



Aerial Crossing Monitoring 2022/2023

Oxley Highway to Kempsey, Pacific Highway Upgrade

Transport for NSW

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Cover photograph: Brushtail Possum on Rope Bridge 1 (left) and Feathertail Glider on Glider Pole 3 (right).

Executive Summary

Context

This report documents findings for the 2022/2023 monitoring period, the final of three monitoring periods for the aerial crossings, as required for the Oxley Highway to Kempsey (OH2K) Pacific Highway Upgrade Project (the Project) and specified in the Oxley Highway to Kempsey (OH2K) Ecological Monitoring Program (EMP, TfNSW 2022).

Aims

The aim of the aerial crossing monitoring program is to determine whether the aerial crossings, rope bridges and gliders poles, are being used by the nominated target arboreal fauna species. The aims of this report are to summarise the methods and results of the 2022/2023 monitoring period and determine if performance measures are being met, as per the EMP.

Methods

In accordance with the EMP, three rope bridges (RB1, RB2 and RB3) and three glider pole crossings (GP1, GP2 and GP3) in the northern Kundabung to Kempsey (Ku2K) section of the Project were monitored in autumn 2022 and late spring/early summer of 2022/2023. Monitoring involved the use of automated cameras for a period of 60 consecutive days, hair tube deployment on rope bridge poles and 50 metre radius searches around crossing poles for dead animals or road kill.

Key Results

A successful crossing was considered to have occurred if an individual animal was detected using the median glider pole or was detected in rapid succession at both the western and eastern ends of the rope bridge. In summary, for the 2022/2023 monitoring period:

- All rope bridge poles were used by at least one indicator species, including the Feathertail Glider, Sugar Glider and Brushtail Possum.
- Successful crossings were recorded on RB3.
- Glider crossing GP3 has been successfully used by indicator glider species including the Feathertail Glider and Sugar Glider. No fauna were detected using GP1 or GP2. GP2 provided no signal during summer monitoring download.
- No targeted threatened species were detected during the 2022/2023 monitoring.
- No dead animals were recorded during the 50 metre perimeter searches around each pole or during analogous road kill surveys that were undertaken as part of the ecological monitoring for the Project.

Conclusions

Performance measures to date have been met for the rope bridge crossings. Rapid succession observations of indicator species (Brushtail Possum and Ringtail Possum) were recorded at RB1 and RB3. A possible rapid succession observation of an indicator species (Brushtail Possum) occurred in 2017 at RB2. Indicator glider species (Sugar Glider, Feathertail Glider) have also been recorded at RB1 and RB2. It is therefore considered that the monitoring has demonstrated that all three rope bridges are providing opportunity for dispersal and re-colonisation.

Performance measures to date have been met for two of the three glider pole crossings (GP2 and GP3), with indicator species, Feathertail Gliders and Sugar Gliders being recorded using the median glider poles at both these locations, indicating a successful crossing. No gliders have been recorded at GP1 during any

monitoring period. A previous review of the glider pole connectivity concluded that according to recorded glide distance of glider species the poles are within an achievable glide distance for pole to pole glides and pole to canopy glides (Niche 2021).

Management Implications

No further monitoring is required to be undertaken for the following reasons:

- Cameras may not always be triggered by gliders utilising glider poles due to technical and design limitations, for example the trigger requires passage of the gliding individual through the collar, any arrivals/departures from above or below this point would not be captured.
- GP2 is within 100 m of GP1 and has recorded Feathertail and Sugar Gliders using the median glider pole at GP2, thus confirming connectivity in the vicinity of GP1 and GP2 demonstrating opportunity for dispersal and recolonisation in the area.
- A review of pole connectivity and glide distances at GP1 in comparison to those at GP2 and GP3 has been undertaken. According to recorded glide distance of glider species all poles are within an achievable glide distance for pole to pole glides and pole to canopy glides.

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1. Introduction

1.1 Context

The Oxley Highway to Kempsey (OH2K) section of the Pacific Highway Upgrade Project (the Project) was approved in 2012 subject to various Ministers Conditions of Approval (MCoA) and a Statement of Commitments (SoC). A subsequent approval with additional conditions of consent (CoA) was granted in 2014 by the then Commonwealth Department of Environment (DoE) for Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1995* (EPBC Act). The Ecological Monitoring Program (hereafter referred to as the EMP) (TfNSW 2022) combines these approval conditions and defines the mitigation and offsetting requirements for threatened species and ecological communities impacted by the Project.

Aerial crossings have been installed to reduce the impacts on fauna, facilitate movement and maintain habitat connectivity for existing glider/arboreal mammal populations. These structures are to be monitored to assess their effectiveness in maintaining habitat connectivity, as required by the EMP.

1.1.1 Monitoring framework

The design, methods and performance indicators that define the aerial crossing monitoring program are specified in the EMP.

The EMP requires monitoring to occur in autumn and late spring/early summer in Years 4, 6 and 8 (operational phase) of the Project. The EMP specifies that additional monitoring may be required if the aerial crossings are found to be ineffective and require modification.

This report represents the final of three reports required for the aerial crossing monitoring – Year 8 autumn 2022 and spring/summer 2022/2023.

1.1.2 Background data

The installation of aerial crossings was employed as a means of mitigating the barrier effects of roads on gliders and arboreal mammals. Section 2.2.4 of the EMP states:

“The effectiveness of wildlife crossings will be based on their use by fauna groups previously recorded in proximity to the Project (<one kilometre). It is assumed that the Project bisects the habitat of at least some individuals from each of the nominated fauna groups (Table 4). Fauna species known to occur within the Project area that may be potentially adversely affected by the upgrade are listed in Table 5. These species will indicate the successful usage of crossing structures.”

Gliding and arboreal fauna potentially impacted by habitat fragmentation and the barrier effect of the Project are provided in Table 1. The EMP states that *“some of these species will be used as indicator species to measure the success of fauna crossings”*. Table 2 lists the target gliders and arboreal mammals and the indicator species to be used to assess crossing use. The use of aerial crossings by indicator and target species from Table 2 will be discussed.

Table 1: Species that are known or likely to occur in the Project area potentially impacted by habitat fragmentation (from Table 4 of the EMP)

Fauna group	Species	Occurrence in Project area
Gliders	Feathertail Glider (<i>Acrobates pygmaeus</i>)	Known
	Yellow-bellied Glider (<i>Petaurus australis</i>)	Known
	Sugar Glider (<i>Petaurus breviceps</i>)	Known
	Squirrel Glider (<i>Petaurus norfolcensis</i>)	Moderate likelihood
Arboreal mammals	Koala (<i>Phascolarctos cinereus</i>)	Known
	Common Brushtail Possum (<i>Trichosurus vulpecula</i>)	Known
	Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>)	Known
	Brush-tailed Phascogale (<i>Phascogale tapoatafa</i>)	High likelihood

Table 2: Indicator and target species to assess usage of crossings (from Table 5 of the EMP)

Fauna group	Indicator species (known from Project area)	Target (threatened) species
Arboreal mammals	Brushtail Possum, Ringtail Possum	Brush-tailed Phascogale
Koala	Koala	Koala
Gliders	Sugar Glider, Feathertail Glider	Squirrel Glider, Yellow-bellied Glider

1.1.3 Purpose of this report

This report details the findings of the final of three monitoring periods for the aerial crossings. The aims of this report are to summarise the methods and results of the 2022/2023 monitoring and determine if performance measures are being met, as per the EMP.

1.2 Performance Measures

The EMP specifies the following performance measures for the rope bridges:

- *Complete crossing of the rope bridge, (through camera monitoring or other evidence of complete crossings), by native arboreal fauna species known to occur in the Project area, (see Table 1) or other indicator species (see Table 2) on at least one occasion in order to demonstrate opportunity for dispersal and re-colonisation. This performance measure would also be considered to be met where gliders are not detected at both ends of the rope bridge due to the likelihood of gliders to leave the bridge once within gliding distance of habitat.*
- *For target non-EPBC listed species (Brush-tailed Phascogale, Squirrel Glider and (at the time) Yellow-bellied Glider), complete crossing of the rope bridge, (through camera monitoring or other evidence of complete crossings), by the arboreal target species or their nominated indicator species on at least one occasion in order to demonstrate opportunity for dispersal and re-colonisation. This performance measure would also be considered to be met where gliders are not detected at both ends of the rope bridge due to the likelihood of gliders to leave the bridge once within gliding distance of habitat*
- *Lower rates of road kill arboreal species in proximity to rope bridges than in sections of the upgrade away from crossing structures.*

The EMP specifies the following performance measures for the glider poles:

- *Evidence of use of glider poles by native gliders known to occur in the Project area (see Table 1).*
- *For target non-EPBC listed species (Squirrel Glider and (at the time) Yellow-bellied Glider), the complete passage of the target species or their nominated indicator species (see Table 2) on at least one occasion in order to demonstrate opportunity for dispersal and recolonisation).*
- *Lower rates of road kill gliders in proximity to glider poles than in sections of the upgrade away from crossing structures.*

1.3 Monitoring Timing

Monitoring is to be undertaken in Years 4, 6 and 8 of the Project's operational phase. Monitoring is to occur in late autumn and late spring/early summer each year for a minimum of 60 days. The timing of monitoring coincides with breeding seasons and dispersal periods for target and other gliding or arboreal species known from the Project area. Arboreal species' movements increase in autumn as individuals seek flowering resources and in spring as individuals disperse post-breeding.

1.4 Reporting

Annual reporting of monitoring results will include:

- Detailed description of monitoring methodology
- Results of the monitoring period
- Discussion of results, including how the results compare against performance measures, if any modifications to timing or frequency of monitoring periods or monitoring methodology are required and any other recommendations
- If contingency measures should be implemented.

All reports prepared under the EMP will be submitted to the NSW Department of Planning and Environment (DPE) and the NSW Environment Protection Authority (EPA).

1.5 Limitations

The following limitations to the monitoring procedure were encountered:

- The camera detection system is designed to maximise the likelihood that any animal using the structures is photographed, i.e. the cameras are fitted with motion detectors triggered to take photographs as animals pass by and the glider poles also have collars to force the animals through a single gap where the camera lens is trained. However, the highly mobile nature of gliders may result in their arrival on the structures at a variety of locations, all of which cannot be captured by the cameras. As a result, complete passage across the structure/road may not always be captured. This limitation applies to both glider poles and rope bridges.

2. Survey Methods

2.1 Monitoring Sites

The Project involved the installation of eleven rope bridge and seven glider pole crossings. Of these, three rope bridge crossings and three glider pole crossings in the northern Kundabung to Kempsey (Ku2K) section of the Project were monitored. Details of the monitored crossings, including nominated target and indicator species, are provided in Table 3 and their location is provided in Figure 1.

Rope bridge crossings consist of a single rope crossing between two poles, each located on either side of the carriageway. Glider crossings consist of three poles, one on the eastern and western sides of the carriageway and one in the median, allowing gliders to traverse the highway.

Table 3: Monitored aerial crossings (adopted from Tables 4, 5, 14, 15 and 16 of the EMP)

Site	Crossing type	Target species	Indicator species
RB1	Rope bridge	Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale*	Brush-tail Possum, Ringtail Possum, Sugar Glider, Feathertail Glider
RB2	Rope bridge	Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale*	Brush-tail Possum, Ringtail Possum, Sugar Glider, Feathertail Glider
RB3	Rope bridge	Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale*	Brush-tail Possum, Ringtail Possum, Sugar Glider, Feathertail Glider
GP1	Glider pole	Yellow-bellied Glider, Squirrel Glider	Sugar Glider, Feathertail Glider
GP2	Glider pole	Yellow-bellied Glider, Squirrel Glider	Sugar Glider, Feathertail Glider
GP3	Glider pole	Yellow-bellied Glider, Squirrel Glider	Sugar Glider, Feathertail Glider

*The Brush-tailed Phascogale was excluded from the target species in Table 14 of the EMP but included as a target species in Table 15, and has therefore been considered a target species for all rope bridge crossings.

2.2 Survey Methods

2.2.1 Remote cameras

Automated cameras were installed at each crossing structure. A single camera was installed on each median glider pole and at each end of the rope bridge crossing. Customised surveillance systems were installed at rope bridge and glider crossings using BuckEye Cam X7D Covert IR wireless surveillance cameras (minimum response time 200 milliseconds) and standard antennae. Cameras were mounted on a customised adjustable camera mount or strut. Power was provided via a solar panel and extension power cable connected to a battery housing near ground level, which is mounted on each pole. Each median glider pole was fitted with a collar to direct animals toward the camera lens in order to capture their image. Rope bridge poles were fitted with an external dual active infra-red sensor to trigger cameras. All cameras were calibrated for short focus and reduced infrared output to maximise species identification. These devices were specifically designed by Faunatech Pty Ltd for these crossing structures. Images were downloaded wirelessly to ground level via X-Manager software installed on a laptop. Images were downloaded from two 60-day periods; one in late autumn and one in late spring/early summer. However, where possible, downloaded images that occurred outside of the specified monitoring periods were retained and used as value adding data.

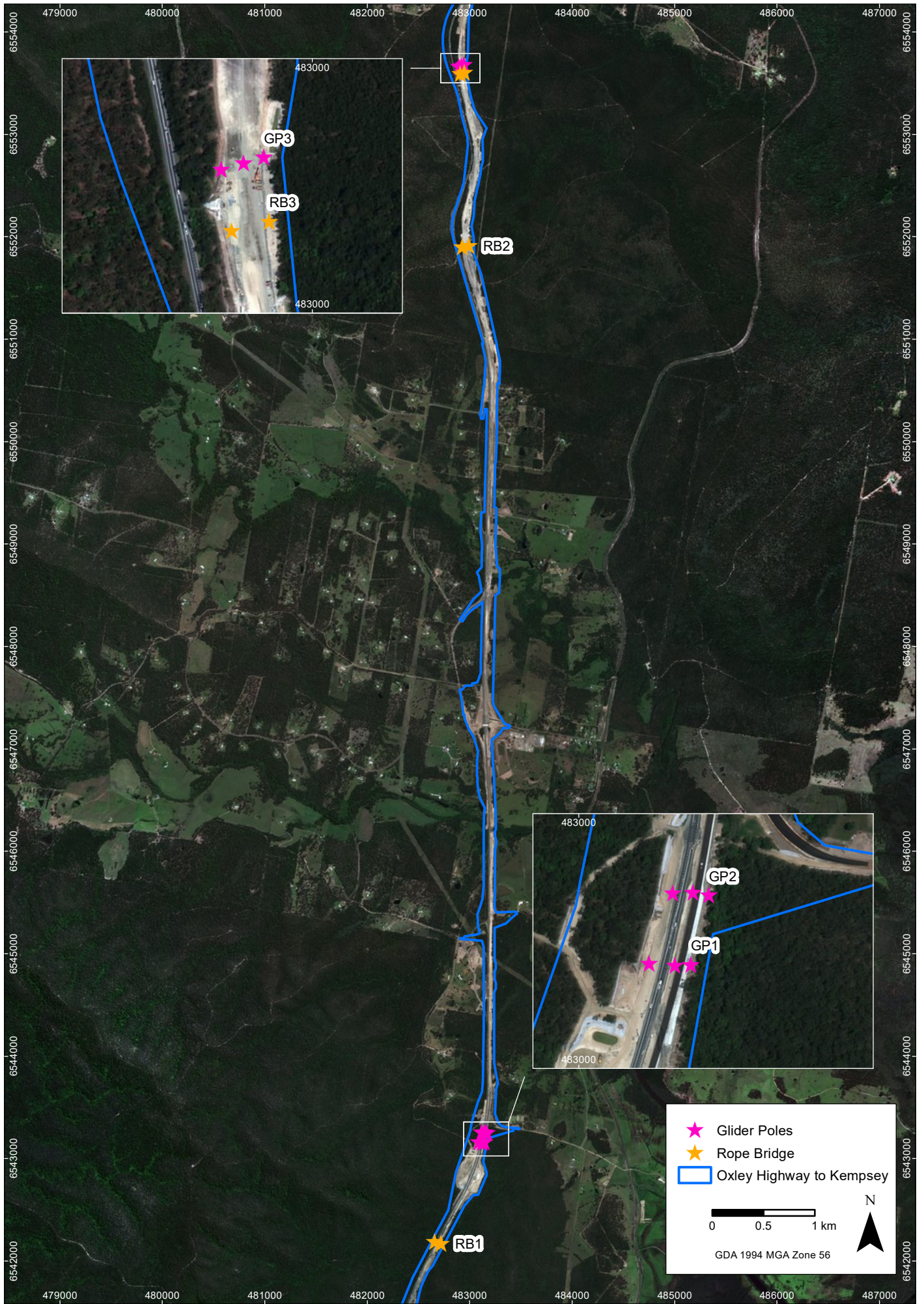
2.2.2 Hair tubes

Hair tubes were installed on the pole at each end of the rope bridge structures only and left in place for 14 consecutive nights during both monitoring periods. Each hair tube was baited with a mixture of oats and peanut butter. Hair samples were sent to Robyn Carter Hair ID for analysis, and were identified to species level where possible.

2.2.3 Terrestrial perimeter search

At each download, the ground within a 50 metre radius of both rope bridge poles and glider poles was inspected for any dead animals or road kill. Data collected during the road kill surveys as part of the broader ecological monitoring for the Project was also reviewed for road kill within 50 metres of the crossing poles.

Drawn by: MH Project Manager: RM Project Number: 1702 5.10 Date: 4/11/2019



Location of monitored aerial crossings

Aerial Crossing Monitoring: Pacific Highway Upgrade – Oxley Highway to Kempsey

FIGURE 1

Imagery: (c) LPI 2009-04-17

3. Results

Raw data and camera details for the autumn and spring/summer 2022/2023 monitoring periods are presented in Annex 1.

3.1 2022/2023 Remote Cameras

Combined results from autumn and spring/summer 2022/2023 monitoring for the rope bridge and glider pole crossings are presented in Table 4 and Table 5 respectively.

The sixty day monitoring periods were 12 March – 12 May 2022 (autumn) and 1 November – 31 December 2022 (late spring/early summer). Image downloads occurred in June 2022 (for the autumn data set) and February/March 2023 (for the spring/summer data set). As such, fauna records obtained outside the nominated 60-day monitoring period were included in the results as they are considered to provide potentially valuable data. It should be noted that 139 of the 142 arboreal fauna records (98%) on aerial crossing structures occurred outside of the specified monitoring periods.

3.1.1 Rope bridge crossings

All six cameras provided a signal for the 2022/2023 autumn monitoring period, however two cameras did not provide a signal for the summer monitoring period (Camera 2 of RB1 and Camera 5 of RB2).

Photographic data was analysed for the detection of the same species in rapid succession between the western and eastern ends of the rope bridge crossings as an indication of a successful crossing. Successful crossings by a Brushtail Possum on 31 separate occasions at RB3. One of these successful crossings occurred inside the 60 day Autumn 2022 monitoring period.

All rope bridge poles were used by at least one nominated indicator species including the Feathertail Glider, Sugar Glider and Brushtail Possum. No target threatened species were recorded using the rope bridges.

Table 4: 2022/2023 fauna use of rope bridge crossings

Species	RB1		Crossings	RB2		Crossings	RB3		Crossings
	East (Cam 2)	West (Cam 1)		East (Cam 6)	West (Cam 5)		East (Cam 8)	West (Cam 7)	
Feathertail Glider		Y (11)	Y*		Y (2)	Y*			
Brushtail Possum		Y (1)					Y (39)	Y (48)	31
Sugar Glider		Y (3)	Y*	Y (7)		Y*			
<i>Antechinus</i> sp.				Y (3)					

(n) = number of separate occasion the species was detected. * = as per the EMP “performance measure would also be considered to be met where gliders are not detected at both ends of the rope bridge due to the likelihood of gliders to leave the bridge once within gliding distance of habitat”.

3.1.2 Glider crossings

Two of the three cameras on median glider poles provided a signal during both autumn and summer 2022/2023 monitoring periods, Camera 4 GP2 provided no signal during the summer 2022/2023.

A successful crossing is considered to have occurred if an individual animal is detected using the median pole. Feathertail Gliders and Sugar Gliders were detected using the median pole at GP3 on at least one occasion during the 2022/2023 monitoring, and therefore are considered to have successfully used the

poles to cross the carriageway. Target threatened species were not detected using any of the glider crossings. All records occurred outside of the 60 day monitoring period.

Table 5: 2022/2023 fauna use of glider crossings

Species	GP1 (Cam 3)	GP2 (Cam 4)	GP3 (Cam 9)
Feathertail Glider			Y (7)
Sugar Glider			Y (3)

(n) = number of separate occasions the species was detected.

3.1.3 Camera maintenance

Camera 2, 4 and 5 could would not connect to the laptop during the spring/summer 2022/2023 monitoring period. Maintenance was previously conducted prior to autumn 2020 by TfNSW following connection issues experienced in January 2019 (Niche 2019).

3.2 2022/2023 Hair Tubes

Hair samples were obtained at the eastern pole of RB3 only during the 2022/2023 monitoring period. One hair sample was identified as Brushtail Possum during spring/summer.

3.3 2022/2023 Road Kill and 50 metre Perimeter Search

No dead animals were recorded during the 50 metre perimeter searches around each pole or during road kill surveys undertaken as part of the broader ecological monitoring for the Project.

3.4 Cumulative Analysis

3.4.1 Rope bridge crossings and glider poles

The use of rope bridges to date by arboreal species is provided in Table 6 and the use of glider poles to date by various glider species is provided in Table 7. A summary of the results in relation to target and indicator species is provided in Table 8.

Successful crossings have been observed at both RB1 and RB3. Non-gliding arboreal fauna have been detected at RB2 on the eastern pole.(single occasion, a Brushtail Possum and Antechinus on three occasions). As reported in Niche (2019), a possible successful crossing of RB2 occurred in November 2017 prior to the first official autumn 2018 monitoring event, whereby a Brushtail Possum was recorded heading west from the eastern RB2 pole, a second Brushtail Possum was then recorded by the same camera approximately 14 minutes later heading east back towards the eastern RB2 pole. It is considered likely that this was the same individual. The lack of image at the western pole of RB2 (camera 5) may indicate an incomplete crossing, or failure of camera 5 to capture the image.

Both the Sugar Glider and Feathertail Glider have been recorded using GP2 and GP3. However, there have been no glider species recorded using GP1. GP2 is located approximately 100 metres north of GP1 and has demonstrated, albeit limited, use. GP3 has the highest recorded use of the three glider pole crossing structures.

None of the target threatened species have been recorded using either the rope bridges or the glider poles.

Table 6: Rope bridge records to date

Species	RB1		Crossings	RB2		Crossings	RB3		Crossings
	East (Cam 2)	West (Cam 1)		East (Cam 6)	West (Cam 5)		East (Cam 8)	West (Cam 7)	
Feathertail Glider	Y (19)	Y (11)	Y*	Y (20)	Y (5)	Y*			
Brushtail Possum	Y (2)	Y (1)		Y (1)			Y (70)	Y (105)	55
Ringtail Possum	Y (17)	Y (16)	16						
Sugar Glider	Y (7)	Y (3)	Y*	Y (7)		Y*			
<i>Antechinus</i> sp.				Y (3)					

(n) = number of separate occasions the species was detected. * = as per the EMP “performance measure would also be considered to be met where gliders are not detected at both ends of the rope bridge due to the likelihood of gliders to leave the bridge once within gliding distance of habitat”.

Table 7: Glider pole records to date

Species	GP1 (Cam 3)	GP2 (Cam 4)	GP3 (Cam 9)
Feathertail Glider		Y (1)	Y (19)
Sugar Glider		Y (1)	Y (5)

Table 8: Summary of outcomes

Site	Crossing type	Target species	Indicator species	Successful non-gliding arboreal species crossings	Observed indicator glider species
RB1	Rope bridge	Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale*	Brushtail Possum, Ringtail Possum, Sugar Glider, Feathertail Glider	Ringtail Possum (2020/2021)	Sugar Glider, Feathertail Glider
RB2	Rope bridge	Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale*	Brushtail Possum, Ringtail Possum, Sugar Glider, Feathertail Glider	Possible Brushtail Possum (2017)	Feathertail Glider, Sugar Glider
RB3	Rope bridge	Yellow-bellied Glider, Squirrel Glider, Brush-tailed Phascogale*	Brushtail Possum, Ringtail Possum, Sugar Glider, Feathertail Glider	Brushtail Possum (2020/2021, 2022/2023)	
GP1	Glider pole	Yellow-bellied Glider, Squirrel Glider	Sugar Glider, Feathertail Glider	Not applicable to glider poles	No records
GP2	Glider pole	Yellow-bellied Glider, Squirrel Glider	Sugar Glider, Feathertail Glider	Not applicable to glider poles	Sugar Glider, Feathertail Glider
GP3	Glider pole	Yellow-bellied Glider, Squirrel Glider	Sugar Glider, Feathertail Glider	Not applicable to glider poles	Sugar Glider, Feathertail Glider

*The Brush-tailed Phascogale was excluded from the target species in Table 14 of the EMP but included as a target species in Table 15, and has therefore been considered a target species for all rope bridge crossings.

4. Discussion

4.1 Performance Measures

A summary of the survey results to date in relation to the performance measures is provided in Table 9 and Table 10.

Table 9: Indicators of success for rope bridge crossings

Performance measure	Discussion
<i>Complete crossing of the rope bridge, (through camera monitoring or other evidence of complete crossings), by native arboreal fauna species known to occur in the Project area, (see Table 1) or other indicator species (see Table 2) on at least one occasion in order to demonstrate opportunity for dispersal and re-colonisation. This performance measure would also be considered to be met where gliders are not detected at both ends of the rope bridge due to the likelihood of gliders to leave the bridge once within gliding distance of habitat.</i>	This performance measure has been met. Rapid succession records of native fauna species (Brushtail Possum and Ringtail Possum) have been recorded at RB1 and RB3. A possible rapid succession record (Brushtail Possum) occurred in 2017 at RB2. Indicator glider species (Sugar Glider, Feathertail Glider) have been recorded at RB1 and RB2.
<i>For target non-EPBC listed species (Brush-tailed Phascogale, Squirrel Glider and (at the time) Yellow-bellied Glider), complete crossing of the rope bridge, (through camera monitoring or other evidence of complete crossings), by the arboreal target species or their nominated indicator species on at least one occasion in order to demonstrate opportunity for dispersal and re-colonisation. This performance measure would also be considered to be met where gliders are not detected at both ends of the rope bridge due to the likelihood of gliders to leave the bridge once within gliding distance of habitat</i>	This performance measure has been met. Rapid succession records of indicator species (Brushtail Possum and Ringtail Possum) have been recorded at RB1 and RB3. A possible rapid succession record of an indicator species (Brushtail Possum) occurred in 2017 at RB2. Indicator glider species (Sugar Glider, Feathertail Glider) have been recorded at RB1 and RB2.
<i>Lower rates of road kill arboreal species in proximity to rope bridges than in sections of the upgrade away from crossing structures.</i>	This performance measure has been met. No dead animals were recorded during the 50 metre perimeter searches around each pole or during road kill surveys that were undertaken as part of the broader ecological monitoring for the Project.

Table 10: Indicators of success for glider poles

Performance measure	Discussion
<i>Evidence of use of glider poles by native gliders known to occur in the Project area (see Table 1).</i>	This performance measure has been met at GP2 and GP3. Feathertail Gliders and Sugar Gliders have been recorded using median glider poles at GP2 and GP3, indicating a successful crossing. No gliders have been recorded at GP1.
<i>For target non-EPBC listed species (Squirrel Glider and (at the time) Yellow-bellied Glider), the complete passage of the target species or their nominated indicator species (see Table 2) on at least one occasion in order to demonstrate opportunity for dispersal and recolonisation).</i>	This performance measure has been met at GP2 and GP3. Indicator species, Feathertail Gliders and Sugar Gliders, have been recorded using median glider poles at GP2 and GP3, indicating a successful crossing. No gliders have been recorded at GP1.
<i>Lower rates of road kill arboreal species in proximity to rope bridges than in sections of the upgrade away from crossing structures.</i>	This performance measure has been met. No dead animals were recorded during the 50 metre perimeter searches around each pole or during road kill surveys that were undertaken as part of the ecological monitoring for the Project.

5. Recommendations

5.1 Contingency Measures

The EMP lists potential problems and contingency measures for various components of the monitoring program. Those that are considered to be relevant to the aerial crossing monitoring program are listed and discussed in Table 11.

Table 11: Contingency measures

Potential problems	Contingency measure (EMP)	Discussion of proposed measure
<ul style="list-style-type: none"> No use of rope bridge by arboreal native fauna. No use of glider poles by gliding species. Arboreal vehicle strike in proximity to rope bridges. 	<ul style="list-style-type: none"> Review/modify frequency and/or timing of monitoring periods. Review/modify habitat (i.e. canopy species adjoining rope bridge and connectivity to rope bridge). 	<p>RB1, RB2, RB3, GP2, and GP3 have all demonstrated use by native arboreal fauna. GP1 has no recorded use to date. These contingency measures have therefore been considered for GP1.</p> <p><i>Monitoring frequency:</i> recommendations are discussed below in Table 12.</p> <p><i>Review of crossing structure:</i> A previous review of the glider pole connectivity concluded that according to recorded glide distance of glider species the poles are within an achievable glide distance for pole to pole glides and pole to canopy glides (Niche 2021). It should be acknowledged that, given GP2 is 100 metres north of GP1 and that GP2 has demonstrated use by gliding species, connectivity for animals that occur in the vicinity of GP1 and GP2 is not necessarily compromised.</p>

5.2 Recommendations

The recommendations provided in Table 12 aim to address proposed contingency measures and to meet performance criteria. The recommendation has been provided to maximise the opportunity to capture records at GP1.

Table 12: Recommendations

Relevant contingency measure proposed in EMP	Discussion	Recommendation
Review/modify frequency and/or timing of monitoring periods.	The majority of fauna records have occurred outside the specified monitoring period. It was previously recommended that camera monitoring should be increased from the two 60-day monitoring events to continual monitoring/downloading at GP1. This recommendation was adopted by TFNSW for the 2022/2023 monitoring period.	Further monitoring is not considered necessary – see below.
Review/modify habitat (i.e. canopy species adjoining rope bridge and connectivity to rope bridge).	According to recorded glide distance of glider species the poles are within an achievable glide distance for pole to pole glides and pole to canopy glides. Previous recommendation stated that if fauna records remain absent from GP1 at the completion of Year 8 monitoring, these	Despite continual monitoring of GP1 during year 8 to maximise the likelihood of confirming use of the structure no fauna was recorded. No further monitoring is required to be undertaken for the following reasons: <ul style="list-style-type: none"> Cameras may not always be triggered by gliders utilising glider poles due to technical and design limitations, for example the trigger requires passage

Relevant contingency measure proposed in EMP	Discussion	Recommendation
	<p>outcomes and the need for further action should be discussed with the EPA.</p>	<p>of the gliding individual through the collar, any arrivals/departures from above or below this point would not be captured.</p> <ul style="list-style-type: none"> • GP2 is within 100 m of GP1 and has recorded Feathertail and Sugar Gliders using the median glider pole at GP2, thus confirming connectivity in the vicinity of GP1 and GP2 demonstrating opportunity for dispersal and recolonisation in the area. • A review of pole connectivity and glide distances at GP1 in comparison to those at GP2 and GP3 has been undertaken. According to recorded glide distance of glider species all poles are within an achievable glide distance for pole to pole glides and pole to canopy glides (Niche 2021).

References

Goldingay R.L., Taylor, B.D. and Parkyn J.L. (2018). Use of tall wooden poles by four species of gliding mammal provides further proof of concept for habitat restoration. *Australian Mammalogy* 41(2) 255-261.

Niche (2019). Aerial Crossing Monitoring 2018. Oxley highway to Kempsey, Pacific Highway Upgrade. Prepared by Niche Environment and Heritage Pty Ltd for Transport for NSW.

Niche (2021). Aerial Crossing Monitoring 2020/2021. Oxley highway to Kempsey, Pacific Highway Upgrade. Prepared by Niche Environment and Heritage Pty Ltd for Transport for NSW.

TfNSW (2022). Oxley Highway to Kempsey Pacific Highway Upgrade Ecological Monitoring Program. Transport for NSW Update to report prepared by SMEC Hyder Joint Venture, February 2022.

Annex 1 – Field Data

Table 13: 2022/2023 aerial crossing camera results

Results presented below are all fauna records downloaded from aerial cameras since the previous download i.e. between July 2020 and March 2023.

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022 autumn	GP3	Glider	9	Mid	22/01/2021 0:24	Feathertail Glider	Y	OUT	D	Unk	Yes
2022 autumn	GP3	Glider	9	Mid	25/01/2021 0:39	Feathertail Glider	Y	OUT	D	Unk	Yes
2022 autumn	GP3	Glider	9	Mid	26/01/2021 23:56	Feathertail Glider	Y	OUT	D	Unk	Yes
2022 autumn	GP3	Glider	9	Mid	27/01/2021 0:57	Feathertail Glider	Y	OUT	D	Unk	Yes
2022 autumn	GP3	Glider	9	Mid	5/02/2021 23:52	Sugar Glider	Y	OUT	P	Unk	Yes
2022 autumn	GP3	Glider	9	Mid	8/02/2021 22:47	Feathertail Glider	Y	OUT	D	Unk	Yes
2022 autumn	GP3	Glider	9	Mid	3/03/2021 22:20	Feathertail Glider	Y	OUT	D	Unk	Yes
2022 autumn	RB1	Rope	1	W	20/03/2021 20:32	Brushtail Possum	Y	OUT	P	Unk	Unknown
2022 autumn	RB2	Rope	5	W	5/08/2020 11:44	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	26/10/2020 10:33	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	29/10/2020 10:17	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	30/10/2020 10:58	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	3/11/2020 14:59	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	6/12/2020 23:38	Feathertail Glider	Y	OUT	D	Unk	Unknown
2022 autumn	RB2	Rope	5	W	16/12/2020 11:02	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	30/12/2020 8:24	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	5	W	11/01/2021 2:32	Feathertail Glider	Y	OUT	D	Unk	Unknown
2022 autumn	RB2	Rope	5	W	19/01/2021 0:43	Feathertail Glider	Y	OUT	D	Unk	Unknown
2022 autumn	RB2	Rope	6	E	4/03/2021 23:05	Sugar Glider	Y	OUT	P	West	Unknown
2022 autumn	RB2	Rope	6	E	4/03/2021 23:06	Sugar Glider	Y	OUT	P	East	Unknown
2022 autumn	RB2	Rope	6	E	8/03/2021 5:15	Sugar Glider	Y	OUT	P	West	Unknown
2022 autumn	RB2	Rope	6	E	8/03/2021 5:15	Sugar Glider	Y	OUT	P	East	Unknown

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022 autumn	RB2	Rope	6	E	24/03/2021 8:50	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	6	E	4/04/2021 0:23	Sugar Glider	Y	OUT	P	West	Unknown
2022 autumn	RB2	Rope	6	E	4/04/2021 0:23	Sugar Glider	Y	OUT	P	East	Unknown
2022 autumn	RB2	Rope	6	E	11/04/2021 1:40	Sugar Glider	Y	OUT	D	West	Unknown
2022 autumn	RB2	Rope	6	E	11/04/2021 1:42	Sugar Glider	Y	OUT	D	West	Unknown
2022 autumn	RB2	Rope	6	E	3/10/2021 13:35	Butcher Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	6	E	26/10/2021 21:45	<i>Antechinus</i> sp.	Y	OUT	P	East	Unknown
2022 autumn	RB2	Rope	6	E	23/11/2021 22:56	Sugar Glider	Y	OUT	P	East	Unknown
2022 autumn	RB2	Rope	6	E	9/12/2021 7:44	Bird	N	OUT	D	Unk	NA
2022 autumn	RB2	Rope	6	E	18/12/2021 9:08	Magpie	N	OUT	D	NA	NA
2022 autumn	RB2	Rope	6	E	19/12/2021 14:04	Magpie	N	OUT	D	NA	NA
2022 autumn	RB2	Rope	6	E	25/12/2021 3:28	Sugar Glider	Y	OUT	P	West	Unknown
2022 autumn	RB2	Rope	6	E	25/12/2021 3:28	Sugar Glider	Y	OUT	P	West	Unknown
2022 autumn	RB2	Rope	6	E	25/12/2021 3:29	Sugar Glider	Y	OUT	P	East	Unknown
2022 autumn	RB2	Rope	6	E	25/12/2021 3:29	Sugar Glider	Y	OUT	P	West	Unknown
2022 autumn	RB3	Rope	7	W	27/08/2020 21:44	Brushtail Possum	Y	OUT	D	West	Unknown
2022 autumn	RB3	Rope	7	W	27/08/2020 22:27	Brushtail Possum	Y	OUT	D	East	Unknown
2022 autumn	RB3	Rope	7	W	14/09/2020 9:07	Kookaburra	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	26/09/2020 21:01	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	26/09/2020 22:34	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	5/10/2020 2:31	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	5/10/2020 2:43	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	6/10/2020 19:23	Common Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	7	W	14/10/2020 0:42	Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	14/10/2020 23:24	Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	7	W	14/10/2020 23:32	Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	31/10/2020 6:10	Bird	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	31/10/2020 18:00	<i>Corvus</i> sp.	N	OUT	D	NA	NA

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022 autumn	RB3	Rope	7	W	1/11/2020 5:38	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	2/11/2020 4:42	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	5/11/2020 22:49	Common Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	5/11/2020 22:55	Common Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	7	W	9/11/2020 16:51	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	14/11/2020 3:09	Common Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	4/03/2021 3:49	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	5/03/2021 6:50	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	10/03/2021 0:07	Short-eared Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	10/03/2021 0:53	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	10/03/2021 18:09	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	7	W	11/03/2021 22:45	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	12/03/2021 0:59	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	12/03/2021 21:42	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	13/03/2021 2:40	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	13/03/2021 20:23	Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	13/03/2021 20:24	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	14/03/2021 4:06	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	14/03/2021 23:23	Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	7	W	15/03/2021 1:31	Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	15/03/2021 23:26	Common Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	7	W	8/04/2021 18:57	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	12/05/2022 21:33	Brushtail Possum	Y	IN	D	East	Yes
2022 autumn	RB3	Rope	7	W	8/06/2022 17:39	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	8/06/2022 19:52	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	8/06/2022 20:03	Common Brushtail Possum	Y	OUT	D	East	No
2022 autumn	RB3	Rope	7	W	8/06/2022 20:21	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	8/06/2022 20:23	Common Brushtail Possum	Y	OUT	D	East	Yes

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022 autumn	RB3	Rope	7	W	8/06/2022 20:46	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	7	W	9/06/2022 17:47	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	7	W	10/06/2022 1:02	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	30/07/2020 12:49	Magpie	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	27/08/2020 21:43	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	27/08/2020 22:29	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	5/10/2020 2:31	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	5/10/2020 2:45	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	13/10/2020 17:23	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	14/10/2020 0:44	Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	14/10/2020 5:38	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	14/10/2020 23:34	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	17/10/2020 5:39	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	27/10/2020 16:33	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	1/11/2020 4:35	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	2/11/2020 5:39	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	3/11/2020 5:32	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	4/03/2021 3:52	Short-eared Brushtail Possum	Y	OUT	D	Unk	Yes
2022 autumn	RB3	Rope	8	E	7/03/2021 8:52	<i>Corvus</i> sp.	N	OUT	D	NA	NA
2022 autumn	RB3	Rope	8	E	9/03/2021 23:14	Common Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	8	E	9/03/2021 23:15	Common Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	8	E	9/03/2021 23:48	Common Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	8	E	10/03/2021 0:05	Brushtail Possum	Y	OUT	P	West	Yes
2022 autumn	RB3	Rope	8	E	10/03/2021 0:57	Short-eared Brushtail Possum	Y	OUT	P	East	Yes
2022 autumn	RB3	Rope	8	E	11/03/2021 22:42	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	12/03/2021 1:03	Short-eared Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	12/03/2021 21:41	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	13/03/2021 2:45	Common Brushtail Possum	Y	OUT	D	East	Yes

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022 autumn	RB3	Rope	8	E	13/03/2021 20:26	Short-eared Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	13/03/2021 20:27	Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	8	E	13/03/2021 20:28	Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	8	E	14/03/2021 4:01	Short-eared Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	8/04/2021 18:54	Short-eared Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	12/05/2022 21:35	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	8/06/2022 17:36	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	8/06/2022 19:49	Common Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	8/06/2022 20:06	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	8/06/2022 20:24	Common Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	8/06/2022 20:26	Short-eared Brushtail Possum	Y	OUT	D	East	Yes
2022 autumn	RB3	Rope	8	E	8/06/2022 20:43	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	9/06/2022 17:44	Brushtail Possum	Y	OUT	D	West	No
2022 autumn	RB3	Rope	8	E	9/06/2022 17:45	Brushtail Possum	Y	OUT	D	West	Yes
2022 autumn	RB3	Rope	8	E	10/06/2022 1:04	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB1	Rope	1	W	28/01/2023 2:26	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	28/01/2023 2:26	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	29/01/2023 2:59	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	29/01/2023 3:55	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	15/02/2023 21:27	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	16/02/2023 0:28	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	17/02/2023 19:44	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	19/02/2023 1:27	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	19/02/2023 1:27	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	22/02/2023 3:39	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	22/02/2023 3:39	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	24/02/2023 23:35	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	24/02/2023 23:35	Feathertail Glider	Y	OUT	D	West	No

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022/23 summer	RB1	Rope	1	W	25/02/2023 0:53	Sugar Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	25/02/2023 0:53	Sugar Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	25/02/2023 3:50	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	25/02/2023 3:50	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	25/02/2023 20:38	Feathertail Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	25/02/2023 20:38	Feathertail Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	26/02/2023 1:09	Sugar Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	26/02/2023 1:09	Sugar Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	26/02/2023 1:09	Sugar Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	26/02/2023 1:09	Sugar Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	26/02/2023 1:09	Sugar Glider	Y	OUT	D	West	No
2022/23 summer	RB1	Rope	1	W	6/03/2023 1:05	Sugar Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	6/03/2023 1:05	Sugar Glider	Y	OUT	D	East	No
2022/23 summer	RB1	Rope	1	W	6/03/2023 1:06	Sugar Glider		OUT	D	West	No
2022/23 summer	RB2	Rope	6	E	30/10/2022 1:57	<i>Antechinus</i> sp.	Y	OUT	D	West	No
2022/23 summer	RB2	Rope	6	E	30/10/2022 1:57	<i>Antechinus</i> sp.	Y	OUT	D	West	No
2022/23 summer	RB2	Rope	6	E	30/10/2022 1:57	<i>Antechinus</i> sp.	Y	OUT	D	East	No
2022/23 summer	RB2	Rope	6	E	30/10/2022 1:57	<i>Antechinus</i> sp.	Y	OUT	D	West	No
2022/23 summer	RB2	Rope	6	E	30/10/2022 1:57	<i>Antechinus</i> sp.	Y	OUT	D	East	No
2022/23 summer	RB2	Rope	6	E	4/11/2022 2:59	<i>Antechinus</i> sp.	Y	IN	D	East	No
2022/23 summer	RB2	Rope	6	E	29/11/2022 11:24	Noisy Friarbird	N	IN	D		No
2022/23 summer	RB3	Rope	7	W	11/06/2022 3:09	Common Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	7	W	11/06/2022 3:59	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	7	W	11/06/2022 3:59	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	7	W	11/06/2022 3:59	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	7	W	11/06/2022 18:09	Common Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	7	W	11/06/2022 18:09	Common Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	7	W	11/06/2022 18:09	Common Brushtail Possum	Y	OUT	D	West	Yes

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022/23 summer	RB3	Rope	7	W	12/06/2022 1:01	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	7	W	12/06/2022 1:01	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	7	W	13/06/2022 2:06	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	16/06/2022 20:08	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	17/06/2022 22:49	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	17/06/2022 22:49	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	17/06/2022 22:49	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	17/06/2022 22:49	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	17/06/2022 23:51	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	17/06/2022 23:51	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	18/06/2022 2:19	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	18/06/2022 2:19	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	18/06/2022 2:19	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	18/06/2022 2:19	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	20/06/2022 18:05	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	21/06/2022 1:43	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	22/06/2022 21:23	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	22/06/2022 21:23	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	22/06/2022 21:23	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	24/06/2022 0:58	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	24/06/2022 0:58	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	24/06/2022 0:58	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	25/06/2022 21:23	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	25/06/2022 21:23	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	26/06/2022 1:08	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	26/06/2022 1:08	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	26/06/2022 1:08	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	26/06/2022 1:23	Common Brushtail Possum	Y	OUT	D	West	No

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022/23 summer	RB3	Rope	7	W	26/06/2022 23:38	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	26/06/2022 23:38	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	26/06/2022 23:38	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	29/06/2022 18:27	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	29/06/2022 18:27	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	30/06/2022 2:22	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	30/06/2022 2:22	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	30/06/2022 12:53	Raven	N	OUT	D		No
2022/23 summer	RB3	Rope	7	W	3/07/2022 18:41	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	3/07/2022 18:41	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	4/07/2022 23:55	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	4/07/2022 23:55	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	7/07/2022 17:58	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	7/07/2022 17:58	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	7/07/2022 17:58	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	8/07/2022 21:39	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	8/07/2022 21:39	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	9/07/2022 19:30	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	9/07/2022 19:30	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	9/07/2022 19:30	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	9/07/2022 19:30	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	9/07/2022 19:30	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	28/02/2023 23:21	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	7	W	3/03/2023 3:09	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	7	W	3/03/2023 3:09	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	11/06/2022 3:07	Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 3:07	Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 4:01	Common Brushtail Possum	Y	OUT	D	East	Yes

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022/23 summer	RB3	Rope	8	E	11/06/2022 4:01	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 4:01	Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 18:04	Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 18:04	Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 18:04	Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	8	E	11/06/2022 18:04	Brushtail Possum	Y	OUT	D	West	Yes
2022/23 summer	RB3	Rope	8	E	12/06/2022 1:03	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	8	E	12/06/2022 1:03	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	8	E	12/06/2022 1:03	Common Brushtail Possum	Y	OUT	D	East	Yes
2022/23 summer	RB3	Rope	8	E	13/06/2022 2:03	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	13/06/2022 2:03	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	16/06/2022 20:11	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	16/06/2022 20:11	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	16/06/2022 20:11	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:45	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:45	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:45	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:45	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:46	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:46	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 22:46	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	17/06/2022 23:54	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	18/06/2022 2:15	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	18/06/2022 2:15	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	18/06/2022 2:15	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	18/06/2022 2:15	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	20/06/2022 18:07	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	20/06/2022 18:07	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	21/06/2022 1:40	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	21/06/2022 1:40	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	21/06/2022 1:40	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	22/06/2022 21:25	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	22/06/2022 21:25	Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	22/06/2022 21:25	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	24/06/2022 0:56	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	24/06/2022 0:56	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	25/06/2022 21:26	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	25/06/2022 21:26	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	25/06/2022 21:26	Common Brushtail Possum	Y	OUT	D	East	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No

Season	Site	Crossing	Camera	Pole	Date and Time	Species	Arboreal	IN/OUT	Certainty	Direction	Evidence complete crossing
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No
2022/23 summer	RB3	Rope	8	E	26/06/2022 1:12	Common Brushtail Possum	Y	OUT	D	Unk	No
2022/23 summer	RB3	Rope	8	E	3/03/2023 3:06	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	3/03/2023 3:06	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	3/03/2023 3:06	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	RB3	Rope	8	E	3/03/2023 3:06	Brushtail Possum	Y	OUT	D	West	No
2022/23 summer	GP3	Glider	9	Mid	14/03/2021 2:28	Feathertail Glider	Y	OUT	D	NA	No
2022/23 summer	GP3	Glider	9	Mid	16/11/2021 7:49	Bird	N	OUT	D	NA	No
2022/23 summer	GP3	Glider	9	Mid	23/12/2021 6:31	Raven	N	OUT	D	NA	No
2022/23 summer	GP3	Glider	9	Mid	8/07/2022 1:55	Sugar Glider	Y	OUT	D	NA	No
2022/23 summer	GP3	Glider	9	Mid	8/07/2022 1:55	Sugar Glider	Y	OUT	D	NA	No
2022/23 summer	GP3	Glider	9	Mid	8/07/2022 1:55	Sugar Glider	Y	OUT	D	NA	No
2022/23 summer	GP3	Glider	9	Mid	3/03/2023 3:25	Feathertail Glider	Y	OUT	D	NA	No

E = east; W = west; M = median; NA = not applicable; N = No; Y = Yes; Unk = unknown, P=Probable, D= Definite

Table 14: Camera details

Camera	Crossing	Loc	Season	start 60 days	end 60 days	TOTAL photos	TOTAL fauna	TOTAL arboreal	60 day photos	60 day fauna	60 day arboreal	Notes
1	RB1	W	Autumn 2022	12/03/2022	12/05/2022	15	1	1	0	0	0	
2	RB1	E	Autumn 2022	12/03/2022	12/05/2022	1	0	0	0	0	0	
3	GP1	M	Autumn 2022	12/03/2022	12/05/2022	42	0	0	0	0	0	
4	GP2	M	Autumn 2022	12/03/2022	12/05/2022	3	0	0	0	0	0	
5	RB2	W	Autumn 2022	12/03/2022	12/05/2022	100	2	2	0	0	0	
6	RB2	E	Autumn 2022	12/03/2022	12/05/2022	119	65	59	0	0	0	
7	RB3	W	Autumn 2022	12/03/2022	12/05/2022	166	92	90	3	3	3	
8	RB3	E	Autumn 2022	12/03/2022	12/05/2022	219	80	79	1	1	1	
9	GP3	M	Autumn 2022	12/03/2022	12/05/2022	37	13	13	0	0	0	
1	RB1	W	Summer 2022/23	1/11/2022	31/12/2022	34	27	27	0	0	0	

Camera	Crossing	Loc	Season	start 60 days	end 60 days	TOTAL photos	TOTAL fauna	TOTAL arboreal	60 day photos	60 day fauna	60 day arboreal	Notes
2	RB1	E	Summer 2022/23	1/11/2022	31/12/2022	0	0	0	0	0	0	No signal or connection
3	GP1	M	Summer 2022/23	1/11/2022	31/12/2022	47	0	0	32	0	0	
4	GP2	M	Summer 2022/23	1/11/2022	31/12/2022	0	0	0	0	0	0	No signal or connection
5	RB2	W	Summer 2022/23	1/11/2022	31/12/2022	0	0	0	0	0	0	No signal or connection
6	RB2	E	Summer 2022/23	1/11/2022	31/12/2022	137	7	6	22	2	1	
7	RB3	W	Summer 2022/23	1/11/2022	31/12/2022	60	60	59	0	0	0	
8	RB3	E	Summer 2022/23	1/11/2022	31/12/2022	66	65	65	0	0	0	
9	GP3	M	Summer 2022/23	1/11/2022	31/12/2022	62	7	5	6	0	0	

Loc = location; E = east; W = west; M = median; NA = not applicable

Niche Environment and Heritage

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