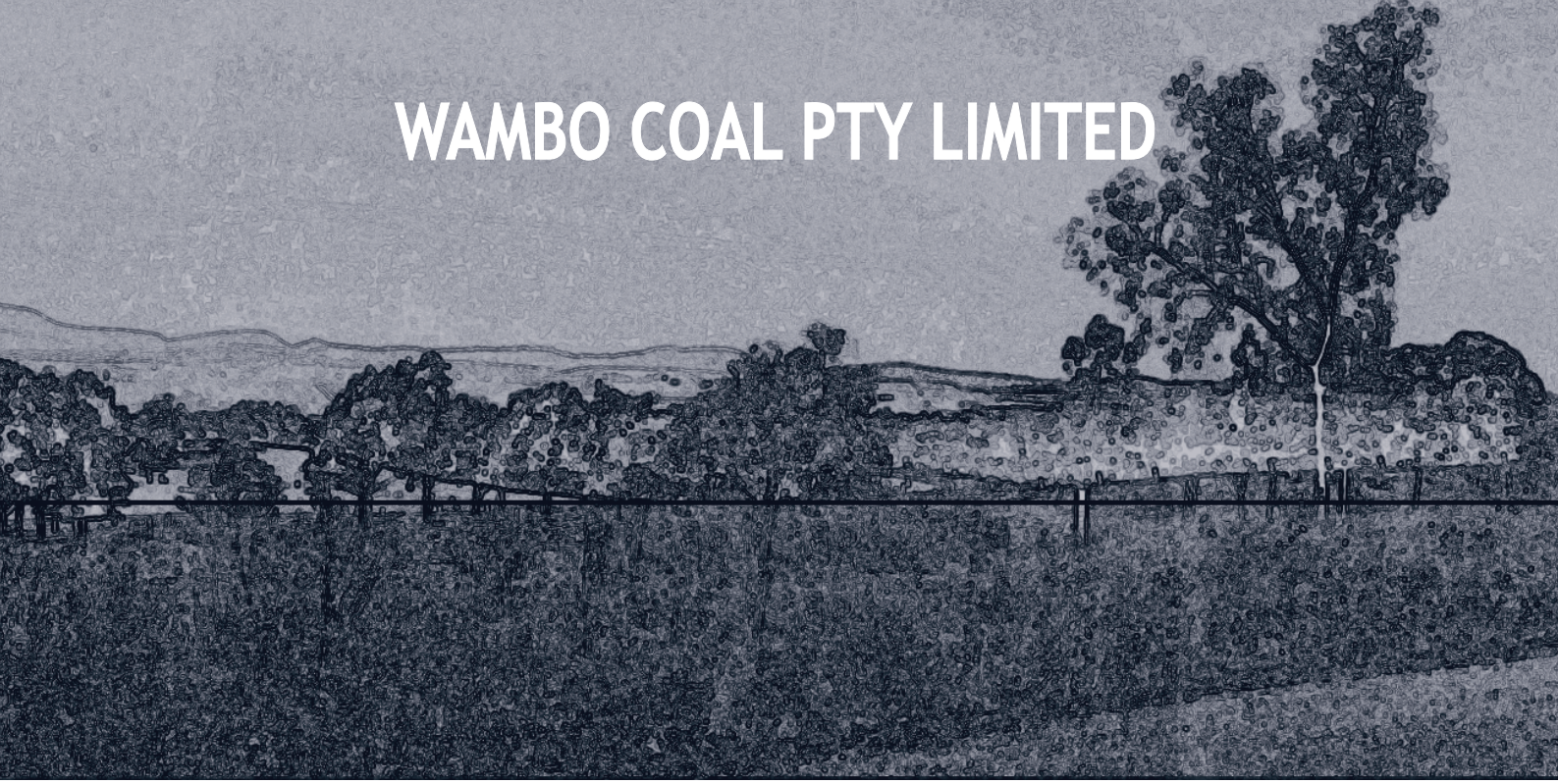

WAMBO COAL PTY LIMITED

SOUTH WAMBO UNDERGROUND MINE MODIFICATION

ENVIRONMENTAL ASSESSMENT

APPENDIX E

Fauna Assessment

Peabody ENERGY

Wambo Coal Mine – South Wambo Underground Mine Modification

Fauna Assessment

Prepared for
Wambo Coal Pty Limited

14 March 2016

DOCUMENT TRACKING

Item	Detail
Project Name	Wambo Coal Mine - South Wambo Underground Mine Modification Fauna Assessment
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Project Manager	Daniel Magdi (02) 4302 1228 Level 1, 79 Market St, Mudgee NSW 2850
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Reviewed by	Dr Paul Frazier
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ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Executive Summary

Eco Logical Australia Pty Ltd was engaged by Wambo Coal Pty Limited (WCPL) to undertake a fauna assessment for a proposed South Wambo Underground Mine Modification (the Modification). This fauna assessment will be used to support an Environmental Assessment to facilitate Modification 12 to the existing approval, Development Consent (DA 305-7-2003) originally approved in 2004, under section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act).

This fauna assessment has been undertaken to determine any potential impacts from the Modification on threatened fauna within and adjacent to the Modification area pursuant to the EP&A Act, NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Modification would involve a realignment and extension/relocation of the approved South Wambo (Arrowfield Seam) Underground Mine longwall panels and mining of the Woodlands Hill Seam, rather than the Bowfield Seam. The rearrangement of the South Wambo Underground Mine would require a minor extension of the existing/approved surface development area and result in an extension of the approved mine life by 7 years (i.e. up to and including 2032).

Within the Study area, eight birds and five mammals (microbats) have been recorded during the field survey, which are listed under the TSC Act and/or EPBC Act, including *Chthonicola sagittata* (Speckled Warbler), *Circus assimilis* (Spotted Harrier), *Climacteris picumnus victoriae* (Brown Treecreeper [eastern subspecies]), *Pomatostomus temporalis temporalis* (Grey-crowned Babbler [eastern subspecies]), *Daphoenositta chrysoptera* (Varied Sittella), *Glossopsitta pusilla* (Little Lorikeet), *Grantiella picta* (Painted Honeyeater), *Melanodryas cucullata cucullata* (Hooded Robin [south-eastern form]), *Chalinolobus dwyeri* (Large-eared Pied Bat), *Mormopterus norfolkensis* (Eastern Freetail-bat) *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat), *Scoteanax rueppellii* (Greater Broad-nosed Bat) and *Vespadelus troughtoni (*Eastern Cave Bat).

Habitat requirements for observed and potentially occurring threatened species were compared with the Study area's characteristics. Forty threatened fauna species were deemed to occur (i.e. were recorded), be likely to occur or had potential to occur within the Study area. Based upon the potential impacts of the Modification associated with the underground disturbance and surface disturbance, 40 threatened fauna species have been further assessed in accordance with the relevant guidelines.

The proposed mining activities associated with the Modification would potentially result in additional subsidence over an area of approximately 185 hectares (ha) and approximately 7.9 ha of additional direct surface disturbance.

Within the underground disturbance area, some minor impacts are expected upon natural features which provide habitat for threatened fauna species, including streams and steep slopes due to subsidence. Subsidence of vegetation within the Modification area is not expected to result in the loss of vegetation cover or community structure. Fauna habitat (including that identified as potential Koala habitat) would not be directly impacted by the occurrence of subsidence. Direct mortality of animals (small ground-dwelling mammals, reptiles and amphibians) may occur as a result of subsidence-induced surface cracking, however the potential impacts of such events are expected to be short-term and insignificant.

Within the proposed surface disturbance areas of the Modification, some impacts are expected to potential threatened fauna species habitat, including that for diurnal birds, forest owls, and microbats, however, these impacts are not considered to be significant due to the small scale of clearing (total of 7.9 ha additional clearance, consisting of isolated, small patches), and the temporary nature of the disturbance. Further, the majority of surface disturbance activities would be within mixed native/exotic grassland and suitable habitat resources would remain present outside the Modification area, with abundant similar habitat available in wooded areas to the south, east and west as well as in the connected corridor with Wollemi National Park to the south of the Modification area.

Impacts from the removal of structural habitat features on the proposed surface disturbance areas would require management, particularly for threatened species that might rely on these resources for breeding and do not have the ability to migrate to new areas (small ground-dwelling mammals, reptiles and amphibians), establish new territories or await the rehabilitation of habitat on site. Measures to minimise adverse impacts would be undertaken in accordance with the Flora and Fauna Management Plan (or subsequent revision) and include, where practical, the salvaging and relocation of large hollows identified during pre-clearing surveys.

The potential impacts on threatened fauna species associated with the Modification are not considered to be significant.

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Abbreviations

Abbreviation	Description
DA	Development Application
DotE	Commonwealth Department of the Environment
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ha	Hectares
km	Kilometres
LGA	Local Government Area
m	Metres
mm	Millimetres
MNES	Matter of National Environmental Significance under EPBC Act
MOD 12	Modification 12
Mtpa	Million tonnes per annum
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
ROM	Run of Mine
TSC Act	NSW *Threatened Species Conservation Act 1995*
WCPL	Wambo Coal Pty Limited

1 Introduction

1.1 BACKGROUND

Eco Logical Australia Pty Ltd (ELA) was engaged by Wambo Coal Pty Limited (WCPL) to undertake a fauna assessment for a proposed South Wambo Underground Mine Modification (the Modification). This fauna assessment will be used to support an Environmental Assessment to facilitate Modification 12 (MOD 12) to the existing approval, Development Consent (DA 305-7-2003) approved in 2004, under section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act). This fauna assessment has been undertaken to determine any potential impacts from the Modification on threatened fauna within and adjacent to the Modification area (i.e. surface and underground mining areas), and is required pursuant to the EP&A Act, NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 DESCRIPTION OF PROJECT

The Modification would involve a realignment and extension/relocation of the approved South Wambo (Arrowfield Seam) Underground Mine longwall panels and mining of the Woodlands Hill Seam rather than the Bowfield Seam (**Figure 1**). The rearrangement of the South Wambo Underground Mine would require a minor extension of the existing/approved surface development area and result in an extension of the approved mine life by 7 years (i.e. up to and including 2032).

The run-of-mine (ROM) coal production rate from the underground operations would increase from 7.5 to 9.75 million tonnes per annum (Mtpa), however the approved total ROM coal production rate (i.e. 14.7 Mtpa) would remain unchanged. The Modification would not involve changes to any aspects of the approved North Wambo Underground Mine or South Bates Underground Mine.

The Modification would also include an extension of approved open cut mining operations by 3 years (i.e. up to and including 2020). The Modification would not include any change to the approved open cut limit.

Approximately 1,823 hectares (ha) would be subject to subsidence impacts as a result of the Modification. The surface area that is located above the proposed longwalls that has not been previously affected by mining (underground or open cut) and has not been previously approved is around 185 ha (Mine Subsidence Engineering Consultants [MSEC] 2016). Approximately 21 ha within the Modification area would be subject to surface disturbance, of which 7.9 ha is additional surface disturbance being assessed under this Modification (i.e. in addition to approved surface disturbance).

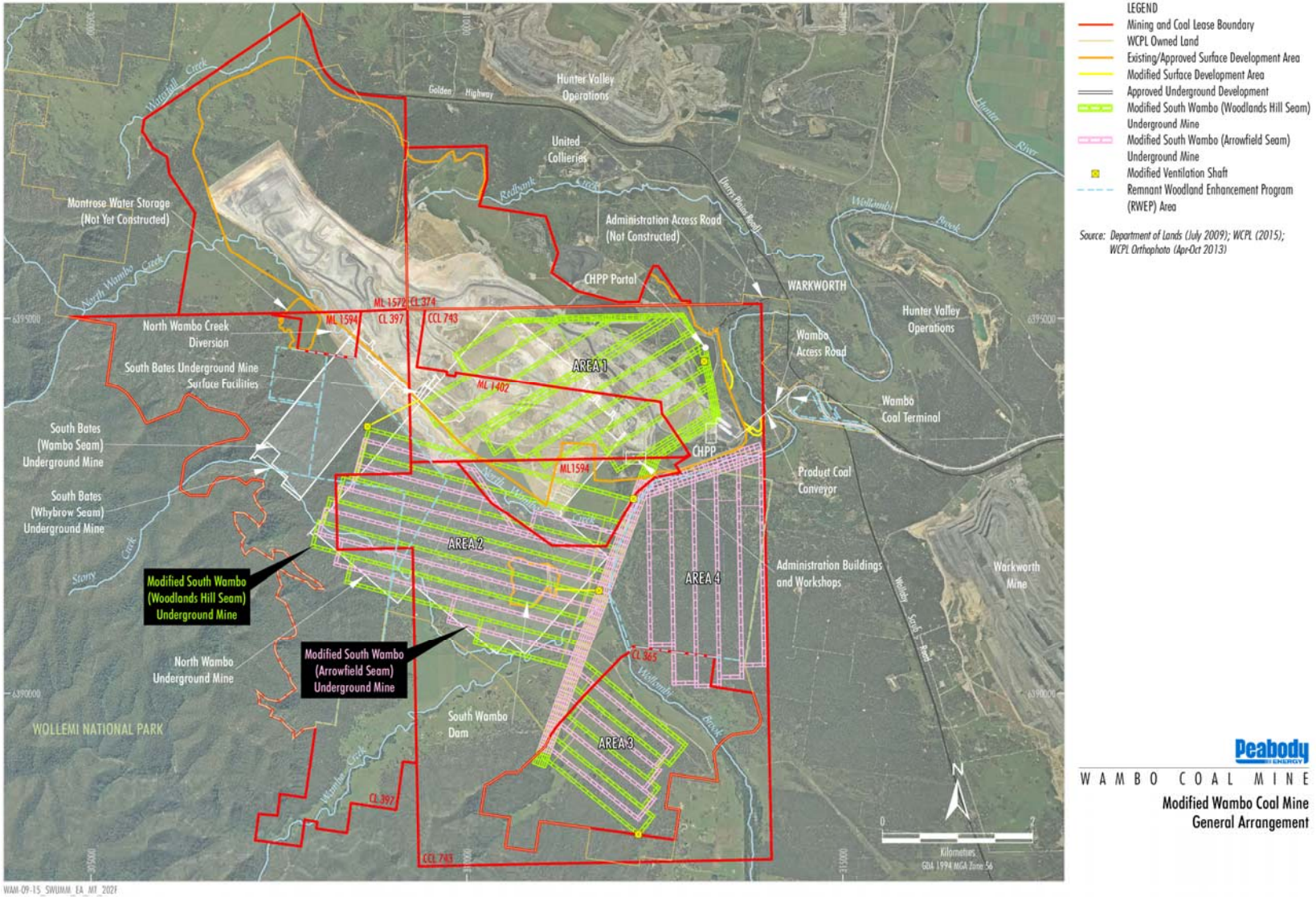

Figure 1: Proposed Modification Location

The Modification involving the realignment and extension/relocation of the approved longwalls in the Arrowfield Seam and the extraction of longwalls in the Woodlands Hill Seam rather than in the Bowfield Seam is predicted to result in an overall decrease in the predicted maximum vertical subsidence and tilt from the original approved underground mining layout (MSEC 2015) and would also extend the area affected by subsidence.

The maximum predicted additional subsidence, due to the extraction of the modified longwalls in the Woodlands Hill and Arrowfield Seams, is 4,050 millimetres (mm). The maximum predicted total subsidence, due to mining in the Wambo, Woodlands Hill and Arrowfield Seams with the modified layout, is 6,250 mm. The current approved underground layout maximum predicted total subsidence within the Wambo, Arrowfield and Bowfield Seams is 9,000 mm. The maximum predicted total subsidence reduces as a result of the proposed modifications due to the modified longwalls in the Woodlands Hill and Arrowfield Seams being *staggered* (i.e. offset); whereas the approved longwalls in the Arrowfield and Bowfield Seams were *stacked* (i.e. directly above/below). Also, the overall mining heights based on the modified layout are less than those based on the approved layout (MSEC 2016).

The predicted subsidence as a result of the Modification may potentially impact natural features as summarised below in **Table 1**.

Table 1: Summarised Subsidence Impacts upon Natural Features of the Modification Area (MSEC 2016)

Feature	Predicted Impacts
Wollombi Brook	• Banks of Wollombi Brook are located 180 metres (m) at its closest point to the proposed longwalls • Predicted vertical subsidence is less than 20 mm for both the approved and the Modification layouts
Streams	**Stony Creek**: • Potential five ponding areas are predicted to develop, which is similar to the approved longwall layout • Fracturing of the topmost bedrock would occur along sections • Maximum predicted tilts, curvatures and strains remain similar to the approved layout **North Wambo Creek (natural alignment)**: • Potential six ponding areas are predicted to develop, which is less than the approved longwall layout • Fracturing of the topmost bedrock would occur along sections • Subsidence parameters reduce as a result of the Modification layout **Wambo Creek**: • Potential two ponding areas are predicted to develop, which is greater than the approved longwall layout • Fracturing of the topmost bedrock would occur along sections • Subsidence parameters increase as a result of the Modification layout

Feature	Predicted Impacts
North Wambo Creek diversion	• Additional subsidence movements (2,400 mm vertical subsidence; 25 mm/m tilt) • Potential for increased ponding – one ponding area is expected • Fracturing and dilation of the topmost bedrock is expected to develop in sections directly above longwall panels
Wollemi Escarpment	• Cliffs associated with the escarpment are located outside of the angle of draw for the Modification, and are predicted to experience less than 20 mm vertical subsidence based on both the approved and Modification layouts • Cliffs are not predicted to experience any significant conventional tilts, curvatures or strains
Steep slopes	• Maximum predicted tilt (40 mm/m) is small compared to natural surface grades • Curvature and ground strain – tension cracking at the tops of the steep slopes and compression ridges forming at the bottoms of the steep slopes
Wollemi National Park	• Predicted to experience less than 20 mm vertical subsidence based on both the approved and Modification layouts • Not expected to experience any significant tilts, curvatures or strains

Wherever possible, the Modification would utilise existing surface infrastructure and supporting services at Wambo. The Modification would involve additional surface disturbance areas associated with the South Wambo Underground Mine infrastructure area, access road, ventilation infrastructure, gas management infrastructure and other ancillary activities (such as monitoring, subsidence remediation works and general site maintenance activities). As desribed in Section 1.3, approximately 21 ha within the Modification area would be subject to surface disturbance, of which only 7.9 ha is additional surface disturbance being assessed under this Modification (i.e. in addition to approved surface disturbance). A description of the extent of the total additional surface disturbance (i.e. 21 ha) is summarised below in **Table 2**.

Table 2: Summarised Surface Disturbance Impacts within the Modification Area

Area	Disturbance Description	Overall Disturbance (ha)
South Wambo Underground Mine Infrastructure Area	The Modification would require an extension to the existing/approved surface infrastructure area to allow for the South Wambo Underground Mine infrastructure area.	2.6
Wambo Access Road	An access road to the South Wambo Underground Mine infrastructure area would be constructed.	1.7

Area	Disturbance Description	Overall Disturbance (ha)
Ventilation Infrastructure	The Modification would require the construction of five ventilation shafts (i.e. an additional four ventilation shafts compared to the approved South Wambo Underground Mine). One of these ventilation shafts would be located within the existing/approved surface development area. Each ventilation shaft would require an approximate 75 m by 75 m construction footprint with ancillary disturbance for associated infrastructure.	3.2
Gas Management Infrastructure	Surface disturbance for gas management infrastructure would be required within the Modification area. This disturbance would include gas drainage boreholes, centralised gas plants and associated infrastructure such as access tracks, power supply and pipelines. Surface disturbance associated with gas management infrastructure would be temporary and isolated in nature. The surface disturbance would occur progressively and would be rehabilitated progressively as the gas management infrastructure is no longer required.	13.5

1.3 MODIFICATION AREA

The Wambo Coal Mine is located approximately 15 kilometres (km) west of Singleton in the Hunter Valley near the village of Warkworth, within the Singleton Local Government Area (LGA).

The Modification would involve a realignment and extension/relocation of the approved South Wambo (Arrowfield Seam) Underground Mine longwall panels and mining of the Woodlands Hill Seam rather than the Bowfield Seam. Longwall mining areas associated with the Modification are detailed below:

- **Area 1 (Woodlands Hill Seam)** – The modified mine layout includes additional longwall panels in the Woodlands Hill Seam beneath the existing/approved surface development area.
- **Area 2 (Arrowfield Seam and Woodlands Hill Seam)** – The modified mine layout includes a reorientation and minor extension of the approved Arrowfield Seam mine layout in Area 2. The Woodlands Hill Seam is proposed to replace the Bowfield Seam in this location with a reorientation and minor extension to the approved mine layout.
- **Area 3 (Arrowfield Seam and Woodlands Hill Seam)** – The modified mine layout includes an extension of mining in the Arrowfield Seam and Woodlands Hill Seam into Area 3, comprising three longwall panels in the Arrowfield Seam and four longwall panels in the Woodlands Hill Seam.
- **Area 4 (Approved Arrowfield Seam)** – The Modification does not propose any changes to the approved Arrowfield Seam mine layout to the east of Wollombi Brook. The approved Bowfield Seam mine layout is no longer proposed to be mined in Area 4 and therefore there would be a reduction in subsidence impacts in Area 4.

The modified layout of the Wambo Coal Mine is shown on Figure 1.

The Modification area encompasses the extent of conventional subsidence resulting from the modified longwall layout and the surface development areas (Figure 1).

Subsidence effects resulting from longwall mining the Arrowfield and Bowfield Seams in Area 4 were approved as part of the *Wambo Development Project Environmental Impact Statement* (WCPL 2003). The modified subsidence impacts in Area 4 are predicted to reduce as only the Arrowfield Seam is proposed to be mined as part of the Modification (MSEC 2016). The potential impacts on agricultural resources in Area 4 are therefore also expected to reduce as a result of the Modification and therefore this assessment has not considered Area 4 any further.

Based on the above, the Study area has been adopted as the focus of this assessment and includes the surface development areas, the extent of subsidence from Areas 1,2 and 3 and surrounds.

1.4 REPORT OBJECTIVES

The aims of this report are to:

- Report on the fauna species values present within the Study area;
- Describe the methods and results of the fauna surveys;
- Assess the impact of the Modification on threatened fauna species and populations that occur, are likely to occur or have potential to occur in the Study area in accordance with TSC Act and EPBC Act requirements; and Propose mitigation and management measures where appropriate to minimise and/or manage impacts.

1.5 LEGISLATIVE REQUIREMENTS

Relevant legislation applicable to the Modification is identified in **Table 3**.

Table 3: Legislation Relevant to the Modification

Legislation	Relevance to the Modification
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999	The EPBC Act establishes a process for assessing the environmental impact of activities and developments where "matters of national environmental significance" (MNES) may be affected. Under the EPBC Act, any action which "has, will have, or is likely to have a significant impact on a matter of national environmental significance" is defined as a "controlled action", and requires approval from the Commonwealth Department of the Environment (DotE), responsible for administering the EPBC Act. MNES have been identified within the Study area and have been considered in this report. Components of the Modification (the action) were referred to the Minister (or delegate) to determine whether the action is a controlled action on 19 January 2016.
State	
Environmental Planning and Assessment Act 1979	The Modification is to be assessed under the transitional provisions for Part 3A, section 75W of the EP&A Act. Assessments of significance for impacts to threatened species and endangered ecological communities have been prepared in accordance with the the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005).

Legislation	Relevance to the Modification
Threatened Species Conservation Act 1995	The TSC Act, as amended, aims to protect and encourage the recovery of threatened species, populations and communities listed under the TSC Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development is likely to significantly affect threatened species, populations and ecological communities or their habitat. This report assesses the potential impacts on threatened species and populations and their habitat that are known or likely to occur, as described in the *Draft Guidelines for Threatened Species Assessment* (NSW Department of Environment and Conservation [DEC] 2004). This document identifies matters which are relevant to the assessment of impacts to threatened species or populations, or their habitats arising from a development proposal assessed under the transitional provisions of Part 3A of the EP&A Act.
Fisheries Management Act 1995	The *Fisheries Management Act 1995* (FM Act) provides for the protection, conservation, and recovery of threatened species defined under the Act. It also makes provision for the management of threats to aquatic threatened species, populations and ecological communities defined under the FM Act, as well as the protection of fish and fish habitat in general. This report assesses the potential impacts on aquatic habitats or species that are known or likely to occur within the Study area.
State Environmental Planning Policy No. 44 – Koala Habitat Protection	Singleton Shire Council is listed as one of the Councils to which *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) applies, *albeit* that SEPP 44 is not relevant to an application made under section 75W of the EP&A Act. Notwithstanding, the following has been considered for this assessment: • No LGA-wide Koala Plan of Management has been developed by Singleton Shire Council to date. • *Eucalyptus albens* (White Box) and *Eucalyptus tereticornis* (Forest Red Gum) located within the Study area are trees listed under Schedule 2 of SEPP 44 as *Phascolarctos cinereus* (Koala) feed tree species qualifying the site as 'potential Koala habitat'. • Core Koala habitat means an area with a resident population of Koalas, evidenced by attributes such as breeding females, recent sightings and historical records. • There is no current or recent history of Koala activity on site. • There is no Core Koala habitat identified within the Study area.

2 Methods

2.1 DATA AUDIT

A desktop literature review was undertaken to determine the location, extent and key findings of previous surveys. The review aimed to identify fauna species present within the Study area and the potential for any threatened species and/or populations listed under the TSC Act and EPBC Act to occur. The following assessments and databases were reviewed as a component of the desktop investigation:

- Atlas of Living Australia (Atlas of Living Australia 2014);
- BioNet Atlas of NSW Wildlife (Office of Environment & Heritage [OEH] 2015) covering an area from latitude -32.51 to -32.61 and longitude 150.92 to 151.03 (Datum GDA94);
- EPBC Protected Matters Search Tool (DotE 2015a) using a radius of 10 km around coordinates -32.56, 150.97 (Datum GDA94);
- Wambo Development Project Terrestrial Fauna Assessment (Mount King Ecological Surveys 2003);
- Wambo Development Project Bat Fauna Assessment (Greg Richards and Associates Pty Ltd 2003);
- Wambo Development Project Eight Part Tests of Significance (Resource Strategies 2003);
- North Wambo Underground Mine Modification Environmental Assessment - Fauna Assessment (Niche 2012);
- Montrose Water Storage Modification Terrestrial Fauna Assessment (Biosphere Environmental Consultants 2012);
- North Wambo Underground Mine Longwall 10A Modification - Fauna Assessment (Niche, 2014a);
- Referral of proposed action for the United and Wambo Open Cut Coal Mine Project (Umwelt Australia Pty Limited 2015);
- South Bates (Wambo Seam) Underground Mine Modification - Fauna Assessment (ELA 2015); and
- Annual Ecological Monitoring Reports (RPS Harper Somers O'Sullivan 2007-2013; Niche 2014b; ELA 2016).

Appendix A identifies the threatened species returned by the database searches together with an assessment of the likelihood of occurrence for each species. Each species' likely occurrence was determined by reviewing records in the area, considering the habitat available and using expert knowledge of the species ecology.

Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- "yes" = the species was or has been observed on the site;
- "likely" = a medium to high probability that a species uses the site;
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely, or unlikely to occur;
- "unlikely" = a very low to low probability that a species uses the site; and
- "no" = habitat on site and in the vicinity is unsuitable for the species.

2.2 FIELD SURVEY

The Study area was surveyed over three weeks by ELA ecologists Antony von Chrismar, Daniel McKenzie and Emily Mowat between 28 September and 23 October 2015. Temperatures were cool to warm, ranging from 2.7 degrees Celsius (°C) to 35.1 °C. Approximately 10.4 mm of rainfall was recorded on 23 October 2015; however no rainfall was recorded on the majority of survey days. Weather records were collected from the nearest public weather station in Singleton, NSW (Bureau of Meteorology 2015) (**Table 4**).

Table 4: Weather Conditions during the Field Survey

Date	Minimum Temperature (°C)	Maximum Temperature (°C)	Rainfall (mm)
28 September 2015	2.7	23.9	0.0
29 September 2015	2.9	26.6	0.0
30 September 2015	4.5	26.1	0.0
1 October 2015	8.0	29.5	0.0
2 October 2015	8.9	26.0	0.0
12 October 2015	11.5	33.5	0.0
13 October 2015	15.5	25.4	0.0
14 October 2015	14.5	26.7	0.0
15 October 2015	11.0	30.0	0.0
16 October 2015	9.5	34.4	0.0
19 October 2015	14.9	30.4	0.2
20 October 2015	11.5	34.4	0.0
21 October 2015	13.8	35.1	0.0
22 October 2015	16.2	26.6	1.8
23 October 2015	13.4	21.2	10.4

A comprehensive fauna survey was conducted for the Study area (**Figure 2**), specifically targeting areas that had been excluded from the significant body of detailed ecological assessments and monitoring that had previously been completed within the Study area (**Figure 3**) and surrounds to date. The field surveys supplement the previous surveys completed over the Study area. These surveys contributed to the current knowledge of the presence of threatened species within the Study area.

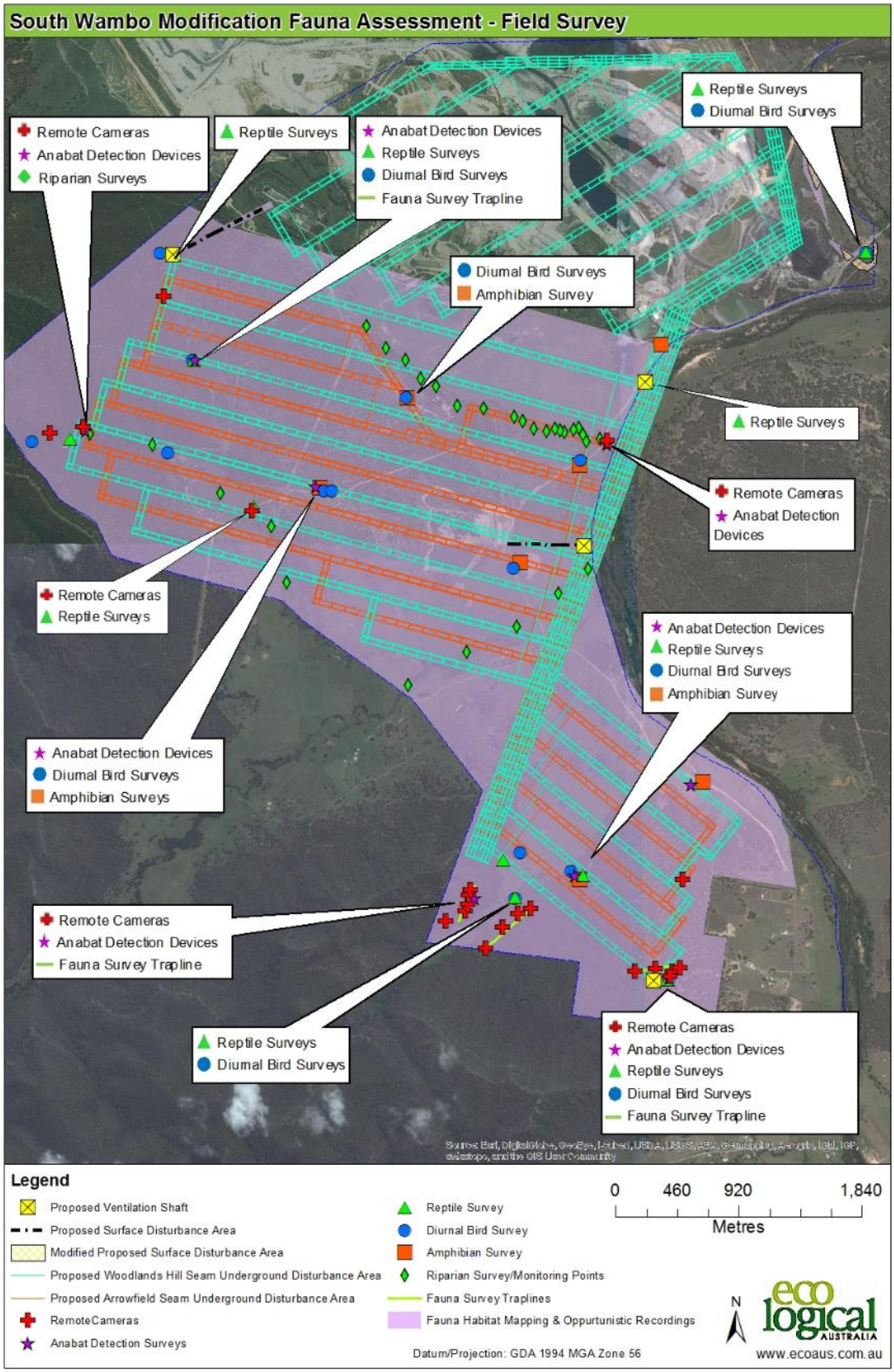

Figure 2: Field Survey Locations

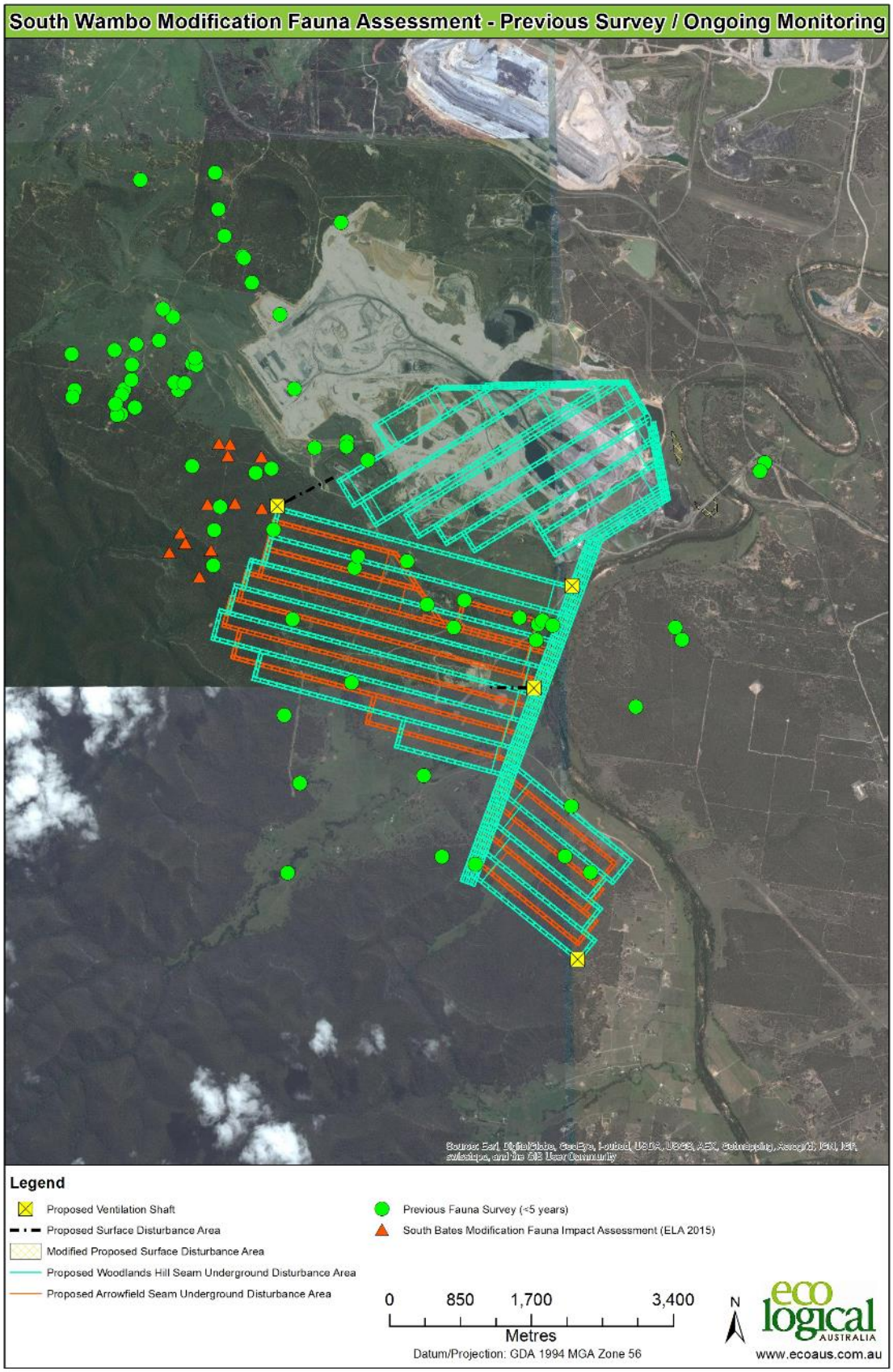

Figure 3: Previous Field Survey and Ongoing Monitoring Locations

In addition to this, potential threatened fauna and their habitats (e.g. tree hollows and large woody debris) listed under the TSC Act and EPBC Act that may be susceptible to potential subsidence impacts associated with the Modification were targeted during the field survey.

The field survey has been informed by relevant NSW and Commonwealth survey guidelines, including the *NSW Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC 2004), *NSW Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians* (Department of Environment and Climate Change [DECC] 2009), *Survey Guidelines for Australia's threatened birds* (Department of Environment, Water, Heritage and the Arts [DEWHA] 2010a), *Survey Guidelines for Australia's threatened bats* (DEWHA 2010b), *Survey Guidelines for Australia's threatened frogs* (DEWHA 2010c), *Survey Guidelines for Australia's threatened mammals* (DEWHA 2010d) and *Survey Guidelines for Australia's threatened reptiles* (DEWHA 2010e). The field survey consisted of:

- Fauna habitat mapping and recording of habitat values (including mapping of clifflines [rock wallaby and microbat habitat] and other fauna habitat resources [i.e. hollow-bearing tree densities] and a Koala habitat assessment);
- Diurnal bird surveys;
- Microbat Detection devices;
- Remote Camera surveys;
- Amphibian survey;
- Nocturnal mammal and reptile surveys;
- Reptile survey;
- Terrestrial and arboreal mammal trapping;
- Riparian habitat assessment; and
- Opportunistic fauna sightings were recorded throughout the Study area.

All fauna observed within the Study area are recorded in **Appendix B**.

2.2.1 Diurnal Bird Surveys

Bird surveys were conducted by performing 20 minute point counts at 14 different locations across the Study area by two ecologists during the morning and afternoon.. The survey locations were positioned in a representative sample of fauna habitats present within the Study area (see **Figure 2**). At 12 of the 14 sites, the survey method was repeated on separate days (approximately 17 person hours of bird survey in total). Bird species were identified using both visual and acoustic cues. Opportunistic bird observations were conducted while travelling around the Study area.

2.2.2 Microchiropteran Bat Surveys

Microchiropteran bat surveys were conducted using SM2+ songmeters to record ultrasonic bat calls. The songmeters were placed at eight separate locations across the Study area (see **Figure 2**), targeting potential habitat for a period of two consecutive nights per location. Each songmeter was set to record for a four hour interval between 7:15 pm and 11:15 pm, with a half hour recording each hour until 5:30 am. A total of seven hours of recording was completed each night.

2.2.3 Reptile and Amphibian Surveys

Reptile surveys consisted of both passive and active searches within the Study area. Opportunistic (passive) observations of reptiles and amphibians were recorded while walking and driving throughout the Study area during both day and night. Active searches consisted of log and rock turning with two people for half an hour (one person hour) at 10 different locations, typically during mid-morning (9.00 am – 11.00 am) (see **Figure 2**). A second round of survey was conducted at seven of the 10 survey sites.

Amphibian surveys were conducted at seven separate water bodies on the nights of 1, 13, 14 and 15 October 2015 (see **Figure 2**). As the smaller creeks in the Study area were dry at the time of survey, farm dams and low-lying ponded areas above previous mine subsidence were targeted. Quiet listening and call playback for *Litoria aurea* (Green and Golden Bell Frog) was combined with a walk around the perimeter of each water body after dusk.

2.2.4 Terrestrial and Arboreal Mammal Surveys

Remote cameras were used to survey for the potential occurrence of the *Dasyurus maculatus* (Spotted-tail Quoll) and other terrestrial carnivores in the Modification. Eight remote cameras were placed in potential habitat areas for a period of four nights with a container filled with tuna and with additional tuna oil sprayed throughout the surrounding area (see **Figure 2**) as bait.

Three lines of both terrestrial and arboreal mammal traps (trap lines), combined with remote cameras were set out in the south of the Modification for four nights between 19 and 23 October (see **Figure 2**). Each trap line consisted of 20 terrestrial Elliot A size traps spaced 15 to 20 m apart, eight Elliot B size traps placed approximately 30 m apart on trees approximately 2 m from the ground, two arboreal remote cameras and two terrestrial remote cameras. Traps and cameras were baited with universal bait (a combination of honey, oats and peanut butter). Arboreal traps and cameras were sprayed with a honey/water mixture each day as an additional attractant for possums and gliders.

This survey effort equated to 64 trap/camera nights for carnivorous mammals, 204 trap/camera nights for small/medium sized terrestrial mammals and 120 trap/camera nights for arboreal mammals.

Four walking spotlight surveys were also completed with 1-2 person hours spent in each location searching for nocturnal wildlife. Spotlight surveys were completed on 1, 13 and 14 October.

2.2.5 Riparian Habitat Surveys

The current condition of riparian vegetation was surveyed through visual assessment of riparian vegetation across a defined transect (**Figure 2**) with measures taken for:

1. Dominant plant species;
2. Natural regeneration;
3. Possible subsidence impacts;
4. Health and sustainability of vegetation communities;
5. Site disturbance;
6. Microhabitat presence; and
7. Erosion type and extent.

3 Results

3.1 FAUNA HABITAT

The Study area contains a suite of fauna habitat elements. These habitat elements and the fauna likely to utilise them are presented in **Table 5** and the first four types are illustrated in **Figure 4.**

Table 5: Fauna Habitats Found in the Study Area and Associated Fauna

Habitat Type	Fauna Use
Woodlands and tall shrublands	Shelter, nesting and foraging habitat for birds, amphibians, reptiles, bats and both terrestrial and arboreal mammals
Subtropical gully and dry rainforests	Shelter, nesting and foraging habitat for birds and small mammals
Mixed native/exotic derived grassland	Shelter, nesting and foraging habitat for birds and small mammals
Creekline and riparian habitat	Shelter and foraging habitat for birds, frogs and reptiles
Koala habitat	Shelter, nesting and foraging habitat for Koalas.
Hollow-bearing live trees and dead trees (stags)	Shelter, nesting and foraging habitat for birds, bats and arboreal mammals
Large woody debris (logs and bark on ground)	Shelter and foraging habitat for birds, small mammals, frogs and reptiles
Paddock trees (flower, lerp and mistletoe bearing)	Shelter, nesting and foraging habitat for birds, bats and arboreal mammals

The Study area is largely comprised of shrubby woodlands dominated by gum and ironbark species on lower footslopes with floodplains consisting of primarily mixed native/exotic derived grasslands. Historical logging has reduced the density of hollow-bearing trees within the shrubby woodlands to the extent they are uncommon from the lower relief areas. The remaining hollow-bearing trees and decorticating bark forms habitat for arboreal mammals, hollow-roosting bats and reptile species. The shrub layer itself is healthy across most of the shrubby woodland areas, it is of a high diversity and varying structural complexity.

A large proportion of the Study area contains mixed native/exotic derived grassland, which have been historically cleared for predominantly agricultural purposes. These areas generally have low habitat values for threatened fauna, despite providing broader foraging areas for threatened birds of prey (e.g. *Circus assimilis* [Spotted Harrier] and *Hieraaetus morphnoides* [Little Eagle]) and some microbat species (e.g. *Saccolaimus flaviventris* [Yellow-bellied Sheathtail-bat]).

The habitat types observed are described in detail in the following subsections.

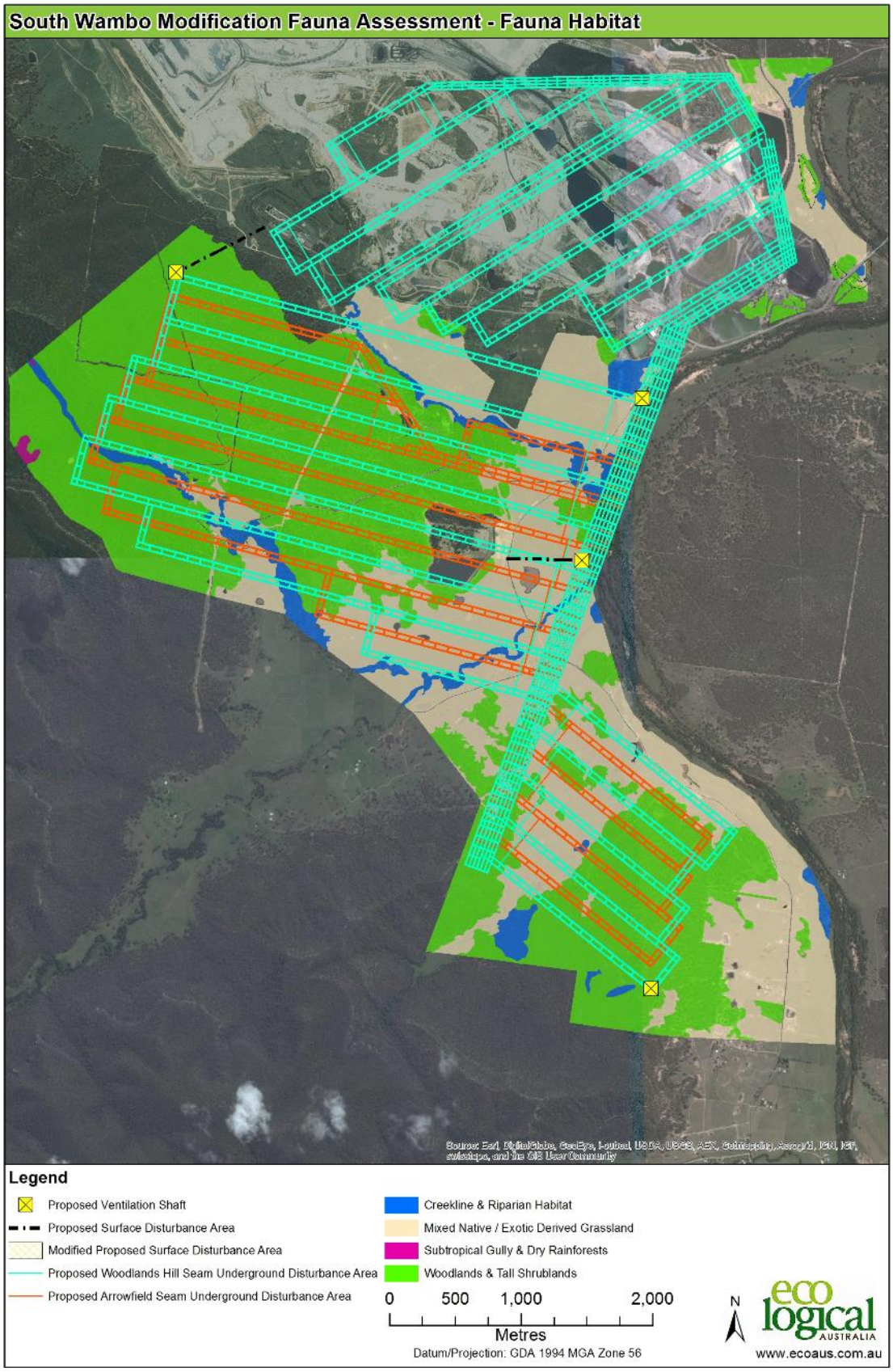

Figure 4: Broad Fauna Habitat within the Study Area

3.1.1 Woodland, Regenerating Woodland and Tall Shrubland

Woodlands dominate the lower slopes, ridgelines and small rises above floodplains in the Study area. They occur in four types, grassy woodland, shrubby woodland, regenerating woodland and tall shrubland. Grassy woodlands consist of a canopy layer that is either dominated or contains a mixture of *Eucalyptus crebra* (Narrow-leaved Ironbark), *Eucalyptus moluccana* (Grey Box) or *Eucalyptus dawsonii* (Slaty Gum) with a scattered mid-story of *Allocasuarina luehmannii* (Bulloak) and *Bursaria spinosa* subsp*. spinosa* (Blackthorn) (**Figure 5**). In some areas of poor drainage, *Melaleuca decora* (White Feather Honeymyrtle) dominates the mid-story layer.

Shrubby woodlands, generally occur on hillsides, small rises and some ridgelines. These areas are usually dominated by either *E. dawsonii* (Slaty Gum) or *Corymbia maculata* (Spotted Gum) and may also contain *E. crebra* (Narrow-leaved Ironbark) or *E. moluccana* (Grey Box) (**Figure 6**). The shrub layer in this habitat type generally consists of *Olearia elliptica* (Sticky Daisy Bush)*, Notelaea microcarpa* var. *microcarpa* (Native Olive), *Geijera salicifolia and Canthium odoratum* along with several *Acacia* spp*.* (Wattles).

Regenerating woodland occurs in areas that have been historically cleared. These areas are generally located on lower slopes on the edges of the cleared floodplain. These areas are either dominated by *Allocasuarina luehmannii* (Bulloak) and small regenerating *E. crebra* (Narrow-leaved Ironbark) (**Figure 7**) or if originally part of the shrubby woodland habitat contain areas of dense *Olearia elliptica* (Sticky Daisy Bush) and *Notelaea microcarpa* var. *microcarpa* (Native Olive) and often *Acacia salicina* (Native Willow).

Tall shrubland dominated by *Acacia binervia* (Coast Myall) with a sparse understory also occurs in small areas within the Study area.

These areas are likely to provide habitat for a range of fauna groups, particularly for small woodland birds.

Figure 5: Grassy Woodland Dominated by Grey Box

Figure 6: Shrubby Woodland/Forest on Sheltered South Facing Slope near Stony Creek with Spotted Gum and Grey Box Dominating the Canopy

Figure 7: Regenerating Ironbark Woodland Dominated by Bulloak

3.1.2 Subtropical Gully and Dry Rainforests

One type of mesic-dominated vegetation community occurred in the west of the Study area (outside of the Modification area). This community was associated with sheltered escarpment habitat along a drainage line. This community is locally significant and rare (**Figure 8**). It provides habitat suited to rainforest birds including fruit-eating pigeons, honeyeaters and undergrowth dwellers such as *Menura novaehollandiae* (Superb Lyrebird). This community was dominated by native, fruit-bearing trees and shrubs and supported a fauna assemblage more characteristic of rainforest environments, including the *Sericornis magnirostris* (Large-billed Scrubwren) and *Gerygone mouki* (Brown Gerygone). It is likely to support frugivorous pigeons and other rainforest specialists.

Figure 8: Rusty Fig – Native Quince – Native Olive Dry Rainforest

3.1.3 Mixed Native/Exotic Derived Grassland

A large portion of the Study area was dominated by derived grassland. This community was very homogenous in terms of fauna habitat. Low densities of mature trees and shrubs provided some habitat availability, as did scattered logs and wood piles.

3.1.4 Riparian Areas, Floodplain Forest and Dams

Small ephemeral creek lines dissect the woodlands of the lower footslopes and cross the floodplains before entering Wollombi Brook. These creeks contain pools for birds and mammals to drink from and frogs to breed within. Some areas where clearing has occurred or stock has accessed creeks in the past are eroded, and banks are sometimes steep.

On the lower reaches of these creeks and associated floodplains, *Casuarina cunninghamiana* (River Oak), *Eucalyptus camaldulensis* (River Red Gum), *Angophora floribunda* (Rough-barked Apple), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus melliodora* (Yellow Box) are present. Scattered remnant trees along these creek lines and floodplains are hollow-bearing and provide roosting sites and breeding structures for hollow-dependant bats, birds and arboreal mammals. These areas are also likely to provide connectivity for woodland and forest dependant fauna across the cleared grassland areas on the floodplain.

3.1.5 Koala Habitat

The areas containing designated Koala 'Feed Species' as listed under Schedule 2 of SEPP 44 have been mapped across the Study area. The scheduled Koala 'Feed Species' present within the Study area are *Eucalyptus albens* (White Box) and *Eucalyptus tereticornis* (Forest Red Gum) (OEH 2014).

Potential Koala habitat occurred across the entire Study area, however only 21 ha contained SEPP 44 Schedule 2 Koala Feed Species (**Figure 9**). These trees were scattered across the Study area.

3.2 FAUNA

A total of 171 fauna species were recorded within the Study area during the field survey period. This consisted of 120 birds, 12 non-flying mammals, 14 microbats, 18 reptiles and seven frogs (**Appendix B**).

3.2.1 Diurnal Birds

The diurnal bird surveys resulted in four distinct bird groups being observed within the Study area, with bird species recorded in the sheltered forested gullies and some riparian areas being typical of more coastal forests, a woodland bird group found in the drier *Eucalyptus crebra* (Narrow-leaved Ironbark), *E. dawsonii* (Slaty Gum) and *E. moluccana* (Grey Box) dominated forests, a wetland bird group found in the wetlands, farm dams and pools on Wollombi Brook and a grassland group found in cleared areas with long grass and also grazed areas.

One-hundred and twenty (120) bird species were observed during the field survey, of which eight were listed as threatened under the TSC Act and/or EPBC Act were recorded (**Figure 10**), including:

1. *Chthonicola sagittata* (Speckled Warbler) – Vulnerable under the TSC Act;
2. *Circus assimilis* (Spotted Harrier) – Vulnerable under the TSC Act;
3. *Climacteris picumnus victoriae* (Brown Treecreeper – eastern subspecies) – Vulnerable under the TSC Act;
4. *Pomatostomus temporalis temporalis* (Grey-crowned Babbler - eastern subspecies) – Vulnerable under the TSC Act;
5. *Daphoenositta chrysoptera* (Varied Sittella) – Vulnerable under the TSC Act;
6. *Glossopsitta pusilla* (Little Lorikeet) – Vulnerable under the TSC Act;
7. *Grantiella picta* (Painted Honeyeater) – Vulnerable under the TSC Act and EPBC Act; and
8. *Melanodryas cucullata cucullata* (Hooded Robin – south-eastern form) – Vulnerable under the TSC Act.

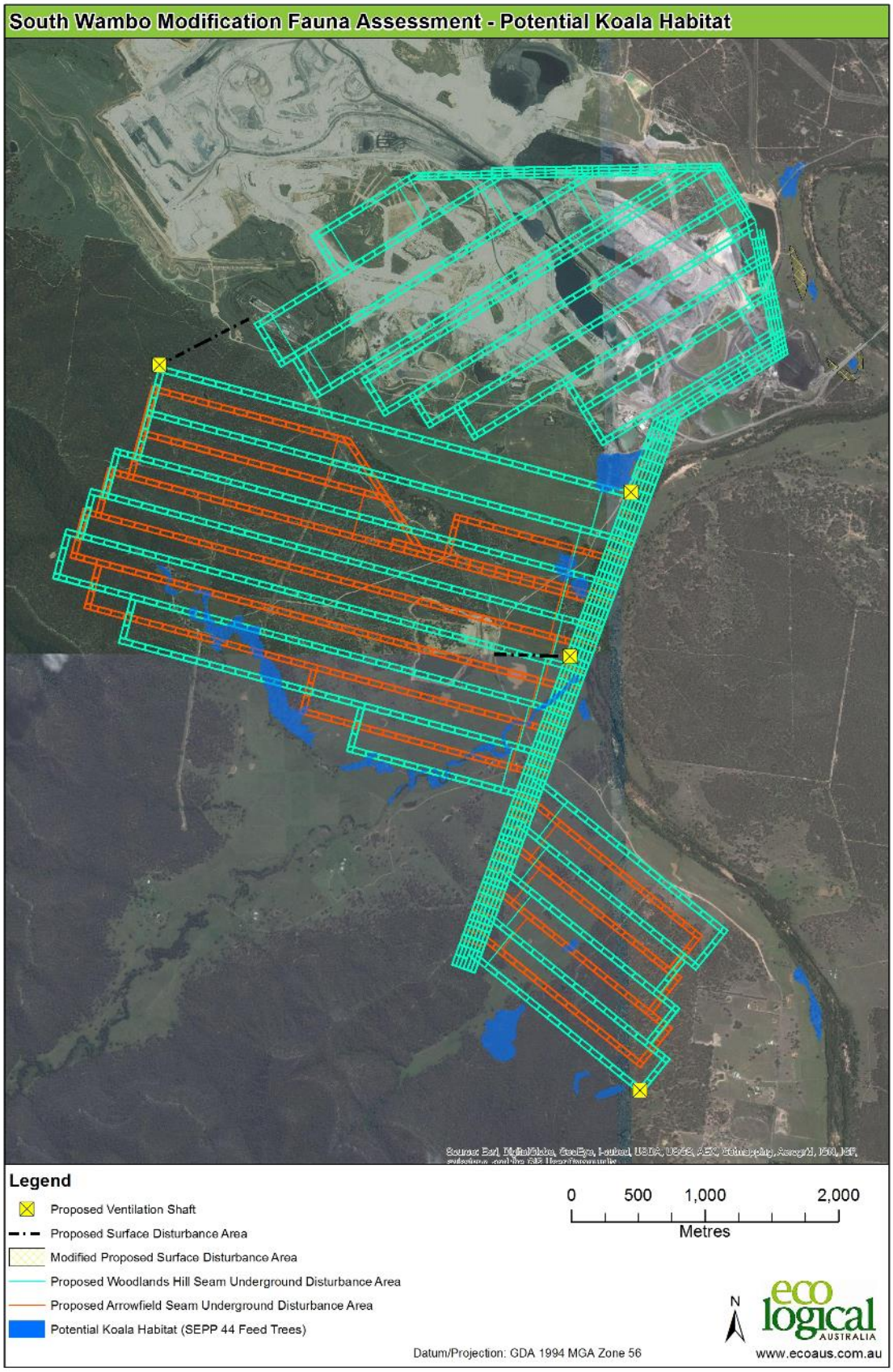

Figure 9: Koala Habitat within Study Area

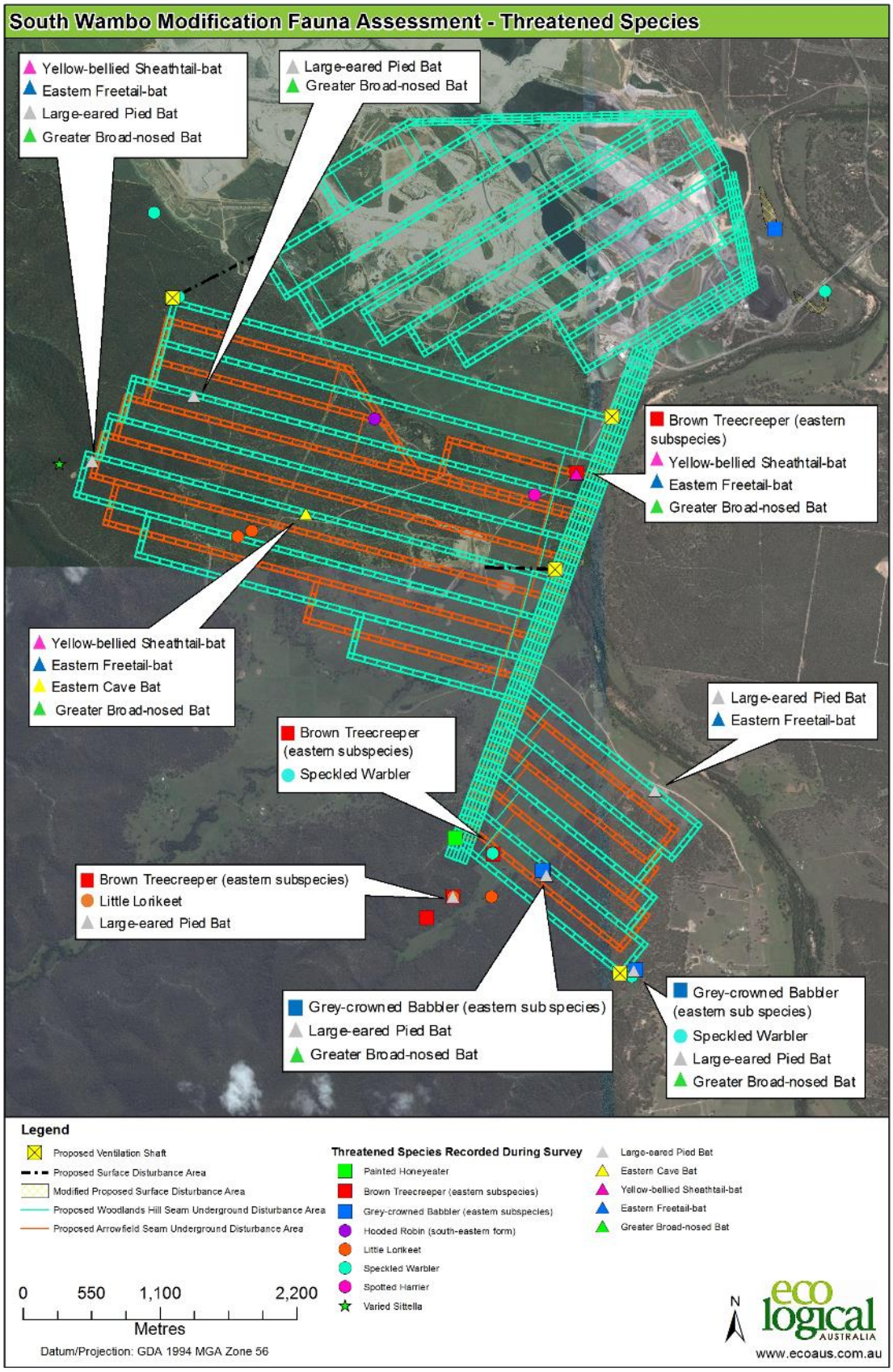

Figure 10: Threatened Species Found Within the Study Area

Two introduced species; *Sturnus tristis* (Common Myna) and *Sturnus vulgaris* (Common Starling) were observed in cleared land adjacent to the administration offices.

3.2.2 Reptiles and Amphibians

Habitat for reptiles in the Study area includes sandstone/conglomerate outcrops on hills and in steep valleys, with logs and hollow-bearing trees and also termitaria in the woodland and forest habitats. Riparian areas, swamps and farm dams provide habitat for species such as *Chelodina longicollis* (Eastern Snake-necked Turtle), *Eulamprus quoyii* (Eastern Water-skink), *Intellagama lesuerii* (Eastern Water Dragon) and *Pseudechis porphyriacus* (Red-bellied Black Snake).

Amphibian breeding habitat in the Study area primarily consists of ephemeral streams and pools in the minor drainage lines, farm dams and more permanent waterbodies within Wollombi Brook. Additional habitat would be created following heavy rainfall as depressions in forest and grassland and ephemeral drainage lines pond with water.

Eighteen reptile species and seven amphibian species were detected. No listed threatened reptile or amphibian species were detected during the current survey.

3.2.3 Microchiropteran Bats

Microchiropteran bat surveys undertaken across the Study area recorded a total of 6,448 call sequences, of which 3,885 call sequences were able to be analysed. A total of 14 microbat species and one species guild (*Nyctophilus* sp. which could represent up to four species) have been identified from the data to one of the three confidence levels: definite, probable or possible (**Table 6**).

Table 6: Microchiropteran Bat Results (Threatened Species in Grey Rows)

Scientific Name	Common Name	Total	Definite	Probable	Possible
Austronomus australis	White-striped Freetail-bat	82	82	0	0
Chalinolobus dwyeri	Large-eared Pied Bat	132	120	5	7
Chalinolobus gouldii	Gould's Wattled Bat	986	963	13	10
Mormopterus norfolkensis	Eastern Freetail-bat	391	388	3	0
Mormopterus planiceps	South-eastern Freetail-bat	266	251	5	10
Nyctophilus sp	Long-eared Bat	46	44	0	2
Rhinolophus megaphyllus	Eastern Horseshoe Bat	50	50	0	0
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	77	75	0	2
Scoteanax rueppellii	Greater Broad-nosed Bat	24	11	6	7
Scotorepens orion	Eastern broad-nosed Bat	332	316	11	5
Vespadelus darlingtoni	Large Forest Bat	441	430	7	4
Vespadelus pumilus	Eastern Forest Bat	49	42	0	7
Vespadelus troughtoni	Eastern Cave Bat	40	15	3	22
Vespadelus vulturnus	Little Forest Bat	978	953	18	7
Total		3,894			

Data from some sites represented very high activity levels (number of calls) and a diverse number of species including numerous listed threatened species. Five threatened Microchiropteran bat species listed under the TSC Act and/or EPBC Act were recorded within the Study area, including:

1. *Chalinolobus dwyeri* (Large-eared Pied Bat) – Vulnerable under the TSC and EPBC Acts;
2. *Mormopterus norfolkensis* (Eastern Freetail-bat) – Vulnerable under the TSC Act;
3. *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat) – Vulnerable under the TSC Act;
4. *Scoteanax rueppellii* (Greater Broad-nosed Bat) – Vulnerable under the TSC Act; and
5. *Vespadelus troughtoni* (Eastern Cave Bat) – Vulnerable under the TSC Act.

The location of all threatened Microchiropteran bat species identified during the survey was mapped (**Figure 10**). Threatened Microchiropteran bat species are shown in grey rows in Table 6 above.

3.2.4 Terrestrial and Arboreal Mammals

Eight native mammal species (excluding bats) and four introduced mammal species were detected. These included four kangaroo and wallaby species: *Macropus giganteus* (Eastern Grey Kangaroo), *Macropus robustus* (Wallaroo), *Macropus rufogriseus* (Red-neck Wallaby) and *Wallabia bicolor* (Swamp Wallaby). Other native mammals observed were: *Vombatus ursinus* (Common Wombat), *Trichosurus vulpecula* (Brushtail Possum), *Tachyglossus aculeatus* (Short-beaked Echidna) and *Antechinus flavipes* (Yellow-footed Antechinus).

Introduced mammal species observed included *Oryctolagus cuniculus* (Rabbit), *Lepus europaeus* (European Brown Hare), *Vulpes vulpes* (Red Fox) and *Canis lupus familiaris* (Domestic Dog).

Yellow-footed Antechinus was the only species captured during terrestrial and arboreal mammal trapping. No threatened terrestrial or arboreal mammal species were detected.

3.3 RIPARIAN HABITAT

3.3.1 North Wambo Creek

North Wambo Creek is an ephemeral creek south-west of Wambo Open Cut Coal Mine. The central portion of the creek has been diverted around the current open cut coal mine. Large trees, regenerating overstory and midstory species and generally <20% cover of exotic species occurs along sections of this creek.

Erosion was present at some cross sections along the creek, along with evidence of pigs and rabbits. A traverse of the survey transect identified potential mine subsidence cracks (**Figure 11**), slumping (forming ephemeral water bodies) (**Figure 12**) and steep sided eroding and undercutting banks – likely a result of historic vegetation clearing and grazing.

Figure 11: Crack Running Perpendicular to Bank Top Approximately 50 Centimetres Deep in Places

Figure 12: Vertical Eroded Banks in Sections of North Wambo Creek

3.3.2 Stony Creek

Stony Creek is an ephemeral creek that runs from the intact vegetation on the escarpment, through a rocky creekline before entering sandy soil on flats at the base of the escarpment. Once entering the floodplain, the banks and surrounding plain have been historically cleared, with some large remnant *Angophora floribunda* (Rough-barked Apple) and *Eucalyptus tereticornis* (Forest Red Gum) and riparian shrubs and small trees.

Low levels of erosion, areas with regenerating canopy species, fallen timber for fauna habitat and also low exotic cover occur along this creek line. Tree canopy cover is low due to historic vegetation clearing, however both overstory and midstory regeneration is occurring.

A traverse of the stream transect noted some issues such as minor erosion caused by water flowing over a ford for vehicle access and being trapped by a pipeline. Areas of steep vertical banks due to past vegetation clearing in riparian areas were also observed (**Figure 13**).

Figure 13: Stony Creek

3.3.3 Wambo Creek

Wambo Creek is an ephemeral creek running from the escarpment and meeting the floodplain where it is joined by Stony Creek. Wambo Creek then flows in a north-easterly direction, before running into Wollombi Brook.

Riparian assessment indicates that Wambo Creek is in moderate condition with low tree canopy cover, high exotic species cover and bank erosion in several places. Evidence of both Rabbit and Feral Pig activity appeared higher in this area than the other creeklines, with at least one section of bank with active warrens (**Figure 14**). The majority of issues appear to be related to the highly cleared riparian zone and bank destabilisation. These issues are then intensified in places by Rabbit warrens. Areas of active rehabilitation (tree plantings) by WCPL were noted.

Figure 14: Rabbit Warrens and Bank Erosion on Wambo Creek

4 Impact Assessment

4.1 SUMMARY OF IMPACTS

The Modification would require removal of vegetation and potential fauna habitat within the proposed surface disturbance areas (approximately 7.9 ha of additional disturbance) and potentially result in additional subsidence over an area of 185 ha which has not been previously affected by mining (underground or open cut) and has not been previously approved (MSEC 2016). The potential impacts are described below in relation to direct and indirect impacts upon any potential habitat for threatened fauna species. The assessment was undertaken based on NSW and Commonwealth legislation and guidelines to determine the significance of impacts.

4.1.1 Assessment of Impacts on Threatened Species and Populations

Thirteen threatened fauna species listed under the TSC Act and/or the EPBC Act were observed within the Study area (**Section 3.2**).

Appendix A has considered the likelihood of occurrence for threatened fauna species being present within the Study area based upon habitat requirements for the potential threatened fauna species. Forty threatened fauna species were classed as either potential, likely or previously recorded within the Study area. **Table 7** below summarises the threatened fauna species that were classed as occurring (i.e. were recorded), likely to occur or a having potential to occur within the Study area, and provides a consideration of the likelihood of potential impacts from the Modification.

Based upon the potential impacts of the Modification associated with the underground disturbance and approximately 7.9 ha of additional direct surface disturbance, 40 species have been further assessed in accordance with the relevant guidelines. Assessments for the species listed under the TSC Act are detailed in **Appendix C**, while assessments for the species listed under the EPBC Act are detailed in **Appendix D**.

Within the underground disturbance area, no impacts are expected to occur to threatened diurnal birds, forest owls and tree-roosting microbats due to no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Study area. As some impacts are expected upon natural features, including streams and steep slopes due to subsidence, minor potential impacts could occur upon threatened fauna species including reptiles, cave roosting microbats and ground dwelling mammals (for a full list see **Table 7**). These impacts are not considered to be significant as the impacts are minor and suitable habitat resources would remain present outside the Modification area, with abundant similar habitat available in wooded areas to the east, west and south.

Within the proposed surface disturbance areas of the Modification, some impacts are expected for threatened fauna species including diurnal birds, forest owls, and microbats from the loss of potential habitat (for a full list see **Table 7**). However, these impacts are not considered to be significant as the additional clearance would be small (7.9 ha), isolated and temporary in nature. Surface disturbance would occur within small patches (e.g. for ventilation shafts or mine safety gas drainage) and would be progressively rehabilitated as sites are no longer required. The majority of surface disturbance activities would be within mixed native/exotic grassland and suitable habitat resources would remain present outside the Modification area, with abundant similar habitat available in wooded areas to the south, east and west as well as in the connected corridor with Wollemi National Park to the south of the Modification area. Surface disturbance would impact approximately 7.9 ha, of which 4.5 ha is mixed native/exotic grassland habitat and 3.4 ha is woodland/tall shrubland habitat.

The Modification would not impact any additional species to the currently approved project. No significant impact is anticipated as a result of surface and underground disturbance activities upon the threatened fauna species within the Study area.

Table 7: Summary of Potential Impacts on Threatened Fauna

Scientific Name	Common Name	Conservation Significance[1]		Likelihood of Impact		Significance of Impact
		TSC Act	EPBC Act	Surface Disturbance	Underground Disturbance	
Litoria Aurea	Green and Golden Bell Frog	E	V	Unlikely	Potential – impacts on aquatic habitat through surface cracking	Not Significant
Lophoictinia isura	Square-tailed Kite	V	-	Potential – Foraging Habitat	No	Not Significant
Circus assimilis	Spotted Harrier	V	-	Yes – Foraging Habitat	No	Not Significant
Hieraaetus morphnoides	Little Eagle	V	-	Likely – Foraging Habitat	No	Not Significant
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Likely – Foraging and Nesting Habitat	No	Not Significant
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	Likely – Foraging Habitat	No	Not Significant
Glossopsitta pusilla	Little Lorikeet	V	-	Yes – Foraging and Nesting Habitat	No	Not Significant
Neophema pulchella	Turquoise Parrot	V	-	Likely – Foraging and Nesting Habitat	No	Not Significant
Lathamus discolour	Swift Parrot	E	E	Potential – Foraging Habitat	No	Not Significant
Tyto novaehollandiae	Masked Owl	V	-	Potential – Foraging and Nesting Habitat	No	Not Significant
Ninox strenua	Powerful Owl	V	-	Likely – Foraging and Nesting Habitat	No	Not Significant
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	Yes – Foraging and Nesting Habitat	No	Not Significant

Scientific Name	Common Name	Conservation Significance[1]		Likelihood of Impact		Significance of Impact
		TSC Act	EPBC Act	Surface Disturbance	Underground Disturbance	
Chthonicola sagittata	Speckled Warbler	V	-	Yes – Foraging and Nesting Habitat	No	Not Significant
Anthochaera phrygia	Regent Honeyeater	CE	CE	Potential – Foraging Habitat	No	Not Significant
Grantiella picta	Painted Honeyeater	V	V	Yes – Foraging and Nesting Habitat	No	Not Significant
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	Yes – Foraging and Nesting Habitat	No	Not Significant
Petroica phoenicea	Flame Robin	V	-	Potential – Foraging Habitat	No	Not Significant
Petroica boodang	Scarlet Robin	V	-	Likely – Foraging Habitat	No	Not Significant
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	Yes – Nesting and Foraging Habitat	No	Not Significant
Daphoenositta chrysoptera	Varied Sittella	V	-	Yes – Foraging and Nesting Habitat	No	Not Significant
Stagonopleura guttata	Diamond Firetail	V	-	Likely – Foraging and Nesting Habitat	No	Not Significant
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE mainland population)	V	E	Potential – Foraging and Nesting Habitat	No	Not Significant
Phascolarctos cinereus	Koala	V	V	Potential – Koala Feed Trees	No	Not Significant
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	Potential – Foraging and Nesting Habitat	No	Not Significant
Petaurus norfolcensis	Squirrel Glider	V	-	Potential – Foraging and Nesting Habitat	No	Not Significant
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Unlikely	Likely - Foraging and Sheltering Habitat	Not Significant
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Potential – Foraging Habitat	No	Not Significant
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Yes – Roosting (Trees) and Foraging Habitat	No	Not Significant
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Yes – Roosting (Trees) and Foraging Habitat	No	Not Significant
Miniopterus australis	Little Bentwing-bat	V	-	Potential – Roosting (Trees) and Foraging Habitat	Unlikely – potential roosting habitat outside Modification area	Not Significant

Scientific Name	Common Name	Conservation Significance[1]		Likelihood of Impact		Significance of Impact
		TSC Act	EPBC Act	Surface Disturbance	Underground Disturbance	
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	Potential – Foraging Habitat	Unlikely – potential roosting habitat outside Modification area	Not Significant
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Potential – Roosting (Trees) and Foraging Habitat	No	Not Significant
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Yes – Foraging Habitat	Unlikely – potential roosting habitat outside Modification area	Not Significant
Chalinolobus picatus	Little Pied Bat	V	-	Potential – Roosting (Trees) and Foraging Habitat	Unlikely – potential roosting habitat outside Modification area	Not Significant
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Potential – Roosting (Trees) and Foraging Habitat	No	Not Significant
Myotis macropus	Southern Myotis	V	-	Potential – Roosting (Trees) and Foraging Habitat	No	Not Significant
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Yes – Roosting (Trees) and Foraging Habitat	No	Not Significant
Vespadelus troughtoni	Eastern Cave Bat	V	-	Yes – Foraging Habitat	Unlikely – potential roosting habitat outside Modification area	Not Significant
Pseudomys novaehollandiae	New Holland Mouse	-	V	Potential – Nesting and Foraging Habitat	Potential - Nesting and Foraging Habitat (subsidence cracking)	Not Significant
Pseudomys oralis	Hastings River Mouse	E	E	Unlikely	Potential - Nesting and Foraging Habitat (subsidence cracking)	Not Significant

[1] Conservation status listed under the TSC Act and the EPBC Act, current at January 2016.

TSC Act Status: E – Endangered; V – Vulnerable; CE – Critically Endangered.

EPBC Act Status: E – Endangered; V – Vulnerable.

4.2 DIRECT IMPACTS

4.2.1 Loss of Fauna Habitat

The proposed Modification within the surface disturbance areas would potentially impact native woodland/tall shrub vegetation and mixed native/exotic grassland containing potential fauna habitat. The proposed Modification has potential to directly impact fauna and fauna habitat as a result of land clearing within the proposed surface disturbance areas. This is due to loss of habitat and habitat trees from the vegetation clearing activities. However, vegetation clearing associated with the Modification would be small (approximately 7.9 ha), isolated and temporary in nature. Approximately 4.5 ha of mixed native/exotic grassland habitat would be removed as a result of the surface disturbance works, as well as 3.4 ha of woodland/tall shrubland habitat.

Impacts from the removal of these structural habitat features on the proposed surface disturbance areas would require management, particularly for threatened species that might rely on these resources for breeding and do not have the ability to migrate to new areas (small ground-dwelling mammals, reptiles and amphibians), establish new territories or await the rehabilitation of habitat on site. Measures to minimise adverse impacts would be undertaken in accordance Flora and Fauna Management Plan (WCPL 2014a) (or subsequent revisions) and include, where practical, the salvaging and relocation of large hollows identified during pre-clearing surveys.

A proportion of the species listed in **Table 7** are considered to have the potential to breed within the natural habitat currently present in the proposed surface disturbance areas. Collectively, approximately 3.4 ha of potential threatened species breeding habitat would be removed from the proposed surface disturbance areas.

Subsidence of vegetation within the Modification area is not expected to result in the loss of vegetation cover or community structure. Fauna habitat (including that identified as potential Koala habitat) would not be directly impacted by the occurrence of subsidence. Direct mortality of animals may occur as a result of surface cracking, however the potential impacts of such events are expected to be very unlikely, given negligible impact upon the Wollemi Escarpment is expected and if impacted, would be rare, short-term and insignificant.

4.3 INDIRECT IMPACTS

A series of potential indirect impacts may occur as a result of the Modification and are discussed in detail in the following subsections.

4.3.1 Noise and Vibration

The proposed Modification is adjacent to an existing mining area. Mine operations already emit noise in the Modification area, which has the ability to disrupt fauna behaviour.

The Modification would result in no material change to approved noise or vibration levels at the Wambo Coal Mine.

4.3.2 Dust

An increased generation of dust may impact fauna. Existing mining operations in the area produce significant volumes of dust. Dense coatings of dust may alter natural growth of plants within the Modification area, which may in turn impact habitat for fauna. The limited surface disturbance activities within the Modification area have potential to contribute slightly to the dust load in the locality for a limited period of time, however, is expected to be negligible. Disturbance from subsidence would not contribute to increased dust generation. Measures to minimise adverse impacts from dust during surface disturbance works would be undertaken in accordance with the Air Quality and Greenhouse Gas Management Plan (WCPL 2014b) (or subsequent revisions). Dust related impacts as a result of the Modification would be negligible and are not predicted to significantly affect the health of the vegetation.

4.3.3 Light Pollution

Increased light pollution has the potential to alter the foraging and nesting patterns of nocturnal fauna. The surrounding area is currently affected by artificial light pollution from existing mining activities. Artificial lighting is unlikely to be significantly exacerbated by the proposed Modification, as the majority of the additional area to be disturbed under this Modification would be underground disturbance activities that would not require additional artificial light requirements. Additional artificial lighting would be required for the ventilation shafts and gas management infrastructure, however this lighting would be minimal.

4.3.4 Fragmentation, Edge Effects and Connectivity

Fragmentation of habitat occurs where areas that were once continuous become divided into separate, isolated fragments by non-woodland areas. It can decrease genetic exchange in vegetation and fauna populations that cannot navigate non-woodland areas (Saunders *et al*. 1991).

A large connected patch of remnant vegetation occurs within and adjacent to the Modification area, connecting it to wooded areas to the south, west and east and connects with remnant vegetation associated with the Wollemi National Park. The proposed surface disturbance activities are relatively small in size, impacting small areas of mixed/native exotic grassland which have historically been impacted by clearing, grazing and mining, or along edges of relativelty small woodland areas that are currently being impacted by edge effects caused by historical land uses. Thus the Modification would not affect large patches of contiguous forest and woodland habitat.

Delineated ‘edges’ in vegetation are created by clearing within or adjacent to a patch of vegetation. Increasing edges in remnant vegetation can lead to changes in microclimate and ecological processes. These changes are known as ‘edge effects’. Microclimatic changes can include changes in light, temperature, humidity and wind, which can favour certain species, leading to changes in structure and diversity in these areas. These changed conditions can suit disturbance tolerant species such as weeds, and increases the ability for feral animals to colonise and utilise remnant vegetation (Oliveira Filho *et al*. 1997).

Woodland within the Modification area is currently impacted by edge effects. Any additional edge effects would be minimised, where possible, using active management techniques. For example, weeds and feral animals would be managed in accordance with the Flora and Fauna Management Plan (WCPL 2014a) (or subsequent revisions).

4.3.5 Pest Species

Given the small nature of the proposed surface disturbance works involving the removal of an additonal 3.4 ha of woodland/tall shrubland, consisting of a number of small, isolated patches, it is not considered likely that this impact will further increase the potential for pest species including the Red Fox and Rabbit to occur within the Modification area. Given the location of the surface disturbance impacts (mixed/native exotic grassland and along the edges of woodland/tall shrubland), the Modification is not considered to result in an increase in pest species numbers in surrounding conservation reserves. Mitigation measures including feral animal management and control would be implemented utlising methods outlined within the the Flora and Fauna Management Plan (WCPL, 2014a).

4.4 CUMULATIVE IMPACTS

Cumulative impacts include successive, incremental and combined impacts of one or more activities on the environment. Cumulative disturbance impacts result from the accumulation and interaction of impacts from past, present or future activities.

Woodland habitat within the Wambo area has been removed as a result of agricultural activites as well as expansions in operations to Wambo and further afield within the Hunter Valley for other mining operations. The surface disturbance activities associated with the Modification are relatively minor (4.5 ha of mixed native/exotic grassland and 3.4 ha of woodland/tall shrubs) in comparison to the remaining vegetation above the underground disturbance areas and remnant vegetation associated with the Wollemi National Park and within the Remnant Woodland Enhancement Program (RWEP) areas.

It is noted that an assessment of the potential cumulative subsidence impacts associated with the Modification has been undertaken, including a consideration of potential impacts associated with mining activities in the Wambo Seam and the Woodlands Hill and Arrowfield Seams (this Modification) (MSEC 2016).

Implementing the recommended impact mitigation and management techniques are utilised would aid in further reducing the overall cumulative impacts contributed by the proposed Modification.

4.5 KEY THREATENING PROCESSES

Five Key Threatening Processes (KTPs) listed under the TSC Act and/or EPBC Act are likely to be relevant to the proposal. These are:

- Clearing of native vegetation (TSC Act)/Land clearance (EPBC Act);
- Loss of hollow bearing trees (TSC Act);
- Removal of dead wood and trees (TSC Act);
- Invasion of native plant communities by exotic perennial grasses (TSC Act); and
- Alteration of habitat following subsidence due to long wall mining (TSC Act).

These threatening processes are considered in the impact assessments in **Appendix C** and **Appendix D**.

4.6 IMPACT MITIGATION MEASURES

A Flora and Fauna Management Plan (WCPL, 2014a) is currently implemented at the Wambo Coal Mine and includes (but is not limited to) a vegetation clearance protocol, threatened species management protocol and rehabilitation and monitoring programs.

Mitigation measures for impacts on fauna habitat associated with the Modification would be undertaken in accordance with the Flora and Fauna Management Plan (WCPL, 2014a), or its future revisions and would include the following measures:

- Implementation of Vegetation Clearance Protocol. This includes the delineation of areas to be cleared, pre-clearing surveys, management of impacts to fauna, and vegetation clearance procedures.
- Collection and stockpiling of habitat features important to threatened fauna species would be collected and stockpiled for reinstatement in rehabilitation areas.
- Implementation of dust minimisation and suppression measures detailed in the Air Quality and Greenhouse Gas Management Plan (WCPL, 2014b).
- Incorporation of ongoing management for weeds and pest animals to manage potential impacts upon fauna and their habitat.
- Implementation of any remedial works that may be required for minor impacts to creeklines, including potential rehabilitation if pondage occurs, cracks in the creek bed occur or the creek banks show instability after subsidence may cause sedimentation.
- Continuation of monitoring within revegetated areas (including areas subject to subsidence from underground mining) such as visual monitoring of vegetation to assess the success of revegetation efforts and the condition of the vegetation, to determine the need for any maintenance and/or contingency measures (e.g. the requirement for weed and pest animal control).
- If remediation works are required, use of appropriate native flora species characteristic of the original communities, including use of local provenance seed stock where possible. Remediation activities would be undertaken in accordance with the Mining Operations Plan and relevant Extraction Plan.

4.7 BIODIVERSITY OFFSET

In addition to the impact mitigation measures listed in Section 4.6, a biodiversity offset has been developed for the Modification to offset residual impacts to threatened fauna species and their habitats. The biodiversity offset is discussed in detail in Appendix C of the Flora Assessment for the Modification (Florasearch 2016).

5 Conclusion

This fauna assessment prepared for WCPL assessed the impact of the Modification on the fauna present within the Study area.

Within the Study area, eight birds and five mammals (microbats) were recorded during the field survey, which are listed under the TSC Act and/or EPBC Act, including Speckled Warbler, Spotted Harrier, Brown Treecreeper (eastern subspecies), Grey-crowned Babbler (eastern subspecies), Varied Sittella, Little Lorikeet, Painted Honeyeater, Hooded Robin (south-eastern form), Large-eared Pied Bat, Eastern Freetail-bat, Yellow-bellied Sheathtail-bat, Greater Broad-nosed Bat and Eastern Cave Bat.

The proposed mining activities associated with the Modification would potentially result in additional subsidence over an area of approximately 185 ha which has not been previously affected by mining (underground or open cut) and has not been previously approved (MSEC 2016), and approximately 7.9 ha of additional direct surface disturbance (comprising 3.4 ha of woodland/tall shrub vegetation and 4.5 ha of mixed native/exotic grasslands). However, direct surface disturbance associated with the Modification would be small (approximately 7.9 ha), isolated and temporary in nature.

Assessments of significance were applied under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) as well as significance assessments under the EPBC Act guidelines to determine the potential impacts to species in the Study area. Following these detailed assessments (**Appendices C** and **D**) it is considered that the Modification is unlikely to result in any significant impacts to threatened fauna species.

The management of potential impacts associated with the Modification would be in accordance with the Flora and Fauna Management Plan (WCPL 2014a) (or subsquent revisions) currently implemented at the Wambo Coal Mine.

Habitat resources occur outside the disturbance footprint, with abundant similar habitat available in wooded areas to the south, west and east, and in the connected remnant vegetation associated with the Wollemi National Park.

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Appendix A – Threatened Fauna Likelihood of Occurrence Table

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Amphibians					
Litoria aurea	Green and Golden Bell Frog	E	V	Since 1990, the Green and Golden Bell Frog has been recorded from approximately 50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the Australian Capital Territory (ACT) region. This frog prefers marshes, dams and stream-sides, particularly those containing *Typha* spp. (bullrushes) or *Eleocharis* spp. (spikerushes). Some populations occur in highly disturbed areas (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 15 km north of the Modification area. Potential habitat does exist within the Modification area however, in the form of farm dams.	Potential
Litoria booroolongensis	Booroolong Frog	E	E	The Booroolong Frog typically inhabits western-flowing rocky creeks, although a small number of populations have also been recorded in eastern-flowing streams (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is over 50 km north-east of the Modification area. No potential habitat for this species is located within the Modification area.	No

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Litoria littlejohni	Littlejohn's Tree Frog	V	V	The Littlejohn's Tree Frog is found on plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade. Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is over 50 km south of the Modification area. No potential habitat for this species is located within the Modification area.	No
Reptiles					
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundcover, particularly those dominated by Kangaroo Grass (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is over 105 km west of the Modification area. No potential habitat for this species is located within the Modification area.	No
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Typical habitat sites for the Broad-headed Snake consist of exposed sandstone outcrops and benching where the vegetation is predominantly woodland, open woodland and/or heath on Triassic sandstone of the Sydney Basin. The Broad-headed Snake utilises rock crevices and exfoliating sheets of weathered sandstone during the cooler months and tree hollows during summer (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 60 km south-west of the Modification area. No potential habitat for this species is located within the Modification area.	Unlikely

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Hoplocephalus stephensii	Stephens' Banded Snake	V	-	The Stephens' Banded Snake is nocturnal, and shelters between loose bark and tree trunks, amongst vines, or in hollow trunks limbs, rock crevices or under slabs during the day. It is found in rainforest and eucalypt forests and rocky areas up to 950 m in altitude (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is over 40 km south-west of the Modification area. No potential habitat for this species is located within the Modification area.	Unlikely
Birds					
Botaurus poiciloptilus	Australasian Bittern	E	E	The Australasian Bittern is found over most of NSW except for the far north-west. This species is found in permanent freshwater wetlands with tall, dense vegetation, particularly *Typha* spp. (bullrushes) and *Eleocharis* spp. (spikerushes) (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is over 55 km east of the Modification area. No potential habitat for this species is located within the Modification area.	No
Lophoictinia isura	Square-tailed Kite	V	-	The Square-tailed Kite occurs in woodland and forested areas (OEH 2016). This species forages and breeds along inland timbered watercourses. It is also known to forage in wooded farmland or urban environments (OEH 2016). This species was not recorded during the field survey, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring.. Potential habitat for this species exists within the proposed Modification area in the form of potential foraging habitat as open woodland.	Potential

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Circus assimilis	Spotted Harrier	V	-	The Spotted Harrier occurs in grassy open woodland and grasslands (OEH 2016). This species was recorded during the field survey. Habitat for this species exists within the Modification area in the form of potential foraging habitat as open woodland.	Yes
Hieraaetus morphnoides	Little Eagle	V	-	The Little Eagle occupies open eucalypt forest, woodland or open woodland (OEH 2016). It nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. This species was not recorded during the field survey, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Foraging and nesting habitat for this species exists within the proposed Modification area in the form of open woodlands.	Likely
Falco subniger	Black Falcon	V	-	The Black Falcon is sparsely distributed in NSW, occurring mostly in inland regions. This species prefers woodland, shrubland and grassland habitats, especially riparian woodland and agricultural land. Often associated with streams or wetlands (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 15 km south-east of the Modification area. No potential habitat for this species is located within the Modification area.	No

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Rostratula australis	Australian Painted Snipe	E	E, Ma	The Australian Painted Snipe inhabits shallow inland wetlands which are fresh or brackish, temporarily or permanently inundated. Preferred habitats are fringes of swamps, dams and nearby marshy areas where there is a cover of grass, lignum, low scrub or open timber (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 58 km south-east of the Modification area. No potential habitat for this species is located within the Modification area.	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	The Glossy Black-Cockatoo is associated with a variety of forest types containing *Allocasuarina* species. This species nests in large trees with large hollows (OEH 2016). This species was not recorded during the field survey, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the proposed Modification area in the form of foraging habitat (*Allocasuarina* spp.) and potential nesting habitat (hollow-bearing trees).	Likely
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	The Gang-gang Cockatoo is known to inhabit tall, wet forests of mountains and gullies as well as alpine woodlands in summer (OEH 2016). In winter they occur at lower altitudes in drier more open forests and woodlands, particularly box-ironbark assemblages (OEH 2016). This species was not recorded during the field surveys for the Modification, however it has been previously recorded during ongoing monitoring. Potential habitat for this species exists within the proposed Modification area in the form of potential foraging habitat as open woodland.	Likely

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Glossopsitta pusilla	Little Lorikeet	V	-	The Little Lorikeet mostly occurs in dry, open eucalypt forests and woodlands containing nectar-bearing eucalypts and mistletoes on which it feeds (OEH 2016). This species was recorded during the field surveys and has been previously recorded during assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the proposed Modification area in the form of potential foraging and nesting habitat.	Yes
Neophema pulchella	Turquoise Parrot	V	-	The Turquoise Parrot is found in open forest and timbered grassland, especially low shrub ecotones between woodland and grasslands with high proportion of native grasses and forbs (OEH 2016). This species was not recorded during the field survey, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals. Likely habitat for this species exists within the proposed Modification area in the form of foraging and nesting habitat.	Likely
Lathamus discolour	Swift Parrot	E	E	The Swift Parrot occurs in areas where eucalypts are flowering profusely, or where there are abundant lerp. This species breeds in Tasmania during spring and summer, migrating to south-eastern Australia in the autumn and winter months (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is 7 km east of the Modification area. Potential habitat for this species exists within the proposed Modification area in the form of potential foraging habitat with winter flowering eucalypt species.	Potential

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Tyto novaehollandiae	Masked Owl	V	-	The Masked Owl is associated with forest with sparse, open, understorey, typically dry sclerophyll forest and woodland and especially the ecotone between wet and dry forest, and non-forest habitat (OEH 2016). This species is known to utilise forest margins and isolated stands of trees within agricultural land and heavily disturbed forest where its prey of small and medium sized mammals can be readily obtained (OEH 2016). This species was not recorded during the field survey, however it has been previously recorded during assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Potential habitat for this species exists within the proposed Modification area in the form of foraging and nesting habitat.	Potential
Ninox strenua	Powerful Owl	V	-	The Powerful Owl is found in eastern forests, from the coast to the tablelands. This species is now uncommon and occurring at low densities. Powerful Owls can inhabit a wider range of vegetation types, preferring large tracts of woodland or forest habitat (OEH 2016). This species was not recorded during the field survey, however it has been previously recorded during assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Likely habitat for this species exists within the proposed Modification area in the form of potential foraging and roosting habitat.	Likely
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	The Brown Treecreeper occupies dry eucalypt woodlands, particularly open grassy woodland lacking a dense understorey but containing abundant fallen woody debris (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of foraging habitat and potential nesting habitat.	Yes

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Chthonicola sagittata	Speckled Warbler	V	-	The Speckled Warbler occupies a wide range of eucalypt dominated communities with a grassy understorey, often on rocky ridges or in gullies. Typical habitat for this species would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of potential foraging and nesting habitat.	Yes
Anthochaera phrygia	Regent Honeyeater	CE	CE, M	The Regent Honeyeater occupies open woodlands and forests, particularly *Eucalyptus sideroxylon* (Mugga Ironbark), *E. albens* (White Box), *E. melliodora* (Yellow Box) and *E. blakelyi* (Blakely's Red Gum) as well as mistletoes which provide sufficient nectar on which it feeds. This species makes nomadic movements following winter flowering eucalypt species (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 5 km east of the Modification area. Potential habitat for this species exists within the Modification area in the form of potential foraging habitat with winter flowering eucalypt species.	Potential
Grantiella picta	Painted Honeyeater	V	V	The Painted Honeyeater is a nomadic species that typically inhabits woodlands with abundant mistletoe. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring *Amyema sp.* mistletoe (OEH 2016). This species was recorded during the field survey and has been previously recorded during assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of potential foraging and nesting habitat.	Yes

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	The Hooded Robin is associated with a wide range of eucalypt woodlands and open forests, usually open grassy temperate woodlands. The species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of foraging habitat and potential nesting habitat.	Yes
Petroica phoenicea	Flame Robin	V	-	The Flame Robin breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. This species prefers clearings or areas with open understoreys, and grassy ground layer for breeding habitat. Shrub density does not appear to be an important habitat factor for the Flame Robin. Many individuals move to the inland slopes and plains in winter, or to drier more open habitats in the lowlands (OEH 2016). This species was not recorded during the field surveys for the Modification, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring.. Potential habitat for this species exists within the Modification area in the form of foraging habitat.	Potential
Petroica boodang	Scarlet Robin	V	-	The Scarlet Robin breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. During autumn and winter some birds may appear on the eastern edges of the inland plains. They inhabit dry eucalypt forests and woodlands with an open grassy understorey with few scattered shrubs. Abundant logs and fallen timber are important components of its habitat (OEH 2016). This species was not recorded during the field survey, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring.. Potential habitat for this species exists within the Modification area in the form of foraging habitat.	Likely

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	The Grey-crowned Babbler (eastern subspecies) is known from open woodlands dominated by mature eucalypts with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Potential habitat for this species exists within the Modification area in the form of potential foraging and nesting habitat.	Yes
Daphoenositta chrysoptera	Varied Sittella	V	-	The Varied Sittella occurs in eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of foraging habitat and potential nesting habitat.	Yes
Pandion haliaetus	Eastern Osprey	V	M	The Eastern Osprey favours coastal areas, especially the mouths of large rivers, lagoons and lakes. They feed on fish over clear, open water. The Eastern Osprey breeds from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea (OEH 2016) This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is approximately 15 km north of the Modification area. No potential habitat for this species is located within the Modification area.	No

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Stagonopleura guttata	Diamond Firetail	V	-	The Diamond Firetail is typically found in grassy eucalypt woodlands, but also occurs in open forest, mallee, natural grassland, and in secondary grassland derived from other communities. It is often found in riparian areas and sometimes in lightly wooded farmland (OEH 2016). This species was not recorded during the field surveys for the Modification, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Likely habitat for this species exists within the Modification area in the form of foraging habitat and potential nesting habitat.	Likely
Mammals					
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE mainland population)	V	E	The Spotted-tailed Quoll has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 2 km north of the Modification area. Potential habitat for this species exists within the Modification area in the form of roosting (tree hollows), nesting and foraging (woodland) habitats.	Potential
Phascolarctos cinereus	Koala	V	V	The Koala is associated with both wet and dry eucalypt forest and woodland with acceptable eucalypt food trees. Some preferred *Eucalyptus* species are: *Eucalyptus albens* (White Box), *E. blakelyi* (Blakely's Red Gum) and *E. punctata* (Grey Gum) (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 8 km south-east of the Modification area. Potential habitat for the Koala exists within the Modification area in the form of feed trees (*Eucalyptus albens* [White Box]).	Potential

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	In NSW the Brush-tailed Phascogale is mainly found east of the Great Dividing Range although there are occasional records west of the divide. This species prefers dry sclerophyll open forest, heath, swamps, rainforest and wet sclerophyll forest (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 2 km north of the Modification area. Potential habitat for this species exists within the Modification area in the form of dry open forest for foraging, shelter and nesting habitat.	Potential
Petaurus norfolcensis	Squirrel Glider	V	-	The Squirrel Glider is associated with dry forest and woodlands typically including high nectar producing species, including winter flower species (OEH 2016). The presence of hollow-bearing eucalypts is a critical habitat feature for the Squirrel Glider (OEH 2016). This species was not recorded during the field survey, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring.. Potential habitat for this species in the form of foraging, nesting and shelter (woodlands containing *Eucalyptus punctata* [Grey Gum]*, E. blakelyi* [Blakely's Red Gum]*, E. albens* [White Box]*, E. melliodora* [Yellow Box] and *Angophora floribunda* [Rough-barked Apple]) exists within the Modification area.	Potential
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	The Brush-tailed Rock-wallaby is found in rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices and usually near fresh water (OEH 2016). This species was not recorded during the field surveys for the Modification, however it has been previously recorded during assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. No potential habitat for this species exists within the Modification area.	Likely

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	The Grey-headed Flying-fox roosts in large camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy (OEH 2016). This species was not recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is immediately north of the Modification area. Potential habitat for this species exists within the Modification in the form of foraging habitat, with no roost sites occurring within the Modification.	Potential
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	The Yellow-bellied Sheathtail-bat is found in almost all habitats, from wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests and heathland. This species roosts in tree hollows; may also use caves; has also been recorded in a tree hollows in paddock trees (OEH 2016). This species was recorded during the field surveyand was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Yes
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	Most records of the Eastern Freetail-bat are from dry eucalypt forest and woodland east of the Great Dividing Range (OEH 2016). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges. The Eastern Freetail-bat primarily roosts in hollows or behind loose bark in mature eucalypts (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Yes

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Miniopterus australis	Little Bentwing-bat	V	-	The Little Bentwing-bat inhabits moist eucalypt forest, wet and dry sclerophyll forest. This species is generally found in well-timbered areas. Roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. Males and juveniles disperse in summer. Only five nursery sites/maternity colonies are known within Australia (OEH 2016). This species was not recorded during the field surveys for the Modification, however it was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring.. Potential habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Potential
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	The Eastern Bentwing-bat is associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (OEH 2016). It forages above and below the tree canopy on small insects. This species will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (OEH 2016). This species was not recorded during the field survey, however was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees and caves).	Potential
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	The Corben's Long-eared Bat is thought to prefer structurally complex forest as foraging habitat, and breeding and sheltering is in tree hollows (OEH 2016). This species has not been recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 25 km west of the Modification area. Potential habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Potential

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	The Large-eared Pied Bat has been recorded in a variety of habitats, including dry sclerophyll forests, woodland, sub-alpine woodland, edges of rainforests and wet sclerophyll forests. This species roosts in caves, rock overhangs and disused mine shafts (OEH 2016). This species was recorded during the field survey and was recorded during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Foraging habitat for this species exists within the Modification area in the form of open woodland.	Yes
Chalinolobus picatus	Little Pied Bat	V	-	The Little Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. This species occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee and Bimbil Box and roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. This species feeds on moths and possibly other flying invertebrates (OEH 2016). This species has not been recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 15 km east of the Modification area. Potential foraging habitat for this species exists in the Modification area in the form of open woodland.	Potential
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	The Eastern False Pipistrelle prefers moist habitats with trees taller than 20 m (OEH 2016). This species roosts in tree hollows but has also been found roosting in buildings or under loose bark (OEH 2016). This species was not recorded during the field surveys for the Modification, however it has been previously recorded during assessments undertaken for DA 305-7-2003 and for WCPL approvals, and/or ongoing monitoring. Potential habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Potential

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Myotis macropus	Southern Myotis	V		In NSW the Southern Myotis is found in the coastal band. It is rarely found more than 100 km inland, except along major rivers. Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m (OEH 2016) This species has not been recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 2 km west of the Modification area. Potential habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Potential
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	The Greater Broad-nosed Bat is associated with moist gullies in mature coastal forest, or rainforest, east of the Great Dividing Range (Churchill 2008), tending to be more frequently located in more productive forests. Within denser vegetation types use is made of natural and man-made openings such as roads, creeks and small rivers, where this species hawks backwards and forwards for prey (OEH 2016). This species was recorded during the field survey. Habitat for this species exists within the Modification area in the form of potential foraging and roosting habitat (hollow-bearing trees).	Yes
Vespadelus troughtoni	Eastern Cave Bat	V	-	The Eastern Cave Bat is known to inhabit tropical mixed woodland and wet sclerophyll forest on the coast and the dividing range but extend into the drier forest of the western slopes and inland areas. This species has been found roosting in sandstone overhand caves, boulder piles, mine tunnels and occasionally in buildings (OEH 2016). This species was recorded during the field survey. Foraging habitat for this species exists within the Modification area in the form as open woodland.	Yes

Scientific Name	Common Name	Conservation Significance[1]		Habitat Associations	Likelihood of Occurrence
		TSC Act	EPBC Act		
Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse inhabits open heathlands, open woodlands with a heathland understorey and vegetated sand dunes. A social animal, this species lives predominantly in burrows shared with other individuals (DotE 2016). This species has not been recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 3 km north of the Modification area. Potential habitat for this species exists within the Modification area in the form of nesting and foraging (shrubby woodland on sands).	Potential
Pseudomys oralis	Hastings River Mouse	E	E	In NSW the distribution of the Hastings River Mouse spans the Great Dividing Range, north from Mt Royal in the Hunter Valley at elevations between 300 m and 1100 m. This species prefers dry open forest types with dense, low ground cover. Access to seepage zones, creeks and gullies is important, as is permanent shelter such as rocky outcrops. Nests may be in either gully areas or ridges and slopes. They eat seeds, leaves, insects and fungi. This species has not been recorded during the field survey or during previous assessments undertaken for DA 305-7-2003 and for WCPL approvals and/or ongoing monitoring. The closest record of this species is less than 45 km north of the Modification area. Potential habitat for this species exists within the Modification area in the form of nesting and foraging habitat.	Potential

[1] Conservation status listed under the TSC Act and the EPBC Act, current at January 2016.

TSC Act Status: E – Endangered; V – Vulnerable; CE – Critically Endangered; M = Migratory; Ma = Marine.

EPBC Act Status: E – Endangered; V – Vulnerable; M – Migratory, Ma – Marine.

Appendix B – Fauna Species Recorded in the Study Area

Scientific Name	Common Name
Amphibians	
Litoria caerulea	Green Tree Frog
Litoria fallax	Eastern Sedge Frog
Litoria latopalmata	Broad-palmed Rocket Frog
Litoria peronii	Emerald-spotted Tree Frog
Limnodynastes tasmaniensis	Spotted Marsh Frog
Crinia signifera	Eastern Froglet
Uperoleia laevigata	Eastern Gungan
Birds	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill
Acanthiza lineata	Striated Thornbill
Acanthiza nana	Yellow Thornbill
Acanthiza pusilla	Brown Thornbill
Acanthiza reguloides	Buff-rumped Thornbill
Calamanthus pyrrhopygia	Chestnut-rumped Heathwren
Chthonicola sagittata	**Speckled Warbler**
Gerygone albogularis	White-throated Gerygone
Gerygone fusca	Western Gerygone
Gerygone mouki	Brown Gerygone
Origma solitaria	Rockwarbler
Sericornis frontalis	White-browed Scrubwren
Sericornis magnirostra	Large-billed Scrubwren
Smicrornis brevirostris	Weebill
Accipiter fasciatus	Brown Goshawk
Aquila audax	Wedge-tailed Eagle
Circus assimilis	**Spotted Harrier**
Elanus axillaris	Black-shouldered Kite
Acrocephalus australis	Australian Reed-Warbler
Aegotheles cristatus	Australian Owlet-nightjar
Anas gracilis	Grey Teal
Anas superciliosa	Pacific Black Duck
Aythya australis	Hardhead
Chenonetta jubata	Australian Wood Duck

Scientific Name	Common Name
Malacorhynchus membranaceus	Pink-eared Duck
Ardea intermedia	Intermediate Egret
Ardea modesta	Eastern Great Egret
Ardea pacifica	White-necked Heron
Egretta novaehollandiae	White-faced Heron
Nycticorax caledonicus	Nankeen Night Heron
Artamus cyanopterus	Dusky Woodswallow
Cracticus nigrogularis	Pied Butcherbird
Cracticus tibicen	Australian Magpie
Cracticus torquatus	Grey Butcherbird
Strepera graculina	Pied Currawong
Cacatua galerita	Sulphur-crested Cockatoo
Eolophus roseicapillus	Galah
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Coracina papuensis	White-bellied Cuckoo-shrike
Elseyornis melanops	Black-fronted Dotterel
Erythrogonys cinctus	Red-kneed Dotterel
Vanellus miles	Masked Lapwing
Cisticola exilis	Golden-headed Cisticola
Climacteris picumnus victoriae	**Brown Treecreeper (eastern subspecies)**
Cormobates leucophaea	White-throated Treecreeper
Geopelia humeralis	Bar-shouldered Dove
Geopelia striata	Peaceful Dove
Leucosarcia picata	Wonga Pigeon
Ocyphaps lophotes	Crested Pigeon
Phaps chalcoptera	Common Bronzewing
Corcorax melanorhamphos	White-winged Chough
Corvus coronoides	Australian Raven
Cacomantis flabelliformis	Fan-tailed Cuckoo
Chalcites basalis	Horsfield's Bronze-Cuckoo
Chalcites lucidus	Shining Bronze-Cuckoo
Eudynamys orientalis	Eastern Koel
Scythrops novaehollandiae	Channel-billed Cuckoo
Neochmia temporalis	Red-browed Finch
Taeniopygia bichenovii	Double-barred Finch
Psophodes olivaceus	Eastern Whipbird
Falco cenchroides	Nankeen Kestrel
Falco peregrinus	Peregrine Falcon

Scientific Name	Common Name
Dacelo novaeguineae	Laughing Kookaburra
Hirundo neoxena	Welcome Swallow
Petrochelidon nigricans	Tree Martin
Malurus cyaneus	Superb Fairy-wren
Malurus lamberti	Variegated Fairy-wren
Cincloramphus mathewsi	Rufous Songlark
Acanthagenys rufogularis	Spiny-cheeked Honeyeater
Grantiella picta	**Painted Honeyeater**
Lichenostomus chrysops	Yellow-faced Honeyeater
Lichenostomus leucotis	White-eared Honeyeater
Lichenostomus melanops	Yellow-tufted Honeyeater
Lichenostomus penicillatus	White-plumed Honeyeater
Manorina melanocephala	Noisy Miner
Manorina melanophrys	Bell Miner
Meliphaga lewinii	Lewin's Honeyeater
Melithreptus brevirostris	Brown-headed Honeyeater
Philemon corniculatus	Noisy Friarbird
Plectorhyncha lanceolata	Striped Honeyeater
Menura novaehollandiae	Superb Lyrebird
Merops ornatus	Rainbow Bee-eater
Grallina cyanoleuca	Magpie-lark
Myiagra rubecula	Leaden Flycatcher
Anthus novaeseelandiae	Australasian Pipit
Dicaeum hirundinaceum	Mistletoebird
Daphoenositta chrysoptera	**Varied Sittella**
Oriolus sagittatus	Olive-backed Oriole
Colluricincla harmonica	Grey Shrike-thrush
Pachycephala pectoralis	Golden Whistler
Pachycephala rufiventris	Rufous Whistler
Pardalotus punctatus	Spotted Pardalote
Pardalotus striatus	Striated Pardalote
Pelecanus conspicillatus	Pelican
Eopsaltria australis	Eastern Yellow Robin
Melanodryas cucullata cucullata	**Hooded Robin (south-eastern form)**
Microeca fascinans	Jacky Winter
Petroica goodenovii	Red-capped Robin
Phalacrocorax carbo	Great Cormorant
Coturnix ypsilophora	Brown Quail

Scientific Name	Common Name
Podargus strigoides	Tawny Frogmouth
Poliocephalus poliocephalus	Hoary-headed Grebe
Tachybaptus novaehollandiae	Australasian Grebe
Pomatostomus temporalis	**Grey-crowned Babbler (eastern subspecies)**
Alisterus scapularis	Australian King-Parrot
Glossopsitta pusilla	**Little Lorikeet**
Platycercus elegans	Crimson Rosella
Platycercus eximius	Eastern Rosella
Psephotus haematonotus	Red-rumped Parrot
Fulica atra	Eurasian Coot
Gallinula tenebrosa	Dusky Moorhen
Porphyrio porphyrio	Purple Swamphen
Himantopus leucocephalus	Black-winged Stilt
Rhipidura albiscapa	Grey Fantail
Rhipidura leucophrys	Willie Wagtail
*Sturnus tristis**	Common Myna*
*Sturnus vulgaris**	Common Starling*
Platalea flavipes	Yellow-billed Spoonbill
Platalea regia	Royal Spoonbill
Zosterops lateralis	Silvereye
Mammals	
*Canis **	Dog
*Vulpes vulpes**	Red Fox
Antechinus flavipes	Yellow-footed Antechinus
*Lepus europaeus**	European Brown hare
*Oryctolagus cuniculus**	Rabbit
Macropus giganteus	Eastern Grey Kangaroo
Macropus robustus	Wallaroo
Macropus rufogriseus	Red-neck Wallaby
Wallabia bicolor	Swamp Wallaby
Trichosurus vulpecula	Brushtail Possum
Tachyglossus aculeatus	Short-beaked Echidna
Vombatus ursinus	Common Wombat
Austronomus australis	White-striped Freetail-bat
Chalinolobus dwyeri	**Large-eared Pied Bat**
Chalinolobus gouldii	Gould's Wattled Bat
Mormopterus norfolkensis	**Eastern Freetail-bat**
Mormopterus planiceps	South-eastern Freetail-bat

Scientific Name	Common Name
Nyctophilus sp	Long-eared Bat
Rhinolophus megaphyllus	Eastern Horseshoe Bat
Saccolaimus flaviventris	**Yellow-bellied Sheathtail-bat**
Scoteanax rueppellii	**Greater Broad-nosed Bat**
Scotorepens orion	Eastern Broad-nosed Bat
Vespadelus darlingtoni	Large Forest Bat
Vespadelus pumilus	Eastern Forest Bat
Vespadelus troughtoni	**Eastern Cave Bat**
Vespadelus vulturnus	Little Forest Bat
Reptiles	
Amphibolurus muricatus	Jacky Lizard
Intellagama lesuerii	Eastern Water Dragon
Pogona barbata	Bearded Dragon
Underwoodisaurus milii	Thick-tailed Gecko
Diplodactylus vittatus	Wood Gecko
Pygopus lepidopodus	Common Scaly-foot
Anomolopus swansoni	Swanson's Worm Skink
Carlia tetradactyla	Southern Rainbow-skink
Ctenotus robustus	Robust Ctenotus
Ctenotus taeniolatus	Copper-tailed Skink
Cyclodomorphus gerardii	Pink-tongued Lizard
Egernia striolata	Tree Skink
Eulamprus quoyii	Eastern Water-skink
Liopholis whitii	White's Skink
Lygisaurus foliorum	Tree-base Litter Skink
Varanus varius	Lace Monitor
Chelodina longicollis	Eastern Snake-necked Turtle
Pseudechis porphyriacus	Red-bellied Black Snake

* - Exotic Species.

Appendix C – EP&A Act Assessment of Significance

Under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005), an assessment of the possibility of 'significant effect on threatened species, populations or ecological communities, or their habitats' is required. The threatened species that are the subject of the '*Assessment of Significant Effect'* for the Modification are:

- *Litoria aurea* (Green and Golden Bell Frog)
- *Lophoictinia isura* (Square-tailed Kite)
- *Circus assimilis* (Spotted Harrier)
- *Hieraaetus morphnoides* (Little Eagle)
- *Calyptorhynchus lathami* (Glossy Black-Cockatoo)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Glossopsitta pusilla* (Little Lorikeet)
- *Neophema pulchella* (Turquoise Parrot)
- *Lathamus discolor* (Swift Parrot)
- *Tyto novaehollandiae* (Masked Owl)
- *Ninox strenua* (Powerful Owl)
- *Climacteris picumnus victoriae* (Brown Treecreeper [eastern subspecies])
- *Chthonicola sagittata* (Speckled Warbler)
- *Anthochaera phrygia* (Regent Honeyeater)
- *Grantiella picta* (Painted Honeyeater)
- *Melanodryas cucullata cucullata* (Hooded Robin [south-eastern form])
- *Petroica phoenicea* (Flame Robin)
- *Petroica boodang* (Scarlet Robin)
- *Pomastomus temporalis temporalis* (Grey-crowned Babbler [eastern subspecies])
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Stagonopleura guttata* (Diamond Firetail)

- *Phascolarctos cinereus* (Koala)
- *Petrogale penicillata* (Brush-tailed Rock-Wallaby)
- *Petaurus norfolcensis* (Squirrel Glider)
- *Dasyurus maculatus maculatus* (Spotted-tailed Quoll [SE mainland population])
- *Phascogale tapoatafa* (Brush-tailed Phascogale)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)
- *Mormopterus norfolkensis* (Eastern Freetail-bat)
- *Miniopterus australis* (Little Bentwing-bat)
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)
- *Nyctophilus corbeni* (Corben's Long-eared Bat)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Chalinolobus picatus* (Little Pied Bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle)
- *Myotis macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Greater Broad-nosed Bat)
- *Vespadelus troughtoni* (Eastern Cave Bat)
- *Pseudomys novaehollandiae* (New Holland Mouse)
- *Pseudomys oralis* (Hastings River Mouse).

Litoria aurea (Green and Golden Bell Frog)

Litoria aurea (Green and Golden Bell Frog [GGBF]) is an endangered species listed under schedule 1 of the TSC Act and as a vulnerable species under the EPBC Act.

This species was once considered common throughout its predominately coastal range encompassing the coastal areas between Brunswick Head in north-east NSW and North-east Victoria and extending as far west as Bathurst. The species is now estimated to be absent from at least 90% of this area being limited to fragmented populations (OEH 2016). Within western Sydney a population referred to as the 'St Marys population' is known to occur, consisting of a number of sub-populations on lands at St Marys, Mt Druitt, Prospect and Riverstone (OEH 2016).

The species appears to use a number of habitat components during different parts of its life cycle including breeding, foraging and refuge habitat and habitat to facilitate movement patterns. The ideal breeding habitat for GGBFs is shallow, still or slow flowing waterbodies without heavy shading. This incorporates a range of waterbodies including both natural and man-made waterbodies including estuarine and fresh water wetlands through to minor structures such as tanks, wells and water troughs (OEH 2016). In addition to aquatic breeding sites GGBFs utilise terrestrial habitats, generally peripheral to breeding habitat, for foraging and/or refuge. GGBFs appear to favour terrestrial areas with extensive grassy areas and an abundance of shelter sites such as rocks and logs. Refuge habitat is required by the species during periods of metabolic quiescence particularly during the cooler parts of the year but also when not diurnally active or seeking shelter from adverse conditions or predators (OEH 2016).

A number of threats are recognised as contributing to the decline in GGBFs including habitat loss, modification and disturbance, predation of tadpoles by *Gambusia holbrooki* (Plague Minnow), spread of amphibian chytrid fungus, high frequency fire within foraging and refuge habitat and predation by introduced fauna.

This species was not detected during the field surveys although potential foraging and refuge habitat was identified within the Study area.

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been completed to assess potential impacts to the GGBF.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The Modification may potentially impact foraging and sheltering habitat through potential surface cracking in ephemeral waterways and dams. Potential habitat with the Modification area is relatively minor in regards to potential habitat in the surrounding area, and no known population of GGBF occurs within the Modification area. Potential impacts from subsidence along creeklines, including additional ponding areas may create further potential habitat for the GGBF within the Modification area. Subsidence impacts are already approved within the Modification area and any additional subsidence associated with the Modification is considered unlikely to affect the lifecycle of this species or cause a long-term decrease in the size of an important population of the GGBF (if the species is present).
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The Modification may potentially impact foraging and sheltering habitat through potential surface cracking in ephemeral waterways and dams. Potential habitat with the Modification area is relatively minor in regards to potential habitat in the surrounding area, and no known population of GGBF occurs within the Modification area.

Factor	Assessment
	Extensive areas of potential habitat will continue to exist in the Modification area, and to the east and west of the Modification area.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of the species distribution.
How is the proposal likely to affect current disturbance regimes?	Subsidence impacts are already approved within the Modification area and any additional subsidence impacts associated with the Modification is not considered to have a significant impact on any local population of the GGBF (if the species is present).
How is the proposal likely to affect habitat connectivity?	The area of potential habitat to be cleared is located in areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation and riparian habitat occurring adjacent to the proposed surface disturbance areas, connecting it to wooded, forested and riparian areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

Vulnerable Small Woodland Birds

These 11 species occupy distinct ecological niches. Some species are nectarivores and frugivores, granivores and some are insectivores. All species have individually specific foraging and nesting needs (e.g. canopy, ground cover, tree trunk, fallen debris) within the woodland environment. Despite the variations in foraging and nesting, these species all share the need for suitable, non-fragmented woodland habitat to forage and breed within. All of these species have suffered extents of decline across their distributional ranges in NSW resulting in their Vulnerable listing.

***Climacteris picumnus victoriae* (Brown Treecreeper [eastern subspecies])**

This species inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, open ground and fallen timber. It nests in hollows of standing dead or live trees and tree stumps. Fallen timber is an important habitat component for this species and is regularly foraged upon (OEH 2016). The Brown Treecreeper is considered to be a sedentary species, though some birds may disperse locally after breeding (OEH 2016). Populations consist of pairs to groups of three to six.

***Stagonopleura guttata* (Diamond Firetail)**

The Diamond Firetail can be found in grassy eucalypt woodlands, including Box-Gum Woodlands. This species can also be found in open forest, mallee, riparian vegetation, and grasslands. This species is often seen in flocks of between five to forty birds. It is a ground feeder, feeding on ripe and partly-ripe grass, herb seeds, green leaves, and on insects. It nests in dense shrubs or in tree canopy (OEH 2016).

***Daphoenositta chrysoptera* (Varied Sittella)**

The distribution of this species includes most of mainland Australia with the exception of deserts and open grasslands. It prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches, mallee and *Acacia spp.* woodland and feeds on arthropods from bark, dead branches, or small branches and twigs. The Varied Sitella nests in a small cup built onto a branch or peeling bark crevice of a rough-barked tree (OEH 2016).

***Chthonicola sagittata* (Speckled Warbler)**

The Speckled Warbler inhabits a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. A typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. The bird builds a grass dome nest in a dense grass tussock or shrub (OEH 2016).

Large, relatively undisturbed remnant vegetation is required for the species to persist in an area. The diet of this species consists of seeds and insects, with most foraging occurring around the base of tussocks and under bushes and trees. Speckled Warblers often join mixed species' feeding flocks in winter, with other species such as the Yellow-rumped, Buff-rumped, Brown and Striated Thornbills (OEH 2016).

***Pomatostomus temporalis temporalis* (Grey-crowned Babbler [eastern subspecies])**

This species inhabits open woodlands dominated by mature eucalypts with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. This species avoids very wet areas. Nesting occurs in a large stick nest within the canopy of a medium sized *Allocasurina sp*., *Acacia sp*. or *Callitris sp*. Chicks are raised communally with roosting occurring in old nests (OEH 2016).

***Petroica boodang* (Scarlet Robin)**

During autumn and winter some birds migrate from higher altitudes to the eastern edges of the inland plains. They inhabit dry eucalypt forests and woodlands with an open grassy understorey with few scattered shrubs. Abundant logs and fallen timber are important components of its habitat (OEH 2016).

***Petroica phoenicea* (Flame Robin)**

During autumn and winter some birds may appear on the eastern edges of the inland plains. They inhabit dry eucalypt forests and woodlands with an open grassy understorey with few scattered shrubs. Abundant logs and fallen timber are important components of its habitat. This species displays flocking behaviour and often appear in areas after fire (OEH 2016).

***Melanodryas cucullata cucullata* (Hooded Robin [south-eastern form])**

This bird is associated with a wide range of eucalypt woodlands, shrubland and open forests. In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover. Hooded Robin home ranges are relatively large, averaging 18 hectares (ha) for birds from the New England Tableland (OEH 2016).

***Neophema pulchella* (Turquoise Parrot)**

This species is found in rocky ridges and gullies, rolling hills, valleys and river flats and the plains of the Great Dividing Range (OEH 2016) and spends much of the time on the ground foraging on seed and grasses (OEH 2016). It is associated with open forests and timbered grasslands, especially eco tones between woodland and grasslands with a high proportion of native grasses and forbs (OEH 2016).

***Glossopsitta pusilla* (Little Lorikeet)**

This species is distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range. It is a nomadic nectarivore which follows flowering of preferred food trees such as *Eucalyptus albens, E. melliodora, E. blakelyi, E. sideroxylon, E. tereticornis* and mistletoes (OEH 2016).

***Grantiella picta* (Painted Honeyeater)**

This species is nomadic and typically inhabits box-ironbark-gum woodlands with abundant mistletoe. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring *Amyema sp.* mistletoe (OEH 2016).

Assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been addressed to assess potential impacts of the proposed Modification on these species.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The surface disturbance conatins suitable habitat for foraging, nesting and roosting habitat for all of the above mentioned vulnerable woodland birds. The proposed surface disturbance area contains 7.9 ha of potential foraging habitat (majority of which is mixed native/exotic grassland), of which 3.4 ha provides potential nesting and roosting habitat (woodland and tall shrubland habitat). Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. Given that similar habitat for these mobile species is available across the locality and the region, the small area of habitat loss from the proposed surface disturbance, the Modification is unlikely to affect the life cycles of viable local populations of these species such that they would be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	Approximately 7.9 ha of potential foraging habitat (majority of which is mixed native/exotic grassland), of which 3.4 ha of potential potential nesting and roosting habitat would be removed by the proposed surface disturbance. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. It is noted, however, that much larger areas of potential habitat will continue to exist within the underground disturbance area, as well as to the south, east and west of the Modification area.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of these species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 7.9 ha of woodland and mixed native/exotic grassland and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas, including within the underground disturbance. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved by the existing three mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

Nomadic Nectivorous Birds

These two species have undergone significant population declines, and although highly mobile have suffered from historical clearing of temperate woodlands across NSW. The Swift Parrot is a non-breeding annual foraging visitor to NSW. The Regent Honeyeater is a breeding resident of NSW but has suffered from a severe reduction in preferred breeding locations and foraging habitat. Both species are nomadic in NSW, following fluctuating flowering among a selection of *Eucalyptus spp., Corymbia spp.* and Rough-barked Apple.

***Anthochaera Phrygia* (Regent Honeyeater)**

This species is a nomadic, migratory nectivorous bird that occurs in open woodlands and forests, particularly *Eucalyptus sideroxylon* (Mugga Ironbark), Yellow Box, Blakely's Red Gum and White Box associations on fertile flats and alluvial areas (DotE 2016; OEH 2016). Foraging can occur anywhere there is sufficient flowering of potential feed trees and elsewhere (DotE 2016; OEH 2016). Breeding is only known from select areas within its distribution. The closest location to the Modification site is the Capertee Valley (approximately 60 km south-east). The bulk of the population forages and breeds in box-gum and ironbark woodlands west of the great divide (DotE 2016; OEH 2016) and makes sporadic migratory movements to the east to forage on coastal flowering eucalypt species during times of low eucalypt flowering inland (DotE 2016; OEH 2016).

***Lathamus discolour* (Swift Parrot)**

This species is a nomadic, migratory nectivorous bird that occurs in open woodlands and forests, particularly Mugga Ironbark, Yellow Box, Blakely's Red Gum, *E.tereticornis* (Forest Red Gum), and White Box associations on fertile flats and alluvial areas (DotE 2016; OEH 2016). Foraging can occur anywhere there is sufficient flowering of potential feed trees and elsewhere (DotE 2016; OEH 2016). It breeds in Tasmania during spring and summer, migrating to south-eastern Australia in the autumn and winter months (OEH 2016).

Potential habitat for the Regent Honeyeater and Swift Parrot to forage or pass through exists within the Study area, although neither species has been recorded within 5 km of the site.

Assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005) has been addressed to assess potential impacts of the proposed Modification on these species.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The Study area contains White Box and Forest Red Gum, that are known to provide habitat of the Regent Honeyeater. Evidence of foraging or breeding has not been recorded in the Modification area, with the closest record of this species approximately 7 km to the east. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. The Study area exists within potential habitat of the Swift Parrot. Important feed species are present within the Study area. It is therefore likely that the Study area may represent potential foraging habitat for the Swift Parrot. Evidence of foraging has not been recorded in the Modification area. Given that similar habitat for these highly mobile species are available across the locality and the region, the small area of habitat loss from the proposed impact is unlikely to affect the life cycles of viable local populations of these species such that they would be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	Approximately 0.6 ha of potential foraging habitat, (forest/woodland) containing potential feed trees (White Box and Red Gum) would be removed by the proposed surface disturbance. It is noted, however, that much larger areas of potential habitat will continue to exist within the underground disturbance area, as well as to the south, east and west of the Modification area.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of these species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 7.9 ha of woodland and mixed native/exotic grassland and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to potential surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved by the existing three mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

Vulnerable Raptors

These three raptors are apex predators. They each occupy different foraging niches but all share the need for abundant vertebrate prey resources and large territories for breeding. They all overlap in their need for sheltered, mature canopy trees for nesting. All three species build their nest out of sticks in a tree and lay their eggs around spring (or sometimes autumn), with young remaining in the nest for several months. All prey on birds, mammals and reptiles and occasionally insects, but only the Little Eagle forages on carrion (OEH 2016). The Square-tailed Kite's diet features small and medium sized woodland birds, while the Spotted Harrier mostly preys on small grassland birds and mammals and the Little Eagle mostly preys on small to medium sized grassland mammals and medium to larger birds.

***Circus assimilis* (Spotted Harrier)**

The Spotted Harrier is a medium-sized, slender bird of prey which is found throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population (OEH 2016).

The Spotted Harrier can be found within grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grass land and shrubland. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands (OEH 2016).

***Hieraaetus morphnoides* (Little Eagle)**

The Little Eagle is a medium to large, stocky raptor which closely resembles a kite rather than an eagle. It occupies open eucalypt forest, woodland or open woodland and grassland. This species may be in decline as a result of loss of prey species (decline in critical weight range marsupials and rabbits) and secondary poisoning from pindone (OEH 2016).

***Lophoictinia isura* (Square-tailed Kite)**

This species is a medium to large sized raptor with long-broad wings. It occurs in woodland and forested areas with an abundance of small birds on which it feeds (OEH 2016). This species is sometimes recorded breeding and foraging along inland timbered watercourses and is also known to forage in wooded farmland or urban environments (OEH 2016).

Assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been addressed to assess potential impacts of the proposed Modification to these species.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The proposed Modification would potentially impact/modify a small area of foraging habitat within the Modification area. The potential removal of a small amount of mixed native/exotic grassland and woodland vegetation within the surface disturbance areas is unlikely to significantly affect foraging habitat for these species. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. The vegetation to be removed has been previously modified which reduces its suitability as nesting habitat. Higher quality habitat remains in the Study area and would not be disturbed as a result of the Modification proposal. No clearing works would take place in any areas where nests of these species are known or observed. As such, the proposed Modification is not likely to affect the life cycle of these species.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	Habitat for the Spotted Harrier, Square-tailed Kite and Little Eagle present within the Modification area consists of vegetation which could be used for foraging and nesting. The proposed Modification would potentially impact/remove a small area of woodland and mixed native/exotic grassland foraging habitat (but not nesting habitat) within the surface disturbance areas (a maximum of 7.9 ha). The Study area has undergone clearing in the past and is subject to ongoing grazing activities.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of these species distribution.
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland/tall shrubs and 4.5 ha of mixed native/exotic grassland and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features.

Factor	Assessment
	The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved by the existing three mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

Vulnerable Forest Owls

These two species of bird occupy very distinct ecological niches. Both species share the need for large tree-hollows in which to nest and extensive woodland in which to forage (OEH 2016).

***Ninox strenua* (Powerful Owl)**

The Powerful Owl occurs in forests and woodlands with mature hollow-bearing trees and abundant mammalian prey (particularly possums). It can inhabit a wider range of vegetation types, preferring large tracts of woodland or forest habitat and forages in fragmented landscapes. This species nests in large hollows in mature trees near thick forest growth (OEH 2016).

***Tyto novaehollandiae* (Masked Owl)**

The Masked Owl lives in dry eucalypt forests and woodlands from sea level to 1100 metres (m). Pairs have a large home-range of 500 to 1000 ha. This species roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Their diet typically consists of tree-dwelling and ground mammals, especially rats (OEH 2016).

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005) has been completed to assess potential impacts to these species.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The surface disturbance contains suitable habitat for foraging, nesting and roosting habitat for all of the above mentioned vulnerable owls. The proposed surface disturbance area contains 7.9 ha of potential foraging habitat (majority of which is mixed native/exotic grassland), of which 3.4 ha provides potential nesting and roosting habitat (woodland and tall shrubland habitat). Areas of historically cleared vegetation containing large hollow bearing trees (paddock trees), which are potential breeding resources for at least one of these species (Masked Owl), could be removed for the proposed surface disturbances. This could limit species recruitment and displace breeding pairs.

Factor	Assessment
	Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. Increased noise and light may deter Owls from breeding or foraging in areas immediately adjacent to the surface distrubance areas which would be retained. The Study area is considered to represent a small component of these threatened owl's home ranges. As connectivity to large expanses of native bushland and conservation reserves would be retained, these owls would have access to alternative foraging areas and breeding sites outside the Modification area. Therefore, the removal of this potential breeding habitat is not expected to impact the species such that they would decline.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The proposed Modification would result in the removal of a limited area of marginal foraging habitat in the form of shrubs which support small and medium sized mammals (prey for Masked Owl and Powerful Owl). Such shrubbery may also be used for roosting purposes by both. The total area of potential foraging and roosting habitat removed under the proposed Modification would be 7.9 ha. Very limited potential nesting habitat for any of these species would be impacted and this impact would be restricted to the previously disturbed, surface disturbance areas. Even though hollow-bearing trees may be removed through the surface disturbance activities, their position in an already disturbed landscape reduce their suitability for nesting by these disturbance-sensitive species. The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. If the species occurs within in the Modification area, potential habitat being removed may be used by the species as a shelter and breeding resource. It is noted, however, that much larger areas of potential habitat exist to the east and west of the Modification area.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at a known limit of these species distribution.
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland/tall shrubs and 4.5 ha mixed native/exotic grassland and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to potential surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved for the existing mining operations in the locality.

Factor	Assessment
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

Vulnerable Cockatoos

***Callocephalon fimbriatum* (Gang-gang Cockatoo)**

The Gang-gang Cockatoo is an altitudinal migrant, spending spring and summer in tall montane forests, and migrating to lower altitude, drier woodlands in winter. This species breeds from spring to summer in tall montane forests, and therefore would not breed in the lower altitude, drier woodlands of the Study area. As such, the breeding cycle of this species is unlikely to be affected. The species also requires a proximal source of freshwater for drinking (OEH 2016).

***Calyptorhynchus lathami* (Glossy Black-Cockatoo)**

The Glossy Black-Cockatoo is found in a variety of forest types in the Study area containing *Allocasuarina sp*. (particularly *A. gymnanthera* and *A. diminuta*). Large tree hollows in sheltered woodlands are required for nesting. The species also requires a proximal source of freshwater for drinking (OEH 2016).

Assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been addressed to assess potential impacts of the proposed Modification to these species.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	Evidence of foraging or breeding has not been recorded in the Study area; however the potential habitat within the proposed surface disturbance area is likely to support breeding and foraging habitat for the Glossy Black-Cockatoo and foraging habitat for the Gang-gang Cockatoo. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. Given similar habitat considered suitable for these species are available across adjacent woodlands and the surrounding region, the proposed Modification is unlikely to affect the life cycles of viable local populations of these species such that they would be placed at risk of extinction.

Factor	Assessment
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The proposed Modification would clear a maximum area of approximately 7.9 ha of potential foraging habitat (the majority of which is mixed native/exotic grassland), of which 3.4 ha of potential habitat containing potential roosting would be removed by the proposed surface disturbance. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. Very limited potential nesting habitat for any of these species would be impacted and this impact would be restricted to the previously disturbed, surface disturbance areas. Even though hollow-bearing trees may be removed through the surface disturbance activities, their position in an already disturbed landscape reduced their suitability for nesting by these disturbance-sensitive species. The vegetation removal impact is expected to be minimal as it is restricted to potential surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. If the species occurs within in the Modification area, potential habitat being removed may be used by the species as a shelter and breeding resource. It is noted, however, that much larger areas of potential habitat exist to the east and west of the Modification area.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at a known limit of these species distribution.
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland/tall shrubs and 4.5 ha of mixed native/exotic grassland and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved by the existing three mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

Phascolarctos cinereus (Koala)

The Koala occurs in eucalypt woodlands and forests. A list of known habitat and feed tree species in the Hunter-Central Rivers area has been produced (OEH 2016). Of these, one primary food tree species (*Eucalyptus parramattensis*), five secondary food tree species (*E. albens*, *E. dwyeri*, *E. moluccana, E. blakelyi* and *E. melliodora*) and two Stringybark/supplementary species (*E. macrorhyncha* and *E. agglomerata*) were present within the Study area. In addition, two tree species listed under Schedule 2 of the SEPP 44 were present within the Study area, *E. punctata* and *E. albens. E. blakelyi* was also present in the Study area.

Koalas spend most of their time in trees (resting and foraging), but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than 2 ha to several hundred hectares in size. The species is generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year (OEH 2016).

Assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005)has been addressed to assess potential impacts of the proposed Modification on the Koala.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	Koala was not recorded in the Study area during the field survey. The species is considered as having potential to occur, but in low numbers. Potential foraging habitat in the form of White Box and Red Gum trees would be removed as a result of the proposed surface disturbance. However, the removal of this potential habitat is marginal (0.6 ha in total) and is unlikely to impact the Koala due to its high dispersal capability across suitable habitat which would remain in the locality. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. Increased noise and light may deter Koala from foraging in areas immediately adjacent to the Modification area which would be retained. This species may move through the proposed surface disturbance areas between more suitable habitat patches which would remain unaffected in the proposed underground disturbance areas. The surface disturbance areas are not likely to constitute important breeding habitat. Therefore the Koala's life cycle is unlikely to be significantly impacted such that local populations would be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The proposed Modification would remove up to 0.6 ha of potential foraging habitat for the Koala from the Modification area. This habitat is not considered important for a local population. The proposed Modification is considered unlikely to fragment habitat for this species as the only habitat clearing expected will take place in areas of historically disturbed woodland that exist on the edge of more suitable woodland which would remain unaffected.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of this species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed surface disturbance works would clear a maximum area of approximately 3.4 ha of woodland and would add to the current disturbance regimes. However, impacts would be managed including measures to revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable habitat. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved by the existing three mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

Petrogale penicillata (Brush-tailed Rock-wallaby)

The Brush-tailed Rock-wallaby is listed as an Endangered species under the TSC Act and Vulnerable under the EPBC Act. The closest record of this species is over 40 km south-west of the Modification area.

The Brush-tailed Rock-wallaby is found in rocky areas in a variety of habitats, typically north facing sites with numerous ledges, caves and crevices and usually near fresh water (OEH 2016). This species browses on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. This species is highly territorial and have strong site fidelity with an average home range size of about 15 ha.

This species was not recorded during the field surveys for the Modification, however has been previously recorded during ongoing monitoring. There were no clifflines identified within the Modification area (MSEC 2016). Potential threats to this species include loss, degradation and fragmentation of habitat (OEH 2016).

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been completed to assess potential impacts to the Brush-tailed Rock-wallaby.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	No decrease would occur in the habitat that is available for this species. Any habitat that may be impacted by subsidence is insignificant compared to the volume of suitable foraging and sheltering habitat which would remain in the surrounding adjacent vegetation. Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species potentially present within the Modification area.

Factor	Assessment
	Any additional subsidence associated with the Modification is considered unlikely to affect the lifecycle of this species or cause a long-term decrease in the size of an important population of the species (if the species is present).
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The Modification may impact upon only a small area of potential sheltering and foraging habitat for this species. It is unlikely the Modification would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** The Modification would not result in any further increase in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. The Modification would only impact potential sheltering and foraging habitat. Due to the availability and large expanse of more contiguous and suitable habitat surrounding the Modification area, it is unlikely that the Modification would affect habitat critical to the survival of a species.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of the species distribution.
How is the proposal likely to affect current disturbance regimes?	The Modification would not result in any further increase in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. Subsidence impacts are already approved within the Modification area and any additional subsidence associated with the Modification is not considered to have a significant impact on any local population of the species (if the species is present).
How is the proposal likely to affect habitat connectivity?	The Modification may impact upon only a small area of potential sheltering and foraging habitat for the Brush-tailed rock wallaby. Due to the species being highly fecund and tolerant of disturbed regrowth areas, it is unlikely the Modification would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** The Modification would only impact potential sheltering and foraging habitat. Due to the availability and large expanse of more contiguous and suitable habitat surrounding the Modification area, it is unlikely that the Modification would affect habitat critical to the survival of a species. The Modification would not fragment an existing important population into two or more populations.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

***Petaurus norfolcensis* (Squirrel Glider)**

Petaurus norfolcensis (Squirrel Glider) is a vulnerable species listed under the TSC Act. It is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland, where it occurs in dry sclerophyll forest and woodland (OEH 2016). Suitable habitat for this species requires abundant hollow-bearing trees and a mix of eucalypts including some smooth barked and winter flowering species (OEH 2016).

Squirrel Gliders are nocturnal and dependent upon hollows for shelter. They feed on nectar, pollen, flowers, acacia gum and insects, but may also eat sap from feeding scars from other species of Glider (OEH 2016).

This species is threatened by a number of processes including the loss and fragmentation of habitat through clearing, loss of hollow bearing trees, depletion of food resources by inappropriate fire regimes and predation by foxes and cats.

No Squirrel Gliders were recorded during field surveys undertaken as part of this project, however, this species has been recorded during previous field survey work completed within the Study area.

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been completed to assess potential impacts to the Squirrel Glider.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The Squirrel Glider was not recorded in the Study area during the field survey, however, this species has been recorded during previous field survey work conducted within the Study area. Potential habitat for this species in the form of foraging, nesting and shelter (woodlands containing *Eucalyptus crebra* [Narrow-leaved Ironbark], *E. punctata* [Grey Gum], *E. blakelyi* [Blakely's Red Gum], *E. albens* [White Box], *E. melliodora* [Yellow Box] and *Angophora floribunda* [Rough-barked Apple]) exists within the Modification area. Potential foraging and nesting habitat in the form of flowering and hollow-bearing Narrow-leaved Ironbark, White Box and Blakely's Red Gum trees would be removed as a result of the proposed Modification. However, the removal of this potential habitat is marginal (3.4 ha in total, consisting of small, isolated patches) and is unlikely to impact the Squirrel Glider due to its large home range size and high dispersal capability across suitable habitat which will remain in the locality. Increased noise and light may deter Squirrel Glider from breeding or foraging in areas immediately adjacent to the Study area which would be retained. This species may move through the proposed surface disturbance areas between more suitable habitat patches which will remain unaffected in the proposed underground disturbance areas. The surface disturbance areas are not likely to constitute important breeding habitat. Therefore the Squirrel Glider life cycle is unlikely to be significantly impacted such that local populations will be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The proposed Modification will remove up to 3.4 ha of potential foraging and possibly nesting habitat (hollow-bearing woodland) for the Squirrel Glider from the Study area. This habitat is not considered important for a local population. The proposed Modification is considered unlikely to fragment habitat for this species as the only habitat clearing expected will take place in areas of historically disturbed woodland that exist on the edge of more suitable woodland which will remain unaffected.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the proposed Modification is not at the known extent of this species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland and add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to the proposed surface disturbance areas only. Large undisturbed areas of potential habitat will remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed modification are considered insignificant additions to increased noise and light already approved by the existing mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The Modification area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. The Modification would not affect the overall connectivity, with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

***Dasyurus maculatus* (Spotted-tailed Quoll)**

Dasyurus maculatus (the Spotted-tailed or Tiger Quoll) is a medium-sized marsupial carnivore with reddish-brown fur and white spots. It occupies a range of environments within a disjunct distribution along the east coast of Australia, extending from south-eastern Queensland through NSW and Victoria to Tasmania (OEH 2016).

This species is found in a variety of habitats, including sclerophyll forest and woodlands, coastal heathlands and rainforests. Occasional sightings are made in open country, grazing lands, rocky outcrops and other treeless areas. This species feeds on a wide variety of birds, reptiles, mammals and invertebrates and uses several 'latrines' within its territory for defecation. It is mostly terrestrial, but is also an agile climber (OEH 2016).

Nesting occurs in rock shelters, hollow logs, caves or tree hollows and they use numerous dens within the home range. Estimates of home ranges vary from 800 ha to 20 km^2 and individuals may move several kilometres in a night (OEH 2016).

The Spotted-tailed Quoll is threatened by a number of processes including fragmentation and degradation of habitat through clearing of native vegetation, logging and frequent fire. The loss of large hollow logs and other potential den sites is a major problem, as well as competition for food and predation by foxes and cats (OEH 2016).

The Spotted-tailed Quoll was not detected during field surveys, although there are historical records within the surrounding region.

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been completed to assess potential impacts to the Spotted-tailed Quoll.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The Spotted-tailed Quoll was not recorded in the Study area during the field survey, however, the species is considered as having potential to occur. Potential foraging and nesting habitat in the form of woodland and tall shrubland (approximately 3.4 ha additional to approved disturbance), including hollow logs and trees occurrs within the proposed surface disturbance area and would be removed. However, this potential habitat is marginal due to having been heavily disturbed by historical agriculture and ongoing mining activities. The proposed Modification is unlikely to impact the Spotted-tailed Quoll due to its large home range size and high dispersal capability across suitable habitat which will remain in the locality. Increased noise and light have potential to deter Spotted-tailed Quoll from breeding or foraging in areas immediately adjacent to the Study area that would be retained, however, increased light and noise from the proposed modification are considered insignificant additions to increased noise and light already approved by the existing mining operations in the locality. This species may move through the proposed surface disturbance areas between more suitable habitat patches which will remain unaffected in the proposed underground disturbance areas. The proposed surface disturbance areas are not likely to constitute important breeding habitat. Therefore the Spotted-tailed Quoll life cycle is unlikely to be significantly impacted such that local populations will be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The proposed Modification would remove up to 3.4 ha of potential foraging habitat (woodland/tall shrubland) for the Spotted-tailed Quoll from the Study area. This habitat is not considered important for a local population. The proposed Modification is considered unlikely to fragment habitat for this species as the only habitat clearing expected would take place in areas of historically disturbed woodland that exist on the edge of more suitable woodland which will remain unaffected.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification is not at the known extent of this species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland and tall shrublands, and add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat will remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed modification will not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed modification are considered insignificant additions to increased noise and light already approved by the existing mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The Modification area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. The Modification would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

***Phascogale tapoatafa* (Brush-tailed Phascogale)**

Phascogale tapoatafa (Brush-tailed Phascogale) is a tree-dwelling marsupial carnivore. It has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occassional records west ot the divide (OEH 2016).

This species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. It can also be found within eath, swamps, rainforest and wet sclerophyll forest. This species forages in rough-barked trees of 25 cm DBH or greater and feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates (OEH 2016).

Nesting and sheltering occurs in tree hollows with entrances 2.5 - 4 cm wide and it uses many different hollows over a short time span (OEH 2016).

The Brush-tailed Phascogale is threatened by a number of processes including fragmentation and loss of habitat, the loss of large hollow-bearing trees, and predation foxes and cats (OEH 2016).

The Brush-tailed Phascogale was not detected during field surveys although there are historical records within the surrounding region.

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) has been completed to assess potential impacts to the Brush-tailed Phascogale.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The Brush-tailed Phascogale was not recorded in the Study area during the field survey, however, the species is considered as having potential to occur. Potential foraging and nesting habitat in the form of woodland and tall shrubland (approximately 3.4 ha additional to approved disturbance), including hollow-bearing trees occurrs within the surface disturbance area and would be removed. However, this potential habitat is marginal due to having been heavily disturbed by historical agriculture and ongoing mining activities. The proposed Modification is unlikely to impact the Brush-tailed Phascogale due to its large home range size (20-40 ha for females and 100 ha for males) and high dispersal capability across suitable habitat which will remain in the locality. Increased noise and light may deter size from breeding or foraging in areas immediately adjacent to the study area that will be retained, however, increased light and noise from the proposed modification are considered insignificant additions to increased noise and light already approved by the existing mining operations in the locality. This species may move through the proposed surface disturbance areas between more suitable habitat patches which will remain unaffected in the proposed underground disturbance areas. The surface disturbance areas are not likely to constitute important breeding habitat. Therefore the Brush-tailed Phascogale life cycle is unlikely to be significantly impacted such that local populations would be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The proposed Modification would remove up to 3.4 ha of potential foraging and nesting habitat (woodland and tall shrubland) for the Brush-tailed Phascogale from the Study area. This habitat is not considered important for a local population. The proposed Modification is considered unlikely to fragment habitat for this species as the only habitat clearing expected would take place in areas of historically disturbed woodland that exist on the edge of more suitable woodland which will remain unaffected.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification is not at the known extent of this species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland and tall shrublands additional to approved disturbance, and add to the current disturbance regimes. However, impacts will be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features. The vegetation removal impact is expected to be minimal as it is restricted to proposed surface disturbance areas only. Large undisturbed areas of potential habitat will remain present in areas surrounding the proposed disturbance areas. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for all of these highly mobile species. Consequently the proposed modification will not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed modification are considered insignificant additions to increased noise and light already approved by the existing mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The Modification area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. The Modification would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

Tree-roosting Bats

The following assessment of significance addresses the potential impacts to the following obligate tree-hollow-roosting, threatened bat species.

***Nyctophilus corbeni* (Corben's Long-eared Bat)**

The Corben's Long-eared Bat is a large microbat which occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. It is most abundant in vegetation with a distinct canopy with a dense cluttered shrub layer. It roosts in tree hollows (OEH 2016).

***Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)**

The Yellow-bellied Sheathtail-bat roosts singularly or in groups of up to six, in tree hollows and buildings. In treeless areas they are known to utilise mammal burrows. They forage in most habitats throughout their very wide range, including areas with and without trees and appear to defend an aerial foraging territory (OEH 2016).

***Falsistrellus tasmaniensis* (Eastern False Pipistrelle)**

The Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. It hunts beetles, moths, weevils and other flying insects above or just below the tree canopy (OEH 2016).

***Scoteanax rueppellii* (Greater Broad-nosed Bat)**

The Greater Broad-nosed Bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young (OEH 2016).

Mormopterus norfolkensis (Eastern Freetail-bat)

The Eastern Freetail-bat usually occurs in dry sclerophyll forest, woodland and swamp forests east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures (OEH 2016).

While only one of these five tree-roosting bat species were recorded during the field survey in the Study area, they have each been recorded/or are expected to occur within the locality. Suitable foraging habitat and potential roost sites (hollow-bearing trees) were observed within the Study area.

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005)has been completed to assess potential impacts of the proposed Modification to threatened tree roosting bats.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The surface disturbance contains suitable habitat for foraging and roosting habitat for all of the above mentioned vulnerable microbats. The proposed surface disturbance area contains 7.9 ha of potential foraging habitat (majority of which is mixed native/exotic grassland), of which 3.4 ha provides potential roosting habitat (woodland and tall shrubland habitat). Hollow bearing trees are considered a limiting resource in the Study area and the removal of this resource could impact these species given the likely competition for such resources in the landscape. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area. Potential breeding habitat would be removed for all species which may cause movement out of the Modification area into nearby conservation reserves and other connected patches of forest and woodland. Microbats may also be deterred from breeding in areas adjacent to active mining areas due to increased artificial light. Measures to reduce these potential impacts would be implemented through the Flora and Fauna Management Plan. Indirect impacts such as increased artificial lighting may also interrupt these species and potentially affect breeding success in the Study area.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	Approximately 7.9 ha of potential foraging habitat (the majority of which is mixed native/exotic grassland), of which 3.4 ha of potential habitat containing potential roosting habitat, would be removed by the proposed surface disturbance. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon vegetation and hollow-bearing resources within the Modification area.

Factor	Assessment
	This habitat is considered important for the local populations of these species, if they are present, with the exception of the Eastern False Pipistrelle (This species is an altitudinal migrant that sometimes migrates to lower altitude woodlands in winter). As the 'local populations' are defined as those individuals potentially occurring in the Study area and nearby conservation reserves where suitable habitat is available, they are unlikely to be significantly impacted by the proposed Modification. The proposed Modification is considered unlikely to remove important habitat for these species or fragment suitable habitat for these species as clearing is due to occur only in areas previously disturbed by clearing (for agriculture), or previously approved mining activities. The areas due to be cleared also exist on the edge of more extensive, suitable habitat.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of these species distribution.
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear up to 7.9 ha (majority of which is mixed native/exotic grassland) and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged hollows and bush rock to compensate for the loss of these habitat features.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park. The proposed Modification is considered unlikely to remove important habitat for these species or fragment suitable habitat for these species as clearing is due to occur only in areas previously disturbed by clearing (for agriculture), or previously approved mining activities. The areas due to be cleared also exist on the edge of more extensive, suitable habitat.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

Cave-roosting Bats

The following assessment of significance addresses the potential impacts to the following obligate and non-obligate cave-roosting, threatened bat species.

Obligate Cave-roosting Bats

***Chalinolobus dwyeri* (Large-eared Pied Bat)**

The Large-eared Pied Bat is listed as Vulnerable under the TSC Act. It is a small to medium-sized bat with long, prominent ears and glossy black fur. The lower body has broad white fringes running under the wings and tail-membrane, meeting in a V-shape in the pubic area. The species is found mainly in areas with extensive cliffs and caves, from Rockhampton in southern Queensland to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes (OEH 2016).

The Large-eared Pied Bat roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the *Hirundo ariel* (Fairy Martin). Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves. They remain loyal to the same cave over many years (OEH 2016).

The Large-eared Pied Bat forages in well-timbered areas containing gullies. It frequents low to mid-elevation dry open forest and woodland close to caves, crevices in cliffs, old mine workings and disused mud nests of Fairy Martin. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy (OEH 2016).

The threats to this species include clearing and isolation of forest and woodland habitats near cliffs, caves and old mine workings for agriculture or development; loss of foraging habitat close to cliffs, caves and old mine workings from forestry activities; too-frequent burning, usually associated with grazing; damage to roosting and maternity sites from mining operations, and recreational caving activities; and use of pesticides (OEH 2016).

***Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat)**

The Eastern Bentwing-bat is listed as a Vulnerable species under the TSC Act. This species occupies a range of forested environments (including wet and dry sclerophyll forests), along eastern Australia (OEH 2016).

It forages from just above the tree canopy and will utilise open areas where it is known to forage at lower levels. This highly mobile species is capable of large regional movements in relation to seasonal differences in reproductive behaviour and winter hibernation. Though individuals often use numerous roosts, the species usually congregates in large numbers at a small number of nursery caves to breed and hibernate. Although roosting primarily occurs in caves, it has also been recorded in mines, culverts, stormwater channels, buildings, and occasionally tree-hollows. This species occupies a number of roosts within specific territorial ranges usually within 300 km of the maternity cave, and may travel large distances between roost sites (OEH 2016).

The Eastern Bentwing-bat is threatened by a number of processes including loss of foraging habitat, damage to or disturbance of roosting caves (particularly during winter or breeding), application of pesticides in or adjacent to foraging areas, and predation by feral cats and foxes.

***Vespadelus troughtoni* (Eastern Cave Bat)**

The Eastern Cave Bat is listed as Vulnerable under the TSC Act. It inhabits woodland and sclerophyll forest on the coast and the dividing range but extends into the drier forest of the western slopes and inland areas (OEH 2016). It has been found roosting in sandstone overhangs, caves, boulder piles, disused mine workings and occasionally in buildings (OEH 2016).

All three species were detected (on both songmeters) during the field survey.

Non-obligate Cave-roosting Bats

***Chalinolobus picatus* (Little Pied Bat)**

The Little Pied Bat occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and box woodlands. It roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. It can tolerate high temperatures and dryness but needs access to nearby open water (OEH 2016).

***Miniopterus australis* (Little Bentwing-bat)**

The Little Bentwing-bat occurs in moist eucalypt forest, wet and dry sclerophyll forest. Generally found in well-timbered areas. It roosts in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings. Males and juveniles disperse in summer. Only five nursery sites/maternity colonies are known in Australia (OEH 2016).

The Study area contains potential woodland foraging habitat, and sandstone escarpment cave roosting and potential nesting habitat for all three species

***Myotis macropus* (Southern Myotis)**

The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. This species generally roosts in groups of 10 to 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage (OEH 2016).

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005)has been completed to assess potential impacts of the proposed Modification to threatened cave roosting bats.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	Potential foraging habitat for these species may be impacted by the proposed Modification. All caves and clifflines that represent potential roosting habitat are located outside the Modifcation area. There is also a chance of direct mortality of roosting individuals from cave collapse. Subsidence may limit recruitment and decrease the local population size in the long-term as breeding habitat and caves are a limiting factor in the locality. There is also the possibility that habitat availability could remain stable as new roosting habitat is created from subsidence events. Indirect impacts such as increased artificial lighting may also interrupt these species and potentially affect breeding success in the Study area. The Eastern Bentwing-bat and Little Bentwing-bat breed in domed limestone caves outside the Modification area, as such their breeding cycle would not be affected. A maximum of approximately 3.4 ha of woodland and 4.5 ha of mixed native/exotic grassland potential foraging habitat would be cleared as a result of the proposed Modification. This habitat is marginal and highly disturbed, so is unlikely to provide important habitat for any of these species.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	A maximum of approximately 7.9 ha of potential foraging habitat (mixed native/exotic grassland and woodland) would be cleared as a result of the proposed Modification. This habitat is marginal and highly disturbed so is unlikely to provide important habitat for any of these species. Foraging habitat is widely distributed in the Study area, with sheltering habitat and potential breeding habitat occurring in more restricted areas, only on ridgelines in open forest.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of this species distribution.

Factor	Assessment
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would remove/impact approximately 7.9 ha of potential foraging habitat and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged hollows and bush rock to compensate for the loss of these habitat features.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for these species by OEH and approved by the Minister of the Environment.

***Pteropus poliocephalus* (Grey-headed Flying-fox)**

The Grey-headed Flying-fox utilises a wide variety of habitats (including disturbed areas) for foraging, and have been recorded as travelling long distances on feeding forays (Churchill 1998). Fruits and flowering plants of a wide variety of species are the main food source. The species roosts in large 'camps' of up to 200,000 individuals. Camps are usually formed close to water and along gullies however the species has been known to form camps in urban areas (OEH 2016).

Potential habitat for the Grey-headed Flying-fox to forage, or pass through, exists within the Modification area and adjacent areas.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	The surface disturbance conatins suitable habitat for foraging for the Grey-headed Flying-fox. The proposed surface disturbance area contains 3.4 ha of potential foraging habitat (woodland and tall shrubland habitat). Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon foraging resources within the Modification area. Given that similar habitat for these mobile species is available across the locality and the region, the small area of habitat loss from the proposed surface disturbance, the Modification is unlikely to affect the life cycles of viable local populations of these species such that they would be placed at risk of extinction.
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	Approximately 3.4 ha of potential foraging habitat would be removed by the proposed surface disturbance. Within the underground disturbance area, there are no foreseeable impacts from increased subsidence upon foraging resources within the Modification area. It is noted, however, that much larger areas of potential habitat will continue to exist within the underground disturbance area, as well as to the south, east and west of the Modification area.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of this species distribution.
How is the proposal likely to affect current disturbance regimes?	The proposed Modification would clear a maximum area of approximately 3.4 ha of woodland and would add to the current disturbance regimes. However, impacts would be managed including measures to retain salvaged stags and revegetate previously cleared areas to compensate for the loss of habitat features.

Factor	Assessment
	The vegetation removal impact is expected to be minimal as it is restricted to potential surface disturbance areas only. Large undisturbed areas of potential habitat would remain present in areas surrounding the proposed disturbance areas, including within the underground disturbance. These surrounding areas are expected to contain a higher density of suitable nesting, roosting and foraging for this highly mobile species. Consequently the proposed Modification would not place a viable local population of the species at risk of extinction. Increased light and noise from the proposed Modification are considered insignificant additions to increased noise and light already approved by the existing three mining operations in the locality.
How is the proposal likely to affect habitat connectivity?	The proposed disturbance area covers areas that have already been modified (from historical agricultural activity) or occur in very close proximity to existing mining activity. It would not affect the overall connectivity with a large connected patch of remnant vegetation occurring adjacent to the proposed surface disturbance areas, connecting it to wooded and forested areas to the south, east and west, including Wollemi National Park.
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

***Pseudomys oralis* (Hastings River Mouse)**

The Hastings River Mouse is listed as an Endangered species under both the TSC Act and the EPBC Act. The closest record of this species is less than 45 km north of the Modification area.

In NSW the distribution of the Hastings River Mouse spans the Great Dividing Range, north from Mt Royal in the Hunter Valley at elevations between 300 m and 1100 m. This species prefers dry open forest types with dense, low ground cover. Access to seepage zones, creeks and gullies is important, as is permanent shelter such as rocky outcrops. Nests may be in either gully areas or ridges and slopes. They eat seeds, leaves, insects and fungi (OEH 2016).

This species has not been recorded during the field survey or previously during assessments undertaken for WCPL approvals and/or ongoing monitoring. Potential habitat for this species exists within the Modification area in the form of sheltering, nesting and foraging habitat (creek and gullies) (OEH 2016).

Potential threats to this species include loss of habitat through clearing for agriculture, as well as reduced groundwater and stream flow as a result of clearing or canopy reduction (OEH 2016).

An assessment of impact criteria under the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI, 2005)has been completed to assess potential impacts to the Hastings River Mouse.

Factor	Assessment
How is the proposal likely to affect the lifecycle of a threatened species and/or population?	Any additional subsidence associated with the Modification is considered unlikely to affect the lifecycle of this species or cause a long-term decrease in the size of an important population of the species (if the species is present).
How is the proposal likely to affect the habitat of a threatened species, population or ecological community?	The Modification may impact upon only a small area of potential foraging and nesting habitat for the Hastings River Mouse. It is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.**

Factor	Assessment
	There would be no disturbance to groundcover or woody debris which provides habitat for this species.
Does the proposal affect any threatened species that are at the limit of its known distribution?	No, the Modification area is not at the known extent of the species distribution.
How is the proposal likely to affect current disturbance regimes?	Subsidence impacts are already approved within the Modification area and any additional subsidence associated with the Modification is not considered to have a significant impact on any local population of the species (if the species is present).
How is the proposal likely to affect habitat connectivity?	The Modification may impact upon only a small area of potential foraging and nesting habitat for the Hastings River Mouse. Due to the species being highly fecund and tolerant of disturbed regrowth areas, it is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.**
How is the proposal likely to affect critical habitat?	No critical habitat has been declared for this species by OEH and approved by the Minister of the Environment.

Appendix D – EPBC Act Significant Impact Guidelines

The EPBC Act administrative guidelines on significance set out **'Significant Impact Criteria'** that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance. Matters listed under the EPBC Act as being of national environmental significance include:

- Listed threatened species and ecological communities
- Listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World Heritage properties
- National Heritage places
- Nuclear actions

Specific **'Significant Impact Criteria'** are provided for each matter of national environmental significance except for threatened species and ecological communities in which case separate criteria are provided for species listed as endangered and vulnerable under the EPBC Act.

The following table assesses impacts on threatened fauna species against the relevant siginificant impact criteria. The relevant Significant Impact Criteria have been applied to the following species:

- *Litoria aurea* (Green and Golden Bell Frog)
- *Anthochaera phrygia* (Regent Honeyeater)
- *Lathamus discolour* (Swift Parrot)
- *Grantiella picta* (Painted Honeyeater)
- *Phascolarctos cinereus* (Koala)
- *Pseudomys novaehollandiae* (New Holland Mouse)
- *Nyctophilus corbeni* (Corben's eastern Long-eared Bat)
- *Chalinolobus dwyeri* (Large-eared Pied Bat)
- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Dasyurus maculatus maculatus* (Spotted-tailed Quoll [SE mainland population])
- *Petrogale penicillata* (Brush-tailed Rock-wallaby)
- *Pseudomys oralis* (Hastings River Mouse).

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
any impact on Commonwealth Listed Critically Endangered or Endangered Species; any impact on Commonwealth Listed threatened Species;	***Litoria aurea* (Green & Golden Bell Frog)** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The Modification may potentially impact foraging and sheltering habitat through potential surface cracking in ephemeral waterways and dams. Potential habitat with the Modification area is relatively minor in regards to potential habitat in the surrounding area, and no known population of GGBF is known to occur within the Modification area. Potential impacts from subsidence along creeklines, including additional ponding areas may create further potential habitat for the GGBF within the Modification area. Subsidence impacts are already approved within the Modification area and any additional subsidence associated with the Modification is considered unlikely to affect the lifecycle of this species or cause a long-term decrease in the size of an important population of the GGBF (if the species is present). **Criterion 2: reduce the area of occupancy of an important population** The Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The Modification may potentially impact foraging and sheltering habitat through potential surface cracking in ephemeral waterways and dams. Potential habitat with the Modification area is relatively minor in regards to potential habitat in the surrounding area, and no known population of GGBF is known to occur within the Modification area. The Modification is unlikely to adversely affect any habitat critical to the survival of this species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. No impacts would be expected within the available habitat, even if the species was determined to be present within the Modification area. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The Modification may potentially impact foraging and sheltering habitat through potential surface cracking in ephemeral waterways and dams. Potential habitat with the Modification area is relatively minor in regards to potential habitat in the surrounding area, and no known population of GGBF is known to occur within the Modification area. The Modification is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	Criterion 8: introduce disease that may cause the species to decline The Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere substantially with the recovery of the species** No current recovery plan exists for the Green and Golden Bell Frog. **Nomadic Nectarivorous Birds** ***Anthochaera phrygia* (Regent Honeyeater);** and ***Lathamus discolor* (Swift Parrot)** **An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification would only remove a small area of potential habitat in the form of a small cluster of nectar-bearing trees (0.6 ha in total, dominated by Forest Red Gum). Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The proposed Modification would only disturb potential foraging habitat for these species. Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the proposed Modification area, it is unlikely that the proposed Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. Due to the species being highly mobile it is unlikely to that disturbance to foraging habitat would disrupt the breeding cycle of an important population. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification may impact upon only a small area of potential foraging habitat for these species. Due to the species being highly mobile it is unlikely the development would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.**

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	Criterion 7: result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of an endangered species** The long-term objectives of the Regent Honeyeater Recovery Plan are to: ensure that the species persists in the wild; to achieve a down-listing from nationally endangered to vulnerable by stabilising the population decline and securing habitat extent and quality in the main areas of occupancy; and, to achieve increasing reporting rates (5% per annum) in areas previously used regularly. As no records of this species have been made within the subject site, and very limited suitable habitat is going to be removed, no impact is expected on any individuals or populations of Regent Honeyeater. It is therefore believed that the action proposed remains consistent with the objectives of the recovery plan for this species. The overall objectives of the Swift Parrot Recovery Plan are to: prevent further decline of the Swift Parrot population; and achieve a demonstrable sustained improvement in the quality and quantity of Swift Parrot habitat to increase carrying capacity. As no records of this species have been made within the subject site, and a very limited area of suitable is going to be removed, no impact is expected on any individuals or populations of Swift Parrot. It is therefore believed that the action proposed remains consistent with the objectives of the recovery plan for this species. ***Grantiella picta* (Painted Honeyeater)** **An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification area conatins suitable habitat for foraging, nesting and roosting habitat for the Painted Honeyeater. The proposed surface disturbance area contains 7.9 ha of potential foraging habitat (majority of which is mixed native/exotic grassland), of which 3.4 ha provides potential nesting and roosting habitat (woodland and tall shrubland habitat). Given that similar habitat for this mobile species is available across the locality and the region, and the small area of habitat loss from the proposed surface disturbance, it is unlikely the Modification will lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	Criterion 4: adversely affect habitat critical to the survival of a species The proposed Modification would disturb 7.9 ha of potential foraging habitat (majority of which is mixed native/exotic grassland), of which 3.4 ha provides potential nesting and roosting habitat (woodland and tall shrubland habitat). Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the proposed Modification area, it is unlikely that the proposed Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. Due to the species being highly mobile it is unlikely to that disturbance to foraging habitat would disrupt the breeding cycle of an important population. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification may impact upon only a small area of potential foraging habitat for these species. Due to the species being highly mobile it is unlikely the development would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** **Criterion 7: result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat** The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of an endangered species** No recovery objectives have been set for this species. ***Chalinolobus dwyeri* (Large-eared Pied Bat)** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification may disturb a very small area of woodland which would serve little foraging habitat potential. Subsidence may cause mortality of individuals if roost sites collapse, but this will be a very rare occurrence. Long-term loss of roosting sites is unlikely to occur as subsidence is likely to re-create roosting habitat at the same time as destroying areas of habitat. The loss of marginal foraging habitat or the chance loss of individual bats from roost site collapse is unlikely to lead to a long-term decrease in the size of an important population of the species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	Criterion 4: adversely affect habitat critical to the survival of a species The proposed Modification would only disturb a small area of potential foraging habitat for the Large-eared Pied Bat. Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the proposed Modification area, it is unlikely that the proposed Modification will affect habitat critical to the survival of a species. Long-term loss of roosting sites is unlikely to occur as subsidence is likely to re-create roosting habitat at the same time as destroying areas of habitat. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known within the Modification area. Due to the species being highly mobile it is unlikely that disturbance to foraging habitat would disrupt the breeding cycle of an important population of Large-eared Pied Bat. Collapse of potential maternal roost sites (breeding habitat) may occur as a result of subsidence, however this will be rare occurrence and is likely to occur randomly over small areas, the majority of suitable breeding habitat would remain unaffected by subsidence, therefore the breeding cycle of local populations would not be significantly impacted. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification would impact upon only a small area of very marginal potential foraging habitat for the Large-eared Pied Bat. The low suitability of this area for foraging habitat and the high mobility of this species would allow it to forage in optimal woodland habitat which would remain. Subsidence may cause mortality of individuals if roost sites collapse, but this would be a very rare occurrence. Long-term loss of roosting sites is unlikely to occur as subsidence is likely to re-create roosting habitat at the same time as destroying areas of habitat. It is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of a vulnerable species** A national recovery plan has been prepared for the Large-eared Pied Bat. The objective of the recovery plan is "to ensure the persistence of viable populations of the Large-eared Pied Bat throughout its geographic range". As no key populations have been identified in the area surrounding the proposed Modification area, the proposed action does not apply to the Modification. However, taking the precautionary principle and assuming the species is present and forms a key population, the area of woodland habitat disturbed, and areas of sporadic roost site disturbance that may occur as a result of the proposed Modification is still not likely to contribute significantly to the species habitat, therefore would not interfere with species recovery.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	***Nyctophilus corbeni* (Corben's Long-eared Bat])** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification may disturb a very small area of woodland which would serve little foraging or roosting habitat potential. Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The proposed Modification would only remove a small area of potential, but marginal foraging and roosting habitat for the Corben's Long-eared Bat. Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the proposed Modification area, it is unlikely that the proposed Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. Due to the species being highly mobile it is unlikely to that disturbance to foraging habitat would disrupt the breeding cycle of an important population of Corben's Long-eared Bat. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification would impact upon only a small area of potential foraging habitat for the Corben's Long-eared Bat. Due to the species being highly mobile it is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species.** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of a vulnerable species.** A national recovery plan is being prepared for the Corben's Long-eared Bat. The only relevant recovery action is "Identify key populations and protect these from habitat loss and fragmentation". As no important populations have been identified in the area surrounding the proposed Modification area, the proposed action does not apply to the Modification.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	***Pseudomys novaehollandiae* (New Holland Mouse)** A small burrowing native rodent that inhabits open heath lands and open woodlands with a shrubby (heath-like) understorey, the New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals (OEH 2016). **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification would remove some woodland vegetation, most notably shrubbery (foraging and sheltering habitat) from within the proposed surface disturbance area. The area of habitat would be insignificant compared to the volume of suitable foraging and sheltering habitat which would remain in the surrounding adjacent vegetation. Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The proposed Modification would only disturb potential foraging and sheltering habitat. Due to the availability and large expanse of more contiguous and suitable habitat surrounding the proposed surface disturbance area, it is unlikely that the proposed Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. It is unlikely that disturbance to foraging habitat would disrupt the breeding cycle of an important population of New Holland Mouse. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification may impact upon only a small area of potential foraging and breeding habitat for the New Holland Mouse. Due to the species being highly fecund and tolerant of disturbed regrowth areas, it is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species.** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of a vulnerable species.** No recovery objectives have been set for this species.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	***Pteropus poliocephalus* (Grey-headed Flying-fox)** **An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification would only remove a small area of potential habitat in the form of foraging habitat trees (3.4 ha in total). Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The proposed Modification would only disturb potential foraging habitat for these species. Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the proposed Modification area, it is unlikely that the proposed Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. Due to the species being highly mobile it is unlikely that disturbance to foraging habitat would disrupt the breeding cycle of an important population. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification may impact upon only a small area of potential foraging habitat for these species. Due to the species being highly mobile it is unlikely the development would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** **Criterion 7: result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat** The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of an endangered species** The proposed Modification will remove an area of potential foraging habitat that may be valuable to the Grey-headed Flying-fox to pass through, but it will be unlikely to interfere substantially with the overall recovery of the species.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	***Phascolarctos cinereus* (Koala)** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification would remove some woodland vegetation (foraging and sheltering habitat) from within the proposed Modification area. Individual specimens of Koala food-tree species may be removed during the development, although the numbers of trees would be insignificant compared to the volume of suitable foraging and sheltering habitat which would remain in the surrounding adjacent vegetation. Given this, the proposed Modification is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The proposed Modification would only disturb potential foraging habitat for the Koala. Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the proposed Modification area, it is unlikely that the proposed Modification would affect habitat critical to the survival of this species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. Due to the species being highly mobile it is unlikely that disturbance to foraging habitat would disrupt the breeding cycle of an important population of Koala. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification may impact upon only a small area of potential foraging habitat for the Koala. Due to its high dispersal capability across suitable habitat, it is unlikely the development would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The proposed Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species** The proposed Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of a vulnerable species** The overall objective of the NSW Koala recovery plan is to "…reverse the decline of the Koala in New South Wales, to ensure adequate protection, management and restoration of Koala habitat, and to maintain healthy breeding populations of Koalas throughout their current range".

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	No potential Koala habitat would be unnecessarily removed, and effort is being made to retain and restore potential Koala feed trees present in the locality through implementation of the Biodiversity Offset Strategy and Local Environmental Plan. As a result, the proposed action is consistent with the objectives of the recovery plan. ***Dasyurus maculatus* (Spotted-tailed Quoll)** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** The proposed Modification would disturb a small area of woodland as a result of vegetation clearing in the surface disturbance areas; this woodland would serve little foraging habitat potential. An extensive area of remnant habitat, suitable for foraging and nesting by the Spotted-tailed Quoll will remain unimpacted in the underground disturbance areas. Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The proposed Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The proposed Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The Modification would only disturb potential foraging and sheltering habitat for the Spotted-tailed Quoll. Due to the species being highly mobile and the availability of a large expanse of more contiguous and suitable habitat surrounding the Modification area, it is unlikely that the Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Study area. Due to the species being highly mobile it is unlikely to that disturbance to foraging habitat will disrupt the breeding cycle of an important population of Spotted-tailed Quoll. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The proposed Modification will impact upon only a small area of potential foraging and sheltering habitat for the Spotted-tailed Quoll. Due to the species being highly mobile it is unlikely the development will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species.** The Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere with the recovery of an endangered species.** No current recovery plan has been prepared for the Spotted-tailed Quoll.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	***Petrogale penicillata* (Brush-tailed Rock-Wallaby).** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** There would be no decrease in the habitat that is available for this species. Any habitat that may be impacted by subsidence is insignificant compared to the volume of suitable foraging and sheltering habitat which would remain in the surrounding adjacent vegetation. Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The Modification would only impact potential foraging and sheltering habitat. Due to the availability and large expanse of more contiguous and suitable habitat surrounding the Modification area, it is unlikely that the Modification will affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. It is unlikely that any potential disturbance to foraging and sheltering habitat would disrupt the breeding cycle of an important population of this species. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The Modification may impact upon only a small area of potential foraging and sheltering habitat for this species. It is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.** **Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat** The Modification would not result in any further increase in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline** The Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere substantially with the recovery of the species.** A national recovery plan has been prepared for the Brush-tailed Rock-wallaby (Menkorst & Hynes 2010). The objectives for recovery of the Brush-tailed Rock-wallaby are to: 1. Determine and manage threats to the Brush-tailed Rock-wallaby and its habitat. 2. Determine distribution, abundance, population trends and viability for the Brush-tailed Rock-wallaby. 3. Establish and maintain separate, viable captive populations derived from the Southern and Central Evolutionary Significant Units.

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	4. Undertake translocations to improve the genetic and demographic robustness of populations and to establish new colonies of Brush-tailed Rock-wallabies. 5. Investigate key aspects of Brush-tailed Rock-wallaby biology and ecology for conservation management. 6. Increase community awareness and support for Brush-tailed Rock-wallaby conservation. Taking the precautionary principle approach and assuming the species is present and forms a key population, the area of habitat disturbance that may occur as a result of the Modification is still not likely to contribute significantly to the species habitat and therefore would not interfere with species recovery. ***Pseudomys oralis* (Hastings River Mouse).** **An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:** **Criterion 1: lead to a long-term decrease in the size of an important population of a species** There would be no decrease in the habitat that is available for this species. Any habitat that may be impacted by subsidence is insignificant compared to the volume of suitable foraging and sheltering habitat which would remain in the surrounding adjacent vegetation. Given this, it is unlikely to lead to a long-term decrease in the size of an important population of a species. **Criterion 2: reduce the area of occupancy of an important population** The Modification would not reduce the area of occupancy of an important population. **Criterion 3: fragment an existing important population into two or more populations** The Modification would not fragment an existing important population into two or more populations. **Criterion 4: adversely affect habitat critical to the survival of a species** The Modification would only impact potential foraging and nesting habitat. Due to the availability and large expanse of more contiguous and suitable habitat surrounding the Modification area, it is unlikely that the Modification would affect habitat critical to the survival of a species. **Criterion 5: disrupt the breeding cycle of an important population** No important populations are known in the Modification area. It is unlikely that any potential disturbance to foraging habitat would disrupt the breeding cycle of an important population of the Hastings River Mouse. **Criterion 6: modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline** The Modification may impact upon only a small area of potential foraging and nesting habitat for the Hastings River Mouse. Due to the species being highly fecund and tolerant of disturbed regrowth areas, it is unlikely the development would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline**.**

Matters to be addressed	IMPACT (COMMONWEALTH LEGISLATION)
	Criterion 7: result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat The Modification would not result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat. **Criterion 8: introduce disease that may cause the species to decline** The Modification would not introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species. **Criterion 9: interfere substantially with the recovery of the species.** A national recovery plan has been prepared for the Hastings River Mouse (DECC 2005). The objective for recovery of the Hastings River Mouse is to recover the species to a position of viability in nature. In taking the precautionary principle approach and assuming the species is present and forms a key population, the area of habitat disturbance that may occur as a result of the Modification is still not likely to contribute significantly to the species habitat and therefore would not interfere with species recovery.
any environmental impact on Commonwealth Listed Migratory Species;	**Regent Honeyeater** (addressed above)