



Transport for
New South Wales

Warrell Creek to Nambucca Heads

Koala Monitoring Interim Report – Operational Phase,
Year four (2022)

Transport for New South Wales | October 2022 |



Pacific Highway upgrade: Warrell Creek to Nambucca Heads (WC2NH)

Koala Monitoring Interim Report –
Operational Phase, Year four (2022)



Document Distribution

Date	Version	Status	Sent to	Represent	Delivered Format	Dispatched By
6/10/2022	1	Draft	D. Rohweder	SES	MSW	L. Andrews
7/10/2022	2	Final	S. Walker and Jason Sheehan	TfNSW	MSW	L. Andrews
23/03/2023	3	Final	Jason Sheehan	TfNSW	MSW	L. Andrews

Project Team:

Dr D. Rohweder (review)

Mr Luke Andrews (field work and reporting)

Mr Frank Makin (field work)

Ms Erica Leal (field work)

Ms Gabrielle Rose (field work)

Report prepared for:

Transport for New South Wales



Cover Photo: Koala recorded in the Nambucca state forest during nest box inspections.

Disclaimer:

This report has been prepared in accordance with the scope of services described in the contract or agreement between Sandpiper Ecological Surveys (ABN 82 084 096 828) and TfNSW. The report relies upon data, surveys and measurement obtained at the times and locations specified herein. The

report has been prepared solely for use by TfNSW and Sandpiper Ecological Surveys accepts no responsibility for its use by other parties. Sandpiper Ecological Surveys accepts no responsibility or liability for changes in context, meaning, conclusions or omissions caused by cutting, pasting or editing the report.

Table of contents

1. Introduction	1
1.1 Background	1
1.2 Study area	2
2. Methodology	3
2.1 Transect surveys	3
2.2 Survey limitations	3
3. Results	4
3.1 Transect surveys	4
3.2 Tracks and easements	4
3.3 Habitat use and distribution	4
4. Discussion	6
4.1 Koala population	6
4.2 Habitat use and distribution	7
5. Recommendations	7
6. References	7

List of tables

Table 1: Details of koalas recorded during the spring 2022 survey. M = male. A. littoralis = <i>Allocasuarina littoralis</i> . Uk= unknown. OBF = Open Blackbutt Forest.....	4
Table 2: Location of koala scats recorded during spring 2022 transect and track/easement surveys. Datum – GDA 94. ...	4
Table 3: Comparison of koala records during the baseline, construction, and operational phases of the WC2NH upgrade. * individual recorded on four occasions.....	6
Table 4: Recommendations based on findings from operational phase monitoring and response from TfNSW.	7

List of figures

Figure 1: Footprint of the WC2NH pacific highway upgrade.	2
Figure 2: Location of koala records during spring 2022 monitoring at WC2NH.	5

1. Introduction

In 2015, Transport for New South Wales (TfNSW), in conjunction with Acciona Ferrovia Joint Venture (AFJV), commenced the upgrade of the Pacific Highway between Warrell Creek and Nambucca Heads (WC2NH). The WC2NH project was opened to traffic in two stages: stage 2a - 13.5km section from Lower Warrell Creek Bridge to Nambucca Heads opened on 18 December 2017; and stage 2b 6.25km section from the southern end of the project to the Lower Warrell Creek bridge opened in late June 2018.

Approvals for the WC2NH upgrade required monitoring of several species and mitigation measures during the operational phase. Species and mitigation measures targeted include koala, yellow-bellied glider, giant barred frog, green-thighed frog breeding ponds, underpasses, vegetated median, roadkill, exclusion fence, and threatened flora. Sandpiper Ecological Surveys (SES) has been contracted by TfNSW to deliver the WC2NH operational ecological and water quality monitoring program.

The following interim report details the methods and results of spring year five operational phase koala population monitoring. Year one operational phase monitoring was conducted in spring 2018 (Sandpiper 2018) and year 3 in spring 2020 (Sandpiper 2021). The aim of koala monitoring is to identify changes in resident koala activity (abundance, home range and movements) in response to construction of WC2NH and the effectiveness of koala habitat connectivity mitigation measures (i.e. fauna underpasses and exclusion fencing). The following report focuses on targeted koala surveys on replicate transects and nearby management trails and includes general comment on the effectiveness of mitigation measures. Detailed analysis of koala use of underpasses and a summary of all koala records will be provided in the annual (year 5 operational phase) koala report, which is due in August 2023.

1.1 Background

The impact of the upgrade on koala (*Phascolarctos cinereus*) was assessed in the Project Environmental Assessment (Sinclair Knight Merz [SKM] 2010a, SKM 2010b), and following its listing on the *Environment Protection and Biodiversity Conservation Act 1999*, a supplementary assessment in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Gealink 2016). The supplementary assessment found that the Proposal would have negative impacts on koalas utilising the Nambucca State Forest/ Old Coast Road area, mainly through habitat removal and fragmentation. The Project, with effective implementation of proposed mitigation measures, was found to be unlikely to result in a significant impact to the local koala population. Notwithstanding, as the Project adversely affected habitat that satisfied the SEWPaC (2012) definition of 'habitat critical to the survival of the species' (including direct removal of approximately 86.5 ha of vegetation that satisfies this criteria); the Project was considered to constitute a significant impact on the koala as per the DSEWPaC (2012) and DoE (2013a) guidelines.

Measures implemented to minimise impacts on koalas include:

- Ecological monitoring to determine the effectiveness of mitigation measures undertaken as part of the Project.
- Installation of fauna crossings, and fauna exclusion fencing to allow for safe passage of fauna (including the koala) crossing the Pacific Highway.
- Installation of 'floppy-top' fauna exclusion fencing to minimise road strike.

Prior to construction a pre-clearance baseline koala monitoring methodology was prepared and baseline surveys conducted in autumn and spring 2014 (SKM 2014). Construction phase koala monitoring surveys were conducted in spring 2015 (year 1) and spring 2017 (year 3) (Geolink 2017). Operational phase koala monitoring surveys were conducted in spring 2018 (year 1) and spring 2020 (year 3; Sandpiper Ecological 2018, 2021).

1.2 Study area

The WC2NH project covers a total length of 19.75km and extends from Warrell Creek in the south to Nambucca Heads in the north (Figure 1). The alignment bypasses the town of Macksville and the northern section traverses Nambucca State Forest. Koala population monitoring surveys occur within Nambucca State Forest at the northern end of the upgrade.

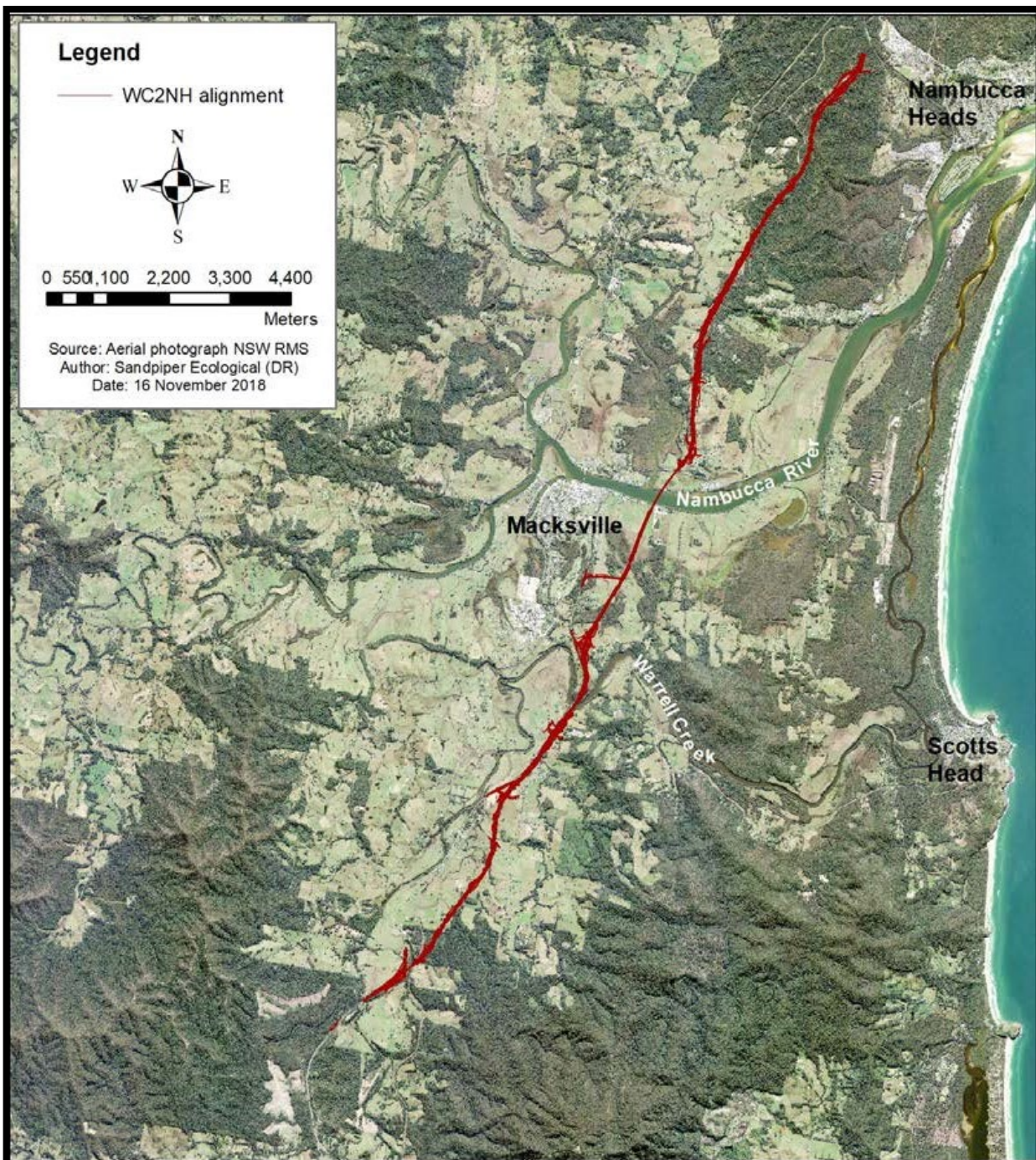


Figure 1: Footprint of the WC2NH Pacific Highway upgrade.

2. Methodology

2.1 Transect surveys

Twenty-five paired transects were established perpendicular to the alignment within the Nambucca State Forest/Old Coast Road area between chainages 15600 and 19500. Transects ranged in length from 34m to 500m and were approximately 150m apart (Figure 2). Shorter transects terminated at the forest edge, or at a private property boundary. Each transect was surveyed by one ecologist during the day and night. All surveys were conducted on foot at a speed of 0.5 to 1kph. At night, the male koala call was broadcast for five minutes through a 5-8 watt speaker or megaphone from the approximate centre-point of each transect. Additional spotlighting was conducted along tracks and roads whilst moving between transects. All nocturnal surveys were conducted using 200+ lumen spotlights.

Four ecologists conducted surveys on 28 and 29 September 2022. Weather conditions during the survey were suitable for sampling koalas with mild to warm temperatures and light winds. Survey time for 500m transects ranged from 26 to 39 minutes/transect. The following data were collected for each koala detected:

- Location (using global positioning system GPS)
- Distance from transect (GIS).
- Occupied tree species.
- Habitat type.
- Height of occupied tree.
- Diameter at breast height of occupied tree.
- Sex.
- Behaviour.
- Evidence of disease.
- Reproductive status.

2.2 Survey limitations

The survey design has substantial limitations when considered in the context of the monitoring aim. The aim of monitoring is to identify changes in resident koala activity (abundance, home range and movements) in response to construction of WC2NH and the effectiveness of koala habitat connectivity mitigation measures (i.e. fauna underpasses and exclusion fencing). The second part of the aim “the effectiveness of koala habitat connectivity mitigation measures” is addressed in a separate component of the WC2NH operational phase monitoring program and is not a focus of population monitoring. The first part of the aim “to identify changes in resident koala activity (abundance, home range, and movements) in response to construction” is covered by the transect surveys and addressed in this report.

The survey design is unsuitable to obtain information on abundance, home range or movement. As noted by Geolink (2017) the dense mid-storey vegetation present on many transects substantially reduces koala detectability. The detection probability on some transects is likely to be less than 25%. The difficult terrain also means that a substantial amount of time is spent looking at the ground rather than the canopy. In addition, transects are not independent and there is a strong likelihood that the same koala could be recorded on adjoining transects making estimates of abundance difficult. Individuals moving beneath the highway exacerbate this problem.

Detection limitations were noted during previous surveys and sampling along tracks was included to supplement transect surveys (Geolink 2017). However, the lack of well-defined spatial and temporal survey effort for the supplementary surveys introduces another potential bias.

3. Results

3.1 Transect surveys

Two koalas were recorded while completing transect surveys during the spring 2022 sample event (Table 1; Figure 2). Both individuals were healthy and were recorded during night surveys (Table 1). One male koala was recorded on the eastern side of the alignment on transect E13 foraging on a small fruited grey gum tree (*Eucalyptus propinqua*) on 28 September 2022 (Table 1). The second individual could not be sexed and was found resting in a black sheoak (*Allocasuarina littoralis*) on the western side of the alignment on transect W10 (Table 1). Koala scats were also recorded beneath a tallowwood tree (*Eucalyptus microcorys*) on transect E14, and beneath a grey gum tree (*Eucalyptus propinqua*) on transect W10 (Table 2).

3.2 Tracks and easements

No koalas or scats were recorded on adjacent tracks or easements during the spring 2022 sample event.

3.3 Habitat use and distribution

Based on the location of koala and scat records during the summer 2022 survey, koala use of adjoining forest was largely evident on ridges and mid-slope within Open Blackbutt Forest located between the central transects 10 and 14 (Figure 1). The combination of scat and koala records confirms use on both sides of the highway.

Table 1: Details of koalas recorded during the spring 2022 survey. M = male. A. littoralis = *Allocasuarina littoralis*. Uk= unknown. OBF = Open Blackbutt Forest.

Date	Easting	Northing	Time	Closest transect & distance (m)	Habitat type	Sex	Behaviour	Health	Side of alignment
28/9/22	496638	6609355	Night	E13; 3m	OBF	M	Foraging in <i>E. propinqua</i>	Healthy	East
29/9/22	496603	6609565	Night	W10; 5m	OBF	Uk	Resting in <i>A. littoralis</i>	Healthy	West

Table 2: Location of koala scats recorded during spring 2022 transect and track/easement surveys. Datum – GDA 94.

Transect	Evidence	Distance from alignment (m)	Easting	Northing	Date
E14	Old scat beneath tallowwood	70	496879	660881	29/9/22
W10	Fresh scat beneath grey gum	45	497131	6609905	28/9/22

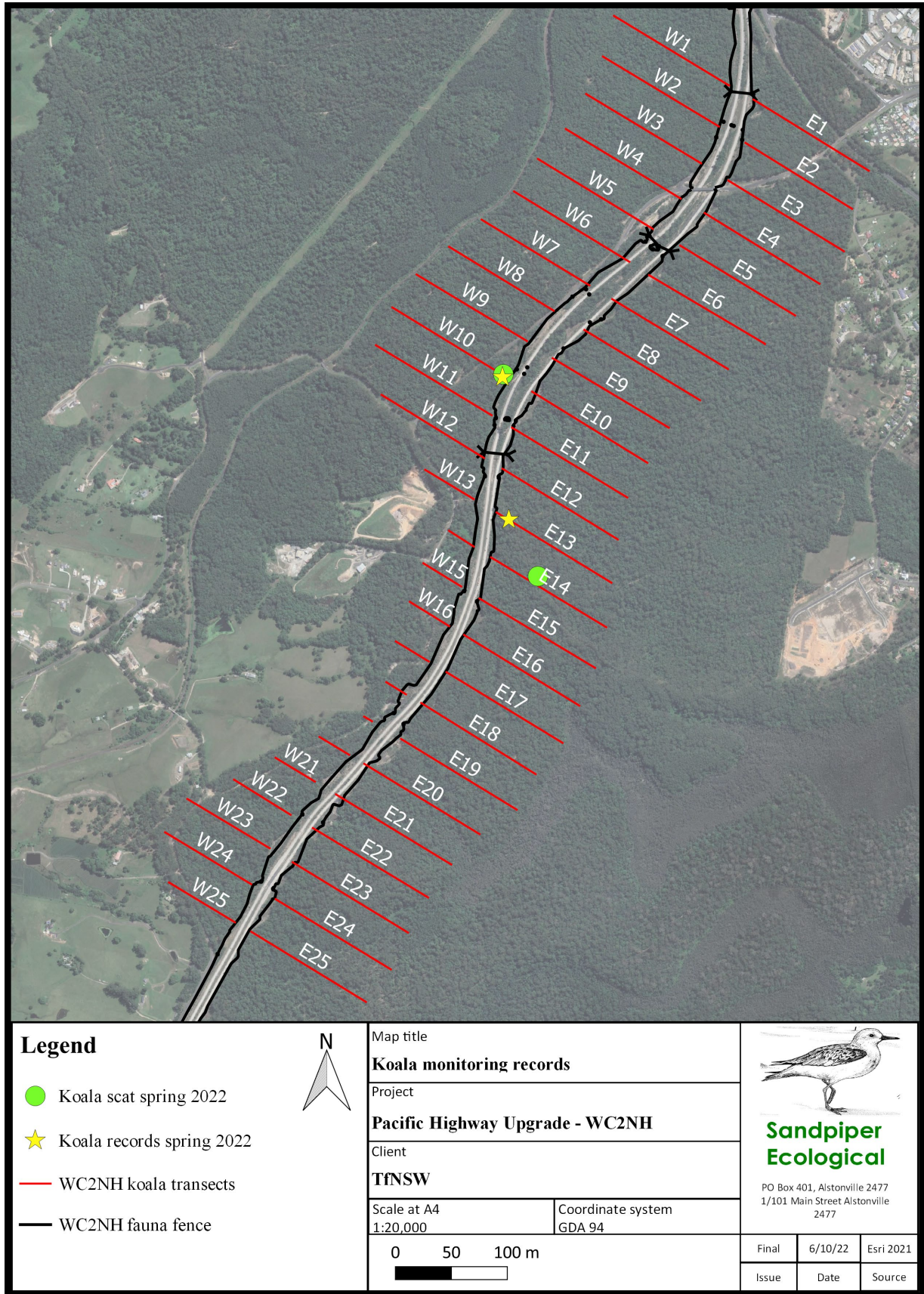


Figure 2: Location of koala records during spring 2022 monitoring at WC2NH.

4. Discussion

4.1 Koala population

The two koalas recorded on transect E13 and W10 was the highest number of transect records to date (Table 3). Nonetheless, fewer koalas were recorded during current surveys (2 individual) compared to spring 2018 and spring 2017 surveys (3 individuals; Table 3). Further, no individuals were recorded on track and easements where most koalas have been recorded previously (Table 3). Inconsistencies in survey method, particularly the effort expended on tracks and easements where most koalas have been recorded, precludes a robust assessment of possible changes in koala abundance and whether this is associated with the WC2NH upgrade.

Notwithstanding, this report is interim and additional koala data will be collated from underpass monitoring, yellow-bellied glider surveys and adjacent habitat surveys and presented in the year five annual report.

Analysis of all koala records gathered during years 4 and 5 of the operational phase will enable a more robust analysis of koala abundance in the locality.

Table 3: Comparison of koala records during the baseline, construction, and operational phases of the WC2NH upgrade. * individual recorded on four occasions.

Phase & year	Transect Surveys (diurnal & nocturnal)		Track & Easement Surveys (nocturnal)	Total koalas recorded
	Koalas observed	Koala evidence (scats)	Koalas observed	
Baseline autumn 2014	0	0	1	1
Baseline spring 2014	0	0	1	1
Construction spring 2015	1	1	1	1*
Construction spring 2017	0	2	3	3
Operation spring 2018	1	3	2	3
Operation spring 2020	0	6	1	1
Operation spring 2022	2	2	0	2

Results of 2017 construction phase surveys and 2018 operation phase showed that at least three koalas were residing within the survey area, estimated to be approximately 104 ha (Sandpiper Ecological 2021). Home range areas of koalas residing in moderate to high habitat quality habitat on the north coast is reportedly in the range of 23-37 ha (see Lassau *et al.* 2008; Goldingay & Dobner 2014). Home range areas of koalas residing in Nambucca State Forest (NSF) would likely be larger than these estimates due to the lower habitat quality and NSF's forest management history. As such, the study area probably supports few individuals.

The impact of clearing for the upgrade on the local koala population is difficult to ascertain. As discussed above, clearing impacts are both compounded and confounded by several exogenous factors acting concurrently on the local koala population. Positive signs of koala persistence include the broad distribution of

scats across the study area, especially adjacent to the upgrade corridor and the presence of at least two healthy individuals.

4.2 Habitat use and distribution

Available data suggest that the highway corridor is not a barrier to movement between habitat east and west of the alignment (Sandpiper 2021). The ability to move beneath the highway is particularly important in areas of poor habitat quality, during drought, or even bushfires when individuals need to extend or shift their home range area. Confirmed underpass crossings in 2018/19, 2019/20 and 2020/21 and the number of repeat crossings suggest that some individuals occupy home ranges that include both sides of the highway and utilise the dedicated underpasses to move within their home range (Sandpiper 2021). Individuals recorded in the recent 2022 surveys were located around underpass 9/10 amongst open blackbutt forest on the ridgelines, which has previously been noted as a preferred habitat type for koalas at WC2NH, particularly when tallowwood is also present (Sandpiper 2021).

5. Recommendations

Recommendations from the year 4 operational koala monitoring are summarised in Table 4.

Table 4: Recommendations based on findings from operational phase monitoring and response from TfNSW.

Number	Recommendation	Transport for NSW Response
1.	Findings of the year five annual report will enable a more robust analysis of koala abundance and distribution in the study area.	

6. References

DoE (2013a). *EPBC Act Policy Statement 1.1 Significant Impact Guidelines*. Department of Environment and Heritage, Canberra.

GeoLINK (2016). *Koala Management Plan. Warrell Creek to Nambucca Heads Upgrade of the Pacific Highway*. Unpublished report prepared for Acciona and Ferrovial Joint Venture and Roads and Maritime Services.

GeoLINK (2017). *Construction stage (year 3) koala monitoring. Warrell Creek to Nambucca Heads Pacific Highway Upgrade*. Report prepared for Roads and Maritime Services.

Goldingay, R. L. & Dobner, B. (2014). Home range areas of koalas in an urban area of northeast New South Wales. *Australian Mammalogy*: **36**, 74-80.

Lassau, S. A., Close, R., Ryan, B. & Pile, J. (2008). Home ranges and mortality of a roadside koala *Phascolarctos cinereus* population at Bonville, New South Wales. *Australian Zoologist*: **34**, 127-136.

Sandpiper Ecological (2018). *Warrell Creek to Nambucca Heads Koala Monitoring Report – Year One Operational Phase – Final Report*. Report prepared for Roads & Maritime Services NSW.

Sandpiper Ecological (2021). *Warrell Creek to Nambucca Heads Underpass Monitoring Report – Year three Operational Phase*. Report prepared for Transport for New South Wales.

SEWPAC (2012). *Interim koala referral advice for proponents*. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

SKM (2014). *Draft Pre-clearance Baseline Koala Monitoring Methodology*. Unpublished report prepared for Acciona and Ferrovial Joint Venture and Roads and Maritime Services.