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Services**

Warrell Creek to Nambucca Heads Koala Monitoring Operational phase

Koala Monitoring Interim Report

Year 3 operational phase

Transport for NSW | October 2020



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Project team:

Dr D. Rohweder (project management,
survey, report review)
Dr B. Taylor (reporting, survey)
Mr L. Andrews (survey)
Ms N. Makings (survey)

Report prepared for:

Transport for NSW

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ABN: 82 084 096 828

PO Box 401
ALSTONVILLE NSW 2477
P 02 6628 3559 | E david@sandpipereco.com.au

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1. Introduction

In 2015, Transport for New South Wales (TfNSW), in conjunction with Acciona Ferrovial 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 three operational phase koala population monitoring. Year one operational phase monitoring was conducted in spring 2018 (Sandpiper 2018). 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 3 operational phase) koala report, which is due in August 2021.

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* (Geolink 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) (Sandpiper Ecological 2018).

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.

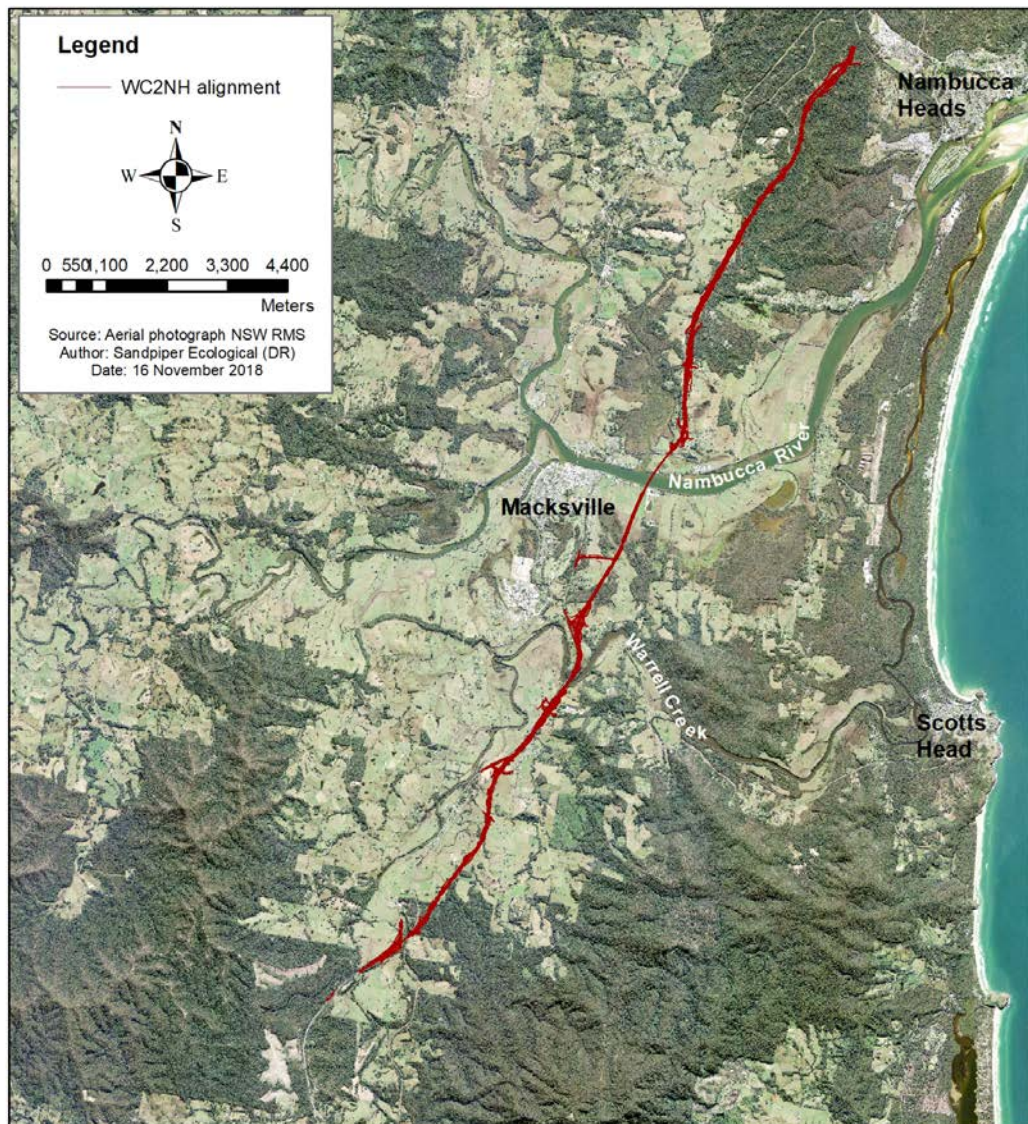


Figure 1: Location of the WC2NH alignment.

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 between 7 and 9 September. Weather conditions during the survey were suitable for sampling koalas with mild to warm temperatures and light winds recorded. 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

No koalas were recorded while completing transect surveys during the spring 2020 sample event (Table 1; Figure 2). Koala scats were recorded beneath a tallowood tree (*Eucalyptus microcorys*) on transects E7, E11, E13, E22, W5, and W16 (Table 2; Figure 2).

3.2 Tracks and easements

One koala was observed inside (i.e. within road corridor) the exclusion fence near E11 during spotlight surveys of tracks and easements on 8/9/2020 (Table 1; Figure 2). The individual was captured and relocated to forest habitat adjacent E11. The male koala was a healthy sub-adult in good condition with no signs of disease. It is likely the individual breached the exclusion fencing via a nearby gate that featured a ~200mm gap between the gate bottom and the ground. The gap was remedied after relocating the individual to the adjoining east forest.

Scats were recorded while surveying the edge of the forest from fence line easements. Scats were detected at three locations near transects E5, E6, and E11. All scat records were beneath tallowoods.

3.3 Habitat use and distribution

Based on the location of scat records, koala use of adjoining forest was largely evident on ridges and mid-slope within Open Blackbutt Forest. While it is unknown what part of the forest the individual outside the exclusion fence emerged from, it was observed near E11, which is positioned on mid-slope.

The distribution of 2020 records suggest that koalas continue to be distributed quite broadly across the study area albeit at low densities (Figure 2). When combined with underpass crossing records (Sandpiper 2019), evidence of habitat use extends from W5/E5 through to W24/E24. Scat records around E10-E13 show a similar distribution to 2018 scat records. Further, scat records around W5/E5-E7 are consistent with 2018/19 records of nearby underpass use (Figure 2). The combination of scat and underpass records confirms use of both sides of the highway particularly in the vicinity of W11/E11 and W6/E6.

Table 1: Details of koala recorded during the spring 2020 survey. M = male.

Date	Easting	Northing	Time of observation	Closest transect & distance (m)	Survey type	Habitat type	Sex	Behaviour	Reproductive & disease status	Side of carriage way
8/9/2020	496638	6609355	Night	E11; 12m	Track & easement	Open Blackbutt Forest	M	On ground inside exclusion fence	Healthy	East

Table 2: Location of koala scats recorded during spring 2020 transect and track/easement surveys. Datum – GDA 94.

Transect	Evidence	Distance from alignment (m)	Easting	Northing	Date
E5 (fence line nearby)	Old scat beneath tallowwood	fence line	497273	6610075	9/9/2020
E6 (fence line nearby)	Old scat beneath tallowwood	fence line	497131	6609905	9/9/2020
E7	Old scat beneath tallowwood	72	497073	6609803	9/9/2020
E11	Old scat beneath tallowwood	205	496805	6609244	9/9/2020
E11 (fence line nearby)	Old scat beneath tallowwood	fence line	496693	6609399	9/9/2020
E13	Old scat beneath tallowwood	466	496995	6608780	9/9/2020
E22	Old scat beneath tallowwood	32	495923	6607876	9/9/2020
W5	Old scat beneath tallowwood	352	496872	6610275	8/9/2020
W16	Old scat beneath tallowwood	162	496266	6608680	8/9/2020

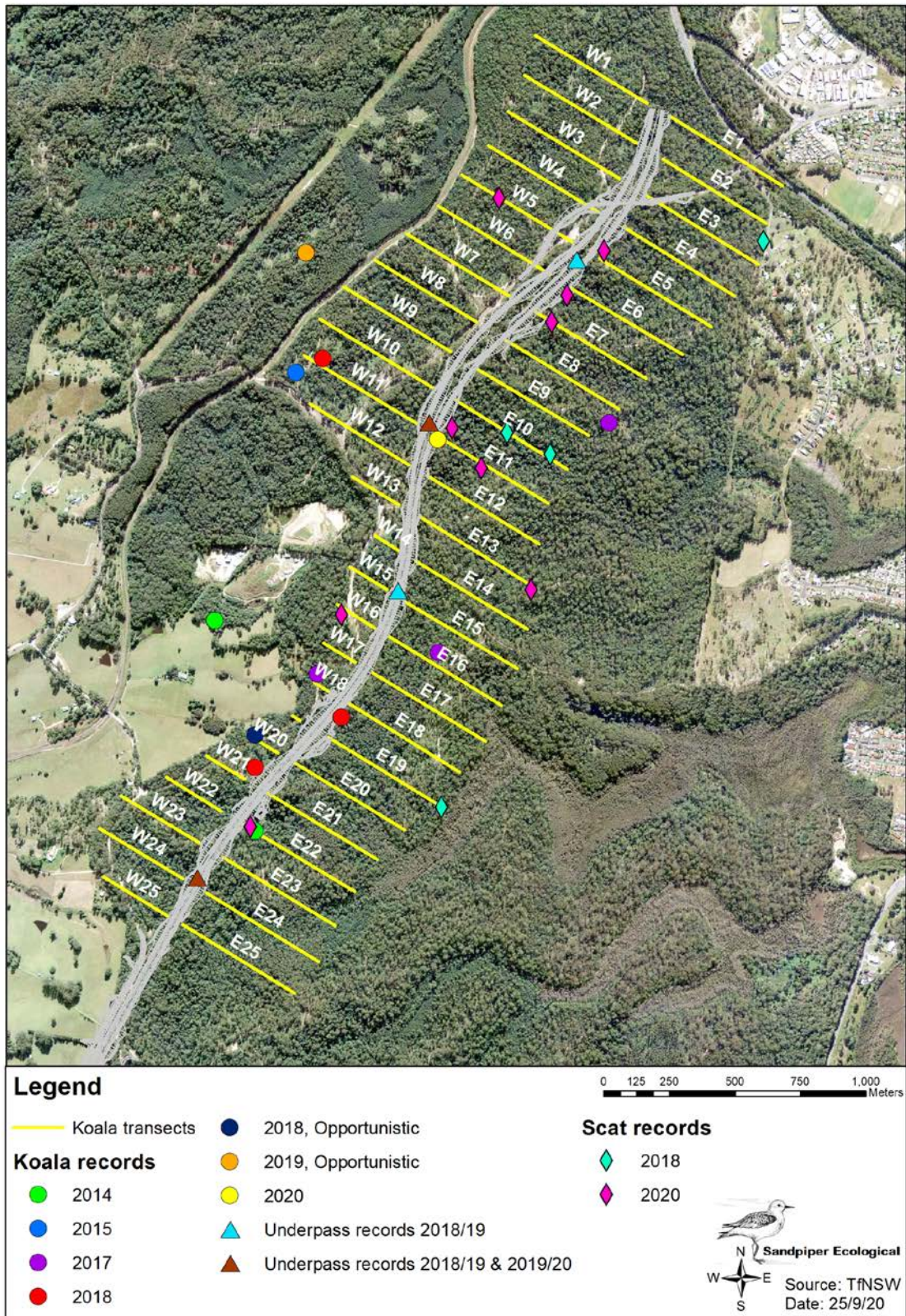


Figure 2: Location of koala observations and scat records between 2014 and 2020.

4. Discussion

4.1 Koala population

Fewer koalas were recorded during current surveys (1 individual) compared to spring 2018 and spring 2017 surveys (3 individuals; Table 3). A single individual was recorded on tracks/easements during baseline surveys and year one of the construction phase (Table 3). However, 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 collected throughout year 3 whilst conducting underpass and adjacent habitat surveys and yellow-bellied glider surveys. The entire year 3 dataset 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

Results of 2017 construction phase surveys and 2018 operation phase showed that at least three koalas were residing within the survey area which was estimated to be approximately 104 ha (Sandpiper Ecological 2019). 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.

Detection of fewer koalas during the current survey may be an artefact of several exogenous factors outside of the control of the upgrade project. Indeed, the broader area has suffered an extended period of drought up until the early part of this year as well as wildfire in the east part of the forest and logging operations in the south-east. While the direct effect of these events is largely unknown, it is expected that they may have adversely affected the local koala population.

Despite fewer koala observations during the current surveys, the detection of scats at nine spatially spread locations suggests there is more than one individual residing in the study area. The distribution of scat records and underpass crossings confirms the findings of 2018/19 monitoring (Sandpiper Ecological 2018, 2019) that some individuals are re-establishing home

ranges to the new forest edge and some home ranges include both sides of the highway. These results also support the notion that the study area supports a low-density koala population (Geolink 2017).

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 one young, healthy individual.

4.2 Habitat use and distribution

It is evident from the distribution of current and 2018/19 monitoring records that koalas are utilising both sides of the highway corridor, particularly in forest areas featuring stands of tallowwood. Encouragingly, koalas have used underpasses to cross the highway corridor at four locations spread along the study area (Figure 2). This suggests that the highway corridor is not a barrier to movement between the forest blocks. The ability to move beneath the highway is particularly important in areas of poor habitat quality or during times of drought or even bushfires when individuals need to extend or shift their home range area.

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Customer feedback
Roads and Maritime
Locked Bag 928,
North Sydney NSW 2059

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