenery and galah chewing?
					2	240	270	350	1200	ne	spout	250x350	btp scat. leaves
					3	240	300	400	1600	ne	spout	300x350	btp scat, chamber has hole
					4	160	190	350	300	w	spout	150x180	no usable chamber tapers. second entrance on top of spout
5	506547	5415002	*amygdalina*	971	1	160	300	900	1200	n	trunk stub	320x280	possible shell and down. Only 2.2m off ground. Bit small
6	506377	5414996		1529	1	160	300	1100	100	se	trunk/stub	600x470	level base. No sign. 350mm max headroom
					2	210	290	1200	0	se	stub trunk		full of rotten wood no chamber
7	506334	5414962	*amygdalina*	981	1	est. 120	150	small					not climbed insufficient girth +small hollow entrance
Y (8)	506562	5415016		1089	1	130	140	550	1350	w	branch scar	350x350	too small. x2 btp
9	506060	5414389	dead	1459							spout		Insufficient girth. 1small hollow + unlikely spout.Not climbed
11	506226	5414686			1	110	340	1200	120	ne	trunk	450x550	a bit damp, pic after detritus removal.
			amygdalina		2	250	350	1200	550	up	major fork	150x220	small open
Z (12)	506203	5414643	*viminalis*	1191	1	80	130	900	1400	n	trunk	380x525	hole in floor to next cavity. 2nd entrance 500mm below 60x160
					2	100	1000	900	550	nw	split trunk	700x150	narrow awkward shape. Beeswax
13	506602	5415081	dead	1497	1								not climbed insufficient girth at hollow +small hollow entrance
15	506407	5414980	dead	939									not worth a climb. Marginal sten diameter and unlikely cavitation
16	506496	5414360	*viminalis*	1624	1	220	290	1200	50	nw	stub	none	Tapers. No usable cavity
					2	100	300	1200	up	se	split	300x300	curls around,
					3	150	200	400	550	e	spout	200x150	x2 btp
X	506250	5414784	*amygdalina*	1217	1	320	110	1000	2200	n	trunk/ b scar	450x370	btp present. Lots rotten stuff to fall down.
stump	506592	5414438	dead	1306	1			~900		up	chimney	est 500x500	tall stump. Not particularly deep hollow in top see gopro