

MONITORING OF KOALAS AND OTHER FAUNA
YELGUN TO CHINDERAH SECTION OF PACIFIC MOTORWAY
March 2014 to February 2015

1.0 Introduction

Two fauna crossing points on the Yelgun to Chinderah section of the Pacific Motorway were monitored continuously between 13 March 2014 and 3 February 2015. These fauna crossing points were:

- Site One - a reinforced concrete box culvert with fauna furniture 200 m south of the Eviron Road overpass.
- Site Five - a dedicated fauna overpass/bridge at Taggets Hill, 1.3 km south of the Pottsville Interchange.

The primary purpose of monitoring was to identify whether koalas were using these sites to cross between habitat areas on the east and west of the Pacific Motorway.

Previously, four fauna crossing points on this section of the Pacific Motorway were monitored. These crossings were monitored between 9 July 2013 and 28 February 2014, with the purpose being to establish what invasive and native fauna species were using these crossings. The fauna crossings that were monitored between July 2013 and February 2014 were:

- Site One (as above) - a reinforced concrete box culvert 200 m south of the Eviron Road overpass.
- Site Two - a bridge crossing 600 m north of the Kanes Road overpass.
- Site Three - a bridge crossing 200 m north of the Pottsville Interchange.
- Site Four - a bridge crossing over Sheens Creek 25 m north of Sleepy Hollow Road.

Sites one, two, four and five were identified in the Tweed Coast Koala Habitat Study (Phillips *et al* 2011) as potential east-west koala linkages.

The results of monitoring between July 2013 and February 2014 are included in Appendix 1 of this report. Based on the results of monitoring and difficulties of monitoring at sites two and four, monitoring was discontinued at sites two, three and four and an additional monitoring site was established (site five).

Sites one and five are shown in Plates 1 to 4 and sites one to five are shown in Figure 1.



Site one, the culvert south of Eviron Road



Site five, the fauna bridge at Taggets Hill

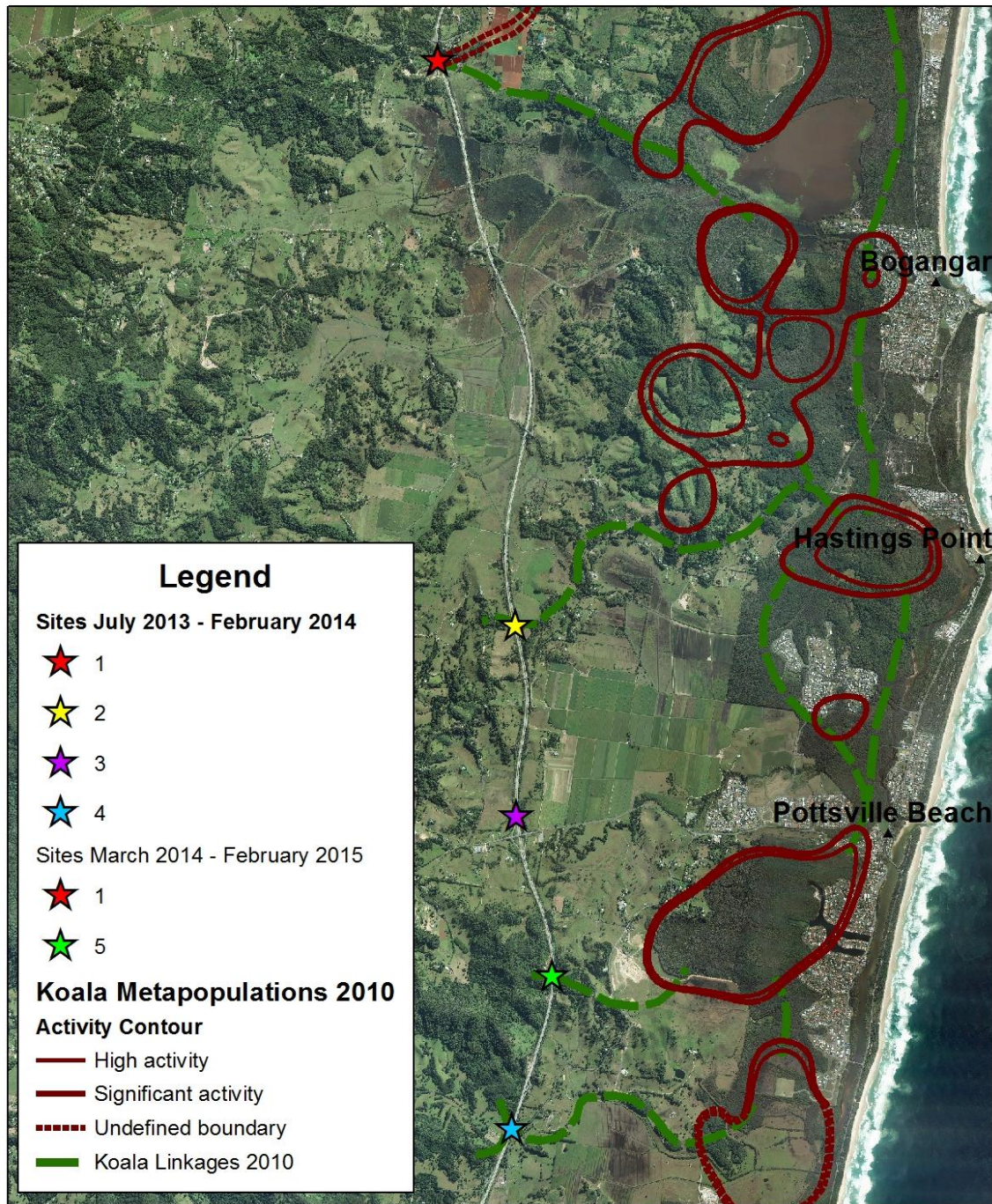


Taggets Hill (Site 5) NW camera



Taggets Hill (Site 5) SW camera

Plates 1 to 4: Camera sites one and five.



**Camera monitoring sites in fauna crossings
Yelgun to Chinderah, Pacific Motorway**

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	<p>Date Printed: 25 March, 2015</p> <p>Author:</p> <p>Filepath:</p>	<p>Coordinate System MGA Zone 56 Datum - GDA 94</p> <p>GDA</p>	<p>T (02) 6670 2400 1300 292 872 F (02) 6670 2429 W www.tweed.nsw.gov.au E planning.reforms@tweed.nsw.gov.au</p>

FIGURE 1: Location of the fauna crossing points with monitoring cameras installed. Koala metapopulation contours and linkages from Phillips *et al* (2011).

2.0 Methods

Two cameras were installed at site one and four cameras installed at site five. The two cameras at site one were installed inside the culvert and directed inwards, with one on the eastern and one of the western extent of the culvert. Of the four cameras installed at site five, two were installed on 13 March 2014 at the north western and south western corners of the overpass. The remaining two were installed on 26 June 2014 at the north eastern and south eastern corners of the overpass. All cameras were directed towards the centre of the overpass so as to provide good coverage and attempt to capture an image of koala(s) making a crossing of the overpass.

Two types of remote sensing infra-red cameras were used, Scout Guard Zero Glow at site one and Reconyx Hyperfire HC600 at site five. The camera type, camera mode and monitoring period at each of the fauna crossing points are shown in Table 1.

TABLE 1: Camera type, camera mode and monitoring period at each of the fauna crossing points

Site Number	Site Name and Camera Location	Camera type	Monitoring period	Camera Mode
1	Eviron Rd – Eastern side of the box culvert	Scout Guard Zero Glow	13 March 2014 to 3 Feb 2015	Video & camera
1	Eviron Rd - Western side of the box culvert	Scout Guard Zero Glow	13 March 2014 to 3 Feb 2015	Video & camera
5	Taggets Hill - NW corner of the overpass	Reconyx Hyperfire HC600	13 March 2014 to 3 Feb 2015	Camera
5	Taggets Hill - SW corner of the overpass	Reconyx Hyperfire HC600	13 March 2014 to 3 Feb 2015	Camera
5	Taggets Hill - SE corner of the overpass	Reconyx Hyperfire HC600	26 June 2014 to 3 Feb 2015	Camera
5	Taggets Hill - NE corner of the overpass	Reconyx Hyperfire HC600	26 June 2014 to 3 Feb 2015	Camera

3.0 Results

During the monitoring period, 27 fauna species were recorded and identified at the two monitoring sites, including 22 native and five introduced fauna species. Fauna recorded at each site are shown in Table 2 and a selection of images recorded on cameras is presented in Appendix 2.

Koala was recorded on all four cameras on the fauna overpass at Taggets Hill (site five) but was not recorded at the fauna box culvert at Eviron Road (site one). Table 3 shows records of koala movements at site five.

A summary of results from each site is presented below.

TABLE 2: Fauna recorded by site

Common name	Site 1		Site 5			
	Eviron Rd E camera BF 1	Eviron Rd W camera BF 2	Taggets Hill NW camera 15	Taggets Hill SW camera 16	Taggets Hill SE camera 17	Taggets Hill NE camera 18
Native Fauna						
Swamp Wallaby	X	X	X	X	X	X
Short-eared Possum	X	X	X	X	X	X
Common Brushtail Possum		X				
Northern Brown Bandicoot	X	X	X	X	X	X
Long-nosed Bandicoot	X		X	X	X	X
Koala			X	X	X	X
Echidna	X	X	X	X	X	X
Possum (unidentified)	X					
Bush Rat	X		X	X	X	
Bandicoot (unidentified)		X				
Microbat (unidentified)	X					
Lace Monitor			X	X	X	X
Eastern Water Dragon	X	X				
Blue-tongue Lizard					X	
Snake (unidentified)		X				
White-browed Scrubwren					X	
Eastern Whipbird					X	
Lewins Honeyeater					X	
Grey Shrike Thrush			X			
Australian Brush Turkey		X	X	X	X	X
Wonga Pigeon			X	X	X	X
Pheasant Coucal			X			
Torresian Crow			X	X	X	X
Small bird (unidentified)					X	
Introduced Fauna						
European Red Fox	X	X	X	X		X
Black Rat	X	X			X	
Domestic (collared) Dog			X	X		
Wild Dog			X	X		X
Hare			X	X		X
Cane Toad				X		

Table 3: Koalas recorded at Site 5 Taggets Hill

Sex/no. of koala	Month Year	NW - camera no. 15	SW - camera no. 16	SE - camera no. 17	NE - camera no.18
Koala 1 - male	March 2014		28/03/2014 W to E	Camera not installed yet	Camera not installed yet
Koala 1 - male			29/03/2014 E to W		
Koala 1 - male	April 2014	28/04/2014 W to E	29/04/2014 E to W		
Koala 1 - male	June 2014				27/06/2014 W to E
Koala 1 - male	July 2014				2/07/2014 E to W
Koala 1 - male	August 2014				9/08/2014 E to W
Koala 1 - male					27/08/2014 W to E
Koala 1 - male					30/08/2014 E to W
Koala 1 - male	September 2014		5/09/2014 W to E		6/09/2014 W to E
Koala 1 - male				10/09/2014 E to W	9/09/2014 E to W
Koala 2 &3- female koala with back young	October 2014	29/10/2014 W to E			29/10/2014 W to E
Koala 2 &3- female koala with back young	November 2014	6/11/2014 E to W			6/11/2014 E to W
Koala 4?					28/11/2014 W to E
Koala 4?					30/11/2014 E to W
Koala 4?	December 2014		2/12/2014 E to W		13/12/2014 E to W
Koala 4?					19/12/2014 W to E
Koala 4?				22/12/2014 E to W	
Koala 4?	January 2015	5/01/2015 W to E			9/01/2015 E to W
Koala 4?			26/01/2015 E to W	22/01/2015 W to E	26/01/2015 E to W
Koala 4?					30/01/2015 Feeding on tree on overpass

Site One - concrete box culvert south of the Eviron Road overpass.

The most common species using the culvert to cross under the motorway were Swamp Wallaby, Short-eared Possum, Fox and Bandicoot (both Long-nosed and Northern Brown - although in many images it was difficult to distinguish to species level). Both Black and Bush Rat used the culvert to forage for insects but recorded images suggested that these species may not be using the culvert to cross under the motorway. Short-eared Possum commonly used the elevated horizontal logs in the culvert to cross under the motorway. The only other native fauna species found to make occasional crossings was the Echidna.

Site Five - fauna overpass at Taggets Hill south of the Pottsville Interchange

Koalas were regularly recorded on cameras on the overpass, with at least four different animals identified. The markings on a koala rump were used to identify individual animals. This was done by comparing images of koalas on their left and/or right hand side. A full analysis of all koala images has not yet been undertaken. An older male koala with possible conjunctivitis was recorded in March and April 2014. As cameras were only installed at this time on the north western and south western corners of the fauna underpass, it could not be established if this koala made a full crossing of the overpass.

In June, July and August koala was recorded on the north west camera only so again it could not be established if this koala was making a full crossing of the overpass.

A koala was recorded on the southwest camera on 5 September moving west to east and then on the north east camera on 6 September again moving west to east, therefore making a full crossing of the overpass from west to east. This koala returned on 9 and 10 September, passing back to the west of the motorway. Based on the appearance of this koala it appears it is the same animal that was first recorded in March and April.

In late October and early November a female koala with back young was recorded making a full pass of the overpass, from west to east then returning to the western side of the motorway eight days later.

In November and December 2014 and January 2015 there was continued koala activity recorded on cameras (refer Table 3) including evidence of koalas using preferred koala food trees planted on the overpass.

As noted above, a full analysis of all koala images and their rump markings has not yet been undertaken to determine exactly how many animals are using the overpass. Koala images recorded on the northwest camera (refer Plates 5 to 7 on Page 8) demonstrate how markings can be used to distinguish individual animals.



Plates 5 to 7: Four different koalas recorded on a single camera over the monitoring period

Swamp Wallaby and Australian Bush Turkey were the most common fauna species recorded on cameras at site five and were observed making passes and using the overpass as habitat. In warmer months records of Lace Monitor were very common. Long-nosed Bandicoot and Northern Brown Bandicoot, Echidna and Wonga Pigeon were also very commonly recorded crossing and foraging on the overpass. Bush Rats were regularly recorded whilst Short-eared Possum was infrequently recorded.

Of the introduced species, the Fox was the most common species recorded with wild dogs recorded occasionally. All dogs recorded, apart from two domestic collared dogs recorded in March 2014, appeared dingo-looking, being red/sandy, red/sandy with some darker markings on the back/neck with white-tipped tail, or black with tan markings around the face. There appeared to be several different wild dogs using the overpass to cross the motorway. Of the other introduced fauna, Black Rat was irregularly recorded and Hare was rarely recorded.

4.0 Conclusions and Recommendations

The overpass at Taggets Hill is functioning as a movement corridor and habitat for the koala and a range of locally occurring native fauna. Whilst introduced predators are also using the overpass as a movement corridor, the overpass provides good cover (albeit weedy) for small ground mammals to find refuge from predators. There are also ample trees for arboreal mammals such as the koala and possum to find refuge from predators, apart from a small area of shrubby vegetation in the centre of the overpass.

Four species of preferred koala food trees have been planted on the overpass and are more than 10 years of age. Koala food trees have also been planted on the eastern and western edges of the overpass and on the batters on the western edge of the motorway. There is also reasonable habitat to the east of the fauna overpass (although this habitat is not continuous with large areas of coastal bushland) and extensive habitat to the west of the fauna overpass. It is likely that the combination of existing habitat either side of the overpass, presence and age of planted preferred koala food trees and accessibility of the overpass from adjacent habitat are the key reasons that koalas are using this site. Based on results to date of koala crossings, koalas appear to spend more time west of the overpass and make occasional crossings, spending short periods on the eastern side before returning.

The culvert at Eviron Road is functioning as a movement corridor between habitats to the east and west of the motorway. Commonly recorded species such as the Swamp Wallaby and Bandicoots move rapidly through the underpass, presumably as it offers no habitat and minimal refuge from predators. In relation to introduced canid predators, only foxes have been recorded in this underpass although wild dogs are known from the area.

The Eviron culvert is not currently being used by koalas, possibly due to a lack of koala food trees adjacent, or leading up to, the underpass entrances. There is also limited koala habitat on adjacent private land to the east of the underpass. Council has recently received approval from Roads and Maritime Services (RMS) to establish a small koala food tree planting at the eastern fauna underpass entrance and has also commenced planning for additional plantings on the adjoining private land.

The following recommendations are made:

- Continue camera monitoring at both sites for a further twelve months.
- Analyse koala images at site five to determine the number of koalas that have used or are still using the overpass.
- Continue to investigate and implement opportunities to improve habitat area and connectivity on the eastern side of the motorway. In particular, the identified koala linkage from site five to the Pottsville Wetland.
- Continue to liaise with RMS regarding maintenance of overpass and underpasses and provide monitoring results with an aim to improve management.

APPENDIX 1: Fauna crossing monitoring report July 2013 to February 2014

**MONITORING OF FAUNA IN CROSSINGS UNDER THE
YELGUN TO CHINDERAH SECTION OF THE PACIFIC MOTORWAY**

Four fauna crossing points under the Yelgun to Chinderah section of the Pacific Motorway were monitored between 9 July 2013 and 28 February 2014. The fauna crossing points that were monitored were:

- A reinforced concrete box culvert with fauna furniture 200 m south of the Eviron Road overpass.
- A bridge crossing 600 m north of the Kanes Road overpass.
- A bridge crossing 200 m north of the Pottsville interchange.
- A bridge crossing over Sheens Creek 25 m north of Sleepy Hollow Road.

Fauna crossing points that were monitored are shown in Figure 1 and Plates 1 to 4.

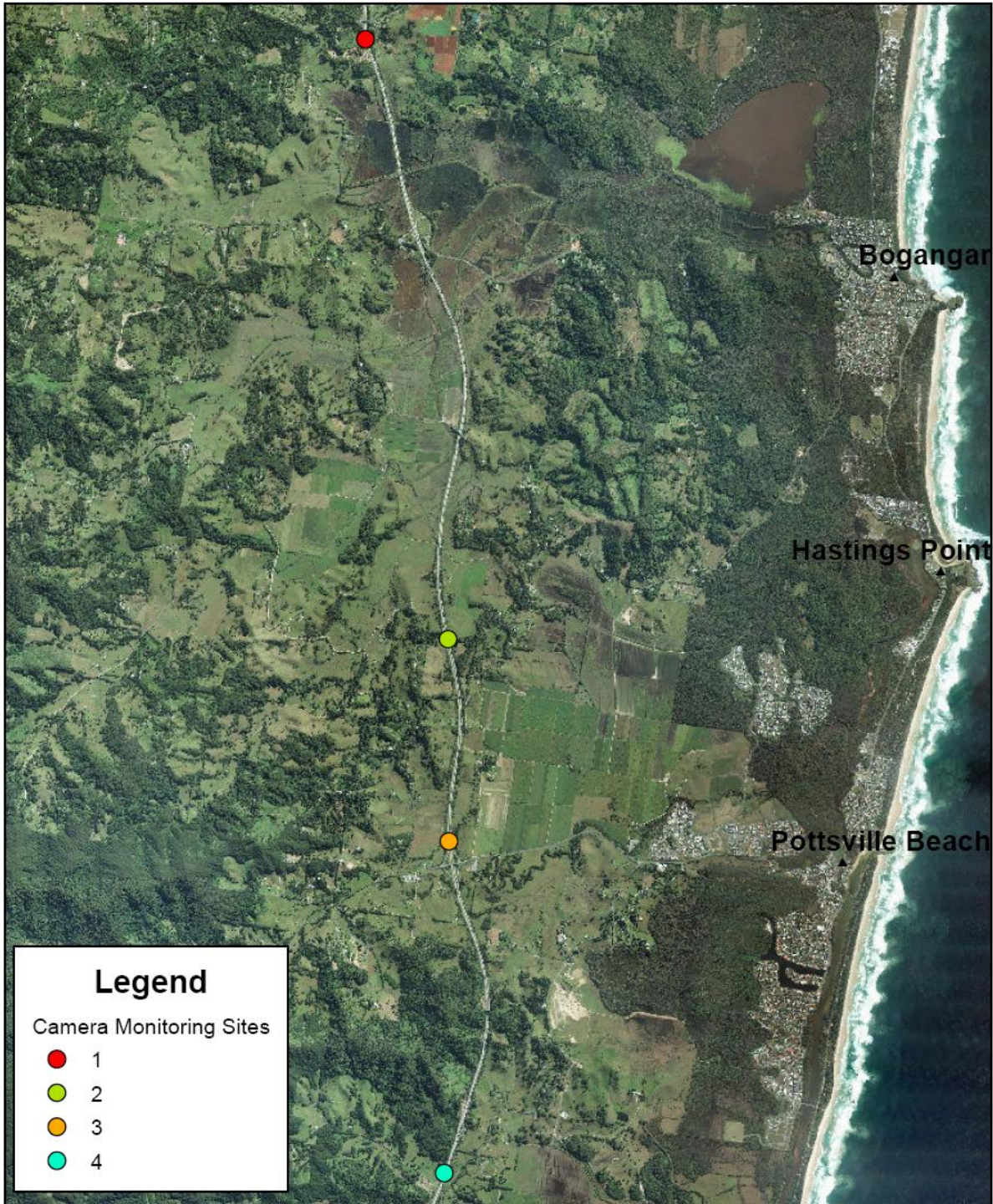
The purpose of the monitoring was to identify the species and relative frequency of occurrence of animals using these crossing points.

Two types of remote sensing infra-red cameras were used (Scout Guard Zero Glow and Reconyx Hyperfire HC600). The camera type, camera mode and monitoring period at each of the fauna crossing points are shown in Table 1.

TABLE 1: Camera type, camera mode and monitoring period at each of the fauna crossing points

Site Name	Site Number	Camera type	Monitoring period	Camera Mode
Eviron Rd	1	Scout Guard Zero Glow	20 Sep 2013 – 3 Oct 2013 [#]	Video
Creek north of Kanes Rd	2	Scout Guard Zero Glow	14 Aug 2013 – 18 Dec 2013 [#]	Video
Creek north of Kanes Rd	2	Reconyx Hyperfire HC600	23 Aug 2013 – 20 Sep 2013	Camera
Pottsville interchange	3	Reconyx Hyperfire HC600	14 Aug 2013 – 18 Dec 2013	Camera
Pottsville interchange	3	Scout Guard Zero Glow	9 July 2013 – 28 Feb 2014	Camera
Sheens Ck at Sleepy Hollow Rd	4	Scout Guard Zero Glow	14 Aug 2013 – 28 Feb 2014	Camera

[#] camera malfunction with video setting reduced the period for data collection



MONITORING OF FAUNA IN CROSSINGS UNDER THE YELGUN TO CHINDERAH SECTION OF THE PACIFIC MOTORWAY

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FIGURE 1: Location of the fauna crossing points



Site 1: Culvert south of Eviron Rd



Site 2: Unnamed creek north of Kanes Rd



Site 3: Unnamed creek north Pottsville interchange



Site 4: Sheens Creek at Sleepy Hollow Road



Signs erected at camera sites



Scout Guard Zero Glow camera

PLATES 1 TO 6: Camera sites

During the monitoring period, 27 fauna species were recorded and identified at the four monitoring sites, including 22 native and 5 non-native species. Fauna recorded at each of the four sites are shown in Table 2 and a selection of images recorded on the cameras is presented in Appendix 1.

TABLE 2: Fauna recorded by site

Common name	Site 1 Eviron Road	Site 2 Creek north of Kanes Rd	Site 3 Creek north of Pottsville interchange	Site 4 Sheens Ck at Sleepy Hollow Rd
Native fauna				
Swamp Wallaby	X		X	X
Common Brushtail Possum	X		X	X
Short-eared Possum	X		X	
Northern Brown Bandicoot			X	X
Long-nosed Bandicoot				X
Echidna			X	
Lace Monitor		X		
Eastern Water Dragon		X	X	
Brown Snake		X		
Whip Snake				
Brown Tree Snake				X
Green Tree snake			X	
Carpet Python		X		
Torresian Crow			X	
Australian Wood Duck			X	
Pacific Black Duck				X
Purple Swamp Hen				X
Willy Wagtail				X
Collared Sparrowhawk			X	
Australian Bush Turkey		X		
Buff-banded Rail				X
Pheasant Coucal			X	
Non-native fauna				
European Red Fox	X	X	X	X
Black Rat		X	X	
Cow	X	X		X
Domestic Dog		X		
Horse		X		

At Site 1, Common Brushtail and Short-eared Possum were the most commonly recorded species. However this data set is very limited. Short-eared Possums were recorded scaling the fauna fence at this site, with potential for arboreal fauna to enter the Pacific Motorway. It is worth noting that the fauna fence does not extend along the top of the culvert, rather it terminates at each side of the entrance to the culvert. An image of the fauna fence has been included in Appendix 1.

At Site 2, Eastern Water Dragon and the introduced Black Rat and Cow were the most commonly recorded species. Cattle at Site 2 are having a detrimental impact on creek and riparian condition. A reduction in ground cover vegetation as a result of cattle grazing is likely to be reducing the opportunities for movement for some native fauna species. Northern Brown and Long-nosed Bandicoot, Swamp Wallaby, Common Brushtail and Short-eared Possum and Echidna were all absent from this site. This site had the highest number of reptile species recorded, likely due to extensive areas of rock batters providing habitat.

At site 3, Northern Brown Bandicoot, Eastern Water Dragon and non-native fauna European Red Fox and Black Rat were the most commonly recorded species. At Site 4, the European Red Fox and Swamp Wallaby were the most commonly recorded species.

In some instances it was clear that fauna were using the crossings to move under the Pacific Motorway. Fauna were also using the habitat in underpasses to forage. Whilst all of the monitoring sites were highly disturbed, three were on freshwater creeks with adjoining riparian vegetation (although fragmented and disturbed), therefore providing important habitat.

Cameras were removed from the four monitoring sites between 28 February and 5 March 2014. Based on the results to date and further assessment of all available fauna crossing points, six cameras will be installed at the following three sites:

- The reinforced concrete box culvert with fauna furniture 200 m south of the Eviron Road overpass (current Site 1).
- The bridge crossing 600 m north of Kanes Road overpass (current Site 2).
- A purpose built, vegetated overpass 1.5 km south of the Pottsville interchange known as Taggets Hill (new site).

Two cameras will be installed at each of the sites, with the primary aim to monitor for any koala activity or movement. Cameras will be installed for a minimum six month period with cameras checked and maintained on a monthly basis. At the end of the six month period, camera data and location will again be reviewed.

APPENDIX 1: Selection of fauna images recorded on cameras



Termination of the fauna fence at the edge of the box culvert at Site 1. Short-eared Possums were recorded climbing over the fence and onto the top of the culvert.



Eastern Water Dragon at Site 2



European Red Fox at Site 2



Lace Monitor at Site 2



Short-eared Possum at Site 3



Echidna at Site 3



Northern Brown Bandicoot at Site 3



Black Rat at Site 3



Pheasant Coucal at Site 3



Swamp Wallaby at Site 3



European Red Fox with Black Rat at Site 3



Australian Wood Duck pair at Site 3



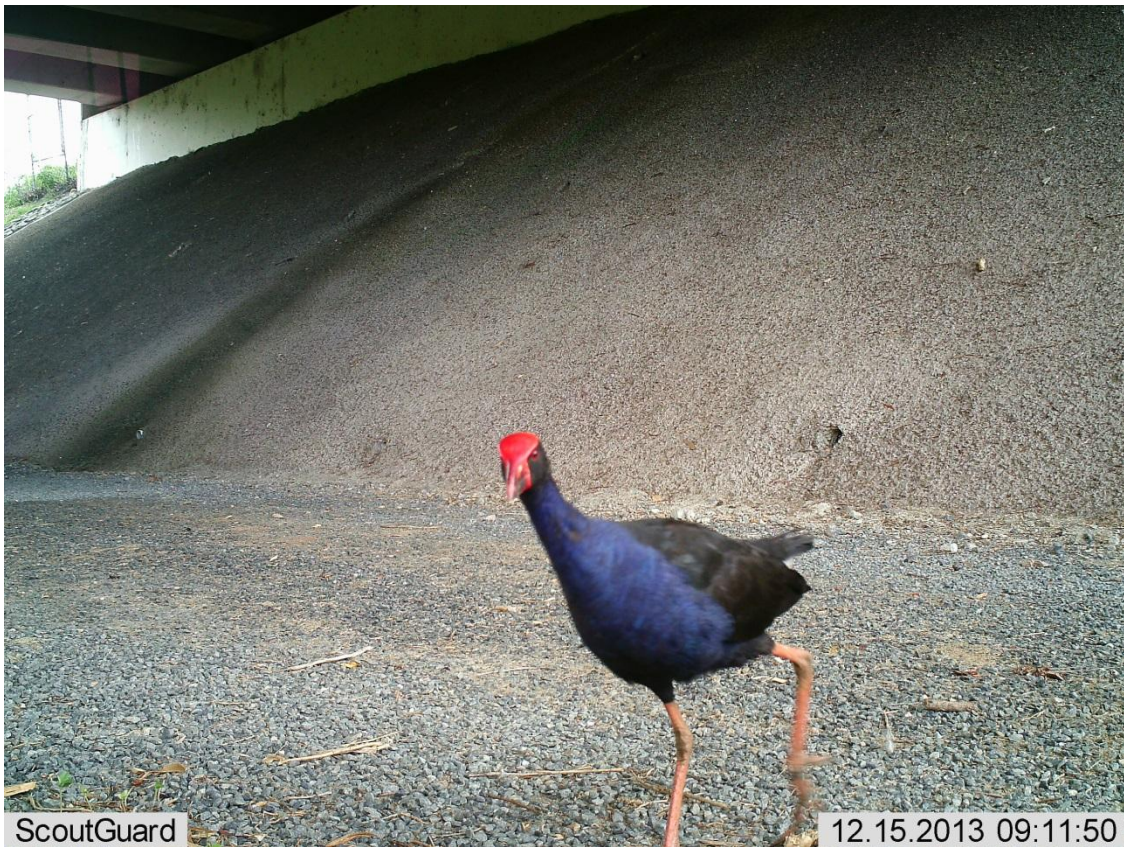
Long-nosed Bandicoot at Site 4



European Red Fox at Site 4



Swamp Wallaby at Site 4



Purple Swamp Hen at Site 4

APPENDIX 2: Selection of fauna images recorded on cameras



Long-nosed Bandicoot



Northern Brown Bandicoot



Short-eared Possum



Swamp Wallabies



Wild dog



Koala



Wonga Pigeons



Bush Turkey in pursuit of Lace Monitor



Foxes



Short-eared Possums